

CR *Ambystoma dumerilii* (Dugès, 1870)**Critically Endangered** B1ab(iii,v)+2ab(iii,v)**Order, Family:** Caudata, Ambystomatidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing**CITES:** Appendix II

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Geographic Range This species is known only from Lago Pátzcuaro in north-western Michoacan, Mexico, at 1,920m asl, and has not been recorded from other localities.

Population The species is believed to be in very serious decline, and might be close to extinction. Recent declines in the catch by local fishermen seem to indicate a severe population crash (information from 2003).

Habitat and Ecology This species does not metamorphose and lives permanently in water. It has a winter breeding season. No field studies of any other aspect of the ecology of the species have been conducted.

Major Threats The filling and pollution of the only lake that the species inhabits is the major threat to its survival. The lake is an important area for local fisheries. Predatory fish have been introduced into the lake, which might be a major problem for the species, although it has been able to co-exist with such species for a long time. The animals are harvested both for human consumption and for medicinal purposes (they are supposed to be a cure for respiratory problems).

Conservation Measures It does not occur in any protected area, and conservation of its remaining habitat is urgent. This species has been bred in captivity, and so captive animals could be a source of new individuals to repopulate natural habitats. Studies are needed to evaluate the sustainability of the current harvest, as well as the impacts of introduced predatory fishes. This latter information is particularly important since *A. dumerilii* is unique among aquatic ambystomatids in its apparent long-term coexistence with introduced largemouth bass (*Micropterus salmoides*) for the last 60 years. This species is protected under the category Pr (Special protection) by the Government of Mexico.

Notes on taxonomy: The taxonomic validity of this species is now well accepted (H.B. Shaffer pers. comm.).

Bibliography: Brandon, R.A. (1970), Brandon, R.A. (1972), Brandon, R.A. (1976), Brandon, R.A. (1992), Highton, R. (2000), Shaffer, H.B. (1984a), Shaffer, H.B. (1984b), Shaffer, H.B. and Lauder, G.V. (1985)

Data Providers: Brad Shaffer, Oscar Flores-Villela, Gabriela Parra-Olea, David Wake

CR *Ambystoma granulosum* Taylor, 1944**Critically Endangered** B1ab(iii)**Order, Family:** Caudata, Ambystomatidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

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Geographic Range This species is known only from a small area on the north-western periphery of Toluca city, central State of Mexico, Mexico, at 3,000m asl.

Population There is no information available on the population status of this species.

Habitat and Ecology This is a metamorphosing species spending most of its time on land in grassland habitat. It breeds in small pools and ponds, both artificial and natural.

Major Threats Introduced predatory fishes are the major threat to this species, but the habitat also has been heavily impacted due to extensive urban and agricultural expansion (leading to the desiccation and pollution of its breeding habitat).

Conservation Measures It does not occur in any protected area, and the conservation and restoration of its habitats is urgent. It might be possible to breed this species in captivity. A survey is urgently needed to determine the current status of this species. Protected under the category Pr (Special protection) by the Government of Mexico.

Notes on taxonomy: The species boundaries between this species and both *Ambystoma lermaense* and *A. rivularis* require further investigation. However, these three taxa are clearly differentiated from all other Mexican ambystomatids (H.B. Shaffer pers. comm.).

Bibliography: Shaffer, H.B. (1984a), Shaffer, H.B. (1984b)

Data Providers: Brad Shaffer, Oscar Flores-Villela, Gabriela Parra-Olea, David Wake

GRANULAR SALAMANDER**CR** *Ambystoma leorae* Taylor, 1943**Critically Endangered** B1ab(iii,v)+2ab(iii,v)**Order, Family:** Caudata, Ambystomatidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

Geographic Range This species is known only from around Río Frio town, in the State of Mexico close to the borderline with Puebla, in central Mexico, at around 3,000m asl. It has not been found at the type locality for over 30 years, since this area is extremely polluted from the town of Río Frio. However, in 1983 it was still found in three sites in small streams at 9 and 15km to the north-east of Río Frio.

Population Formerly relatively common, there appears not to have been any reports of this species for the last 20 years, probably because of the lack of herpetological work within its range.

Habitat and Ecology This species requires the presence of shallow water in streams and humid pine forest areas for breeding; one breeding site is in a stream next to a major road. It metamorphoses, but the adults stay in the water.

Major Threats The pollution and desiccation of the breeding streams in the vicinity of Río Frio town, as well as the clearance of pine forests (for grazing and other economic activities), are the major threats to this species. It is probably caught locally for food, and introduced predatory fish are also a threat.

Conservation Measures It occurs in the Parque Nacional Río Frio, but there is huge recreational disturbance in this protected area, including forest clearance. Forest and stream restoration, and the protection of key sites around Río Frio, are the key priorities. Captive breeding is very difficult for coldwater-adapted *Ambystoma* species, although it is possible, and should be considered. This species is protected under the category Pr (Special protection) by the Government of Mexico.

Notes on taxonomy: The species was previously included in the genus *Rhyacosiredon*. Based on unpublished allozyme and mtDNA sequence data, it is a well-defined taxon distinct from *Ambystoma (Rhyacosiredon) altimirani* (H.B. Shaffer pers. comm.).

Bibliography: Reilly, S.M. and Brandon, R.A. (1994), Shaffer, H.B. (1984a), Shaffer, H.B. (1984b), Shaffer, H.B. and Lauder, G.V. (1985)

Data Providers: Brad Shaffer, Gabriela Parra-Olea, David Wake

LEORA'S STREAM SALAMANDER**CR** *Ambystoma lermaense* Taylor, 1940 (1939)**Critically Endangered** B1ab(iii,v)+2ab(iii,v)**Order, Family:** Caudata, Ambystomatidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

Geographic Range This species is only recorded in the central highlands of the State of Mexico, near the city of Toluca, in the Río Lerma and the Lerma Lake, and around Almolya, at 2,800-3,000m asl. It is possible that this taxon is more widespread than current records indicate, but more work is needed to confirm this.

Population While believed to be extinct in Lerma Lake, there is no recent information on the populations around Almolya, and the species might persist in wetlands in the general area.

Habitat and Ecology It is a variable species, with individuals capable of reaching sexual maturity either in the metamorphosed or larval stage. Metamorphosed individuals spend most of the time on land in grassland habitat. It breeds in streams, lakes and moderately deep-water reservoirs.

Major Threats The extremely high degree of pollution of the rivers and pools where this species breeds has contributed to its decline. There is also a serious problem of habitat loss due to urban

expansion. In addition, animals have been captured for food consumption, while introduced predatory fish might also be a threat.

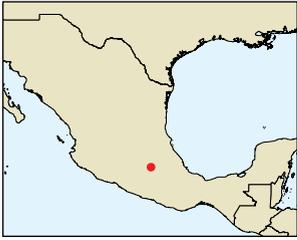
Conservation Measures Further survey work is required to determine the current population status of this species in the wild, before implementing the appropriate conservation and restoration measures, which might include captive breeding. This species is protected under the category Pr (Special protection) by the Government of Mexico.

Notes on taxonomy: Additional work differentiating this species from nearby populations of *Ambystoma velasci* is needed (Shaffer and McKnight 1996).

Bibliography: Aguilar-Miguel, X., Casas-Andreu, G. and Pineda-Arredondo, E. (2002), Shaffer, H.B. (1984a), Shaffer, H.B. (1984b), Shaffer, H.B. and McKnight, M.L. (1996)

Data Providers: Brad Shaffer, Gabriela Parra-Olea, David Wake

LAKE LERMA SALAMANDER

CR *Ambystoma mexicanum* (Shaw, 1789)**Critically Endangered B2ab(iii,v)****Order, Family:** Caudata, Ambystomatidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing**CITES:** Appendix II

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Geographic Range This species is known only from central Mexico, on the southern edge of Mexico City, in canals and wetlands in the general vicinity of Xochimilco (including outside the Xochimilco city limits, around the Chalco wetland). The animals are not homogeneously distributed through their range, and congregate in particular places. Records from close to downtown Mexico City in the Chapultepec Lake could refer to either this species or *Ambystoma velasci*, and require confirmation. It was originally found in Lakes Xochimilco and Chalco (and presumably in the connecting lakes Texcoco and Zumpango), but it has disappeared from most of its range.

Population The surviving wild population is very small. Although populations are difficult to assess, recent surveys covering almost all of its known distribution range have usually captured fewer than 100 individuals (e.g., during 2002 and 2003, more than 1,800 net casts were made along Xochimilco canals covering 39,173m² and this resulted in a catch of only 42 specimens). A recent scientific survey revealed no Axolotls, although wild-caught animals are still found in the local market, which indicates that fishermen still know where to find them. There has not been a density study of the Chalco population, but evidence suggests that the population there is small and, furthermore, Chalco is a highly unstable system that runs the risk of disappearing in the near future.

Habitat and Ecology This species is native to the ancient system of water channels and lakes in Mexico City. It requires deep-water lakes (both natural and artificial canals) with abundant aquatic vegetation. Structures such as plants are needed to lay eggs. It is a paedomorphic species, living permanently in water, and does not undergo complete metamorphosis.

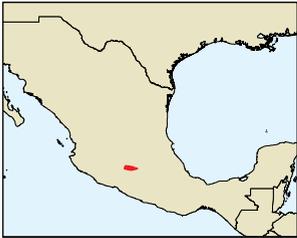
Major Threats The desiccation and pollution of the canal system and lakes in Xochimilco and Chalco, as a result of urbanization, as well as the traditional consumption of the species by local people, is threatening the survival of this species. It is also captured for medicinal purposes. The harvesting is targeted at animals that are less than one year old. It was formerly also captured for the international pet trade, although probably all animals in the international trade are now of captive origin. Introduced fishes (tilapia and carp) have increased to high abundances (a recent study collected 600kg of tilapia in one small channel using a 100m net) and have also impacted axolotls through competition and predation. The animals are also being affected by disease, probably spread by invasive species, and as a result of poor water quality. Although the water regime has changed in the last 10 years, and it is reported that pollution levels are decreasing, factors such as very high levels of bacterial contamination could still pose a serious threat.

Conservation Measures Conservation action is focusing on raising the profile of Lake Xochimilco through conservation education and a nature tourism initiative, coupled with work on habitat restoration and bioremediation. A species action plan has been drafted. There are several captive colonies around the world, since the species is used in physiological and biomedical research, as well as in the pet trade, but the re-introduction of captive-bred axolotls is not recommended until threats can be mitigated, and disease and genetic risks to the wild populations assessed. This species is protected under the category Pr (Special protection) by the Government of Mexico and is in process of being amended to a higher risk category. Although this species is currently on CITES Appendix II, it is currently under the process of "Periodic Review of species included in CITES Appendices".

Notes on taxonomy: The taxonomic validity of this species is confirmed, on the basis of morphology, allozymes, and mtDNA (H.B. Shaffer pers. comm.).

Bibliography: Armstrong, J.B. and Malacinski, G.M. (1989), Brandon, R.A. (1972), Brandon, R.A. (1989), Graue, V. (1998), Griffiths, H.I. and Thomas, D.H. (1998), Griffiths, R.A. *et al.* (2004), Griffiths, R.A., Graue, V. and Bride, I.G. (2003), Highton, R. (2000), Jones, C. (2002), McKay, J.E. (2003), Shaffer, H.B. (1984a), Shaffer, H.B. (1984b), Shaffer, H.B. (1989), Shaffer, H.B. (1993), Shaffer, H.B. and Lauder, G.V. (1985), Smith, H.B. (1989a), Smith, H.B. (1989b), Vergara, G. (1990), Zambrano, L., Reynoso, V.H. and Herrera, G. (2004)

Data Providers: Luis Zambrano, Paola Mosig Reidl, Jeanne McKay, Richard Griffiths, Brad Shaffer, Oscar Flores-Villela, Gabriela Parra-Olea, David Wake

AXOLOTL**EN** *Ambystoma ordinarium* Taylor, 1940 (1939)**Endangered B1ab(iii)+2ab(iii)****Order, Family:** Caudata, Ambystomatidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

Geographic Range This species occurs in the north-eastern parts of the state of Michoacan, from Morelia to the south and east to El Mirador and nearby localities, Mexico, at altitudes above 2,200m asl.

Population Although confined to a small area, in 1999 it was found to be abundant in several localities, with many populations appearing to be stable.

Habitat and Ecology It inhabits streams in pastureland, as well as in forests, so it appears not to be forest-dependent. They appear to favour clear water, but they have been found in very cloudy water, and behind small dams constructed for livestock. Most individuals do not metamorphose, but local people report that some do. Most of the animals spend most of their time in streams, where they can be found all year long. Those individuals that do metamorphose probably spend most of their time on land in pine and fir forests.

Major Threats Major threats to this species include habitat loss and degradation, due to smallholder farming, infrastructure development, and groundwater extraction (resulting in desiccation of its breeding streams), and pollution. Introduced predatory fishes might also be a problem.

Conservation Measures It occurs in Bosencheve National Park. There is a need for forest restoration surrounding the city of Morelia and in the vicinity of Patzcuaro. This species is protected by Mexican law under the "Special Protection" category (Pr).

Notes on taxonomy: Based on allozymes and mtDNA, this is one of the most distinct species of Mexican ambystomatids. It might represent a species complex (H.B. Shaffer pers. comm.).

Bibliography: Alavardo-Diaz, J., Garcia-Garrido, P. and Suazo-Ortuno, I. (2003), Anderson, J.D. (1975), Highton, R. (2000), Lauder, G.V. and Shaffer, H.B. (1985), Shaffer, H.B. (1984a), Shaffer, H.B. (1984b), Shaffer, H.B. and Lauder, G.V. (1985), Shaffer, H.B. and McKnight, M.L. (1996)

Data Providers: Brad Shaffer, Oscar Flores-Villela, Gabriela Parra-Olea, David Wake

MICHOACAN STREAM SALAMANDER**CR** *Ambystoma taylori* Brandon, Maruska and Rumph, 1981**Critically Endangered B1ab(iii,v)+2ab(iii,v)****Order, Family:** Caudata, Ambystomatidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

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Geographic Range This species is endemic to Laguna Alchichica, a saline crater lake in eastern Puebla, eastern-central Mexico, at 2,290m asl.

Population It is a rare species, having formerly been quite common. However, it has been seen recently by divers deep in Laguna Alchichica.

Habitat and Ecology It usually does not metamorphose, and most individuals live permanently in water. It breeds in the lake, and is usually found in very deep water, often more than 30m below the surface.

Major Threats The most serious threat is water extraction and diversion, leading to the lake becoming even more saline; the water level has dropped many metres over the last two decades. Continued transformation and pollution of the lake will result in the disappearance of this species. Attempts to introduce fish in the lake have failed because it is too saline.

Conservation Measures It does not occur in any protected area, and the protection of the Alchichica lake is an urgent priority. In addition, consideration should be given to establishing a captive-breeding programme. This species is protected under the category Pr (Special protection) by the Government of Mexico.

Notes on taxonomy: Based on both allozymes and mtDNA, this is a very distinctive salamander (H.B. Shaffer pers. comm.). The *Ambystoma* salamanders occurring in other natural lakes around Alchichica are not closely related to this species.

Bibliography: Brandon, R.A., Maruska, E.J. and Rumph, W.T. (1982), Camarillo-R, J.L. (1998), Dyer, W.G. (1984), Highton, R. (2000), Santinelli-Ramos, M.A. (1995), Shaffer, H.B. (1984a), Shaffer, H.B. (1984b), Shaffer, H.B. and Lauder, G.V. (1985), Shaffer, H.B. and McKnight, M.L. (1996)

Data Providers: Brad Shaffer, Gabriela Parra-Olea, David Wake

TAYLOR'S SALAMANDER

CRYPTOBRANCHIDAE

CR *Andrias davidianus* (Blanchard, 1871)**Critically Endangered A2ad**

Order, Family: Caudata, Cryptobranchidae
Country Distribution: China
Current Population Trend: Decreasing
CITES: Appendix I



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Geographic Range The largest of all amphibian species (sometimes growing to more than one metre in length) this species is widespread in central, south-western and southern China, although its range is now very fragmented. It occurs

from 100-1,500m asl. Records of the species in Taiwan, Province of China, might be the result of introductions.

Population This species was once reasonably common but has declined catastrophically over the last 30 years, principally due to over-exploitation, and it is now very rare, with few surviving populations known.

Habitat and Ecology It lives and breeds in large hill streams, usually in forested areas. Females lay approximately 500 eggs in a string in an underwater burrow or cavity that is occupied by a male. Eggs are fertilized externally and are guarded by the male until they hatch after 50-60 days. Larvae then develop in the streams, taking food after about 30 days (Haker 1997).

Major Threats Commercial over-exploitation for human consumption is the main threat to this species. It has also suffered from habitat destruction (e.g., from the construction of dams) and habitat degradation (e.g., water pollution from mines). Although there is commercial farming of this species, the vast majority of Chinese Giant Salamanders being traded are believed to originate from the wild.

Conservation Measures In China, this species is listed as a Class II state major protected wildlife species. It occurs, or at least used to occur, in many nature reserves within its range, and some nature reserves even use the species as their main conservation target, such as Zhangjiajie Giant Salamander Nature Reserve. Captive rearing of animals has achieved some success, but these projects are mainly to meet the market demand. It is not clear whether or not animals are actually being bred in captivity.

Notes on taxonomy: This species is sometimes assigned to the genus *Cryptobranchium*.

Bibliography: Fei, L. *et al.* (1999), Haker, J. (1997), MacKinnon, J. *et al.* (1996), Qu, W.-Y. (2000), Wang, P. (2000), Wang, X.-M. *et al.* (2004), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993), Zhang, K.-J. *et al.* (2002), Zhao, E.-M. (1998)

Data Providers: Liang Gang, Geng Baorong, Zhao Ermi

CHINESE GIANT SALAMANDER

HYNOBIIDAE

EN *Batrachuperus cochrae* Liu, 1950**Endangered B2ab(iii)**

Order, Family: Caudata, Hynobiidae
Country Distribution: China
Current Population Trend: Decreasing



Geographic Range This species is known only from Baoxian and Xiaojin Counties of Sichuan Province, China, where it has been found at elevations of 3,500-3,900m asl.

Population The current population status of this species is not known.

Habitat and Ecology It is a totally aquatic salamander found in montane forest streams, and is thought to be quite sensitive to disturbance of its habitat. The breeding biology is unknown, though it is presumably by larval development in streams.

Major Threats The major threats include clear-cutting of forest habitat, and harvesting for traditional Chinese medicine.

Conservation Measures It may occur in the Siguliangshan and Fengtongzhai Nature Reserves, but further studies are needed to confirm this and to better understand the current population status of the species. There is a need to ensure that the offtake of this species from the wild is managed sustainably.

Notes on taxonomy: This species was recently revived from *Batrachuperus pinchonii* by Fei and Ye (2001).

Bibliography: Fei, L. and Ye, C.Y. (2001), Liu, C.C. (1950)

Data Providers: Xie Feng

CR *Batrachuperus gorganensis* Clergue-Gazeau and Thorn, 1979**Critically Endangered B1ab(iii)+2ab(iii)**

Order, Family: Caudata, Hynobiidae
Country Distribution: Iran
Current Population Trend: Decreasing



Geographic Range This species is endemic to the Shir-Abad Cave and the stream flowing from it, 60km east of Gorgan (36° 57'N; 55° 01' E), in the eastern part of the Elburz Mountains, Golestan Province, northern Iran. The cave is at an elevation of 310m asl.

Population There are estimated to be about 100 breeding adults within its extremely localized range.

Habitat and Ecology It is an almost fully aquatic species. The adults are only known from a single pool in the cave that measures 100m by 10m at its widest point. The larvae of the species are only found outside the cave in the stream flowing from it. Its breeding biology is not well known, but eggs are deposited by the female and fertilized by the male. The forest surrounding the cave and stream is a temperate rainforest type (Hyrcanian forest).

Major Threats The Shir-Abad Cave is now significantly impacted by the activities of people visiting the cave (N. Rastegar-Pouyani pers. comm.). However, the forest surrounding both the cave and stream

does not appear to have been logged, since the area is generally considered to be too rugged for development.

Conservation Measures Nearly all the Hyrcanian forests of Iran are conserved within protected areas, including the range of this species (N. Rastegar-Pouyani pers. comm.). Shir-Abad Cave and the surrounding area was designated a Natural National Place by the Department of Environment of Gorgan and Gonbad-e-Kavous in 1998.

Notes on taxonomy: Some workers have suggested that *Batrachuperus gorganensis* might be conspecific with *Batrachuperus persicus* (Stöck 1999).

Bibliography: Baloutchi, M. and Kami, H.G. (1995), Kami, H.G. (1999), Stöck, M. (1999), Thorn, R. (1968)

Data Providers: Theodore Papenfuss, Steven Anderson, Nasrullah Rastegar-Pouyani, Sergius Kuzmin

VU *Batrachuperus karlschmidti* Liu, 1925**Vulnerable B1ab(iii)**

Order, Family: Caudata, Hynobiidae
Country Distribution: China
Current Population Trend: Decreasing



Geographic Range This species is known with certainty from Xinduqiao County, Sichuan Province, China. A second population from Zhendoushan might belong to this species. In general, this species might be more widespread, but further investigation is needed to confirm the identity of populations other than the Xinduqiao County population reported by Fu *et al.* (2001). It can be found at elevations of 1,800 to around 4,000m asl.

Population This species is common within its restricted range.

Habitat and Ecology This is a largely aquatic species associated with slow-flowing streams in grassland areas. Animals can occasionally be found on the stream bank. The female lays a pair of egg sacs and attaches these below stones in the stream. It is unlikely to be adaptable to habitat modification.

Major Threats The species is threatened by overgrazing of habitat by livestock (presumably the vegetation surrounding streams), and the local use of the species for traditional medicine.

Conservation Measures It is not known from any protected areas. There is a need to implement measures to ensure that the offtake of this species from the wild is managed in a sustainable manner.

Bibliography: Fu, J. *et al.* (2001), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993), Zhao, E. *et al.* (1988), Zhao, E.-M. and Adler, K. (1993)

Data Providers: Xie Feng

EN *Batrachuperus londongensis* Liu and Tian, 1978**Endangered B1ab(iii,v)****Order, Family:** Caudata, Hynobiidae**Country Distribution:** China**Current Population Trend:** Decreasing

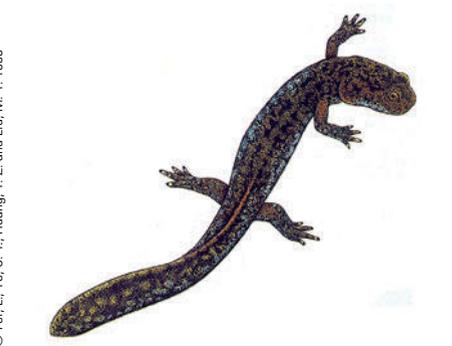
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**Geographic Range** This species is only known from the Longdong River, Mount Emei, in Sichuan Province, China, from 1,300-1,800m asl. However, it might occur a little more widely.**Population** There is no information on the current population status of this species.**Habitat and Ecology** It inhabits the lower section of rivers and springs in forested areas and requires cool water for breeding and stones for the eggs to adhere to. Breeding is not possible in disturbed habitats.**Major Threats** Over-collecting for traditional Chinese medicine and food is a major threat to this species. In the past, stones were collected from the riverbed as construction materials, which impacted on the species' breeding success (although this is now controlled).**Conservation Measures** The only known locality is within a protected scenic site, Emeishan Mountain Nature and Historical Heritage Site. There remains a need to monitor and control levels of offtake of this species from the wild.**Notes on taxonomy:** Inger *et al.* (1990) regarded this taxon as a junior synonymy of *Batrachuperus pinchonii*. It was removed from the synonymy of *B. pinchonii* by Ye, Fei and Hu (1993).**Bibliography:** Fei, L. *et al.* (1999), Fu, J. *et al.* (2001), Inger, R.F. *et al.* (1990), Liu, C.-C. *et al.* (1978), MacKinnon, J. *et al.* (1996), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993), Zhao, E.-M. and Adler, K. (1993)**Data Providers:** Wu Guanfu, Xie Feng**LONGDONG STREAM SALAMANDER****CR** *Batrachuperus mustersi* Smith, 1940**Critically Endangered B2ab(iii)****Order, Family:** Caudata, Hynobiidae**Country Distribution:** Afghanistan**Current Population Trend:** Decreasing

© Max Sparreboom

**Geographic Range** This species is known from the three tributaries of the Paghman stream drainage approximately 4km above the town of Paghman in the Hindu Kush of Kabul Province, Afghanistan. The stream is about 4km in length and is fed by melting glaciers; the mid-point in the stream is at 34° 36' N; 68° 55' E. The salamanders are found at an altitude of 2,440-3,750m asl.**Population** Although the species was previously reported to be common between 2,750 and 3,050m asl, it now appears to be uncommon in the lower elevations of this range. The population is estimated to contain 1,000-2,000 adults.**Habitat and Ecology** This species is fully aquatic and only occurs within cold fast-flowing waters of the Paghman stream drainage. In drier years animals are restricted to the more constant environments of the three tributary sources. Adults are found under flat rocks, crawling through submerged talus or feeding in the stream bed; larvae are usually found in deeper pools than the adults, out of the main flow of the current shaded by vegetation, or under beds of submerged vegetation. The eggs of this species are attached to the underside of rocks in the stream; between 15 and 25 eggs have been found in single egg cases, although the total number of cases deposited by females is not known. The vegetation surrounding the stream in which the salamanders occur is arid scrub without trees. This species is very sensitive to habitat disturbance.**Major Threats** There is some evidence to suggest that there has been a constriction in range and a decline in population, probably caused by irrigated cultivation close to the streams thereby reducing stream flow. Additionally, grazing by livestock has removed stream edge vegetation causing an increase in temperature in the streams (high water temperature might be an important factor limiting their local distribution). The habitat is also impacted by the physical disturbance of pedestrian and livestock traffic in and along the stream. The impact of the recent war in Afghanistan on this species remains to be determined (S. Kuzmin pers. comm.). A potential threat is the damming of the stream to provide a water source for the city of Kabul (T. Papenfuss pers. comm.).**Conservation Measures** Not known to occur in any protected areas, this species will be a priority for survey work as soon as the situation in Afghanistan permits.**Bibliography:** Leviton, A.E. and Anderson, S.C. (1970), Mertens, R. (1970b), Nawabi, S. (1965), Reilly, S.M. (1983), Smith, M.A. (1940a), Thorn, R. (1968)**Data Providers:** Theodore Papenfuss, Steven Anderson, Sergius Kuzmin**VU** *Batrachuperus pinchonii* (David, 1872)**Vulnerable A2ad****Order, Family:** Caudata, Hynobiidae**Country Distribution:** China**Current Population Trend:** Decreasing

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**Geographic Range** This species is found in western Sichuan and north-western Yunnan provinces in China. It was previously found in south-eastern Guizhou, China, but it has not been seen there for over 60 years. It was previously thought to be in southern Shaanxi, but this is now considered a distinct species. It has been recorded from 1,500-3,900m asl.**Population** This species is common within its range, but it has declined significantly in recent years due to over-harvesting.**Habitat and Ecology** It is an inhabitant of high-altitude streams and lakes, and also the surrounding forests (broadleaf and coniferous), and sometimes occurs in marshy grassland. Breeding occurs in the streams and lakes.**Major Threats** Over-collecting for traditional Chinese medicine and for food is a major threat to this species; harvesting methods include poisoning and electrocution. There are also reports of a recent outbreak of disease. Water pollution from mining is also a threat.**Conservation Measures** Most of the range of this species falls within several protected areas. There is a need to implement measures to ensure that the offtake of this species from the wild is managed sustainably. Further research is needed to determine the impact of the recent disease outbreak.**Bibliography:** Fei, L. *et al.* (1999), Inger, R.F. *et al.* (1990), MacKinnon, J. *et al.* (1996), Vredenburg, V., Wang, Y. and Fellers, G. (2000), Wu, L., Dong, Q. and Xu, R.-H. (1987), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993)**STREAM SALAMANDER****VU** *Batrachuperus tibetanus* Schmidt, 1925**Vulnerable A2ad****Order, Family:** Caudata, Hynobiidae**Country Distribution:** China**Current Population Trend:** Decreasing

© Jiang Jianping

**Geographic Range** This species is found in central China from 1,500-4,250m asl.**Population** An observed population decline has resulted in the species becoming increasingly difficult to find in several of its past strongholds.**Habitat and Ecology** It lives and breeds in streams and seepages in high mountains or plateaux. Some populations hibernate on land in winter. This species has a low reproductive rate.**Major Threats** Over-collecting for traditional Chinese medicine and food is a major threat to this species. Habitat loss, and water pollution resulting from mining activities, are also threats.**Conservation Measures** Part of the range of this species falls within protected areas. There is a need to implement measures to ensure that the offtake of this species from the wild is managed sustainably.**Notes on taxonomy:** Ye, Fei and Hu (1993) stated that the distinguishing features between *Batrachuperus tibetanus* and *B. karlschmidti* (colouration and the number of gill filaments) are quite variable and that the two taxa should be synonymized. Fu *et al.* (2001) confirmed the distinctiveness of *B. karlschmidti*, and suggested, on the basis of molecular evidence, that the nominal *B. tibetanus* comprises four species, three of which are undescribed.**Bibliography:** Fei, L. *et al.* (1999), Fu, J. *et al.* (2001), MacKinnon, J. *et al.* (1996), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993)**Data Providers:** Li Cheng, Wang Yuezhao**ALPINE STREAM SALAMANDER**

VU *Batrachuperus yenyuanensis* Liu, 1950

Vulnerable B1ab(iii,v)+2ab(iii,v)
Order, Family: Caudata, Hynobiidae
Country Distribution: China
Current Population Trend: Decreasing

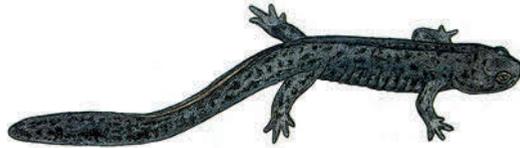


© Fei, L., Ye, C.-Y., Huang, Y.-Z. and Liu, M.-Y., 1999

Geographic Range This species is known from south-western Sichuan Province (Yanyuan, Xichang, Mianning, and Puxiong counties) in China, from 2,900-4,400m asl.

Population This species is uncommon and the population is believed to be small.

Habitat and Ecology It lives and breeds in streams and lakes surrounded by dense vegetation.



YENYUAN STREAM SALAMANDER

Major Threats Over-collecting for traditional Chinese medicine and food is a major threat to this species.

Conservation Measures Part of the species' range is within Luojishan Nature Reserve. There is a need to implement measures to ensure that the offtake of this species from the wild is managed sustainably.

Bibliography: Fei, L. *et al.* (1999), MacKinnon, J. *et al.* (1996), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993)

Data Providers: Wu Guanfu, Fei Liang

CR *Hynobius abei* Sato, 1934

Critically Endangered B2ab(ii,iii,iv)
Order, Family: Caudata, Hynobiidae
Country Distribution: Japan
Current Population Trend: Decreasing



Geographic Range This species is endemic to Japan, occurring in central Honshu, and known only from several localities on the Tango Peninsula, the Tajima region of Hyogo, and the northern part of Fukui.

Population All populations of this species are known to be small.
Habitat and Ecology It occurs in secondary broad-leaved evergreen and deciduous forest, and bamboo forest. It breeds in pools, ditches and springs and the larvae develop in these waterbodies.

Major Threats The species' habitat is steadily becoming unsuitable for survival. In one case, construction of a road destroyed the habitat of a population and resulted in its extirpation. It is currently illegally traded in Japan as a pet.

Conservation Measures One site with suitable habitat in Hidaka Town, Hyogo Prefecture, was designated in November 1998 as a protected area. Designated as a "domestic endangered species of wild fauna and flora" under the Law for Conservation of Endangered

Species of Wild Fauna and Flora. In Kyoto, the species is totally protected as a 'natural monument'.

Bibliography: Matsui, M. (2000a), Sengoku, S. *et al.* (1996)

Data Providers: Yoshio Kaneko, Masafumi Matsui

ABE'S SALAMANDER

CR *Hynobius amjiensis* Gu, 1992

Critically Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Hynobiidae
Country Distribution: China
Current Population Trend: Decreasing

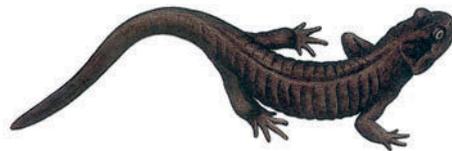


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Geographic Range This species is known only from five small pools at the top of Mount Longwangshan, in the small Longwangshan Nature Reserve, Anji county, north-western Zhejiang, China, at about 1,300m asl.

Population This species is considered rare and the population is believed to comprise only 250-300 breeding females.

Habitat and Ecology Breeding takes place only in the five small



pools, with the breeding season running from end November to mid-March, which is the only time that adults can be found. Each female deposits 140-174 eggs, and the larvae develop in the pools; larvae take three years to reach sexual maturity.

Major Threats The very small range and very limited number of breeding sites makes this species especially susceptible to habitat alteration, which is increasingly a problem due to the growing threat of human disturbance at the site, especially from tourist activities.

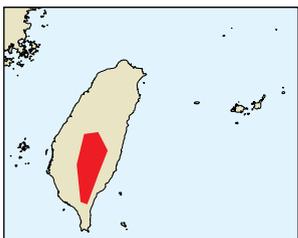
Conservation Measures Although the species is present in the small Longwangshan Nature Reserve, stricter management of the breeding sites is needed. A captive-breeding programme should also be established.

Bibliography: Gu, H. *et al.* (1999), Gu, H.Q. (1992), MacKinnon, J. *et al.* (1996), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993), Zhao, E.-M. (1998)

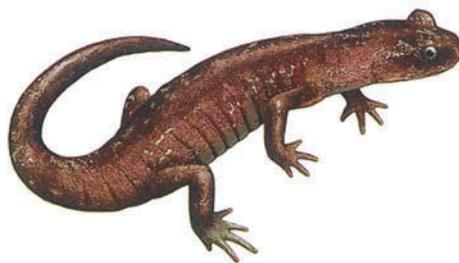
Data Providers: Gu Huiqing, Michael Wai Neng Lau

VU *Hynobius arisanensis* Maki, 1922

Vulnerable B1ab(iii)+2ab(iii)
Order, Family: Caudata, Hynobiidae
Country Distribution: Taiwan, Province of China
Current Population Trend: Decreasing



© Fei, L., Ye, C.-Y., Huang, Y.-Z. and Liu, M.-Y., 1999



Geographic Range This species is restricted to Ali Shan, Yu Shan, and Pei Ta Wu Shan in Taiwan, Province of China. It occurs above 1,800m asl.

Population This species is considered to be very rare.

Habitat and Ecology It inhabits primary conifer forests and broadleaf forests close to streams. It probably breeds in streams, and the larvae most likely develop in streams.

Major Threats The major threat to this species is habitat destruction and degradation, due in particular to infrastructure development for tourism.

Conservation Measures The species is protected within Yu-san National Park and the Tawushan Nature Preserve.

Bibliography: Lue, K.-Y., Tu, M.-C. and Hsiang, G. (1999), MacKinnon, J. *et al.* (1996), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993)

Data Providers: Lue Kuangyang, Chou Wenhao

VU *Hynobius boulengeri* (Thompson, 1912)

Vulnerable B1ab(iii)
Order, Family: Caudata, Hynobiidae
Country Distribution: Japan
Current Population Trend: Decreasing



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Geographic Range This species is endemic to Japan, and is distributed in the Kinki district of Honshu, Shikoku, and the Sobo area of Kyushu.

Population The populations of Kyushu and Honshu are declining, but it seems that the population of Shikoku is abundant and stable.

Habitat and Ecology It occurs in broad-leaved deciduous forest, broad-leaved evergreen forest, and mixed forest. It breeds in montane streams, where the larvae develop.

Major Threats In Honshu and Kyushu, the major threat is habitat loss due to the construction of roads and dams, and logging. This species is also common in the pet trade.

Conservation Measures It is protected in Nara Prefecture, Oita Prefecture, and Mie Prefecture as a natural monument.

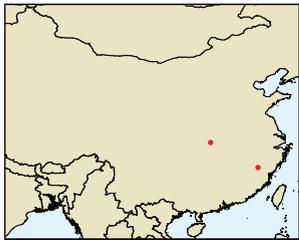
Notes on taxonomy: Nishikawa *et al.* (2001) demonstrate that the populations on Honshu, Shikoku, and Kyushu belong to three separate species, but the formal naming of the populations on Shikoku and Kyushu is pending. *Hynobius boulengeri* is here provisionally treated as a single species.

Bibliography: Matsui, M. (2000f), Nishikawa, K. *et al.* (2001), Nishikawa, K., Matsui, M. and Tanabe, S. (2005), Sengoku, S. *et al.* (1996)

Data Providers: Yoshio Kaneko, Masafumi Matsui

ODAIGAHARA SALAMANDER**EN** *Hynobius chinensis* Günther, 1889

Endangered B2ab(iii)
Order, Family: Caudata, Hynobiidae
Country Distribution: China
Current Population Trend: Decreasing



© Max Sparreboom



Geographic Range This species is known from Hubei Province (the city of Yichang) and Fujian Province (at Chonggan), China. There have been no records from the type locality in Hubei Province for the last 70 years. Records from Zhejiang Province refer to *H. yiwuensis*. It ranges up to 1,400m asl, and probably occurs more widely than current records suggest.

Population It is generally considered rare, although outside the breeding season they are difficult to find. Populations at several localities are believed to be declining.

Habitat and Ecology It inhabits forests and arable fields in hilly areas. It breeds in pools and small streams where the larvae also develop.

Major Threats The major threat is habitat destruction and degradation, in particular due to infrastructure development for human settlement.

Conservation Measures This species has been recorded from the Wuyishan National Nature Reserve, Fujian Province.

Notes on taxonomy: The population currently allocated to *Hynobius chinensis* from Fujian Province, China, might represent a new species. We retain the Fujian population in *H. chinensis* until further taxonomic studies are undertaken. We consider *H. yiwuensis* (Cai, 1985) to be a valid species separate from *H. chinensis* following Fei, Ye and Huang (1990) and Fu *et al.* (2003).

Bibliography: Fu, J.Z. *et al.* (2003), Huang, M.-H., Cai, C.-M., Jin, Y.-L., Gu, H.-Q., Zhang, S.-D., *et al.* (1990), MacKinnon, J. *et al.* (1996), Pope, C.H. (1931), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993), Zhao, E.-M. (1998), Zhao, E.-M. and Adler, K. (1993)

Data Providers: Gu Huiqing, Geng Baorong, Xie Feng

EN *Hynobius dunnii* Tago, 1931

Endangered B2ab(iii)
Order, Family: Caudata, Hynobiidae
Country Distribution: Japan
Current Population Trend: Decreasing



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Geographic Range This species is endemic to Japan, with a very restricted distribution in Kyushu (around the cities of Oita, Kumamoto, Miyazaki) and Shikoku (around the city of Kochi).

Population There is no information available on the current population status of this species.

Habitat and Ecology It occurs in paddy fields, secondary forest and bamboo in hilly areas. It breeds in pools, ponds, paddy fields at forest edges, ditches, and brooks, where the larvae also develop.

Major Threats The major threat is habitat loss, due in particular to infrastructure development for human settlement. It is also threatened by water pollution, and is often found in the pet trade.

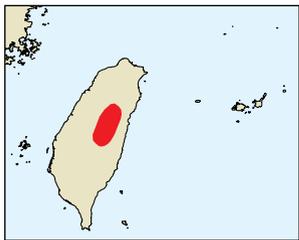
Conservation Measures It is present in several national and quasi national parks, and two populations are designated as natural monuments. There is a need to monitor and control the offtake of this species for the pet trade. Further survey work is needed to determine its current population status.

Bibliography: Matsui, M. (2000g), Sengoku, S. *et al.* (1996)

Data Providers: Yoshio Kaneko, Masafumi Matsui

OITA SALAMANDER**EN** *Hynobius formosanus* Maki, 1922

Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Hynobiidae
Country Distribution: Taiwan, Province of China
Current Population Trend: Decreasing



© Fei, L., Ye, C.-Y., Huang, Y.-Z. and Liu, M.-Y. 1999

Geographic Range This species is restricted to the high mountain ranges of Taiwan, Province of China, at around 2,100m asl.

Population It is known to be rare, and is seldom encountered.

Habitat and Ecology It inhabits primary forests. Breeding takes place in headwater streams and underground seepages where the larvae also develop.

Major Threats The major threat is habitat destruction and degradation, mainly due to the development of infrastructure for tourism.

Conservation Measures This is a protected species in Taiwan, Province of China. It is present in Ray-yuan Nature Reserve and Taroko National Park.

Bibliography: Fei, L. *et al.* (1999), Lue, K.-Y., Tu, M.-C. and Hsiang, G. (1999), MacKinnon, J. *et al.* (1996), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993)

Data Providers: Lue Kuangyang, Chou Wenhao



EN *Hynobius hidamontanus* Matsui, 1987**HAKUBA SALAMANDER****Endangered B1ab(iii)**

Order, Family: Caudata, Hynobiidae

Country Distribution: Japan

Current Population Trend: Decreasing



Geographic Range This species is endemic to Japan, being known from Gifu Prefecture and Toyama Prefecture, and from Hakuba village, Nagano Prefecture, in the central region of Japan.

Population It is believed to be declining.

Habitat and Ecology It occurs in broad-leaved deciduous forest and larch plantations in montane areas. Wetlands and streams are required for breeding and larval development.

Major Threats Habitat loss is an important threat; for example, the habitat around Hakuba village is being destroyed as a result of the rapid construction of villas. Other threats include the shrinkage and drying of wetlands, pollution, and the pet trade.

Conservation Measures It is likely to occur in several protected areas, and has been designated as a natural monument by Hakuba village. There is a need to carefully monitor and control the level of offtake in this species for the pet trade.

Notes on taxonomy: *Hynobius tenuis* was synonymized with this species by

Matsui *et al.* (2002).

Bibliography: Matsui, M. (2000c), Matsui, M. *et al.* (2002), Sengoku, S. *et al.* (1996)

Data Providers: Yoshio Kaneko, Masafumi Matsui

CR *Hynobius okiensis* Sato, 1940**OKI SALAMANDER****Critically Endangered B2ab(iii)**

Order, Family: Caudata, Hynobiidae

Country Distribution: Japan

Current Population Trend: Decreasing



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Geographic Range This species is endemic to Japan, being entirely confined to the island of Dogo in the Oki Islands in Shimane Prefecture.

Population The population status of this species is unknown, but several local populations are extinct, and there is a continuing decline in numbers.

Habitat and Ecology It occurs from sea level to the top of the mountains, inhabiting evergreen forest and coniferous plantations. It breeds in streams by larval development, like most other members of the genus.

Major Threats The major threats to the species include habitat degradation and loss, largely as a result of road construction, deforestation, alteration of river courses, and pollution.

Conservation Measures It is not known whether or not the species occurs in any protected areas, but formal protection of remaining habitat on the Oki Islands is urgently needed. A captive-breeding programme might need to be established for this species. Further survey work is required to determine its current population status.

Bibliography: Matsui, M. (2000h), Sengoku, S. *et al.* (1996)

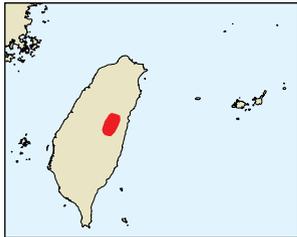
Data Providers: Yoshio Kaneko, Masafumi Matsui

EN *Hynobius sonani* (Maki, 1922)**Endangered B1ab(iii)+2ab(iii)**

Order, Family: Caudata, Hynobiidae

Country Distribution: Taiwan, Province of China

Current Population Trend: Decreasing



Geographic Range This species is restricted to the central mountain range and Nau Kou in Taiwan, Province of China, above 2,750m asl.

Population It is a very rare species.

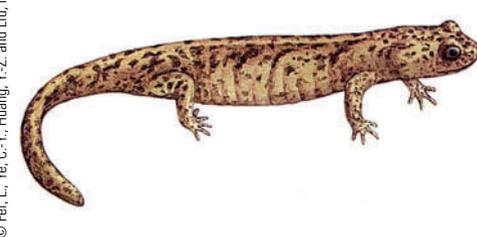
Habitat and Ecology It inhabits undisturbed conifer forests at high elevations. Breeding takes place in streams where the larvae also develop.

Major Threats The major threat is habitat destruction and degradation, mainly due to the development of infrastructure for tourism.

Conservation Measures This is a protected species in Taiwan, Province of China, and it is present in Taroko National Park.

Bibliography: Lue, K.-Y., Tu, M.-C. and Hsiang, G. (1999), MacKinnon, J. *et al.* (1996), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993), Zhao, E.-M. (1998)

Data Providers: Lue Kuangyang, Chou Wenhao



© Fei, L., Ye, C.-Y., Huang, Y.-Z. and Liu, M.-Y. (1999)

VU *Hynobius stejnegeri* Dunn, 1923**AMBER-COLOURED SALAMANDER****Vulnerable B1ab(iii)**

Order, Family: Caudata, Hynobiidae

Country Distribution: Japan

Current Population Trend: Decreasing



© Timothy Johnson

Geographic Range This species is endemic to Japan, and is distributed in Kyushu (Kumamoto, Miyazaki, and Kagoshima Prefectures).

Population There is no information on the population status of this species.

Habitat and Ecology It occurs in broad-leaved evergreen forest and mixed forest. It breeds in upstream areas, where the larvae also develop.

Major Threats The major threats are habitat loss and degradation, due to the construction of roads and logging, and water pollution. This species is also harvested for medicine and food.

Conservation Measures It is designated a natural monument by Kumamoto Prefecture. There is a need to ensure that the offtake of this species from the wild is managed sustainably.

Notes on taxonomy: Taxonomic revision of the *Hynobius boulengeri* species complex should also include populations of this species (Nishikawa, Matsui and Tanabe 2005).

Bibliography: Matsui, M. (2000b), Nishikawa, K., Matsui, M. and Tanabe, S. (2005), Sengoku, S. *et al.* (1996)

Data Providers: Yoshio Kaneko, Masafumi Matsui

EN *Hynobius takedai* Matsui and Miyazaki, 1984**HOKURIKU SALAMANDER****Endangered B1ab(iii)**

Order, Family: Caudata, Hynobiidae

Country Distribution: Japan

Current Population Trend: Decreasing

**Geographic Range** This species is endemic to Japan, and is known from Ishikawa Prefecture and Toyama Prefecture.**Population** Most populations are believed to be in decline.**Habitat and Ecology** It occurs in broad-leaved deciduous forests, and conifer plantations on low mountains. Breeding takes place in springs, streams, ponds and ditches where the larvae also develop.**Major Threats** Major threats include water pollution, predation by introduced predators, and destruction of breeding habitat from infrastructure development.**Conservation Measures** This species is designated as a natural monument by Hakui City (Ishikawa Prefecture), and conservation and population recovery efforts are already under way in this area.**Bibliography:** Matsui, M. (2000d), Matsui, M. and Miyazaki (1984), Sengoku, S. *et al.* (1996)**Data Providers:** Yoshio Kaneko, Masafumi Matsui**VU** *Hynobius tokyoensis* Tago, 1931**TOKYO SALAMANDER****Vulnerable B1ab(iii)**

Order, Family: Caudata, Hynobiidae

Country Distribution: Japan

Current Population Trend: Decreasing



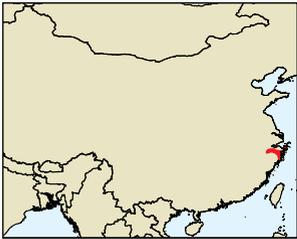
© Henk Wallays

Geographic Range This is a Japanese endemic that is mainly distributed in Kanto District on Honshu Island. It occurs up to 300m asl.**Population** Most populations of this species are currently believed to be in decline.**Habitat and Ecology** It occurs in forests from coastal areas to hilly areas. It breeds in paddy fields, ditches, and springs where the larvae also develop.**Major Threats** This species is threatened by habitat loss due to infrastructure development (housing and road construction), water pollution, invasive species, and the drying out of its habitat. It is also collected for the pet trade.**Conservation Measures** There are currently no known conservation measures in place.**Bibliography:** Matsui, M. (1987), Matsui, M. *et al.* (2001b), Thorn, R. and Raffaëlli, J. (2001)**Data Providers:** Yoshio Kaneko, Masafumi Matsui**VU** *Hynobius yiwuensis* Cai, 1985**Vulnerable B2ab(iii)**

Order, Family: Caudata, Hynobiidae

Country Distribution: China

Current Population Trend: Decreasing



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Geographic Range This species is present in Zhejiang Province (Zhenhai, Xiaoshan, Wenling, Yiwu, Beilun and Zhoushan [including Zhoushan Dao Island]), China. It is present at elevations of 50-200m asl.**Population** It is common in most of its localities.**Habitat and Ecology** It inhabits forests and arable fields in hilly areas. It breeds in pools and small streams where the larvae also develop.**Major Threats** This species is threatened by habitat loss, due to clear-cutting, and water pollution (presumably by agrochemicals).**Conservation Measures** There are no protected areas within the range of this species, and there is a need for improved protection and maintenance of existing forest habitat in its range.**Bibliography:** Adler, K. and Zhao, E. (1990), Fei, L. *et al.* (1999), Fu, J.Z. *et al.* (2003), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993)**Data Providers:** Xie Feng**EN** *Hynobius yunnanicus* Chen, Qu and Niu, 2001**Endangered B1ab(iii)**

Order, Family: Caudata, Hynobiidae

Country Distribution: China

Current Population Trend: Decreasing

**Geographic Range** This species is only known from the vicinity of Shancheng, Henan Province in central China, from 400-910m asl. It might occur a little more widely than current records suggest.**Population** There is no information on the current population status of this newly described species. It is rare, and hard to find.**Habitat and Ecology** It inhabits small, slow-flowing streams in plantation forests. The breeding biology is not known, but it presumably breeds by larval development in streams.**Major Threats** The major threat is habitat destruction and degradation due to small-scale subsistence agriculture and infrastructure development.**Conservation Measures** Part of the range of this species may lie within Jinggangtai Nature Reserve, although there is still a need for improved habitat protection.**Notes on taxonomy:** *Hynobius yiwuensis* is here treated as a valid species, separate from *H. chinensis*, following Fei *et al.* (1999) and Fu *et al.* (2003).**Bibliography:** Chen, X.-H., Qu, W.-Y. and Niu, H.-X. (2001)**Data Providers:** Michael Wai Neng Lau

VU *Pachyhynobius shangchengensis* Fei, Qu and Wu, 1983

Vulnerable B1ab(iii,v)
Order, Family: Caudata, Hynobiidae
Country Distribution: China
Current Population Trend: Decreasing



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Geographic Range This species is known from the Dabieshan area (Hubei, Henan, and Anhui Provinces) in central China, from 380-1,100m asl.

Population It is an uncommon species.

Habitat and Ecology It inhabits slow-flowing hill streams in forested areas. Breeding and larval development take place in streams.

Major Threats Over-collecting for human consumption is a major threat to this species. It is also probably threatened by habitat destruction and degradation, due to human settlement and smallholder farming activities.

Conservation Measures Several protected areas occur within the species' range. There is a need to implement measures to ensure that the offtake of this species from the wild is managed in a sustainable manner. This salamander is included in several captive breeding programmes in Europe.

Bibliography: Chen, B. *et al.* (1991), Fei, L. *et al.* (1999), Fei, L., Qu, W.Y. and Wu, S.H. (1983), MacKinnon, J. *et al.* (1996), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993)

Data Providers: Michael Wai Neng Lau, Fei Liang

VU *Ranodon flavomaculatus* Hu and Fei, 1978

Vulnerable B2ab(iii)
Order, Family: Caudata, Hynobiidae
Country Distribution: China
Current Population Trend: Decreasing



© Fei, L., Ye, C.-Y., Huang, Y.-Z. and Liu, M.-Y. 1999



Geographic Range This species occurs in Nanchuan, Sichuan, Suiyang, Guizhou, Lichuan, Hubei, Sangzhi, and Hunan provinces in China.

Population It is a rare species.

Habitat and Ecology It is terrestrial, normally hiding under the roots of bamboo or in burrows under mosses and soil. It breeds in small streams in April; the larvae develop in these streams.

Major Threats Habitat degradation and destruction is the main threat, due in particular to smallholder farming activities, clear cutting of forest, and infrastructure development for tourism.

Conservation Measures Part of the species' range overlaps with Badagongshan and Xingdoushan National Nature Reserves.

Notes on taxonomy: We follow Kuzmin and Thiesmeier (2001), and include this species in *Ranodon*, rather than *Pseudohynobius*. Zhao (1990) and Zhao and Adler (1993) indicated that this species is a synonym of *Ranodon tsinpaensis*. However, the karyotypes of these two species are significantly different. Hence, Ye, Fei and Hu (1993) and Fei (1999) still regard it to be a valid species.

Bibliography: Fei, L. *et al.* (1999), Hu, S.-Q., Fei, L. and Ye, C.-Y. (1978), Kuzmin, S. and Thiesmeier, B. (2001), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993), Zhao, E.-M. (ed.) (1990), Zhao, E.-M. and Adler, K. (1993)

Data Providers: Fei Liang, Ye Changyuan

YELLOW-SPOTTED SALAMANDER**EN** *Ranodon sibiricus* Kessler, 1866

Endangered B2ab(iii,iv,v)
Order, Family: Caudata, Hynobiidae
Country Distribution: China, Kazakhstan
Current Population Trend: Decreasing



© Henk Wallays



Geographic Range This species is restricted to the southern and south-western spurs of the Junggarian Alatau [Altai] Ridge in southern Kazakhstan and Mount Tianshan in Wenquan County, Xinjiang Uygur Autonomous Region, China. It may also occur in the adjacent Yining, Huocheng and Tacheng Counties of China, and was historically also found in Hergos County. The range is severely fragmented due to the scarcity of suitable habitats (flat plateaus with a dense network of permanent streams). The altitudinal range is 2,100-3,200m asl.

Population This is an extremely rare species. In China, the total population size is estimated at around 6,000 individuals.

Habitat and Ecology It lives in the headwaters of small mountain streams, brooks and lakes in alpine and sub-alpine meadows, and forest-meadow and forest-meadow-steppe belts. Large streams and rivers are avoided. Reproduction extends from April to August. Clutches comprising two egg sacs of around 40-50 eggs each are attached to stones in brooks or streams. Larval development is slow, with larvae mainly feeding on stream invertebrates. The species first breeds at five years and has a lifespan of 15-20 years.

Major Threats It is particularly susceptible to over-exploitation (for medical, commercial and scientific purposes), habitat degradation (caused by over-grazing of forest, lowering of the water table, soil erosion, and desiccation of streams), and accidental mortality caused by the trampling effects of livestock during summer grazing. It is also threatened by local fishing practices.

Conservation Measures This species is listed in the Red Data Books of the USSR and Kazakhstan and is listed as a Class I protected species by the Xinjiang Uygur Autonomous Region, China. The range of this species is thought to be within the Hecheng Four-Claw Turtle Nature Reserve of China, although this requires confirmation. Existing conservation measures are considered to be insufficient, and there is a need for the immediate development and implementation of an effective system for conservation of the species at national (Kazakhstan and China) and international level. The most important measure recommended is the urgent creation of special strict nature reserves.

Bibliography: Bannikov, A.G. *et al.* (1977), Fei, L. *et al.* (1999), Kuzmin, S.L. (1995), Kuzmin, S.L. (1996), Kuzmin, S.L. (1999), Kuzmin, S.L. *et al.* (1998), Kuzmin, S.L., Dodd Jr, C.K. and Pikulik, M.M. (1995), MacKinnon, J. *et al.* (1996), Thorn, R. (1968), Wang, X. and Bai, Y. (2000), Zhao, E.-M. (1998)

Data Providers: Sergius Kuzmin, Wang Xiuling, Vladimir Ishchenko, Boris Tuniyev

SEMIRECHENSK SALAMANDER**VU** *Ranodon tsinpaensis* Liu and Hu, 1966

Vulnerable B1ab(iii,v)+2ab(iii,v)
Order, Family: Caudata, Hynobiidae
Country Distribution: China
Current Population Trend: Decreasing



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Geographic Range This species is restricted to southern Shaanxi (Zhouzhi and Ningshaan Counties) and north-eastern Sichuan (Wanyuan County), China, from 1,600-1,860m asl. It is known from only three locations.

Population It is an uncommon species.

Habitat and Ecology It inhabits small hill streams and riparian habitats, usually in forested areas. It breeds in the mouth of the springs and larval development takes place in the water.

Major Threats It is threatened by exploitation for food and traditional Chinese medicine, as well as by habitat loss and degradation due to agriculture.

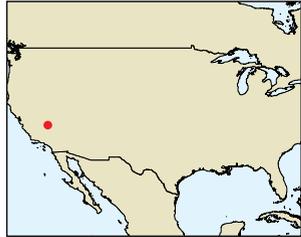
Conservation Measures Taibaishan National Nature Reserve and Zhouzhi National Nature Reserve are within the range of this species. There is a need to implement measures to ensure that the offtake of this species from the wild is managed in a sustainable manner.

Bibliography: Fei, L. *et al.* (1999), Fei, L. and Ye, C.-Y. (1983), Hu, S.-Q., Zhao, E.M. and Liu, C.C. (1966), Kuzmin, S. and Thiesmeier, B. (2001), Liu, C.-C., Hu, S.-Q. and Yang, F.H. (1962), MacKinnon, J. *et al.* (1996), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993), Zhao, E.-M. and Hu, Q.X. (1983), Zhao, E.-M. and Wu, G.F. (1995)

Data Providers: Fei Liang, Liang Gang

TSPINPA SALAMANDER

PLETHODONTIDAE

EN *Batrachoseps campi* Marlow, Brode and Wake, 1979**Endangered B1ab(iii,v)+2ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** United States of America**Current Population Trend:** Decreasing

Geographic Range This species is known only from about 15 localities in the Inyo Mountains, Inyo County, California, USA. It has an elevational range of 490-2,950m asl (Hansen and Wake 2005a). It is quite likely that there are other populations, but while there have been efforts to locate other populations, much of the area surrounding the known inhabited localities are relatively inaccessible and inhospitable.

Population The total adult population size is unknown, but each of the known populations encompasses a very small area and hence is probably represented by a small population. Some populations were declining in the recent past due to spring alterations related to mining.

Habitat and Ecology It occurs along small permanent desert springs and seeps with riparian vegetation, and is generally found under stones, wood, or in holes or crevices in moist soil near spring seepages and pools. Vegetation along watercourses consists of

willows and wild rose. Surrounding slopes are arid, and the vegetation includes sagebrush, buckwheat, rabbit brush, and cactus (Stebbins 1985). It probably breeds by direct development, and the eggs are probably laid in moist crevices within rocky outcrops.

Major Threats Threats include habitat alteration from flash floods, mining, water diversion, and vegetation damage by cattle and feral burros (Jennings and Hayes 1994).

Conservation Measures All populations occur on federal lands managed by the U.S. Bureau of Land Management or USDA Forest Service, but the level of protection is questionable. There is clearly a need for immediate effective protection of remaining habitat from any alteration. Protection of all populations is necessary to maintain diversity, since each population is genetically isolated and unique. This species is registered as a Species of Special Concern by the California Department of Fish and Game.

Bibliography: Frost, D.R. (1985), Hansen, R.W. and Wake, D.B. (2005a), Jennings, M.R. and Hayes, M.P. (1994), Jockusch, E.L. (2001), Petranka, J.W. (1998), Stebbins, R.C. (1972), Stebbins, R.C. (1985b)

Data Providers: Geoffrey Hammerson

INYO MOUNTAINS SALAMANDER

VU *Batrachoseps regius* Jockusch, Wake and Yanev, 1998**Vulnerable D2****Order, Family:** Caudata, Plethodontidae**Country Distribution:** United States of America**Current Population Trend:** Stable

© Kenny Wray

Geographic Range This species is known from two areas in Fresno County, California: the vicinity of the type locality in the lower drainage of the Kings River system, on the western slope of the Sierra Nevada, at an elevation of 335-340m asl (Jockusch, Wake and Yanev 1998); and Summit Meadow, at an elevation of 2,470m asl, in Kings Canyon National Park and about 37 kilometers east-south-east of the lower elevation sites (Stebbins 2003). Additional populations might occur in between known sites. Salamanders discovered in the Middle Fork Kaweah River drainage (610m asl, Sequoia National Park) have been referred to this species (Jockusch and Wake 2002).

Population The small cluster of sites at lower elevations appear to be stable; salamanders have been found here intermittently for the last 25 years. A total of seven specimens have been found at the single high-elevation site on two occasions over a 45-year period (Hansen and Wake 2005).

Habitat and Ecology It is known from a well-shaded, north-facing slope in an area of mixed chaparral with *Aesculus*, *Umbellularia*, and *Quercus wislizenii* and scattered *Pinus sabiniana*, *P. ponderosa*, and *Q. douglasii*; found under rocks in areas of talus near the roadside (Jockusch, Wake and Yanev 1998).

Major Threats Threats are unknown. Its habitat does not appear to be threatened, although the lower Kings River sites are located immediately adjacent to a road and probably would be affected by road construction.

Conservation Measures All known localities where this species has been recorded are on public lands administered by the USDA Forest Service or National Park Service (specifically, Kings Canyon National Park).

Bibliography: Hansen, R.W. and Wake, D.B. (2005b), Jockusch, E.L. and Wake, D. B. (2002), Jockusch, E.L., Wake, D.B. and Yanev, K.P. (1998), Stebbins, R.C. (2003)

Data Providers: Geoffrey Hammerson

KINGS RIVER SLENDER SALAMANDER

VU *Batrachoseps simatus* Brame and Murray, 1968**Vulnerable D2****Order, Family:** Caudata, Plethodontidae**Country Distribution:** United States of America**Current Population Trend:** Stable

© Kenny Wray

Geographic Range This species is known from a number of sites in the lower Kern River Canyon, Kern County, California, at the southern end of the Sierra Nevada mountain range in the USA. It occurs in isolated colonies, and probably occurs in many densely wooded canyons in the lower Kern River Canyon. They have been recorded from 450-1,220m asl. Populations in the vicinity of Fairview, Tulare County, have been allied with *B. simatus*, but probably represent a distinct species.

Population Total adult population size is unknown, although individual population sizes are presumably quite small. It is locally abundant (Bury, Dodd and Fellers 1980).

Habitat and Ecology It favours north-facing slopes and small wooded tributary canyons. It also inhabits oak-pine communities on slopes; willow and cottonwood communities along streams; chaparral; and may range into grassland adjacent to woods. It is often found in crevices in talus slopes or under rocks and logs. It is a terrestrial breeder.

Major Threats At present there do not appear to be any significant threats. Potential future threats include cattle grazing, highway construction, and the proposed development of water storage facilities within the Kern River Canyon.

Conservation Measures Nearly all the known populations occur on public lands administered by the Sequoia National Forest. Kern Canyon slender salamanders are listed as Threatened by the State of California and are a Federal Species of Concern.

Bibliography: Behler, J.L. and King, F.W. (1979), Biosystems Analysis, Inc. (1989), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), California Department of Fish and Game (CDF&G). (1990), Frost, D.R. (1985), Hansen, R.W. and Wake, D.B. (2005c), Stebbins, R.C. (1972), Stebbins, R.C. (1985b)

Data Providers: Geoffrey Hammerson

KERN CANYON SLENDER SALAMANDER

VU *Batrachoseps stebbinsi* Brame and Murray, 1968**Vulnerable D2****Order, Family:** Caudata, Plethodontidae**Country Distribution:** United States of America**Current Population Trend:** Unknown

Geographic Range This species is known from two areas in Kern County, California, USA: scattered sites in the Caliente Creek drainage, Piute Mountains, southern Sierra Nevada, at 550-790m asl; and scattered populations in the Tehachapi Mountains from Tejon Canyon to Fort Tejon, recorded at 945-1,430m asl, which have tentatively been assigned to this species (Hansen and Wake 2005).

Population Individual populations are small and localized, but all populations are believed to be extant.

Habitat and Ecology It can be found in seasonally shaded, north-facing slopes of canyons located in arid to semi-arid terrain. In the Caliente Canyon, they are associated with granitic or limestone talus and scattered rocks, where the vegetation consists of pine, oak, cottonwood, sycamore, and California buckeye. In the Tehachapi Mountains, salamanders occur in areas of downed wood or talus. It is a terrestrial breeder.

Major Threats At present there do not appear to be any significant threats. Potential threats include the development of Tejon Ranch for housing communities, and logging which might cause extirpation of populations. Some sites in Caliente Creek have been affected by road construction, mining, and cattle grazing, and potentially by flood control projects (Hansen and Wake 2005).

Conservation Measures Within Caliente Canyon, much of the known salamander habitat occurs on public lands administered by the U.S. Bureau of Land Management. Much of the Tehachapi Mountains and adjoining areas are inaccessible owing to a combination of rugged terrain and private ownership. Needed conservation measures include the protection of public lands from logging and other alterations, and the acquisition of private lands, especially in the Tehachapi Mountains.

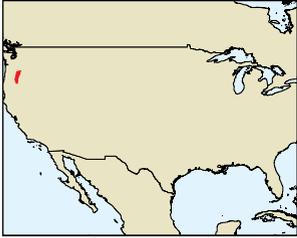
Bibliography: Behler, J.L. and King, F.W. (1979), Biosystems Analysis, Inc. (1989), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), California Department of Fish and Game (CDF&G). (1990), Frost, D.R. (1985), Hansen, R.W. and Wake, D.B. (2005d), Petranka, J.W. (1998), Stebbins, R.C. (1972), Stebbins, R.C. (1985b)

Data Providers: Geoffrey Hammerson

TEHACHAPI SLENDER SALAMANDER

VU *Batrachoseps wrightorum* (Bishop, 1937)

Vulnerable B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Decreasing



Geographic Range This species occurs in north-central Oregon: it occurs on the western slopes of the Cascade Mountains in Lane, Linn, Marion, Clackamas, and Multnomah counties; the Columbia River Gorge in Multnomah and Hood River counties; and several sites on the eastern slopes of the Cascades in Hood River and Wasco counties (Kirk 1991). It usually occurs at elevations of 600-1,300m asl, but to 15m asl in Columbia River gorge. It is generally scarce, occurring in scattered and often widely separated colonies, but sometimes locally common (Stebbins 1985b). See Nussbaum, Brodie and Storm (1983) and Kirk (1991) for spot maps.

Population This species is known to be common in suitable habitat. Results of time-constrained searches (Gilbert and Allwine 1991) showed that Oregon Slender Salamanders were second only to ensatinas in abundance in naturally regenerated stands.

Habitat and Ecology It can be found in moist Douglas fir and mixed maple, hemlock and red cedar woodlands; it is dependent on mature and old-growth stands, commonly in large downed logs. Bury and Corn (1988a) found that fewer numbers occurred in logged than in

mature forests. This species also occurs in the recent lava flows near the crest of the Cascades and in second-growth forest (Nussbaum, Brodie and Storm 1983). It is found under rocks, log, bark and moss; also found in rotting logs, in holes and crevices in the ground, and in termite burrows. Nests that have been located were found under bark and in rotten logs (Nussbaum, Brodie and Storm 1983). It probably also lays eggs underground (Stebbins 1985b).

Major Threats It is moderately threatened and declining due to logging of old-growth Douglas-fir forest; managed forests do not provide ideal habitat. It can be extirpated by clear cutting or even thinning, and is common only in stable, old-growth forests with many large, old logs. Timber harvest might result in slow, long-term decline, which might not be evident during surveys done soon after timber harvest.

Conservation Measures Mature and old-growth forest with large rotting logs might be necessary for maintaining viable populations. Several populations might occur in Mount Hood and Mount Jefferson Wilderness Areas, but are not yet documented. In the Oregon Cascade Mountains, steep terrain is often not subject to intensive timber harvest, so populations are somewhat protected in these areas.

Notes on taxonomy: This species was formerly known as *Batrachoseps wrighti* (see Crother *et al.* 2003).

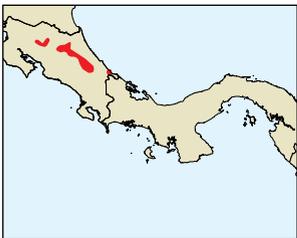
Bibliography: Behler, J.L. and King, F.W. (1979), Blaustein, A.R. *et al.* (1995), Bury, R.B. (In press), Bury, R.B. and Corn, P.S. (1988a), Crother, B.I. *et al.* (2003), Frost, D.R. (1985), Gilbert, F.F. and Allwine, R. (1991), Kirk, J.J. (1991), Leonard, W.P. *et al.* (1993), Nussbaum, R.A., Brodie, Jr., E.D. and Storm, R.M. (1983), Petranka, J.W. (1998), Stebbins, R.C. (1985b)

Data Providers: Geoffrey Hammerson, Bruce Bury

OREGON SLENDER SALAMANDER

EN *Bolitoglossa alvaradoi* Taylor, 1954

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica
Current Population Trend: Decreasing



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Geographic Range This species is known from the Atlantic slopes of Costa Rica at 15-1,116m asl (Savage 2002).

Population There is very little information on the population status of this species; it is rarely seen, and known from one specimen from each of its localities.

Habitat and Ecology It lives in lowland moist and wet forests and premontane rainforest, and does not occur in degraded habitats. It is nocturnal and arboreal, living especially in bromeliads, and being found on leaves of trees at night. Breeding takes place by direct development, and the species is not dependent on water.

Major Threats The main threat is habitat loss due to smallholder farming activities and wood extraction.

Conservation Measures It is known to occur in Parque Nacional Braulio Carrillo. There is a need for additional survey work to better understand the population status of this poorly known species.

Bibliography: García-París, M. *et al.* (2000), Parra-Olea, G., Garcia-Paris, M. and Wake, D.B. (2004), Savage, J.M. (2002), Taylor, E.H. (1954), Wake, D.B. (1987)

Data Providers: Federico Bolaños, Jay Savage, David Wake

CR *Bolitoglossa capitana* Brame and Wake, 1963

Critically Endangered B2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Colombia
Current Population Trend: Decreasing



© Conservación Internacional-Colombia

Geographic Range This species is known only from the type locality, "Hacienda La Victoria (La Granja Infantil-an orphanage, 6km north of Albán on the Albánto Sasaima Road) between Albán and Sasaima...", in the Cordillera Oriental about 50km north-west of Bogotá, in the department of Cundinamarca, in Colombia, at around 1,780m asl.

Population It is known from only six specimens, and is thought to be a rare species; no specimens have been found recently despite surveys at the type locality.

Habitat and Ecology It occurs in undisturbed or slightly disturbed montane cloud forest, among fallen leaves on slopes, and on bushes and herbaceous vegetation. It breeds by direct development.

Major Threats Habitat destruction and degradation, primarily due to agriculture, is the major threat, and the habitat in which the species occurs is now severely fragmented.

Conservation Measures It is not known to occur in any protected areas, and there is a need for urgent protection of the remaining native habitat at the type locality. Further survey work is required to determine the current population status of this species.

Bibliography: Acosta-Galvis, A.R. (2000), Brame, A.H. and Wake, D.B. (1963b), Brame, A.H. and Wake, D.B. (1972), Ruiz-Carranza, P.M., Ardila-Robayo, M.C. and Lynch, J.D. (1996)

Data Providers: Martha Patricia Ramírez Pinilla, Mariela Osorno-Muñoz, Jose Vicente Rueda, Adolfo Amézquita, María Cristina Ardila-Robayo

CR *Bolitoglossa carri* McCranie and Wilson, 1993

Critically Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Honduras
Current Population Trend: Decreasing



© James McCranie

Geographic Range This species is restricted to one hillside at 1,840-2,070m asl on Cerro Cantagallo in Honduras. There is no other suitable habitat nearby, and so the species is unlikely to occur elsewhere.

Population It is relatively abundant in a tiny area of not much more than 100ha.

Habitat and Ecology It is arboreal, living in bromeliads in a tiny patch of cloud forest in an agricultural area. It presumably breeds

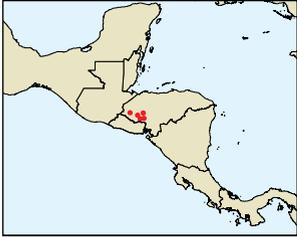
by direct development and is not dependent upon water.

Major Threats The major threat to the species is clearance of its remaining forest habitat for subsistence farming, and the collection of bromeliads.

Conservation Measures The remaining habitat is a watershed reserve, but this is not managed for biodiversity conservation, and the habitat is subject to high rates of disturbance. Improved management and protection of this area is urgently needed.

Bibliography: McCranie, J.R. and Wilson, L.D. (1993a), McCranie, J.R. and Wilson, L.D. (2002b)

Data Providers: Gustavo Cruz, Larry David Wilson, Randy McCranie

EN *Bolitoglossa celaque* McCranie and Wilson, 1993**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Honduras**Current Population Trend:** Decreasing

Geographic Range This species is known only from the Montana de Celaque, the Sierra de Opalaca and the Sierra de Montecillos in the departamentos of Lempira and Intibuca y La Paz in the south-west of Honduras. It is found between 1,900 and 2,620m asl.

Population In Montana de Celaque, it is abundant in suitable habitat.

Habitat and Ecology It has been found in lower montane moist forest in arboreal bromeliads, on wet mosses on the ground, and along the sides of streams; there is little information on its adaptability to habitat degradation. Breeding is by direct development, with the species laying its eggs in low bromeliads and in mosses.

Major Threats The main threat is forest loss due to subsistence agriculture and frequent forest fires.

Conservation Measures Three of the five sites from which this species is reported are within protected areas: Parque Nacional Cerro Celaque, Reserva Biológica de Guajiquiro, and Reserva Biológica de Montecillos.

Bibliography: McCranie, J.R. and Wilson, L.D. (1993a), McCranie, J.R. and Wilson, L.D. (2002b)**Data Providers:** Gustavo Cruz, Larry David Wilson, Randy McCranie**VU** *Bolitoglossa chica* Brame and Wake, 1963**Vulnerable B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Ecuador**Current Population Trend:** Decreasing

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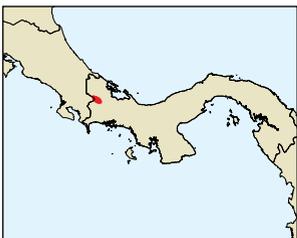
Geographic Range This species is known from the type locality (the vicinity of Santo Domingo de los Colorados), and from the lower part of the Río Bolaniguas and Bilsa Reserve, in Provincia de Pichincha, in Ecuador. It has been recorded from 250-600m asl. It presumably occurs more widely, but is currently known only from four localities.

Population It is considered to be quite rare.

Habitat and Ecology It inhabits moist forest in the western tropical altitude zone. The holotype was captured on a broad-leaved fern at night (Brame and Wake 1963b). It breeds by direct development.

Major Threats Livestock farming and logging are threats to the species' habitat.

Conservation Measures Its range overlaps with Reserva Ecológica Cotacachi Cayapas and Mache Chindul.

Bibliography: Brame, A.H. and Wake, D.B. (1963b), Morales, M. *et al.* (2002), Schargel, W.E. and Rivas-Fuenmayor, G. (2003)**Data Providers:** Diego Cisneros-Heredia, Mario Yáñez-Muñoz, Ana Almandáriz, Luis A. Coloma, Santiago Ron**EN** *Bolitoglossa compacta* Wake, Brame and Duellman, 1973**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Costa Rica, Panama**Current Population Trend:** Decreasing

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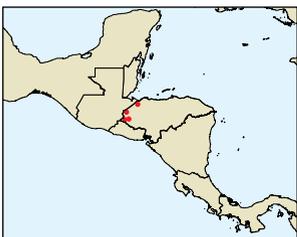
Geographic Range This species is found in the humid lower montane areas on or near the Costa Rica-Panama border, on the Pacific versant of Costa Rica at 1,650-1,980m asl, and the Atlantic and Pacific slopes of western Panama at 1,810-2,780m asl.

Population This is a rare species.

Habitat and Ecology It inhabits humid montane forest, living on the ground and in low vegetation; there is little information on its adaptability to disturbed habitats. It presumably breeds by direct development and is not dependent upon water.

Major Threats The main threat is habitat loss caused by expanding smallholder farming activities and logging.

Conservation Measures It occurs in Parque Internacional La Amistad on the border of Costa Rica and Panama.

Bibliography: García-París, M. *et al.* (2000), Ibáñez, R. *et al.* (2000), Lips, K.R. (1993a), Savage, J.M. (2002), Wake, D.B., Brame, A.H. and Duellman, W.E. (1973), Young, B. *et al.* (1999)**Data Providers:** Frank Solís, Roberto Ibáñez, David Wake, Jay Savage, Gerardo Chaves**EN** *Bolitoglossa conanti* McCranie and Wilson, 1993**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Honduras**Current Population Trend:** Decreasing

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Geographic Range This species is found in four small isolated areas in the west of Honduras: El Chaguiton and El Portillo in the department of Ocotepeque; Quebrada Grande in the department of Copan; and in Parque Nacional Cerro Cusuco. It ranges from 1,370-2,000m asl. Records from the Sierra de Metapan in Santa Ana Department, north-west El Salvador, refer to an undescribed species (E. Greenbaum pers. comm.).

Population It is believed to be rare, although given its arboreal tendencies it can be hard to find.

Habitat and Ecology It is found in arboreal bromeliads and on the ground in lower montane wet forest. There is little information on its adaptability to habitat degradation. It breeds by direct development and lays eggs in bromeliads and on the ground.

Major Threats The main threat is habitat loss due to subsistence and smallholder agriculture and forest fires.

Conservation Measures Two of the four populations are within protected areas, namely Parque Nacional Cerro Cusuco, and a watershed reserve at Río Santa Ana.

Bibliography: McCranie, J.R. and Wilson, L.D. (1993a), McCranie, J.R. and Wilson, L.D. (2002b)**Data Providers:** Gustavo Cruz, Larry David Wilson, Randy McCranie

CR *Bolitoglossa decora* McCranie and Wilson, 1997

Critically Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Honduras
Current Population Trend: Decreasing



Geographic Range This species is known only from Monte Escondido on the Atlantic versant in the north-western portion of the Department of Olancho, north-central Honduras, at 1,430-1,550m asl.

Population It is a moderately common species within its tiny range.

Habitat and Ecology It is found on low vegetation, on the ground, and on arboreal bromeliads in lower montane wet forest. It is not known whether or not it can withstand habitat degradation. It breeds by direct development and is not dependent upon water.

Major Threats The main threat to the species is habitat loss and degradation due to encroaching coffee cultivation, subsistence agriculture, and livestock ranching activities.

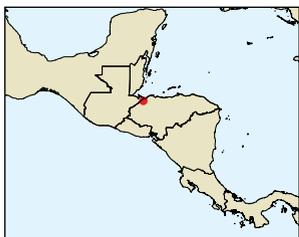
Conservation Measures The only known site is in the Parque Nacional La Muralla, which was declared as a protected area in 1987, but this area is poorly protected, and habitat loss is continuing. Improved protection and management of this area is urgently needed.

Bibliography: McCranie, J.R. and Wilson, L.D. (1997c), McCranie, J.R. and Wilson, L.D. (2002b)

Data Providers: Gustavo Cruz, Larry David Wilson, Randy McCranie

CR *Bolitoglossa diaphora* McCranie and Wilson, 1995

Critically Endangered B2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Honduras
Current Population Trend: Decreasing



© Silviu Petrovan

Geographic Range This species is known only from the Sierra de Omoa on the Atlantic versant of north-western Honduras at 1,470-2,200m asl.

Population Only 21 specimens are known, and is believed to be an uncommon species.

Habitat and Ecology It has been found on low vegetation and on the ground of lower montane wet forest. It breeds by direct development and is not dependent upon water.

Major Threats Its habitat is threatened by encroaching subsistence agriculture and forest fires.

Conservation Measures It occurs in the Parque Nacional El Casuco, but additional and improved protection of the remaining habitat in the area is needed. Further survey work is needed to determine the current population status of this species.

Bibliography: McCranie, J.R. and Wilson, L.D. (1995b), McCranie, J.R. and Wilson, L.D. (2002b)

Data Providers: Gustavo Cruz, Larry David Wilson, Randy McCranie

VU *Bolitoglossa diminuta* Robinson, 1976

Vulnerable D2
Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica
Current Population Trend: Stable



Geographic Range This species is known only from the type locality, near Quebrada Valverde, near Tapanti, Cartago Province, Atlantic versant, Costa Rica, at 1,555-1,650m asl (Savage 2002).

Population Only two specimens plus some egg clutches are known.

Habitat and Ecology It lives in arboreal vegetation (mosses and liverworts) in lower montane rainforest. It does not occur in degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats There are no major threats known. However, its small range renders it vulnerable to stochastic threatening processes.

Conservation Measures The area where this species was collected is now in Parque Nacional Tapanti. There is a need for additional survey work to determine and monitor the population status of this species.

Bibliography: Bolanos, F., Robinson, D.C. and Wake, D.B. (1987), García-Paris, M. *et al.* (2000), Papenfuss, T.J. and Wake, D.B. (1987), Robinson, D.C. (1976), Savage, J.M. (2002), Wake, D.B. (1987), Wake, D.B. and Elias, P. (1983)

Data Providers: Federico Bolaños, David Wake, Jay Savage

EN *Bolitoglossa dunni* (K. Schmidt, 1933)

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala, Honduras
Current Population Trend: Decreasing



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Geographic Range This species is known from the eastern mountains of the Atlantic versant of Guatemala and from the western mountains of Honduras. In Honduras it is known from Quebrada Grande in Copan Department, and from Parque Nacional Cerro Cusuco and the Merendon Mountains west of San Pedro Sula in Cortes Department. It occurs at 1,200-1,600m asl.

Population It can be locally common.

Habitat and Ecology It lives in premontane and lower montane moist forest, and is found in arboreal bromeliads, on low vegetation, and under rotten trees on the ground. It prefers intact forest, and can be found on forest edge, but not in degraded habitats. Breeding takes place by direct development, and the species is not dependent upon water.

Major Threats The main threat is loss of habitat for subsistence and small-scale agriculture, logging, and human settlement.

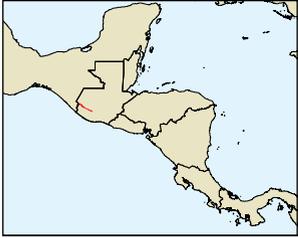
Conservation Measures It occurs in Parque Nacional Cerro Cusuco in Honduras, but there is a need for improved protection of forest habitats elsewhere in the range of the species.

Bibliography: Campbell, J.A. (2001), Campbell, J.A. and Smith, E.N. (1998), Elias, P. (1984), McCranie, J.R. and Cruz, G.A. (1996), McCranie, J.R. and Kohler, G. (1999a), McCranie, J.R. and Kohler, G. (1999b), McCranie, J.R. and Wilson, L.D. (1993a), McCranie, J.R. and Wilson, L.D. (1995a), McCranie, J.R. and Wilson, L.D. (2002b), Schmidt, K.P. (1933), Wake, D.B. (1987), Wake, D.B. and Brame, A.H. (1963)

Data Providers: Gustavo Cruz, Larry David Wilson, Randy McCranie, Manuel Acevedo, David Wake

EN *Bolitoglossa engelhardti* (Schmidt, 1936)**Endangered B1ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala, Mexico
Current Population Trend: Decreasing



© Sean M. Rovito



Geographic Range This species ranges from extreme south-eastern Chiapas, Mexico, along the Pacific versant to Volcán Atitlán, south-western Guatemala. Its altitudinal range is 1,500-2,100m asl.

Population Although it used to be common, it appears to have undergone declines and is now uncommon.

Habitat and Ecology It is an arboreal species, inhabiting pristine cloud forest habitats, and is often found in bromeliads. It breeds by direct development and is not dependent upon water.

Major Threats The major threat is the loss of cloud forest due to extensive agricultural activities (including agro-industry crop farming), logging, and human settlement.

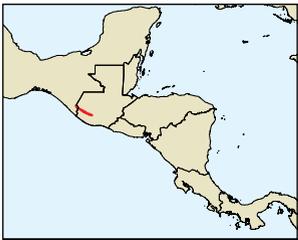
Conservation Measures It has apparently not been recorded from any protected areas, although Volcán Atitlán has been proposed for protection. Surveys are urgently needed to establish the current population status of this species. It is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Campbell, J.A. (2001), Elias, P. (1984), Mendoza Quijano, F. and Rendon Rojas, A. (1995), Wake, D.B. (1987), Wake, D.B. and Brame, A.H. (1963), Wake, D.B. and Lynch, J.F. (1976)

Data Providers: Gabriela Parra-Olea, David Wake, Manuel Acevedo

EN *Bolitoglossa flavimembris* (Schmidt, 1936)**Endangered B1ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala, Mexico
Current Population Trend: Decreasing



© Sean M. Rovito



Geographic Range This species is known from the slopes of the Tacana volcano in Chiapas, Mexico, and from the mountains along the south-western Guatemalan Plateau (in particular the Atitlán, Tajumulco and Tacana volcanoes). Its altitudinal range is 1,800-2,200m asl.

Population It is an uncommon species.

Habitat and Ecology It occurs on mountain slopes covered by pine-oak and cloud forests, living in the vegetation, in bromeliads, and under the bark of logs; it is not commonly found on the ground, and does not occur in disturbed habitats. Breeding is by direct development, and the species is not dependent upon water.

Major Threats The main threat is the loss of forest habitat due to agricultural expansion, logging, and conversion to urban lands, activities that have been very severe throughout its range.

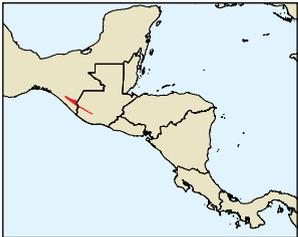
Conservation Measures It might be found in the Biosphere Reserve of La Encrucijada, Chiapas, Mexico, but is not otherwise known from any protected area. The Instituto de Historia Natural de Chiapas is conducting a conservation project in this area. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Campbell, J.A. (2001), Wake, D.B. (1987), Wake, D.B. and Brame, A.H. (1963)

Data Providers: Gabriela Parra-Olea, David Wake, Manuel Acevedo

EN *Bolitoglossa franklini* (Schmidt, 1936)**Endangered B1ab(iii,v)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala, Mexico
Current Population Trend: Decreasing



© Gabriela Parra-Olea



Geographic Range This species occurs along the Pacific border of Chiapas, Mexico, south-east to the Pacific slopes of Guatemala as far as Volcán Atitlán. Its altitudinal range is 1,800-2,500m asl.

Population This used to be an extremely common species, but it has undergone declines and is now very rare.

Habitat and Ecology It occurs in montane cloud forest and pine-oak forests, and requires pristine habitat. It is semi-arboreal, but can also be found under bark or under logs. It breeds by direct development and is not dependent upon water.

Major Threats The main threat to this species is habitat loss following the transformation of forest habitats to agricultural lands and for human settlement. Habitat loss through its range has been quite extensive. When forest is cleared, a close relative, *Bolitoglossa lincolni*, colonizes its range, hybridizes with it, and eventually replaces it.

Conservation Measures It occurs in the Reserva de la Biósfera El Triunfo, which includes some areas that still have pristine habitat, but there is a need for improved protection of the forest habitat of this species in the remainder of its range. It is protected by Mexican law under the "Special Protection" category (Pr).

Notes on taxonomy: This taxon might be a complex of several species (Highton 2000).

Bibliography: Campbell, J.A. (2001), Highton, R. (2000), Wake, D.B. (1987), Wake, D.B. and Brame, A.H. (1963), Wake, D.B. and Lynch, J.F. (1976), Wake, D.B. and Lynch, J.F. (1982), Wake, D.B., Yang, S.Y. and Papenfuss, T.J. (1980)

Data Providers: Gabriela Parra-Olea, David Wake, Manuel Acevedo, Antonio Muñoz Alonso

VU *Bolitoglossa gracilis* Bolaños, Robinson and Wake, 1987**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica
Current Population Trend: Stable



© Wayne Van Devender



Geographic Range This species is known only from two sites in the vicinity of Tapantí, Cartago Province, central Costa Rica, at 1,225-1,280m asl (Savage 2002).

Population There is very little information on its population status, but it is probably very rare.

Habitat and Ecology It lives in premontane rainforest and does not appear to be able to adapt to secondary habitats. One individual was collected from a moss mat 10cm above the ground on a tree (Savage 2002). It breeds by direct development and is not dependent upon water.

Major Threats The habitat outside the Parque Nacional Tapantí has been lost to large-scale coffee plantations; the remaining habitat in the park is relatively secure.

Conservation Measures One of the sites where this species has been collected is now protected in Parque Nacional Tapantí. All suitable habitat has been lost at the type locality (Rio Quirí).

Bibliography: Bolaños, F., Robinson, D.C. and Wake, D.B. (1987), Franzen, M. (1997), García-París, M. *et al.* (2000), Savage, J.M. (2002)

Data Providers: Federico Bolaños, David Wake, Jay Savage

VU *Bolitoglossa guaramacalensis* Schargel, Garcia-Perez and Smith, 2002

Vulnerable D2
Order, Family: Caudata, Plethodontidae
Country Distribution: Venezuela
Current Population Trend: Stable



© Juan Elias Garcia-Perez



Geographic Range This species is known from Macizo de Guaramacal, in the Cordillera de Merida in Trujillo state, Venezuela. It has been recorded from 1,800-2,400m asl.

Population It is a common species.

Habitat and Ecology It is a terrestrial species found on rocks in cloud forest. It breeds by direct development.

Major Threats Threats to this species are unclear; its small range probably makes it more susceptible to stochastic threatening processes.

Conservation Measures Its range includes Parque Nacional Guaramacal. Further survey work is needed to determine the threats to this species, and to monitor its population status.

Bibliography: Barrio Amorós, C.L. (2004), Schargel, W.E., Garcia-Perez, J.E. and Smith, E.N. (2002)

Data Providers: Juan Elias Garcia-Perez, Enrique La Marca

CR *Bolitoglossa heiroreias* Greenbaum, 2004

Critically Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: El Salvador, Guatemala
Current Population Trend: Decreasing



© Tivan Leenders



HOLY-MOUNTAIN SALAMANDER

Geographic Range This species is currently known only from (and is believed to be restricted to) the Sierra de Metapán Range at the borders of El Salvador, Guatemala, and Honduras, although it is not currently known from the Honduran part of this mountain range. It has been recorded from 1,840-2,300m asl. The overall extent of occurrence is likely to be less than 57km² (Greenbaum 2004). Further analysis is required to determine whether or not a species recently found on an isolated peak in eastern Guatemala refers to this or another species (D. Wake pers. comm. 2005).

Population There is no information on the current population status of this species.

Habitat and Ecology It is known from humid montane pine-oak forest and cloud forest. Individuals were found on the ground, on fallen logs, under logs, on *Peperomia* sp. leaves, in water-filled leaf axils of *Heliconia* sp., and in bromeliads. Leenders and Watkins-Colwell (2004) suggested that this species might be arboreal at night, but use terrestrial hiding places during the day. It is presumed to breed by direct development.

Major Threats As extensive areas of forest surrounding the Sierra de Metapán range have been lost or destroyed, there is a likelihood of reduced humidity in the habitats where this species occurs.

Conservation Measures Only the El Salvador side of the mountain range is protected (in the Parque Nacional Montecristo), and so further protection of the remaining habitat on and surrounding the Sierra de Metapán is urgently needed. Additional survey work is needed to determine the current population status of the species.

Bibliography: Greenbaum, E. (2004), Leenders, T.A.A.M. and Watkins-Colwell, G.J. (2004)

Data Providers: Eli Greenbaum, David Wake

VU *Bolitoglossa hiemalis* Lynch, 2001

Vulnerable D2
Order, Family: Caudata, Plethodontidae
Country Distribution: Colombia
Current Population Trend: Stable



Geographic Range This species is known only from the type locality in the Páramo del Duende, Cerro Calina, municipality of Rio Frio, in the department of Valle del Cauca, in Colombia, from 3,000-3,600m asl.

Population There is no information on its current population status; it is only known from five specimens.

Habitat and Ecology It occurs in páramo areas, on low vegetation and in bryophytes. It has not been recorded from other habitats. There is no information on its breeding biology, but it presumably takes place by direct development like other species of the genus.

Major Threats The type locality is pristine páramo, and is relatively inaccessible at present which affords it some protection. Climate change poses a potential future threat.

Conservation Measures The type locality is not within a protected area. There is a need for close monitoring to determine if climate change is having any effect on the population, particularly given its confined range.

Bibliography: Lynch, J.D. (2001)

Data Providers: Fernando Castro, Maria Isabel Herrera, John Lynch

VU *Bolitoglossa hypacra* (Brame and Wake, 1962)

Vulnerable D2
Order, Family: Caudata, Plethodontidae
Country Distribution: Colombia
Current Population Trend: Stable



Geographic Range This species is known from the vicinity of the type locality and Puente Largo, in the Municipality of Frontino in Antioquia department, on the Cordillera Occidental, in Colombia, from 3,600-3,700m asl.

Population It is restricted to the Páramo Frontino, and is not common.

Habitat and Ecology It is restricted to páramo areas, among fallen leaves and fallen trunks and on the low strata of vegetation. Its breeding habits are unknown.

Major Threats The type locality is pristine páramo, and is relatively inaccessible at present which affords it some protection. Climate change poses a potential future threat.

Conservation Measures The type locality is within Parque Nacional Natural Paramillo. There is a need for close monitoring to determine if climate change is having any effect on the population, particularly given its confined range.

Bibliography: Acosta-Galvis, A.R. (2000), Brame, A.H. and Wake, D.B. (1963b), Brame, A.H. and Wake, D.B. (1972), Paez, V.P. et al. (2002), Ruiz-Carranza, P.M., Ardila-Robayo, M.C. and Lynch, J.D. (1996)

Data Providers: Fernando Castro, Maria Isabel Herrera, John Lynch

CR *Bolitoglossa jacksoni* Elias, 1984

Critically Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala
Current Population Trend: Decreasing



© James Hanken

Geographic Range This species has only been found within 1km of the type locality on the Caribbean escarpment of the western Cuchumatanes, Departamento Huehuetenango, western Guatemala. The exact locality is the Las Nubes sector of Finca Chiblac, approximately 12km north-northeast of Santa Cruz Barillas, at about 1,400m asl.

Population There is no information on the population status of this species; it has not been collected since its discovery, despite recent searches.

Habitat and Ecology The only two individuals known were taken from under bark from felled logs in a clearing in very wet (approximately 6,000mm annual precipitation) montane forest. It presumably breeds by direct development and is not dependent upon water.

Major Threats Severe habitat loss is known to have taken place at its only known site due to the settlement of refugees and expanding agriculture.

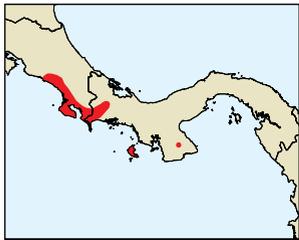
Conservation Measures There are no protected areas near where this species has been found. Surveys are urgently needed to establish its current range and population status in the wild.

Bibliography: Campbell, J.A. (2001), Elias, P. (1984), Wake, D.B. (1987)

Data Providers: Manuel Acevedo, David Wake

VU *Bolitoglossa lignicolor* (Peters, 1873)

Vulnerable B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica, Panama
Current Population Trend: Decreasing



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Geographic Range This species occurs in south-western Costa Rica and adjacent western Panama, and on the Azuero Peninsula and the Isla Coiba, Panama. It occurs up to 880m asl.

Population In Costa Rica, this species turns up occasionally on surveys, but it is uncommon. There is very little information from Panama, where it might be declining.

Habitat and Ecology It inhabits humid lowland and premontane forest, where it requires pristine habitat. It is nocturnal and arboreal and lives in bromeliads. It breeds by direct development and is not dependent upon water.

Major Threats There is some habitat loss due to agriculture (crops and livestock) and clear cutting.

Conservation Measures It occurs in Parque Nacional Coiba in Panama and in Parque Nacional Corcovada in Costa Rica.

Bibliography: Brame, A.H. and Wake, D.B. (1963a), García-París, M. *et al.* (2000), García-París, M., Parra-Olea, G. and Wake, D.B. (2000), Ibáñez, R. *et al.* (2000), Savage, J.M. (2002), Wake, D.B. (1987), Young, B. *et al.* (1999)

Data Providers: Frank Solís, Roberto Ibáñez, Jay Savage, David Wake, Gerardo Chaves

CR *Bolitoglossa longissima* McCranie and Cruz, 1996

Critically Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Honduras
Current Population Trend: Decreasing



Geographic Range This species is known only from the Parque Nacional Sierra de Agalta, in the Departamento de Olancho, east-central Honduras, from 1,840-2,240m asl.

Population It is an uncommon species.

Habitat and Ecology It lives in lower montane wet forest where it can be found in bromeliads near the ground, on low moss-covered branches of trees, and on the ground under moss and leaves. It is not known whether or not it can withstand habitat disturbance. It breeds by direct development, and is not dependent on water.

Major Threats The main threats to the species stem from forest fires and extended dry seasons.

Conservation Measures Although the species occurs in the Parque Nacional Sierra de Agalta, improved management of this area is required (particularly to control frequent fires).

Bibliography: McCranie, J.R. and Cruz, G.A. (1996), McCranie, J.R. and Wilson, L.D. (2002b)

Data Providers: Gustavo Cruz, Larry David Wilson, Randy McCranie

VU *Bolitoglossa macrinii* (Lafrentz, 1930)

Vulnerable B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known only from the Pacific slopes of the Sierra Madre del Sur of Oaxaca between San Gabriel Mixtepec and Pochutla, Mexico. Its altitudinal range is 1,500-2,500m asl. It probably occurs a little more widely than current records suggest.

Population It is an uncommon species.

Habitat and Ecology It lives in pine-oak forests and in shaded coffee plantations. In the forest it is possible to find them inside logs and in rock rubble. In shade-coffee plantations it can be found in the leaf axils of banana plants. It breeds by direct development and is not dependent upon water.

Major Threats Although this species can survive outside its original forest habitat, it does not tolerate the transformation of landscape into very open, and hence less humid, habitats. Such habitat modification is taking place because of increased human settlement and the abandonment of coffee plantations in favour of other forms of agriculture.

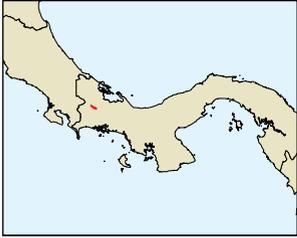
Conservation Measures It does not occur in any protected areas, and there is a need for improved maintenance and protection of pine-oak forests in the Sierra Madre del Sur. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Highton, R. (2000), Papenfuss, T.J., Wake, D.B. and Adler, K. (1983), Parra-Olea, G., García-París, M. and Wake, D.B. (2002), Wake, D.B. and Brame, A.H. (1963)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Bolitoglossa magnifica* Hanken, Wake and Savage, 2005

Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Panama
Current Population Trend: Decreasing



Geographic Range This species is known from a few localities in a small area near Volcán Barú on the Pacific slope of the southern Cordillera de Talamanca-Barú range, between Cerro Punta and Boquete, Chiriquí Province, Panama, at 1,250-2,450m asl. Like other species in this genus, the species is likely to have a small range.

Population It has not been collected or observed in over 30 years. It appears to be rare, and the lack of records is perhaps not indicative of a decline.

Habitat and Ecology The type series was collected in mossy oak forest with small bromeliads in the forest canopy. The species is considered unlikely to be tolerant of much habitat degradation. Individuals were found under logs and rough-hewn planks or inside rotting stumps, and under a small rock. The species is presumed to breed by direct development.

Major Threats Chytrid fungus is a threat, and has been associated with declines of other species to the north and west. Habitat loss,

MAGNIFICENT WEB-FOOTED SALAMANDER

due to smallholder agricultural activities and logging, is presumably also a threat; the forest connecting Volcán Barú to La Amistad consists of a network of privately owned farm properties, and has been under sporadic threat from road development and fires.

Conservation Measures Part of the known range of this species falls within Parque Nacional Volcán Barú. There is a need for further survey work to establish the current population status of this species, particularly given the threat of chytrid.

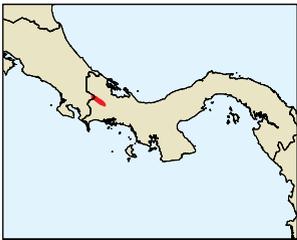
Notes on taxonomy: This species was described from specimens that were earlier provisionally assigned to *Bolitoglossa nigrescens* (Hanken, Wake and Savage 2005).

Bibliography: Hanken, J., Wake, D.B. and Savage, J.M. (2005)

Data Providers: James Hanken, Roberto Ibanez, David Wake

EN *Bolitoglossa marmorea* (Tanner and Brame, 1961)

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica, Panama
Current Population Trend: Decreasing



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Geographic Range This species is found on the lower montane and montane slopes of the southern Cordillera de Talamanca-Barú of eastern Costa Rica and western Panama. Its altitudinal range is 1,920-3,444m asl.

Population Although known to be common, there have been no records of this species for over ten years, although there has been a lack of survey work.

Habitat and Ecology It inhabits humid montane forest, and seems to spend the day under rocks, while at night it is found on mossy trunks and limbs of trees. It survives in degraded habitats. Breeding is by direct development and the species is not dependent upon water.

Major Threats Although it is somewhat adaptable, severe habitat loss due to smallholder agricultural activities, and probably also fire, is a threat.

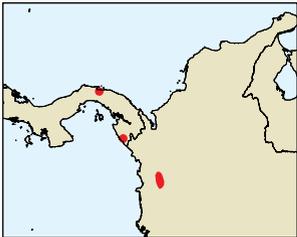
Conservation Measures It occurs in two protected areas: Parque Nacional Volcán Barú in Panama, and Parque Internacional La Amistad in Panama and Costa Rica. Survey work is needed to determine the current population status of this species in the wild.

Bibliography: Ehmccke, J., Clemens, G. and Greven, H. (2003), Hanken, J. and Wake, D.B. (1982), Ibáñez, R. *et al.* (2000), Savage, J.M. (2002), Tanner, W.W. and Brame, A.H. (1961), Wake, D.B. (1987), Wake, D.B., Brame, A.H. and Duellman, W.E. (1973), Young, B. *et al.* (1999)

Data Providers: Frank Solís, Roberto Ibáñez, Jay Savage, David Wake, Gerardo Chaves

VU *Bolitoglossa medemi* Brame and Wake, 1972

Vulnerable B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Colombia, Panama
Current Population Trend: Decreasing



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Geographic Range This species has been recorded from the Río Arquía area in Antioquia Department in the Chocó region of Colombia, south to Quibdo in Chocó Department. Specimens have been referred to this species from the Darién and San Blas regions of central and eastern Panama. It occurs below 600m asl. It is presumably found in intervening areas between the mapped localities.

Population It appears to be a rare species.

Habitat and Ecology It is an arboreal species in humid lowland forest, and does not occur in disturbed habitats. It breeds by direct development and is not dependent upon water.

Major Threats There are very few threats within its range in Panama, though there is a small amount of shifting cultivation. In Colombia, the major threats are deforestation for agricultural development (including the planting of illegal crops), logging, and human settlement, and pollution resulting from the spraying of illegal crops.

Conservation Measures It occurs in Parque Nacional Darién in Panama. It is not known from any protected areas in Colombia.

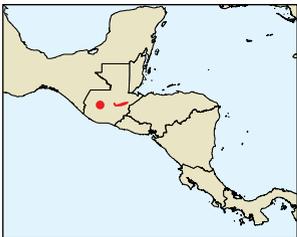
Notes on taxonomy: It is not clear that the Panamanian and Colombian populations belong to the same species.

Bibliography: Brame, A.H. and Wake, D.B. (1972), Ibáñez, R. *et al.* (2000), Ruiz-Carranza, P.M., Ardila-Robayo, M.C. and Lynch, J.D. (1996), Young, B. *et al.* (1999)

Data Providers: Frank Solís, Roberto Ibáñez, David Wake, Wilmar Bolívar, Juan Manuel Renjifo

EN *Bolitoglossa meliana* Wake and Lynch, 1982

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala
Current Population Trend: Decreasing



© Thomas Bille

Geographic Range This species is known from six localities, spanning approximately 160km, in the mountains of central Guatemala, including the Sierra de Chuacús and the Sierra de la Minas, at an altitude of 1,550-2,730m asl.

Population It is a rare species and hard to find.

Habitat and Ecology It lives in both cloud forest and less humid oak-pine forest and forest edge, but not in degraded habitats. It can be found beneath logs, under bark of fallen logs, or in bromeliads. Breeding takes place by direct development and it is not dependent upon water.

Major Threats The major threat is habitat loss due to expanding agriculture and human settlement.

Conservation Measures It occurs in Parque Nacional Sierra de la Minas and Biotopo del Quetzal. Field surveys are needed to better determine the distribution and population status of the species.

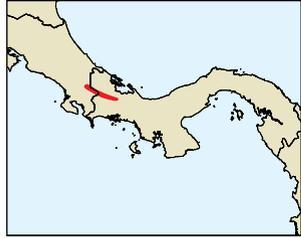
Notes on taxonomy: This species might be a complex of more than one species.

Bibliography: Bille, T. (2000), Campbell, J.A. (2001), Highton, R. (2000), Wake, D.B. (1987), Wake, D.B. and Lynch, J.F. (1982)

Data Providers: Manuel Acevedo, David Wake

EN *Bolitoglossa minutula* Wake, Brame and Duellman, 1973

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica, Panama
Current Population Trend: Decreasing



© Michael and Patricia Fogden



Geographic Range This species is known from the humid lower montane zone on both slopes of the southern Cordillera de Talamanca of western Panama and eastern Costa Rica, at 1,670-2,660m asl. There is a question as to how far east it extends in Panama, since the specimen from near Volcán Barú is taxonomically questionable.

Population This is quite a common species, and its population in Costa Rica is apparently stable (at least through 1996) at Las Tablas.

Habitat and Ecology It inhabits humid montane forest, being scansorial, foraging in vegetation up to 1m above the ground, and sometimes hiding in bromeliads during the day; it does not survive in degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats The major threat is destruction of natural forests due to expanding agriculture, logging, and human settlements.

Conservation Measures It occurs in Parque Internacional La Amistad on the Costa Rica-Panama border.

Bibliography: García-París, M. *et al.* (2000), Ibáñez, R. *et al.* (2000), Lips, K.R. (1993b), Lips, K.R. (1998), Savage, J.M. (2002), Wake, D.B. (1987), Wake, D.B., Brame, A.H. and Duellman, W.E. (1973), Young, B. *et al.* (1999)

Data Providers: Frank Solís, Roberto Ibáñez, Jay Savage, David Wake, Gerardo Chaves

VU *Bolitoglossa mombachoensis* Köhler and McCranie, 1999

Vulnerable D2
Order, Family: Caudata, Plethodontidae
Country Distribution: Nicaragua
Current Population Trend: Stable



Geographic Range This species is known only from Volcán Mombacho, Departamento de Granada, Nicaragua, at 950-1,250m asl. It might occur on other volcanoes in south-western Nicaragua.

Population It is very abundant within its small range.

Habitat and Ecology It inhabits cloud forest and elfin forest, but is also somewhat tolerant of habitat degradation and can live in introduced tall grass. It is arboreal and breeds by direct development and is not dependent upon water.

Major Threats This species is known from an isolated volcano in south-western Nicaragua where severe habitat degradation has occurred except for a small area of cloud forest where the species lives, and which is currently well protected.

Conservation Measures It occurs in the Reserva Natural Volcán Mombacho. There is a need for close monitoring of the population status of this species given its very limited range.

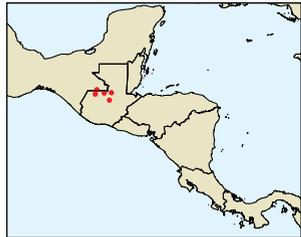
Notes on taxonomy: This species was originally confused with *Bolitoglossa striatula*.

Bibliography: Jansen, M. and Koehler, G. (2001), Köhler, G. (2001), Köhler, G. and McCranie, J.R. (1999)

Data Providers: Gunther Köhler, David Wake

VU *Bolitoglossa mulleri* (Brocchi, 1883)

Vulnerable B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala, Mexico
Current Population Trend: Decreasing



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Geographic Range This species is known from the mountains of the Atlantic slopes of eastern Chiapas (Mexico) and northern Guatemala. In Guatemala, it occurs in the Sierra de Los Cuchumatanes, Alta Verapaz highlands, and the Sierra de Santa Cruz. Its altitudinal range is 140-1,500m asl. It probably occurs more widely in this range than current records suggest.

Population It is an uncommon species.

Habitat and Ecology It lives in cloud forest and pine-oak broadleaf forests, but is somewhat adaptable and has been found under rocks in gardens and in coffee plantations. During dry periods it hides in arboreal bromeliads up to 5m above the ground. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is habitat loss due to expanding agriculture (livestock), wood extraction, and human settlement, which results in the opening up, and hence drying out, of its habitat.

Conservation Measures It has not been recorded from any protected areas, and there is a need for improved protection of pine-oak forest habitats in the range of this species.

Bibliography: Campbell, J.A. (1998), Campbell, J.A. (2001), Elias, P. (1984), Lázcano-Barrero, M.A. (1992), Lee, J.C. (1996), Lee, J.C. (2000), Wake, D.B. (1987)

Data Providers: Manuel Acevedo, David Wake

EN *Bolitoglossa odonnelli* (Stuart, 1943)

Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala, Honduras
Current Population Trend: Decreasing



© Sean M. Revito



Geographic Range This species ranges from the Atlantic slopes of Alta Verapaz to the Montañas del Mico, Guatemala, at 100-1,200m asl. It definitely occurs in Honduras, and it might be widespread in this country, but the exact localities are not yet clear due to recent taxonomic changes, and so it is not currently mapped in this country.

Population This species was formerly common, but has undergone declines and is now rare.

Habitat and Ecology It lives in rainforests and cloud forests, usually in disturbed habitats, and can be found at night on low vegetation near streams and also under leaf sheaths of banana plants. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is habitat loss due to encroachment of agricultural activity and human settlement, and the loss of bromeliads.

Conservation Measures Part of the range of this species is included in Parque Nacional Sierra de las Minas. There is a need for close population monitoring.

Notes on taxonomy: This form is part of a complex of three species that are difficult to separate morphologically, making it hard to know which species occurs where. It might be conspecific with *Bolitoglossa mexicana*.

Bibliography: Campbell, J.A. (1998), Campbell, J.A. (2001), García-París, M., Parra-Olea, G. and Wake, D.B. (2000), Wake, D.B. (1987), Wake, D.B. and Brame, A.H. (1963), Wake, D.B. and Elias, P. (1983)

Data Providers: David Wake, Manuel Acevedo

CR *Bolitoglossa oresbia* McCranie, Espinal and Wilson, 2005**Critically Endangered B1ab(iii)+2ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Honduras**Current Population Trend:** Decreasing

© James McCranie



Geographic Range This species is known only from three specimens collected at 1,880 m on the isolated mountaintop of Cerro El Zarcadero, in the northern part of the department of Comayagua, Honduras. The species is presumed to be restricted to this mountain.

Population There is no information on the population status of this species.

Habitat and Ecology All three specimens were found in cloud forest, inside water-containing arboreal bromeliads before the rainy season had begun in earnest. The species is presumed to breed by direct development.

Major Threats Forest on the isolated mountaintop that comprises the only known range for this species has been reduced to less than 1ha in extent, due to forest removal for agricultural crop fields. Such habitat loss is not only a direct threat, but might also indirectly cause degradation of the environment in the species' remaining habitat by drying of the general environment (and the use of pesticides).

Conservation Measures The limited remaining habitat in the range of this species requires urgent protection. An attempt to entice local businessmen to purchase the land to safeguard the species was unsuccessful.

Bibliography: McCranie, J.R., Espinal, M.R. and Wilson, L.D. (2005)

Data Providers: James McCranie, Larry Wilson, David Wake

VU *Bolitoglossa orestes* Brame and Wake, 1962**Vulnerable D2****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Venezuela**Current Population Trend:** Stable

Geographic Range This species is restricted to cloud forests in the vicinity of Mérida city, in Mérida state, Venezuela. It has been recorded from 2,000-3,500m asl (Brame and Wake 1962).

Population It is not a common species.

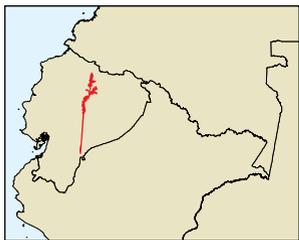
Habitat and Ecology It is restricted to cloud forests, and breeds by direct development.

Major Threats Some populations might be affected by logging and agriculture; however, much of its habitat is conserved in protected areas.

Conservation Measures It is found in Parque Nacional Sierra de la Culata and Parque Nacional Sierra Nevada. It is listed as an endangered species in the Venezuelan Red Data Book.

Bibliography: Barrio Amorós, C.L. (2004), Barrio-Amorós, C.L. and Fuentes-Ramos, O. (1999), Brame, A.H. and Wake, D.B. (1962), Brame, A.H. and Wake, D.B. (1963b), La Marca, E. (1994d), Péfaur, J.E. and Rivero, J.A. (2000), Schargel, W.E., Garcia-Perez, J.E. and Smith, E.N. (2002), Vial, J.L. and Saylor, L. (1993)

Data Providers: Enrique La Marca, Juan Elías García-Pérez

VU *Bolitoglossa palmata* (Werner, 1897)**Vulnerable B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Ecuador**Current Population Trend:** Stable

© Luis A. Coloma



Geographic Range This species occurs on the eastern slopes of the Andes in Ecuador. It has been recorded from 1,600-2,200m asl.

Population It is a rare species.

Habitat and Ecology It is a montane forest species; it is not known whether or not it can persist in altered habitats. It breeds by direct development.

Major Threats Agriculture, both crops and livestock, as well as logging, mining, and infrastructure development for human settlement are major threats to the species' habitat. Agricultural pollution is also a threat.

Conservation Measures Its range overlaps with Parque Nacional Sumaco Napo-Galeras, Parque Nacional Llanganates, Parque Nacional Sangay, Reserva Ecológica Cayambe-Coca, and Reserva Ecológica Antisana.

Bibliography: Almandáriz, A. (1997), Ortiz, A. and Morales, M. (2000), Werner, F. (1897), Yanez-Muñoz, M. (2001)

Data Providers: Luis A. Coloma, Santiago Ron, Manuel Morales, Ana Almandáriz

EN *Bolitoglossa pandi* Brame and Wake, 1963**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Colombia**Current Population Trend:** Decreasing

Geographic Range This species is known only from the vicinity of the type locality: Municipio de Pandi, in the department of Cundinamarca, Colombia, at 1,300m asl. It is likely to occur a little more widely than is currently known.

Population It is an uncommon species.

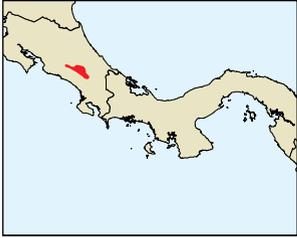
Habitat and Ecology It is found in low vegetation in riverine forest areas, and breeds by direct development.

Major Threats Habitat destruction and degradation caused primarily by agriculture (involving the cultivation of crops and livestock farming) is the major threat, and the habitat is now severely fragmented.

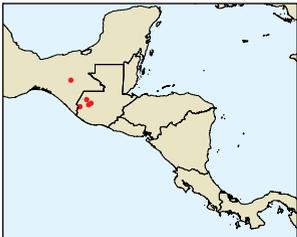
Conservation Measures There are no protected areas within its range, and there is an urgent need to protect the habitat at its only known locality. Further research is needed to help document the full range of this species.

Bibliography: Acosta-Galvis, A.R. (2000), Brame, A.H. and Wake, D.B. (1963b), Brame, A.H. and Wake, D.B. (1972), Hanken, J. and Wake, D.B. (1982), Ruiz-Carranza, P.M., Ardila-Robayo, M.C. and Lynch, J.D. (1996)

Data Providers: Martha Patricia Ramírez Pinilla, Mariela Osorno-Muñoz, Jose Vicente Rueda, Adolfo Amézquita, María Cristina Ardila-Robayo

EN *Bolitoglossa pesrubra* (Taylor, 1952)**Endangered A2ace****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Costa Rica**Current Population Trend:** Decreasing

© Iwan Leenders

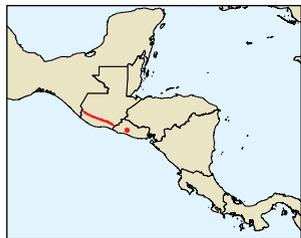
**Geographic Range** This species is restricted to the Cordillera de Talamanca in Costa Rica at 1,870-3,620m asl. Populations in the southern Talamanca probably represent a different species.**Population** It still occurs in many places within its range, but has drastically declined in many sites where it was formerly abundant. Some populations have declined by more than 90% while others appear to be stable.**Habitat and Ecology** It lives in humid lower montane, montane, and sub-alpine zones, occurring in forest as well as disturbed areas such as road sides and garbage dumps. It breeds by direct development and is not dependent upon water.**Major Threats** Habitat loss and fragmentation are ongoing within its range, but probably do not account for the level of decline that has been observed. Although the exact reason is not known, declines in suitable habitat could be the result of other threats such as climate change or disease (possibly chytridiomycosis, although this normally impacts species that are associated with water).**Conservation Measures** The range of this species includes several national parks along the Cordillera de Talamanca, such as Parque Nacional Chirripo. Further research is needed to better understand the reasons for the declines observed in this species.**Notes on taxonomy:** This form was formerly considered to be part of *Bolitoglossa subpalmata*. Several species might still be involved in what is now considered *B. pesrubra*.**Bibliography:** García-París, M. *et al.* (2000), Savage, J.M. (2002), Vial, J.L. (1968)**Data Providers:** Federico Bolaños, Gerardo Chaves, David Wake, Jay Savage**EN** *Bolitoglossa porrasorum* McCranie and Wilson, 1995**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Honduras**Current Population Trend:** Decreasing**Geographic Range** This species occurs in the Montana de Pijol (department of Yoro), Quebrada de Oro, Cerro Bufalo, and Cerro San Francisco (department of Atlantida), all in north-central Honduras, at elevations of 980-1,920m asl.**Population** It is a fairly common species.**Habitat and Ecology** It lives in arboreal bromeliads, on low vegetation, and on the ground under rotten plant material, in premontane and montane wet forests. It can survive in degraded habitats close to forest, especially on banana plants. Breeding takes place by direct development and the species is not dependent upon water.**Major Threats** The main threat is habitat loss due to expanding subsistence and small-scale agriculture (involving the cultivation of crops and livestock farming), forest fires, and logging.**Conservation Measures** It occurs in Parque Nacional Pico Bonito, Parque Nacional Pico Pijol, and on the edge of Texiguat Wildlife Refuge.**Bibliography:** Holm, P.A. and Cruz, G.A. (1994), McCranie, J.R. (1996a), McCranie, J.R. and Wilson, L.D. (1995a), McCranie, J.R. and Wilson, L.D. (2002b)**Data Providers:** Gustavo Cruz, Larry David Wilson, Randy McCranie**EN** *Bolitoglossa riletii* Holman, 1964**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing**Geographic Range** This species is known only from a very restricted area to the north and south of Putla town in extreme western Oaxaca, Mexico, at 700-1,030m asl. It has not been well looked for, and might occur more widely.**Population** It is an uncommon species.**Habitat and Ecology** It lives in secondary tropical semi-deciduous forest, as well as in shaded banana and coffee plantations. It is arboreal, and most specimens have been collected in the leaf axils of bananas and other large-leaved plants. It breeds by direct development and is not dependent upon water.**Major Threats** This species appears to be relatively resistant to habitat modification (taking place across the range due to logging and agriculture) and occurs in shaded plantations, though even these habitats are threatened as a result of agricultural change.**Conservation Measures** It is not known from any protected area, making the protection of forest habitat for this species a priority. It is protected by Mexican law under the "Special Protection" category (Pr).**Bibliography:** Papenfuss, T.J., Wake, D.B. and Adler, K. (1983), Parra-Olea, G., García-París, M. and Wake, D.B. (2002)**Data Providers:** Gabriela Parra-Olea, David Wake**VU** *Bolitoglossa rostrata* (Brocchi, 1833)**Vulnerable B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Guatemala, Mexico**Current Population Trend:** Decreasing

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**Geographic Range** This species is known in Mexico from Volcán Tezontehuitz, north-east of San Cristobal de las Casas, central Chiapas. In Guatemala, it occurs in the Sierra de los Cuchumatanes, the highlands associated with Volcans Tacana and Tajumulco, and in Zunil and the heights above Totonicapan. Its altitudinal range is 2,400-3,300m asl. It probably occurs in intervening areas between the mapped localities.**Population** It was very common, but apparently is now very rare in Mexico. It is still common in Cuchumatanes, Guatemala.**Habitat and Ecology** It inhabits high elevations in areas of cloud forest and pine-oak forests. It is largely terrestrial, being found occasionally in bromeliads or under bark. It can tolerate, and perhaps even benefit from, some disturbance of its habitat, but it avoids grasslands. It breeds by direct development and is not dependent upon water.**Major Threats** Although this species does well with moderate habitat disturbance, the very serious deforestation on Volcán Tezontehuitz is a major threat. Grazing by sheep is the main threat in this area, and any form of habitat management that leads to the encroachment of grassland is detrimental for the species.**Conservation Measures** It is not known from any protected areas. Urgent protection of the forests on Volcán Tezontehuitz is needed. This species is protected by Mexican law under the "Special Protection" category (Pr).**Notes on taxonomy:** This species probably comprises three different species (G. Parra-Olea and D. Wake pers. comm.).**Bibliography:** Alberch, P. and Alberch, J. (1981), Brodie, E.D., Jr., Ducey, P.K. and Baness, E.A. (1991), Campbell, J.A. (2001), Chan, L.M. (2003), Ducey, P.K., Brodie, E., Jr. and Baness, E.A. (1993), Elias, P. (1984), Wake, D.B. (1987), Wake, D.B. and Brame, A.H. (1963), Wake, D.B. and Lynch, J.F. (1976)**Data Providers:** Manuel Acevedo, David Wake

EN *Bolitoglossa salvinii* (Gray, 1868)**Endangered B1ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: El Salvador, Guatemala
Current Population Trend: Decreasing



Geographic Range This species is found in the upper coastal plain at moderate elevations (600-1,250m asl) on the Pacific slopes of southern Guatemala and from one locality in El Salvador (at the Instituto Tropical de Investigaciones Científicas in San Salvador).

Population It used to be reasonably common in suitable habitat, but is now uncommon.

Habitat and Ecology Originally an inhabitant of forest environs, these habitats have largely disappeared within its range, and it is now found mainly in shaded coffee plantations (under bananas) and in sugar-cane fields. It breeds by direct development and is not dependent upon water.

Major Threats The major threat in the past has been habitat loss, due mainly to subsistence agricultural activities and wood extraction. The clearance of shaded habitats to open, drier landscapes will be severely detrimental to this species.

Conservation Measures It is not known from any protected areas

in Guatemala, but might occur in Parque Nacional El Imposible in El Salvador (though this is not confirmed). The maintenance of shaded habitats is important to ensure the long-term persistence of this species.

Bibliography: Campbell, J.A. (2001), García-Paris, M., Parra-Olea, G. and Wake, D.B. (2000), Wake, D.B. (1987)

Data Providers: Manuel Acevedo, David Wake, Gunther Köhler

VU *Bolitoglossa silverstonei* Brame and Wake, 1972**Vulnerable B1ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Colombia
Current Population Trend: Decreasing



Geographic Range This species from north-western Colombia is known from the Pacific lowlands in the departments of Chocó and Valle del Cauca, and from a single locality in the department of Córdoba. Its altitudinal range is 20-400m asl. It probably occurs more widely between the confirmed localities.

Population It appears to be a rare species.

Habitat and Ecology It occurs in very humid tropical forest, and can be found on low herbaceous vegetation, fallen leaves and epiphytes. It is not known whether or not it can adapt to secondary habitats. It is presumed to breed by direct development.

Major Threats The major threats are habitat loss due to agricultural development (including planting of illegal crops), logging, and human settlement, and pollution resulting from the spraying of illegal crops.

Conservation Measures The record from the department of Córdoba is in the Parque Nacional Natural Paramillo. Improved habitat protection at sites at which the species is known to occur is necessary.

Bibliography: Acosta-Galvis, A.R. (2000), Brame, A.H. and Wake, D.B. (1972), Ruiz-Carranza, P.M., Ardila-Robayo, M.C. and Lynch, J.D. (1996)

Data Providers: Fernando Castro, Wilmar Bolívar

VU *Bolitoglossa sima* (Vaillant, 1911)**Vulnerable B1ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Ecuador
Current Population Trend: Decreasing



© Mario Humberto Yáñez-Muñoz

Geographic Range This species occurs in the north-western lowlands of Ecuador, below 1,000m asl. It is likely to have a slightly larger range than currently known.

Population The current population status of this species is not known.

Habitat and Ecology Individuals have been found in dense wet forest, as well as in a grassy field, cleared for cattle grazing (Brame and Wake 1963b). However, this does not necessarily suggest that the species adapts well to human-modified landscapes, and they might prefer regenerated forests. It breeds by direct development.

Major Threats Agriculture, both crops and livestock, as well as logging are major threats to the species' habitat.

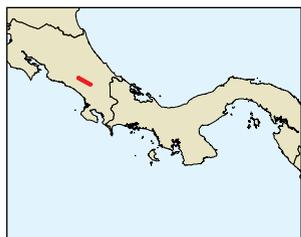
Conservation Measures Its range includes Reserva Ecológica Cotacachi-Cayapas.

Bibliography: Brame, A.H. and Wake, D.B. (1963b), Morales, M. *et al.* (2002), Vaillant, L. (1911)

Data Providers: Luis A. Coloma, Santiago Ron, Mario Yáñez-Muñoz, Diego Cisneros-Heredia, Ana Almandáriz

EN *Bolitoglossa sooyorum* Vial, 1953**Endangered B1ab(iii,v)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica
Current Population Trend: Decreasing



Geographic Range This species is known only from the Atlantic and Pacific slopes of the Cordillera de Talamanca of Costa Rica, at 2,355-3,000m asl. It might extend into western Panama.

Population This species was formerly rare, and has now decreased even further. There has been a fair amount of survey work on this species, and it is rarely seen.

Habitat and Ecology It lives in lower montane and montane rainforests, being found in talus on steep slopes, and on road cuts, but generally not in degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats Habitat loss has been taking place throughout the range, but this probably is not sufficient to explain the levels of decline observed in the species. Declines that have taken place in suitable habitat could be the result of other threats such as climate change or disease (possibly chytridiomycosis, although this normally impacts species that are associated with water).

Conservation Measures It is not known from any protected areas, though it might occur in Parque Nacional Chirripo. There is a need for close population monitoring of this species, and research is also necessary to investigate the reasons for the decline of this species in suitable habitat.

Bibliography: Dundee, H.A. (1998), García-Paris, M. *et al.* (2000), Savage, J.M. (2002), Vial, J.L. (1963), Wake, D.B. (1987)

Data Providers: Federico Bolaños, Gerardo Chaves, David Wake, Jay Savage

EN *Bolitoglossa spongai* Barrio-Amorós and Fuentes-Ramos, 1999**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Venezuela**Current Population Trend:** Decreasing

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Geographic Range This species is apparently restricted to cloud forests in the vicinity of La Carbonera, Campo Elias Municipality, in Mérida State, Venezuela. In the original description, Barrio-Amorós and Fuentes-Ramos (1999) indicate that it is also present in Quebrada La Mucuy (in Parque Nacional Sierra Nevada), but no museum numbers are given, and the only specimen coming from this place, listed by them, is a *Bolitoglossa orestes*. It has been recorded from 2,000-2,800m asl.

Population Recent fieldwork indicates that, although secretive, it is not rare in the La Carbonera region.

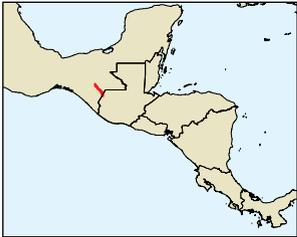
Habitat and Ecology It is a terrestrial inhabitant of mossy terrain in cloud forests, and even in drier sub-páramo shrubland. It has been collected in rotting tree trunks and beneath logs and stones, but never in bromeliads or epiphytes on trees. It breeds by direct development.

Major Threats The major threat is habitat loss due to smallholder agricultural activities. The recent introduction of *Rana catesbeiana* in the vicinity of the type locality may pose a problem in the near future.

Conservation Measures It has not been recorded from any protected areas (except if its presence is confirmed in Parque Nacional Sierra Nevada), but it occurs very close to Parque Nacional Sierra la Culata. Universidad de los Andes has a private reserve where this species was collected. There is a need for close population monitoring of this species.

Bibliography: Barrio Amorós, C.L. (2004), Barrio-Amorós, C.L. and Fuentes-Ramos, O. (1999), Barrio-Amorós, C.L. and Fuentes-Ramos, O. (2004), Schargel, W.E., Garcia-Perez, J.E. and Smith, E.N. (2002)

Data Providers: Enrique La Marca, Juan Elias García-Pérez, Oswaldo Fuentes-Ramos

EN *Bolitoglossa stuarti* Wake and Brame, 1969**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Guatemala, Mexico**Current Population Trend:** Decreasing

Geographic Range This species is found in the interior valley of southern Chiapas, Mexico, extending into extreme western Guatemala. Its altitudinal range is 1,200-2,000m asl.

Population It is known from very few specimens, and there is no information on its population status.

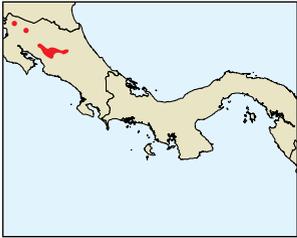
Habitat and Ecology It is an inhabitant of tropical deciduous forest, and it is not known whether or not it occurs in degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats Much of the habitat within the range of this species has been completely transformed to open grassland, due in particular to agricultural activities and selective logging.

Conservation Measures It is found in the Lagunas de Montebello Nature Reserve, Mexico, on the border with Guatemala. There is a need for fieldwork to determine the current population status of this species. It is listed as "Threatened" (Amenazada) by the Mexican government.

Bibliography: Campbell, J.A. (2001), Wake, D.B. and Brame, A.H. (1969)

Data Providers: Gabriela Parra-Olea, David Wake, Manuel Acevedo

EN *Bolitoglossa subpalmata* (Boulenger, 1896)**Endangered B1ab(v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Costa Rica**Current Population Trend:** Decreasing

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Geographic Range This species occurs on both slopes of the Cordillera de Guanacaste, the Cordillera de Tilarán, and the Cordillera Central and their outliers in central and northern Costa Rica, at 1,245-2,900m asl.

Population The current population status of the species is not known, but it appears to have declined (although it is still recorded on a regular basis).

Habitat and Ecology It lives in lower montane wet forest and rainforest, and marginally in the upper portion of premontane rainforest. It is frequently found in bromeliads and under fallen trees, logs, or rocks. It can occur in secondary growth, isolated trees in pastures, and other anthropogenic habitats, provided that there are trees and adequate cover. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is habitat loss and fragmentation, due to agricultural encroachment. It seems to have disappeared from Parque Nacional Poas for no particular reason, and has become extremely rare at Monteverde. Declines that have taken place in suitable habitat could be the result of other threats such as climate change or disease (possibly chytridiomycosis, although this normally impacts species that are associated with water).

Conservation Measures Much of its range is protected by numerous national parks and private reserves, such as Parque Nacional Guanacaste. Further research is needed to determine the reasons for the decline of this species in suitable habitat.

Notes on taxonomy: As assessed here, this taxon is restricted to northern Costa Rica (Savage 2000).

Bibliography: García-París, M. *et al.* (2000), Savage, J.M. (2002), Vial, J.L. (1968), Wake, D.B. (1987)

Data Providers: Alan Pounds, Federico Bolaños, Gerardo Chaves, David Wake, Jay Savage

CR *Bolitoglossa synoria* McCranie and Köhler, 1999**Critically Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** El Salvador, Honduras**Current Population Trend:** Decreasing

© James McCranie



Geographic Range This species occurs on Cerro El Pital in the Department of Ocotepeque in south-west Honduras, and in adjacent north-western El Salvador, at 2,150m asl.

Population It is an uncommon species.

Habitat and Ecology It lives on low vegetation in lower montane moist forest, and in nearby degraded areas where there is good cover. It breeds by direct development and is not dependent upon water.

Major Threats The major threat to this species is habitat loss and degradation due to the impacts of forest fires, and encroachment by subsistence farming.

Conservation Measures Cerro El Pital, which is the highest point in El Salvador, was declared a Biological Reserve in 1987, but on the Honduran side of the border only. Expansion of this protected area to include all of the Cerro El Pital is urgently needed.

Bibliography: McCranie, J.R. and Köhler, G. (1999a), McCranie, J.R. and Köhler, G. (1999b), McCranie, J.R. and Wilson, L.D. (2002b)

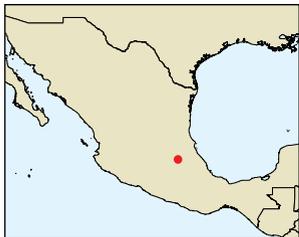
Data Providers: Gustavo Cruz, Larry David Wilson, Randy McCranie, Gunther Köhler

CR *Bradytriton silus* Wake and Elias, 1983**Critically Endangered B1ab(iii)+2ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Guatemala**Current Population Trend:** Decreasing

© James Hanken

**Geographic Range** This extremely distinctive species is known only from the immediate vicinity of the type locality in extreme north-western Guatemala, on the eastern slopes of the Sierra de los Cuchumatanes, at 1,310m asl.**Population** The species is known only from 12 specimens collected at the type locality. It has not been seen since 1976, despite recent searches.**Habitat and Ecology** It has been collected in both disturbed and undisturbed wet forest (approximately 6,000mm annual precipitation). The animals were found under pieces of wood and logs. It presumably breeds by direct development and is not dependent upon water.**Major Threats** There is severe habitat loss taking place at the type locality due to the settlement of refugees and expanding agriculture.**Conservation Measures** This species has not been recorded from any protected areas. Surveys are urgently needed to establish its current population status and whether or not it still survives in the wild.**Bibliography:** Campbell, J.A. (2001), Elias, P. (1984), Wake, D.B. and Elias, P. (1983)**Data Providers:** Manuel Acevedo, David Wake**EN** *Chiropterotriton chondrostega* (Taylor, 1941)**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Gabriela Parra-Olea

**Geographic Range** This species is known only from north-western Hidalgo and eastern Queretaro, Mexico, at 2,000-2,300m asl.**Population** It is uncommon.**Habitat and Ecology** This is a terrestrial species inhabiting only pristine pine-oak forests. It breeds by direct development and is not dependent upon water.**Major Threats** Its forest habitat is under severe pressure from expanding agriculture, and from wood extraction.**Conservation Measures** It is found in Parque Nacional Los Marmoles and the Reserva de la Biósfera Sierra Gorda, and is protected by Mexican law under the "Special Protection" category (Pr).**Bibliography:** Darda, D. (1994), Martin, P.S. (1958), Rabb, G.B. (1958), Ramirez-Bautista, A., Flores-Villela, O. and Casas-Andreu, G. (1982), Wake, D.B. (1987)**Data Providers:** Gabriela Parra-Olea, David Wake**EN** *Chiropterotriton cracens* Rabb, 1958**Endangered B1ab(v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing**Geographic Range** This species is known only from the Reserva de la Biósfera Rancho del Cielo in Tamaulipas in north-eastern Mexico, at 1,500-2,000m asl.**Population** It is probably uncommon and decreasing, but can still be found.**Habitat and Ecology** It lives in bromeliads in cloud forest, occurring only in undisturbed habitat. It breeds by direct development and is not dependent upon water.**Major Threats** Declines are taking place in suitable habitat, and these could be the result of threats such as climate change or disease (possibly chytridiomycosis, although this normally impacts species that are associated with water).**Conservation Measures** It occurs in the Reserva de la Biósfera Rancho del Cielo. Further research is necessary to understand the reasons for the decline of this species in suitable habitat.**Bibliography:** Darda, D. (1994), Rabb, G.B. (1958), Ramirez-Bautista, A., Flores-Villela, O. and Casas-Andreu, G. (1982)**Data Providers:** Gabriela Parra-Olea, David Wake**EN** *Chiropterotriton dimidiatus* (Taylor, 1939)**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Thomas Bille

**Geographic Range** This species is known only from a small area of southern Hidalgo, Mexico, at 2,500-2,700m asl.**Population** It used to be abundant, but its numbers are now severely reduced.**Habitat and Ecology** It inhabits only pristine pine-oak and fir forests, where it is found under bark or logs. It breeds by direct development and is not dependent upon water.**Major Threats** Most of the forests where this species has been recorded have been severely transformed through the activities of smallholder farmers, logging, and human settlement. It has disappeared even from areas where the habitat has been only slightly degraded.**Conservation Measures** It occurs in Parque Nacional El Chico, but improved management of this area is urgently needed to reduce the heavy impacts of tourism, including more fires, and the cutting of forest for recreational facilities. This species is protected by Mexican law under the "Special Protection" category (Pr).**Bibliography:** Darda, D. (1994), Parra-Olea, G., Garcia-Paris, M. and Wake, D.B. (1999), Rabb, G.B. (1958)**Data Providers:** Gabriela Parra-Olea, David Wake

CR *Chiropterotriton lavae* (Taylor, 1942)

Critically Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known only from La Joya, central-western Veracruz, Mexico, at 1,200m asl.

Population It is moderately abundant in its tiny range, although its population does appear to have declined recently, most likely due to loss of suitable habitat.

Habitat and Ecology It lives in bromeliads in pine-oak and cloud forests, and can survive in somewhat disturbed forests, although it is dependent upon the presence of trees. It breeds by direct development and is not dependent upon water.

Major Threats All areas surrounding La Joya are highly disturbed by extensive logging and mining: between 2003 and 2004, the area of forest habitat available for this species was halved due to the expansion of mining activities; the remaining available habitat was only about 15ha in 2004.

Conservation Measures It is not known from any protected areas, and maintenance and protection of the La Joya forests is urgently needed. This species is protected by Mexican law under the "Special Protection" category (Pr).

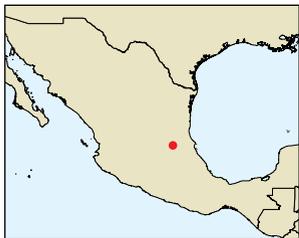
Notes on taxonomy: There is continuing uncertainty as to the taxonomic status of this form (D. Wake and G. Parra-Olea pers. comm.).

Bibliography: Darda, D. (1994), Parra-Olea, G., Garcia-Paris, M. and Wake, D.B. (1999), Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake, Jean Raffaelli

CR *Chiropterotriton magnipes* Rabb, 1965

Critically Endangered B2ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Guillermo Velo Antón

Geographic Range This species is known only from south-eastern San Luis Potosi and eastern Queretaro, Mexico, at around 2,400m asl.

Population Although it has never been common, it used to be seen regularly. However, the species has not been seen in recent years, despite searches.

Habitat and Ecology It lives in caves and crevices in pine-oak forest, and has also been found in a tunnel under a church. It breeds by direct development and is not dependent upon water.

Major Threats The removal of the forest habitat from above the caves has caused the caves to dry out, resulting in the apparent disappearance of this species.

Conservation Measures It is not known from any protected area. A survey is needed to evaluate the status of this species, and protection of the original habitat (both of the caves and the surrounding forest) is urgent. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Darda, D. (1994), Rabb, G.B. (1965)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Chiropterotriton mosaueri* (Woodall, 1941)

Critically Endangered B2ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known only from caves in Durango town and its surroundings, in northern Hidalgo, Mexico, at 2,160m asl.

Population It has not been seen since it was first described, despite searches in the caves where it was first found.

Habitat and Ecology It is a crevice-dweller that apparently requires humid caverns in pine-oak forest in order to survive. It breeds by direct development and is not dependent upon water.

Major Threats The forest habitat surrounding the caves is under severe pressure from expanding agriculture, and from wood extraction. Like *Chiropterotriton magnipes*, this species might have disappeared due to the drying of its caves following the removal of forest.

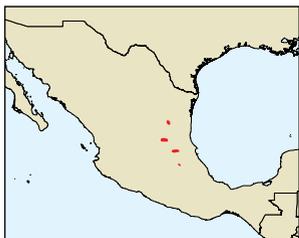
Conservation Measures The type locality is on the edge of the Parque Nacional Los Marmoles, but it is not certain that the species still occurs here, or anywhere else, and additional survey work is required to ascertain whether or not this species survives in the wild. It is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Darda, D. (1994)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Chiropterotriton multidentatus* (Taylor, 1938)

Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Thomas Bille

Geographic Range This species occurs in southern San Luis Potosi, southern Tamaulipas, and southern Hidalgo, Mexico, at 2,000-2,900m asl. The Hidalgo population might belong to an undescribed species.

Population It used to be abundant in Parque Nacional El Chico (Hidalgo), but in the early 1980s it largely disappeared, although a few individuals have been found there in recent years. It can no longer be found at its type locality in San Luis Potosi.

Habitat and Ecology It lives in pine and pine-oak forests, only in undisturbed habitat, where it lives in arboreal bromeliads (and is also a crevice-dweller). It breeds by direct development and is not dependent upon water.

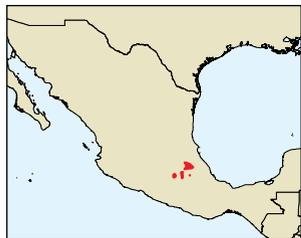
Major Threats The cause of its decline is not clear, although it could be very sensitive to even minor modifications of its forest habitat. Most of the forests where this species has been recorded have been severely transformed by agricultural activities and logging. Declines that have taken place in suitable habitat could be the result of other threats such as climate change or disease (possibly chytridiomycosis, although this normally impacts species that are associated with water).

Conservation Measures It is recorded from Parque Nacional El Chico (where it is now extremely rare, but these records might refer to a different species) and from the Reserva de la Biosfera El Cielo (where it is also very rare). Further research is necessary to understand the reasons for the decline of this species in suitable habitat. It is protected by Mexican law under the "Special Protection" category (Pr).

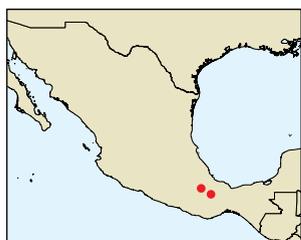
Notes on taxonomy: Darda (1994) split this species into two, but did not provide a formal name for the southernmost population (in Hidalgo State). In this account we treat all four known populations as *Chiropterotriton multidentatus*, pending the formal description of the southernmost population.

Bibliography: Camarillo-R, J.L. (1995), Darda, D. (1994), Martin, P.S. (1958), Parra-Olea, G., Garcia-Paris, M. and Wake, D.B. (1999), Rabb, G.B. (1958), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake, Jean Raffaelli

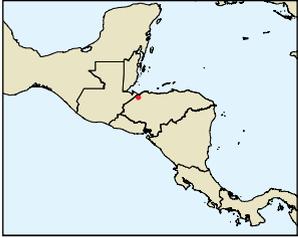
VU *Chiropotertriton orculus* (Cope, 1865)**Vulnerable B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Thomas Bille

Geographic Range This species occurs on the southern and eastern margins of the Mexican Plateau, Mexico, above 2,500m asl.**Population** It is quite a common species.**Habitat and Ecology** It lives in pine-oak forest and fir forest and can survive in slightly disturbed habitats. It is terrestrial and breeds by direct development and is not dependent upon water.**Major Threats** The main threat is habitat loss due to logging and human settlement.**Conservation Measures** It occurs in several protected areas, including Parque Nacional Cumbres del Ajusco and Parque Nacional Iztaccíhuatl-Popocatepetl.**Notes on taxonomy:** Removed from the synonymy of *Chiropotertriton chiropeterus* by Darda (1994).**Bibliography:** Darda, D. (1994)**Data Providers:** Gabriela Parra-Olea, David Wake**EN** *Cryptotriton adelos* (Papenfuss and Wake, 1987)**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing**Geographic Range** This species is known only from the Atlantic slopes of the Sierra de Juárez, Peña Verde, and at Sierra de Mazateca on the Guelatao-Vista Hermosa transect, north-central Oaxaca, Mexico. Its altitudinal range is 1,530-2,050m asl.**Population** It is a very rare, and is occasionally recorded.**Habitat and Ecology** It inhabits undisturbed cloud forests, being found in bromeliads and other epiphytic plants, and in leaf-litter, and does not tolerate disturbance of its habitat. It breeds by direct development and is not dependent upon water.**Major Threats** The major threat is loss of habitat due to logging and expanding agricultural activity and human settlement.**Conservation Measures** It has not been recorded in any protected areas, making formal protection of its remaining cloud forest habitat an urgent priority.**Bibliography:** García-París, M. and Wake, D.B. (2000), Papenfuss, T.J. and Wake, D.B. (1987), Parra-Olea, G., García-París, M. and Wake, D.B. (1999)**Data Providers:** Gabriela Parra-Olea, David Wake**EN** *Cryptotriton alvarezdeltoroi* (Papenfuss and Wake, 1987)**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing**Geographic Range** This species is known only from northern Jitotol, north-central Chiapas, Mexico, at 1,200-1,550m asl.**Population** It is likely to be very rare; only 3-4 specimens of this species are known, and recent surveys have failed to record any specimens.**Habitat and Ecology** It inhabits cloud forest, and seems to require microclimates with very high humidity. It has been found at roadsides, but it is not known whether or not it can live in disturbed habitats. It breeds by direct development and is not dependent upon water.**Major Threats** The major threat is habitat loss due to expanding agriculture and human settlements, and also logging.**Conservation Measures** It has not been recorded from any protected areas, and there is therefore an urgent need for the protection of the cloud forest habitat of this species. Survey work is necessary to determine its current population status.**Bibliography:** García-París, M. and Wake, D.B. (2000), Papenfuss, T.J. and Wake, D.B. (1987)**Data Providers:** Gabriela Parra-Olea, David Wake**CR** *Cryptotriton monzoni* (Campbell and Smith, 1998)**Critically Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Guatemala**Current Population Trend:** Decreasing**Geographic Range** This species is known only from the type specimen from near La Unión, Zacapa, Guatemala, at 1,570m asl.**Population** No information is available on population status, but it is presumed to be rare.**Habitat and Ecology** It inhabits lower montane moist forest. The type specimen was found in a bromeliad in primary forest three metres above the forest floor. It presumably breeds by direct development and is not dependent upon water.**Major Threats** The major threat to this species is habitat loss around La Unión as a result of extensive logging and agricultural encroachment.**Conservation Measures** The species is not known from any protected areas, and protection of the remaining habitat is urgently required. Surveys are needed to establish the current population status of this species.**Bibliography:** Campbell, J.A. (2001), Campbell, J.A. and Smith, E.N. (1998), García-París, M. and Wake, D.B. (2000)**Data Providers:** Manuel Acevedo, David Wake

EN *Cryptotriton nasalis* (Dunn, 1924)

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Honduras
Current Population Trend: Decreasing



© Siliu Petrovan



Geographic Range This species occurs at middle and high elevations in Parque Nacional Cerro Casuco, in the Sierra de Omoa in Cortes Department, in extreme north-western Honduras. Its altitudinal range is 1,220-2,200m asl. It probably also occurs in nearby eastern Guatemala, although these records might involve *Cryptotriton wakei*.

Population It is a reasonably common species.

Habitat and Ecology It lives in pre-montane and lower montane wet forest and cloud forest, and is able to withstand some habitat degradation, providing this is not severe. It is an arboreal species, living in bromeliads. Breeding takes place by direct development and it is not dependent upon water.

Major Threats The main threat is forest loss due to expanding subsistence agriculture, in particular the creation of coffee farms. It might also be adversely affected by prolonged periods of drought.

Conservation Measures It occurs in Parque Nacional Cerro Casuco.

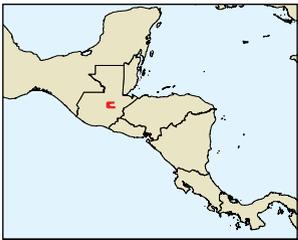
Notes on taxonomy: *Cryptotriton wakei* from Guatemala might be conspecific with this species (D. Wake pers. comm.).

Bibliography: Campbell, J.A. (2001), Campbell, J.A. and Smith, E.N. (1998), García-París, M. and Wake, D.B. (2000), McCranie, J.R. and Wilson, L.D. (2002b), Taylor, E.H. (1944), Wake, D.B. (1987), Wake, D.B. and Elias, P. (1983)

Data Providers: Gustavo Cruz, Larry David Wilson, Randy McCranie

EN *Cryptotriton veraepacis* (Lynch and Wake, 1978)

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala
Current Population Trend: Decreasing



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Geographic Range This species occurs in the Sierra de las Minas and nearby mountains, Guatemala, at 1,610-2,290m asl.

Population It is a fairly common species.

Habitat and Ecology It lives in humid cloud forest in lower montane wet forest, and does not survive in degraded habitats. It is typically found in arboreal bromeliads. Breeding takes place by direct development and is not dependent upon water.

Major Threats There is extensive habitat loss through much of its range due in particular to expanding subsistence farming, and the cultivation of ferns for floral arrangements, which are then exported to Japan.

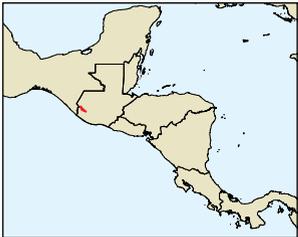
Conservation Measures It occurs in Parque Nacional Sierra de las Minas and Biotopo del Quetzal.

Bibliography: Campbell, J.A. (2001), García-París, M. and Wake, D.B. (2000), Lynch, J.F. and Wake, D.B. (1978), Wake, D.B. (1987)

Data Providers: Manuel Acevedo, David Wake

EN *Dendrotriton bromeliacius* (Schmidt, 1936)

Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala
Current Population Trend: Decreasing



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Geographic Range This species is restricted to south-western Guatemala, being known only from the southern slopes of Volcán Tajumulco and adjacent volcanic highlands in San Marcos, Guatemala. It occurs at elevations of 1,700-2,700m asl.

Population It used to be extremely common, but seems to have undergone declines: when it was discovered in the 1930s, nearly 60 specimens were collected just by searching bromeliads at the type locality. Forty years later, they could be found in around half of all bromeliads inspected.

Habitat and Ecology It lives in humid montane forest and forest edges, surviving only in mature old-growth forest. It is a bromeliad specialist. Breeding takes place by direct development and is not dependent upon water.

Major Threats Much of its forest habitat has been cleared for livestock, cultivation of crops, and wood extraction. **Conservation Measures** It does not occur in any formal protected areas, although its habitat is protected to some extent by the presence of land mines and guerrillas. This species is in need of improved habitat protection and close population monitoring.

Bibliography: Campbell, J.A. (2001), Schmidt, K.P. (1936a), Wake, D.B. (1987), Wake, D.B. and Lynch, J.F. (1976)

Data Providers: Manuel Acevedo, David Wake

CR *Dendrotriton cuchumatanus* (Lynch and Wake, 1975)

Critically Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala
Current Population Trend: Decreasing



Geographic Range This species is known from a single site south-west of San Juan Ixcay, in the Sierra de los Cuchumatanes, Guatemala, at about 2,860m asl. There is a probable recent record from Villa Alicia San Martín Cuchumatanes.

Population There is no information on current population status.

Habitat and Ecology It lives in high-elevation, very humid oak forest. Individuals have been found under moss and bark on large fallen trees; it has also been found in moss, but not in bromeliads. It breeds by direct development and is not dependent upon water.

Major Threats Although there has been extensive forest clearance for timber around the type locality, a small patch of oak forest is known to remain in the area.

Conservation Measures The type locality is inside the proposed Parque Nacional Cuchumatanes, but it is not known if the species still survives at the type locality and further survey work is needed to determine whether or not this species survives in the wild.

Bibliography: Campbell, J.A. (2001), Collins-Rainboth, A. and Buth, D.G. (1990), Elias, P. (1984), Lynch, J.F. and Wake, D.B. (1975), Wake, D.B. (1987), Wake, D.B. and Elias, P. (1983)

Data Providers: Manuel Acevedo, David Wake

VU *Dendrotriton megarhinus* (Rabb, 1960)**Vulnerable D2**

Order, Family: Caudata, Plethodontidae

Country Distribution: Mexico

Current Population Trend: Stable

Geographic Range This species occurs only on Cerro Pres Picos in extreme south-western Chiapas, Mexico, above 2,000m asl.**Population** There is no recent information on the population status of this species, but it was common in its very small range in the 1970s.**Habitat and Ecology** It is a bromeliad dweller in cloud forest. It breeds by direct development and is not dependent upon water.**Major Threats** It lives in a very remote area, and its habitat remains largely intact. Its small range renders it vulnerable to stochastic threatening processes.**Conservation Measures** This species occurs in Reserva de la Biósfera La Sepultura. There is a need for close monitoring of the population status of this species. It is protected by Mexican law under the "Special Protection" category (Pr).**Bibliography:** Collins-Rainboth, A. and Buth, D.G. (1990), Rabb, G.B. (1960), Wake, D.B. (1987), Wake, D.B. and Elias, P. (1983)**Data Providers:** Gabriela Parra-Olea, David Wake**EN** *Dendrotriton rabbi* (Lynch and Wake, 1975)**Endangered B1ab(iii)**

Order, Family: Caudata, Plethodontidae

Country Distribution: Guatemala

Current Population Trend: Decreasing



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Geographic Range This species occurs in western Guatemala on the Montañas de Cuilco, and in the Sierra de los Cuchumatanes, at an altitude of 2,100-2,700m asl.**Population** It is a fairly common species.**Habitat and Ecology** It occurs in bromeliads or under bark on logs and stumps in forest at the subtropical-temperate forest transition zone. It breeds by direct development and is not dependent upon water.**Major Threats** Forest clearance continues at the type locality, mainly as a result of wood extraction and expanding smallholder farming.**Conservation Measures** It occurs in the proposed Parque Nacional Sierra de los Cuchumatanes and presumably in the Reserva de la Biósfera Visis-Cabá.**Notes on taxonomy:** Records from the Sierra de los Cuchumatanes are provisionally assigned to this species.**Bibliography:** Campbell, J.A. (2001), Collins-Rainboth, A. and Buth, D.G. (1990), Elias, P. (1984), Lynch, J.F. and Wake, D.B. (1975), Wake, D.B. (1987), Wake, D.B. and Elias, P. (1983), Wake, D.B., Papenfuss, T.J. and Lynch, J.F. (1992)**Data Providers:** Manuel Acevedo, David Wake**EN** *Dendrotriton sanctibarbarus* (McCranie and Wilson, 1996)**Endangered B1ab(iii)**

Order, Family: Caudata, Plethodontidae

Country Distribution: Honduras

Current Population Trend: Decreasing

Geographic Range This species is known only from Parque Nacional Montana de Santa Barbara, in western Honduras, at 1,829-2,744m asl.**Population** It can be locally common in suitable habitat.**Habitat and Ecology** It lives in lower montane wet forest and montane rainforest, being found in arboreal, and sometimes terrestrial, bromeliads. Breeding takes place by direct development and is not dependent upon water.**Major Threats** There is continued forest loss in particular due to expanding subsistence agriculture and forest fires. Prolonged dry seasons are an increasing problem.**Conservation Measures** It occurs in the 12,000-ha Parque Nacional Montana de Santa Barbara.**Bibliography:** McCranie, J.R. and Wilson, L.D. (1996), McCranie, J.R. and Wilson, L.D. (2002b), Meyer, J.R. and Wilson, L.D. (1971), Wake, D.B. (1998), Wake, D.B. and Elias, P. (1983)**Data Providers:** Gustavo Cruz, Larry David Wilson, Randy McCranie**VU** *Dendrotriton xolocalcae* (Taylor, 1941)**Vulnerable D2**

Order, Family: Caudata, Plethodontidae

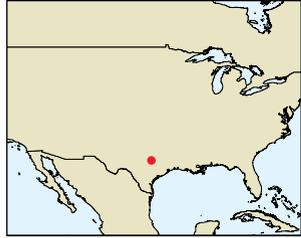
Country Distribution: Mexico

Current Population Trend: Stable

Geographic Range This species is known from one locality: Cerro Ovando, south-western Chiapas, Mexico, at 2,000m asl.**Population** It is probably common in its very small range; on one occasion, 34 individuals were found in a single bromeliad.**Habitat and Ecology** It lives in pine-oak forest, and is found only in bromeliads. It is not found in disturbed habitats. It breeds by direct development and is not dependent upon water.**Major Threats** Its forest habitat is potentially threatened by expanding agriculture and wood extraction, but fortunately this species occurs in an area where anthropogenic impacts on its habitat have been minimal.**Conservation Measures** It might occur in the Reserva de la Biósfera El Triunfo, which is close to Cerro Ovando, but it has not so far been found there, despite searches. There is a need for close monitoring of the population status of this species. It is protected by Mexican law under the "Special Protection" category (Pr).**Bibliography:** Wake, D.B. (1987), Wake, D.B. and Elias, P. (1983)**Data Providers:** Gabriela Parra-Olea, David Wake

VU *Eurycea chisholmensis* Chippindale, Price, Wiens and Hillis, 2000**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



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Geographic Range This species is known only from Big Boiling (= Main, Salado, or Siren) Springs and Robertson Springs at Salado, Bell County, Texas, United States (Chippindale *et al.* 2000). Salamanders that might represent this species have been found in springs of nearby Buttermilk Creek (G. Longley pers. comm. to Chippindale; Chippindale *et al.* 2000). This species is known from 2-3 sites, though additional occurrences might remain undetected (these salamanders are elusive and difficult to find) (Chippindale *et al.* 2000).

Population Chippindale *et al.* (2000) collected most specimens in 1989-1991, when several could sometimes be found on a single visit. Between 1991 and 1998, no additional animals were located despite more than 20 visits to the type locality; one specimen was found in August 1998.

Habitat and Ecology It is an entirely aquatic species, known only from the immediate vicinity of spring outflows, under rocks, and in gravel substrate (Chippindale 2005). Breeding takes place in water.

Major Threats Most spring outlets at Salado have been altered to some degree, and several groundwater contamination incidents have occurred recently (and more may occur in the future) (Chippindale *et al.* 2000).

Conservation Measures The type locality for this species is located in a municipal park. Salado salamanders are listed as a Candidate species for Federal listing. Habitat protection and population monitoring of this species is needed.

Bibliography: Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Chippindale, P.T. (2000), Chippindale, P.T. (2005a), Chippindale, P.T. *et al.* (2000), Chippindale, P.T., Hillis, D.M. and Price, A.H. (1994), Hillis, D.M. *et al.* (2001), Sweet, S.S. (1982)

Data Providers: Geoffrey Hammerson, Paul Chippindale

CHISHOLM TRAIL SALAMANDER**VU** *Eurycea junaluska* Sever, Dundee and Sullivan, 1976**Vulnerable D1**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Stable



Geographic Range This species is known from a portion of the Blue Ridge Mountains in south-western North Carolina and south-eastern Tennessee, USA (Conant and Collins 1991, Redmond and Scott 1996, Ryan 1997, USFWS 1999). It is extant in 17 streams (USFWS 1999).

Population A reliable estimate of population size cannot be made (Bruce and Ryan 1995). It is rare, even where known to be present (Ryan 1997). Richard Bruce (pers. comm., 1998) rated it as the rarest salamander in North America. Natural heritage programs estimated abundance at less than 1,000 individuals in the Great Smoky Mountain National Park (Dana Soehn pers. comm., 1998) and occupied habitat in North Carolina at 10-15 miles of stream (H. LeGrand pers. comm., 1998). Sever (1983) collected fewer than 50 transformed individuals in more than 10 years of fieldwork. Bruce (1982) collected only five adults during a survey period lasting over a year. A 1994-1995 survey of 63 locations yielded seven transformed individuals and no more than two adults; the remaining observations

were of larvae and eggs (Bruce and Ryan 1995). There is no direct evidence of any population declines; no populations are known to have been lost since the species was described (USFWS 1999). It is possibly stable in some areas, but specific range wide information on population trends is not available. One of three populations identified during a 1994-1995 survey appeared to be stable (Bruce and Ryan 1995). The Tennessee Valley and North Carolina populations probably are stable (H. LeGrand and R. Smith pers. comm., 1998).

Habitat and Ecology Its non-breeding habitat is unknown. Adults have been found hiding under objects in or along streams where reproduction and larval development take place. They may be found on roads near creeks on rainy nights, suggesting movement between a terrestrial habitat (possibly forest) and breeding sites along streams. It does not tolerate alterations to stream habitats.

Major Threats This species currently appears to be unthreatened. Potential threats include siltation due to logging, road construction for logging activities, urban development, and other activities that would negatively impact water quality (Braswell 1989, H. LeGrand and R. Smith pers. comm., 1998). Due to a widely disjunctive distribution, it is quite unlikely that migration will be sufficient for recolonization of populations that experience declines or local extinctions (Ryan 1998). Reckless sampling and site disruption during spring may cause undue stress to brooding females and result in the abandonment of clutches (Bruce and Ryan 1995).

Conservation Measures It occurs in the Great Smoky Mountain National Park (USFWS 1999). Most of the North Carolina populations are on Nantahala National Forest lands. *E. junaluska* is a species of special concern in North Carolina and it is listed as a species in need of management in Tennessee.

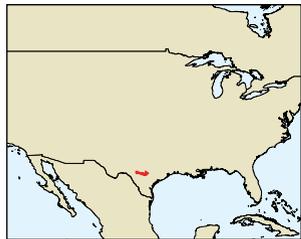
Notes on taxonomy: Jacobs (1987) found *Eurycea junaluska* to be genetically similar to *E. aquatica* and *E. cirrigera* and questioned the taxonomic status of *E. junaluska*. Sever (1989) found *E. junaluska* to be morphologically unique and genetically distinct from all sympatric *Eurycea*.

Bibliography: Behler, J.L. and King, F.W. (1979), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Braswell, A.L. (1989), Bruce, R.C. (1982), Bruce, R.C. and Ryan, T.J. (1995), Conant, R. and Collins, J.T. (1991), Frost, D.R. (1985), Jacobs, J.F. (1987), Martof, B.S. *et al.* (1980), Redmond, W.H. and Scott, A.F. (1996), Ryan, T.J. (1997), Ryan, T.J. (1998), Ryan, T.J. and Sever, D.M. (2005), Sever, D.M. (1983a), Sever, D.M. (1983b), Sever, D.M. (1989), Sever, D.M., Dundee, H.A. and Sullivan, C.D. (1976), U.S. Fish and Wildlife Service (1999a)

Data Providers: Geoffrey Hammerson, Travis Ryan

JUNALUSKA SALAMANDER**VU** *Eurycea latitans* Smith and Potter, 1946**Vulnerable B1ab(iii)+2ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Decreasing



Geographic Range This species is described by Chippindale, Hillis and Price (2000) and is included in the *E. latitans* complex populations from Cascade Caverns, Bear Creek Spring, Cibolo Creek Spring, Kneedeep Cave Spring, Honey Creek Cave Spring, Less Ranch Spring, Cherry Creek Spring, Cloud Hollow Springs, and Rebecca Creek Spring, in Comal, Kerr, Kendall, and Hays counties, in the Edwards Plateau region of central Texas, USA. Chippindale *et al.* (1994) noted that these populations might comprise multiple species.

Population No detailed population surveys have been conducted; the abundance of salamanders appears to vary considerably among localities, but actual numbers are difficult to assess.

Habitat and Ecology It can be found in springs and caves containing water in limestones. This species is completely aquatic and does not metamorphose.

Major Threats It is potentially threatened by declining water quantity and quality.

Conservation Measures Its range includes Guadeloupe River State Park. It is listed as Threatened by the state of Texas, but has no special recognition by the Federal Government.

Notes on taxonomy: This form might represent a species complex.

Bibliography: Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Brown, B.C. (1967a), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), Chippindale, P.T. (2000), Chippindale, P.T. (2005b), Chippindale, P.T. *et al.* (2000), Chippindale, P.T., Hillis, D.M. and Price, A.H. (1994), Hillis, D.M. *et al.* (2001), Petranka, J.W. (1998), Sweet, S.S. (1984), Wiens, J.J., Chippindale, P.T. and Hillis, D.M. (2003)

Data Providers: Geoffrey Hammerson, Paul Chippindale

CASCADE CAVERNS SALAMANDER**VU** *Eurycea nana* Bishop, 1941**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Stable



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Geographic Range This species is known only from a pool at the source of the San Marcos River (San Marcos Springs, Spring Lake), Hays County, Texas, United States, and a short distance downstream (Chippindale *et al.* 2000). A second, smaller population of this species was thought to occur in the Comal River (Springs), slightly to the west in Comal County; however, this population recently was determined not to be *E. nana* (Chippindale, Hillis and Price 1994, Chippindale, Price and Hillis 1998, Chippindale *et al.* 2000).

Population It is abundant within its limited range, where the population is stable. Population densities were estimated to be about 116-129 individuals per m² in vegetation mats (Tupa and Davis 1976; Nelson 1993). The entire population has been estimated as about 53,200 individuals in vegetation mats and suitable rocky substrates (USFWS 1996).

Habitat and Ecology It can be found in shallow alkaline springs carved out of limestone. They have been found in mats of blue-green algae (*Lyngbya* sp.), under rocks, and in gravel substrate at water depths of less than 1m to several metres. The species is completely aquatic and does not metamorphose. Eggs have never been observed in the wild. In captivity, ovipositioning has occurred on aquatic moss, filamentous algae, rocks, and glass marbles.

Major Threats It is vulnerable to alterations in water level and water quality that may result from agricultural and residential development.

Conservation Measures Its range is protected at both the state and federal level. It is listed as Threatened by the state of Texas and Threatened by the Federal government. There is a need for close monitoring of the population status of this species.

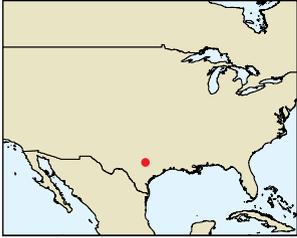
Bibliography: Berkhouse, C.S. and Fries, J.N. (1995), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Brown, B.C. (1967b), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), Campbell, L. (1995), Chippindale, P.T. (2000), Chippindale, P.T. *et al.* (2000), Chippindale, P.T. and Fries, J.N. (2005), Chippindale, P.T., Hillis, D.M. and Price, A.H. (1994), Chippindale, P.T., Price, A.H. and Hillis, D.M. (1998), Frost, D.R. (1985), Hillis, D.M. *et al.* (2001), Matthews, J.R. and Moseley, C.J. (eds) (1990), Nelson, J.M. (1993), Petranka, J.W. (1998), San Marcos Recovery Team. (1985), Tupa, D.D., and Davis, W.K. (1976), U.S. Fish and Wildlife Service (1990a), U.S. Fish and Wildlife Service (1996a), Wiens, J.J., Chippindale, P.T. and Hillis, D.M. (2003)

Data Providers: Geoffrey Hammerson, Paul Chippindale

SAN MARCOS SALAMANDER

EN *Eurycea naufragia* Chippindale, Price, Wiens and Hillis, 2000

Endangered B1ab(ii,v)+2ab(ii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Decreasing



Geographic Range This species can be found in springs and possibly one cave associated with drainages of the south, middle, and north forks of the San Gabriel River, Williamson County, in the northern Edwards Plateau region of central Texas, USA; populations from the Cowan Creek drainage and from Bat Well in the Berry Creek drainage are

SAN GABRIEL SPRINGS SALAMANDER

provisionally assigned to this species (Chippindale *et al.* 2000). Cowan Creek drains into Berry Creek, which drains into the San Gabriel River below the city of Georgetown (Chippindale *et al.* 2000).

Population The population of this species is apparently declining.
Habitat and Ecology It is completely aquatic and does not metamorphose. They are known only from the immediate vicinity of spring outflows, under rocks and leaves and in gravel substrate, and from two water-containing caves. Nothing is known of its breeding biology, though some other spring-dwelling species of central Texas *Eurycea* are thought to deposit eggs in gravel substrates.
Major Threats Populations within the city of Georgetown proper probably are on the brink of extinction (Chippindale *et al.* 2000). Development of retirement and leisure communities (Sun City Georgetown), and quarrying (Middle Fork San Gabriel River), are taking place near some salamander populations, but currently these do not appear to be a major threat to salamander habitat (Chippindale *et al.* 2000).
Conservation Measures This species is not known from any protected areas, and there is a need for improved protection of its habitat. It is a candidate for both state and federal listing.
Notes on taxonomy: Salamanders from springs in the vicinity of Lake Georgetown display a unique combination of alleles and have distinctive mtDNA characteristics; possibly they may also be distinguished based on pigmentation characteristics (Chippindale, Hillis and Price 1994). It is regarded as a distinct species by Chippindale, Hillis and Price (1994) and was formally described as *Eurycea naufragia* by Chippindale *et al.* (2000). It was included in *E. neotenes* by Sweet (1978, 1982).
Bibliography: Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Chippindale, P.T. (2000), Chippindale, P.T. (2005c), Chippindale, P.T. *et al.* (2000), Chippindale, P.T., Hillis, D.M. and Price, A.H. (1994), Hillis, D.M. *et al.* (2001), Sweet, S.S. (1978), Sweet, S.S. (1982)
Data Providers: Geoffrey Hammerson, Paul Chippindale

VU *Eurycea neotenes* Bishop and Wright, 1937

Vulnerable D2
Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



Geographic Range This species is formerly thought to be a wide-ranging species (Sweet 1984). Recent genetic data indicate restriction to Helotes Creek Spring (Bexar County), Leon Springs (Bexar County), and Mueller's Spring (Kendall County), in the Edwards Plateau region of central Texas, USA (Chippindale *et al.* 2000).

Population No detailed population surveys have been conducted; they can be common at spring outflows, but their abundance appears to vary considerably among localities, and actual numbers are difficult to assess.
Habitat and Ecology It occurs in springs in limestones, under rocks and leaves, and in gravel substrate. This species is completely aquatic and does not metamorphose. Breeding habits are unknown in the wild, but closely related species are thought to deposit eggs in gravel substrates. Bogart (1967) described courtship and oviposition in this species; in the laboratory, eggs were deposited on a variety of substrates.
Major Threats It is poorly known, but presumably vulnerable to water quality degradation and aquifer loss.
Conservation Measures It does not appear to occur in any protected areas. They receive no protection by either the state of Texas or by the Federal Government. There is a need for close monitoring of the population status of this species.
Notes on taxonomy: Most references to *E. neotenes* in the literature involve populations that Chippindale *et al.* (2000) considered Fern Bank Salamanders *E. pterophila* or members of the *E. latitans* or *E. troglodytes* species complexes.
Bibliography: Behler, J.L. and King, F.W. (1979), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Bogart, J.P. (1967), Brown, B.C. (1967c), Bruce, R.C. (1976), Chippindale, P.T. (2000), Chippindale, P.T. (2005d), Chippindale, P.T. *et al.* (2000), Chippindale, P.T., Hillis, D.M. and Price, A.H. (1994), Conant R. (1975), Frost, D.R. (1985), Hillis, D.M. *et al.* (2001), Sweet, S.S. (1984), Wiens, J.J., Chippindale, P.T. and Hillis, D.M. (2003)
Data Providers: Geoffrey Hammerson, Paul Chippindale

TEXAS SALAMANDER

VU *Eurycea rathbuni* (Stejneger, 1897)

Vulnerable D2
Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Stable



Geographic Range This species can be found in San Marcos Pool of the Edwards Aquifer, Hays County, south-central Texas, USA (Chippindale *et al.* 2000). They are unlikely to range beyond this region.

Population The total adult population size is unknown. Individuals of this species still appear common in outflows of Diversion Spring, a pipe that carries outflows from the Edwards Aquifer at San Marcos Springs. However, numbers collected vary widely from year to year; currently, most individuals recovered are juveniles (Chippindale 2005).
Habitat and Ecology It can be found in water-filled subterranean caverns, and have been observed climbing rock surfaces or swimming in open water. In some sites it is known only from individuals washed out of artesian wells. This species is completely aquatic and does not metamorphose. Breeding habits are unknown in nature; however, this species has bred on several occasions in captivity, at the Dallas Aquarium at Fair Park, Cincinnati Zoo, Aquarena Centre (San Marcos), and San Marcos National Fish Hatchery and Technology Centre (L. Ables pers. comm.).
Major Threats It is sensitive to changes in water quality and thus vulnerable to groundwater pollutants (Matthews and Moseley 1990). It is potentially threatened by falling groundwater levels that have resulted from increased pumping to support residential and commercial development in the region. Over collecting in the past (1960s) might have reduced populations in accessible locations.
Conservation Measures Listed as Endangered by the state of Texas and by the Federal Government. There is a need for continued close monitoring of this species.
Notes on taxonomy: This species is a member of the *Typhlomolge* clade of central Texas *Eurycea* (Hillis *et al.* 2001).
Bibliography: Bechler, D.L. (1988), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), Campbell, L. (1995), Chippindale, P.T. (2000), Chippindale, P.T. (2005e), Chippindale, P.T. *et al.* (2000), Chippindale, P.T., Hillis, D.M. and Price, A.H. (1994), Hillis, D.M. *et al.* (2001), Longley, G. (1978), Matthews, J.R. and Moseley, C.J. (eds) (1990), Mitchell, R.W. and Reddell, J.R. (1965), Potter, Jr, F.E. and Sweet, S.S. (1981), U.S. Fish and Wildlife Service (1967), U.S. Fish and Wildlife Service (1980d), U.S. Fish and Wildlife Service (1990a), U.S. Fish and Wildlife Service (1996a), Wiens, J.J., Chippindale, P.T. and Hillis, D.M. (2003)
Data Providers: Geoffrey Hammerson, Paul Chippindale

TEXAS BLIND SALAMANDER

VU *Eurycea sosorum* Chippindale, Price and Hillis, 1993**Vulnerable B1+2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Stable



Geographic Range This species can be found in Barton Springs, Edwards Aquifer, Austin, and Travis County, Texas, USA; it occurs in four hydrologically connected spring outlets (see Chippindale *et al.* [1993] for further details). Barton Springs is fed by the Barton Springs segment of the Edwards Aquifer; this segment occurs in portions of Blanco, Hays, and Travis counties.

Population The total population size is unknown. The observable population in Eliza Pool was dozens or hundreds in the 1970s, 15 in November 1992, 0 from December 1993 to May 1995, 0-28 between June 1995 and July 1996. They were reportedly abundant in Barton Springs Pool in 1946, about 150 were seen in November 1992, and survey counts between April 1995 and April 1996 ranged from 3-45 individuals. No more than 20 have been observed during any one survey of the Sunken Garden Springs outlet, but this site is difficult to survey. See population updates by Chippindale and Price (2005). They declined during the 1970s and 1980s, probably due in part to cleaning procedures used by the City of Austin at Barton Springs Pool; new maintenance

procedures at Barton Springs resulted in habitat recovery (e.g., re-establishment of vascular plants) and salamander population increases in the early 1990s, although the number of individuals located has been highly variable from year to year and the most recent data suggest a decline in numbers in 2000. The current population trend is unknown.

Habitat and Ecology It is a spring dweller, occurring in the fourth largest spring in Texas. It inhabits spring outlets impounded/retained by concrete structures. Evidently, this species occurs primarily in non-subterranean waters; they are unlikely to range extensively underground but can live in subterranean waters (Chippindale *et al.* 1993). They are

usually found under rocks or in gravel in about 0.1-5m of water; it also takes refuge among aquatic vascular plants, vegetative debris, and algae when such habitat is available (Chippindale *et al.* 1993). Spring habitat flows throughout the year and maintains a fairly constant temperature of 20 degrees celsius. This species is completely aquatic and does not metamorphose. Breeding is unknown in the wild; some other spring-dwelling species of central Texas *Eurycea* are thought to deposit eggs in gravel substrate. Captive breeding has been achieved at the Dallas Aquarium and the City of Austin facility. Females appear to deposit the eggs randomly on cobble, gravel, aquatic macrophytes, and the glass sides and bottom of the aquaria (L. Ables, D. Chamberlain pers. comm.).

Major Threats It is vulnerable to extinction due to its very limited distribution within a sensitive habitat; the primary threat is contamination of the waters that feed Barton Springs. The Barton Springs Aquifer has been designated by the Texas Water Commission as one of the aquifers most vulnerable to pollution in Texas (Chippindale *et al.* 1993). Excessive groundwater withdrawal is a potential threat. Under pool maintenance procedures in place as of 1992, human use of the Barton Springs Pool for swimming did not conflict with the continued existence of the salamander (Chippindale *et al.* 1993). Recreational swimming in the Barton Springs Pool does not pose a threat.

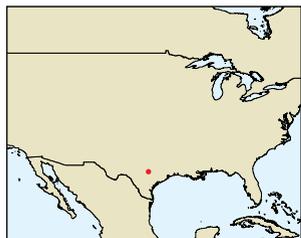
Conservation Measures Barton Springs is in Zilker Park, which is owned and operated by the City of Austin. City property is managed as a park and pool. Various agencies of the state of Texas have committed to expedite developing and implementing conservation measures needed for the species and the Barton Springs segment of the Edwards Aquifer, as set forth in the "Barton Springs Salamander Conservation Agreement and Strategy," signed 13 August 1996 (see Federal Register 61(172):46608-46616, 4 September 1996, for details). The City of Austin has established a captive breeding program for this species. This species is listed as Endangered by both the state of Texas and the Federal Government.

Bibliography: Chippindale, P.T. (2000), Chippindale, P.T. and Hansen, R. (2005), Chippindale, P.T. and Price, A.H. (2005), Chippindale, P.T., Price, A.H. and Hillis, D.M. (1993), Hansen R., Chamberlain, D. and Lechner, M. (1998), Hillis, D.M. *et al.* (2001)

Data Providers: Geoffrey Hammerson, Paul Chippindale

BARTON SPRINGS SALAMANDER**EN** *Eurycea tonkawae* Chippindale, Price, Wiens and Hillis, 2000**Endangered B1ab(iii,v)**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Decreasing



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Geographic Range This species occurs in springs of the Jollyville Plateau region north-west of Austin in Travis and Williamson counties, Texas, USA, and in springs of nearby Brushy Creek; the known range includes the Brushy Creek, Bull Creek, Cypress Creek, Long Hollow Creek, and Walnut Creek drainages; the Shoal Creek drainage includes a population provisionally assigned to this species (Chippindale *et al.* 2000). Also provisionally assigned to this species are populations from Kretschmarr Salamander Cave (Travis County), Testudo Tube (Williamson County), and caves

of the Buttercup Creek system, Williamson County, though some of these cave forms may represent distinct species (Chippindale *et al.* 2000).

Population Chippindale *et al.* (2000) mapped 4-5 population clusters. Although they may be common at some spring outflows, the species is apparently declining in population size and number/condition of occurrences (Chippindale *et al.* 2000, and see update by Davis *et al.* 2001).

Habitat and Ecology Although most populations occur in springs, certain cave-dwelling populations have been provisionally assigned to this species (Chippindale *et al.* 2000). This species is completely aquatic and does not metamorphose.

Major Threats The major threat is habitat loss due to ongoing rapid urbanization (Chippindale *et al.* 2000, Davis *et al.* 2001). For example, an office building was recently built directly above one location. Large amounts of foam have been observed at the type locality (Still House Hollow Springs), and some individuals recently examined from this location exhibited spinal deformations (Chippindale *et al.* 2000). The aquifers that this species depends upon are small and localized and thus susceptible to pollution, drying, or draining (Chippindale *et al.* 2000).

Conservation Measures Some populations occur within city of Austin preserves, while a population that may represent this species exists on the Travis County Audubon Sanctuary (Chippindale *et al.* 2000).

Notes on taxonomy: This species is included in *Eurycea neotenes* by Sweet (1978, 1982) and in previous publications. Certain populations provisionally assigned to this species warrant further study and might prove to be taxonomically distinct (Chippindale *et al.* 2000).

Bibliography: Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Chippindale, P.T. (2000), Chippindale, P.T. (2005f), Chippindale, P.T. *et al.* (2000), Chippindale, P.T., Hillis, D.M. and Price, A.H. (1994), Davis, B. *et al.* (2001), Hillis, D.M. *et al.* (2001), Sweet, S.S. (1978), Sweet, S.S. (1982), Wiens, J.J., Chippindale, P.T. and Hillis, D.M. (2003)

Data Providers: Geoffrey Hammerson, Paul Chippindale

JOLLYVILLE PLATEAU SALAMANDER**VU** *Eurycea tridentifera* Mitchell and Reddall, 1965**Vulnerable B2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



Geographic Range This species can be found on the south-eastern margin of Edwards Plateau of central Texas, in the Cibolo Sinkhole Plain region of Comal, Bexar, and perhaps Kendall counties, USA (Chippindale, Hillis and Price 1994, Chippindale *et al.* 2000). Chippindale *et al.* (2000) listed at least seven apparently separate occurrences.

Population The total adult population size and trends are unknown. Individuals of this species appeared scarce during visits to the type locality in the early 1990s (Chippindale 2005), although earlier collectors were able to collect fairly large series at this site.

Habitat and Ecology It is found on rock and mud substrates of limestone caves. It is completely aquatic and does not metamorphose. Breeding habits are unknown.

Major Threats Potential threats include land development and pollution.

Conservation Measures Listed as Threatened by the state of Texas, but not currently listed federally. There is a need for continued close monitoring of the population status of this species.

Bibliography: Behler, J.L. and King, F.W. (1979), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), Chippindale, P.T. (2000), Chippindale, P.T. (2005g), Chippindale, P.T. *et al.* (2000), Chippindale, P.T., Hillis, D.M. and Price, A.H. (1994), Hillis, D.M. *et al.* (2001), Mitchell, R.W. and Reddell, J.R. (1965), Sweet, S.S. (1977), Sweet, S.S. (1984), Wiens, J.J., Chippindale, P.T. and Hillis, D.M. (2003)

Data Providers: Geoffrey Hammerson, Paul Chippindale

COMAL BLIND SALAMANDER**VU** *Eurycea waterlooensis* Hillis, Chamberlain, Wilcox and Chippindale, 2001**Vulnerable B2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



Geographic Range The extent of the species' subterranean range is unknown; it was observed in three of the four spring outlets at Barton Springs, Zilker Park, Austin, Texas, USA (typically only juveniles) (Hillis *et al.* 2001).

Population Monthly censuses at Barton Springs from July 1998 to December 2000 yielded 1,518 observations of Barton Springs Salamander *E. sosorum* and only 17 of Austin Blind Salamander (Hillis *et al.* 2001). However, the Austin Blind Salamander appears to be primarily subterranean, and so its abundance is unknown.

Habitat and Ecology It has been observed at spring outlets, but is probably mostly restricted to subterranean cavities of the Edwards Aquifer (Hillis *et al.* 2001). This species is completely aquatic and does not metamorphose. Breeding habits are unknown.

Major Threats Former management of Barton Springs outlets probably was detrimental, but now management there is favourable (Hillis *et al.* 2001). The biggest threat currently comes from development of

the recharge zone of the Barton Springs segment of the Edwards Aquifer, which has resulted in increased siltation of the aquifer and springs (Hillis *et al.* 2001).

Conservation Measures Spring outlets are appropriately managed, but the aquifer recharge zone is not (Hillis *et al.* 2001). It occurs within Critical Habitat designated for Barton Springs Salamander. Austin Blind Salamanders are currently listed by the Federal Government as a Candidate species; they receive no special protection in Texas.

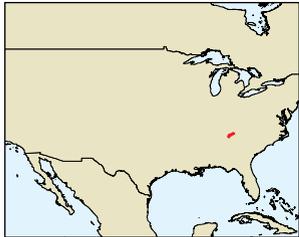
Bibliography: Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Chippindale, P.T. (2005h), Hillis, D.M. *et al.* (2001)

Data Providers: Geoffrey Hammerson

AUSTIN BLIND SALAMANDER

EN *Gyrinophilus gulolineatus* Brandon, 1965

Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Decreasing



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Geographic Range This species can be found in the Ridge and Valley Province of Roane, Knox, and McMinn Counties, eastern Tennessee, USA (Petranka 1998; Frost 2002). Redmond and Scott (1996) mapped five locations within the range of this taxon.

Population There is no information on the current population status of this species, but the population in Berry Cave appears to be declining (Caldwell and Copeland 1992).

Habitat and Ecology It is a peadomorphic species than can be found in aquatic habitats and is restricted to caves. Based on what is known about egg deposition sites in spring salamanders (*G. porphyriticus*), clutches will be attached as a single mass to the underside of large stones.

Major Threats It may be threatened by the destruction of watersheds where inhabited caves are located.

Conservation Measures This species would benefit from the protection of watersheds that drain into sinkhole systems (Petranka 1998).

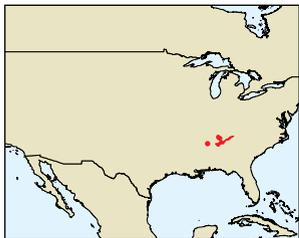
Notes on taxonomy: *Gyrinophilus gulolineatus* was formerly regarded as a subspecies of *G. paleucus*; it was treated as a species by Brandon *et al.* (1986), Collins and Taggart (2002) and Crother *et al.* (2000). Petranka (1998) maintained this taxon as a subspecies of *G. paleucus*.

Bibliography: Beachy, C.K. (2005a), Brandon, R.A. *et al.* (1986), Caldwell, R.S. and Copeland, J.E. (1992), Collins, J.T. (1990), Collins, J.T. (1991), Collins, J.T. (1997), Collins, J.T. and Taggart, T.W. (2002), Crother, B.I. *et al.* (2000), Crother, B.I. *et al.* (2003), Petranka, J.W. (1998), Redmond, W.H. and Scott, A.F. (1996)

Data Providers: Geoffrey Hammerson

BERRY CAVE SALAMANDER**VU** *Gyrinophilus paleucus* McCrady, 1954

Vulnerable B2ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Decreasing



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Geographic Range This species can be found in the southern Cumberland Plateau of south-central Tennessee and north-eastern Alabama, in the Nashville Basin south-east of Nashville, Tennessee, and north-western Alabama and north-western Georgia, USA. Godwin (1995b) regarded Jess Elliot Cave as the most significant site in Alabama. Cave Cove Cave supports the largest population in Tennessee (Caldwell and Copeland 1992).

Population There are approximately two-dozen known populations, though others probably exist (Godwin 1995b). Godwin (1995b) reported this species in 6 of 14 Alabama sites surveyed in 1994-1995. Abundance is difficult to determine. Information available suggests populations contain small numbers of individuals, with densities ranging from 0.06-0.15 animals/m² (Petranka 1998). The population in Custard Hollow Cave, Tennessee, appears to be declining (Caldwell and Copeland 1992).

Habitat and Ecology It occurs in streams in caves that contain amphipods and other aquatic organisms that can serve as food; individuals may be found in rimstone pools, stream runs and pools, and pools isolated by receding waters. Water tends to be clear and free of sediment; substrates include rock, gravel, sand, and mud (Godwin 1995b). Sinkholes are an important habitat component, allowing for detritus inflow (Caldwell and Copeland 1992). Occasionally, it occurs in epigeal environments; probably these individuals have been washed out of caves (Bury, Dodd and Fellers 1980). The habitats for breeding and non-breeding are likely to be the same, but courtship has never been observed in this species. This species is unlikely to tolerate habitat disturbance.

Major Threats Threats include: flooding following dam construction; water pollutants in runoff from agricultural and residential areas; increased water flow and siltation resulting from deforestation, mining, and urbanization; and deposition of fill and trash in sinkholes (Caldwell and Copeland 1992, Godwin 1995b, Petranka 1998).

Conservation Measures It occurs in Russell Cave National Monument (Godwin 1995b). This species is listed as Threatened by the Tennessee Wildlife Resources Agency. This species would benefit from protection of watersheds that drain into sinkhole systems (Petranka 1998).

Notes on taxonomy: Three subspecies (*paleucus*, *gulolineatus*, and *necturoides*) have been recognized; intergradation between *paleucus* and *necturoides* is evident in some Alabama populations (A. Wynne, in Godwin 1995b). Some populations do not conform well to any of the named subspecies. One form in Tennessee might be sufficiently distinct biochemically to warrant recognition as a separate species (Redmond and Scott 1996). *Gyrinophilus gulolineatus* (Berry Cave Salamander) was treated as a species by Brandon *et al.* (1986), Collins and Taggart (2002), and Crother *et al.* (2000), but Petranka (1998) maintained this taxon as a subspecies of *G. paleucus*. In this assessment, *Gyrinophilus gulolineatus* is regarded as a distinct species.

Bibliography: Beachy, C.K. (2005b), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Brandon, R.A. (1965), Brandon, R.A. (1967a), Brandon, R.A. *et al.* (1986), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), Caldwell, R.S. and Copeland, J.E. (1992), Collins, J.T. (1991), Collins, J.T. and Taggart, T.W. (2002), Conant, R. and Collins, J.T. (1991), Crother, B.I. *et al.* (2000), Dowling, H.G. (1993), Frost, D.R. (1985), Godwin, J.C. (1995b), Mount, R.H. (1975), Petranka, J.W. (1998), Redmond, W.H. and Scott, A.F. (1996), Simmons, D.D. (1975), Yeatman, H.C. and Miller, H.B. (1985)

Data Providers: Geoffrey Hammerson, Christopher Beachy

TENNESSEE CAVE SALAMANDER**EN** *Gyrinophilus subterraneus* Besharse and Holsinger, 1977

Endangered D
Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



Geographic Range This species is endemic to one relatively small cave system: General Davis Cave, Greenbrier County, south-eastern West Virginia, USA (Petranka 1998, Beachy 2005). Cave explorers have observed West Virginia spring salamanders almost 2km beyond the cave entrance.

Population Reports typically are of 10 to fewer than 100 individuals per survey; the population size varies but probably totals fewer than 300 individuals.

Habitat and Ecology It occurs during breeding and non-breeding periods in limestone cave stream passages with large amounts of decaying organic matter; it is present in the streams and on mud banks along the streams. It is undoubtedly dependent on high-quality water and the availability of organic material flushed into the cave from outside sources.

Major Threats No immediate threats are known, but logging has been proposed by the current owner of the watershed, an activity

that would lower water quality in the cave where the species occurs. The same owner almost broke through into the cave system during a recent pond construction project.

Conservation Measures The Nature Conservancy owns an easement on the cave system and has title to one entrance; but another entrance and the entire watershed remain unprotected. Additional taxonomic work is probably necessary to clarify the taxonomic status of this species using both morphometric and molecular analyses.

Notes on taxonomy: Some authors have regarded this species as conspecific with *Gyrinophilus porphyriticus* (Blaney and Blaney 1978), but the current consensus is that it is a valid species, based on morphometric analyses (Green and Pauley 1987).

Bibliography: Beachy, C.K. (2005c), Behler, J.L. and King, F.W. (1979), Besharse, J.C. and Holsinger, J.R. (1977), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Blaney, R.M. and Blaney, P.K. (1978), Collins, J.T. (1990), Conant, R. and Collins, J.T. (1991), Green, N.B. and Pauley, T.K. (1987), Petranka, J.W. (1998)

Data Providers: Geoffrey Hammerson, Christopher Beachy

WEST VIRGINIA SPRING SALAMANDER**VU** *Haideotriton wallacei* Carr, 1939

Vulnerable B1ab(iii)+2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



Geographic Range This species can be found throughout the Marianna Lowlands-Dougherty Plain physiographic region, in the states of Florida and Georgia, USA. It is known from several caves in Jackson County, Florida; also occurs in Dougherty and Decatur counties, Georgia. It occurs in at least two sites in Georgia and at least 11 sites in Jackson County, Florida.

Population The total adult population size is unknown, and the current trend is also unknown. In the period 1969-1992, populations seemed fairly abundant, in spite of heavy collecting in one or two localities (Means 2005).

Habitat and Ecology It is a resident of the Marianna Lowlands (Dougherty Plain) karst aquifer; it is found in subterranean streams and clear pools in caves and deep wells. It may sometimes leave water and climb limestone walls of caves. It may ultimately depend on guano from associated bat populations.

Major Threats Threats include pollution from agricultural runoff and fluctuations in the water table due to impoundments and human use. Over-collecting for science or by herp enthusiasts is a potential threat.

Conservation Measures Caves in the Marianna Caverns State Park are protected. Conservation measures include: monitoring known populations and water quality; limiting human intrusion into caves by means of signs, fences, or gates as appropriate; protecting associated bat populations; and limiting pollution and water table fluctuations. Populations cannot be considered adequately protected just because cave mouths are protected.

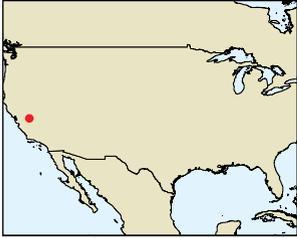
Bibliography: Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Brandon, R.A. (1967b), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), Conant, R. and Collins, J.T. (1991), Frost, D.R. (1985), Means, D.B. (2005), Petranka, J.W. (1998)

Data Providers: Geoffrey Hammerson

GEORGIA BLIND SALAMANDER

VU *Hydromantes brunus* Gorman, 1954**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



© Kenny Wray

Geographic Range This species can be found in the Lower Merced River drainage, Mariposa County, California, USA. In the vicinity of Briceburg: it occurs at the confluence of Bear Creek and Merced River, along tributaries of Bear Creek, along North Fork of Merced River, and at Hell Hollow about 4 miles above Lake McClure and at the

confluence of Hell Hollow Creek with Lake McClure (Stebbins 1985b, California Department of Fish and Game 1990). The elevational range is from 300-760m asl.

Population It is uncommon in favourable habitat, but not rare.

Habitat and Ecology It inhabits moss-covered limestone outcroppings and talus rubble generally in Gray Pine (*Pinus sabiniana*)-Oak (*Quercus wislizenii*, *Q. chrysolepis*, and *Q. dumosa*) woodland, with relatively few pine but numerous California Buckeye (*Aesculus californica*). It also (but less often) occurs in chaparral; typically under rocks and logs near streams or seepages. It stays underground (rock crevices, caves, mines, etc.) in dry weather. It is a terrestrial breeder, presumed to lay large yolk eggs and it is known to lack a larval stage. It disappears from cleared areas, but otherwise adaptability to habitat disturbance is unknown.

Major Threats A proposed gold mine operation in Hell Hollow poses the most serious threat; other potential threats include highway construction (the type locality is along the main access road to Yosemite National Park) and quarrying for limestone (California Department of Fish and Game 1990) as well as dam building.

Conservation Measures Limestone Salamander Ecological Reserve (LSER) protects 120 acres of habitat. The Bureau of Land Management has designated an additional 1,600 acres as the Limestone Salamander Area of Critical Environmental Concern (LSACEC) (encompasses both confirmed and potential habitat) (California DF&G 1990). The species is listed as Threatened by the Department of Fish and Game, under the State of California Endangered Species Act.

Bibliography: Biosystems Analysis, Inc. (1989), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), California Department of Fish and Game (CDF&G) (1990), Frost, D.R. (1985), Gorman, J. (1964), Petranka, J.W. (1998), Stebbins, R.C. (1985b), Stebbins, R.C. (2003), Wake, D.B. and Papenfuss, T.J. (2005a)

Data Providers: Geoffrey Hammerson, David Wake

LIMESTONE SALAMANDER**VU** *Hydromantes shastae* Gorman and Camp, 1953**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Stable



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Geographic Range This species is restricted to a small area in northern California, in the headwaters of Shasta Reservoir drainage, Shasta County, California, USA. As of 1990, there were 12 known populations (California Department of Fish and Game 1990), including those at Backbone Ridge, Mammoth Butte, Hirz Mountain, Potter and Low Pass creeks, McCloud River, Brock Mountain, Samwell Cave, and near Ingot. Since 1990, researchers have expanded the number of populations to 61, thought to represent 16-17 population centres (Nauman and Olson 2004). Populations

are now known from Green Mountain (Lindstrand 2000) and the Calaveras Cement Quarry. It has an elevational range of 300-975m asl (Stebbins 1985b, Bury, Dodd and Fellers 1980).

Population It can be locally abundant within its small range. Populations are believed to be stable.

Habitat and Ecology It is commonly, but not always, found near limestone outcrops; usually in cool, wet ravines and valleys; most commonly in oak-Gray Pine (*Pinus sabiniana*) woodland, also in Douglas-fir woodland and ponderosa/Jeffrey pine-oak at higher elevations; in moist limestone fissures or caves, sometimes under nearby logs and talus in wet weather (Bury, Dodd and Fellers 1980). Little is known concerning breeding activity; eggs are probably laid underground or in cave crevices and fissures during early summer months (May-July) with young hatching in late summer/early fall. During non-breeding seasons animals can be found using limestone or the forested slope habitat. Susceptibility to habitat degradation is difficult to assess because no long-term studies have been conducted.

Major Threats Road construction, quarrying for limestone, and raising the elevation of Lake Shasta are potential threats (California Department of Fish and Game 1990). Impoundment of Lake Shasta has destroyed some habitat; a rise in water level could wipe out some extant populations. Timber harvesting and human recreational activities are additional threats.

Conservation Measures Many of the known populations occur on U.S. Forest Service and Bureau of Land Management land; Shasta-Trinity National Forest has developed a management plan (California Department of Fish and Game 1990). The Shasta Salamander is listed as Threatened under the State of California Endangered Species Act and is protected on federal lands under the survey and management mitigation of the Northwest Forest Plan.

Bibliography: Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), California Department of Fish and Game (CDF&G) (1990), Frost, D.R. (1985), Gorman, J. (1964), Gorman, J. and Camp, C.L. (1953), Herman, A.E. (2003), Highton, R. (2000), Lindstrand, III, L. (2000), Nauman, R.S. and Olson, D.H. (2004), Petranka, J.W. (1998), Smith, H.M. and Wake, D.B. (1993), Stebbins, R.C. (2003), Thomas, J.W. et al. (1993), Wake, D.B. and Papenfuss, T.J. (2005b), Wake, D.B., Maxson, L.R. and Wurst, G.Z. (1978)

Data Providers: Geoffrey Hammerson, David Wake, Andrea Herman

SHASTA SALAMANDER**CR** *Ixalotriton niger* Wake and Johnson, 1989**Critically Endangered B1ab(iii)+2ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known only from south-western Chiapas, Mexico, north of Berriozabal town close to the airport, at around 1,200m asl.

Population It was thought to be extinct, until an individual was seen around 2000. It is presumably extremely rare.

Habitat and Ecology It lives in moist evergreen forest and montane rainforest. This species seems to prefer the trunks of mature large and medium-sized trees, but can also be found on the leaves of understory forbs, or crawling on limestone. Its habitat is in a karstic area. It breeds by direct development and is not dependent upon water.

Major Threats The last few decades have seen extensive transformation of the northern forests of Chiapas, with serious forest loss taking place due to logging and expanding agriculture (including coffee plantations). Very little habitat remains, but what is left is somewhat protected by boulders in the karstic landscape.

Conservation Measures It is not known from any protected area, and protection and restoration of the only suitable known habitat for this species is urgent. This species is listed as "Endangered" by the Mexican government.

Bibliography: Wake, D.B. and Johnson, J.D. (1989)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Ixalotriton parva* (Lynch and Wake, 1989)**Critically Endangered B1ab(iii)+2ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known only from Cerro Baul, above 1,600m asl, in extreme eastern Oaxaca, Mexico.

Population It was last seen in the 1980s, and it might now be extinct since all recent efforts to locate this species have been unsuccessful.

Habitat and Ecology It lives in cloud forests at high elevations, being found in bromeliads, and cannot survive in disturbed forest. It breeds by direct development and is not dependent upon water.

Major Threats The forests on Cerro Baul are now extremely disturbed and much reduced in extent, thus raising concerns as to whether or not this species still survives.

Conservation Measures It does not occur in any protected area. If future survey work results in the discovery of surviving individuals, then the preservation and restoration of the mountain forests on Cerro Baul will be essential.

Bibliography: Lynch, J.F. and Wake, D.B. (1989), Parra-Olea, G. (2002)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Lineatriton lineolus* (Cope, 1865)**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Thomas Bille

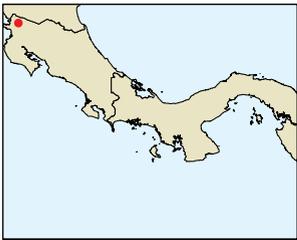
**Geographic Range** This species occurs in the Sierra Madre Oriental around Cuautpan, in east-central Veracruz, Mexico, at 800-1,250m asl.**Population** It used to be common, but it is now hard to find; two specimens were observed as recently as 2004.**Habitat and Ecology** It inhabits pine-oak forest where it can be found beneath stones, logs and other debris, and in subterranean situations. It is somewhat adaptable, and can also survive in shaded coffee plantations, but it does not tolerate the opening up of the landscape (which leads to the drying out of its microhabitat). It breeds by direct development and is not dependent upon water.**Major Threats** The habitat of this species is under threat from expanding agriculture and human settlements, and extraction of wood.**Conservation Measures** It does not occur in any protected areas, making habitat protection for this species an urgent priority. It is protected by Mexican law under the "Special Protection" category (Pr).**Notes on taxonomy:** This genus is undergoing taxonomic revision (G. Parra-Olea and D. Wake pers. comm.).**Bibliography:** Lips, K.R. *et al.* (2004), Parra-Olea, G. and Wake, D.B. (2001), Parra-Olea, G., García-París, M. and Wake, D.B. (1999), Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001), Tanner, W.W. and Dundee, H.A. (2000), Wake, D.B. (1987)**Data Providers:** Gabriela Parra-Olea, David Wake, Jean Raffaelli**EN** *Lineatriton orchileucos* Brodie, Mendelson and Campbell, 2002**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© J.R. Mendelson

**Geographic Range** This species is known only from the northern slopes of the Sierra de Juárez, northern Oaxaca, Mexico, at 1,100m asl.**Population** It is very poorly known, and only a few specimens have ever been recorded, despite much fieldwork having been carried out in its range.**Habitat and Ecology** It lives in cloud forest, where it is terrestrial and fossorial, and does not survive in seriously disturbed habitats. It breeds by direct development and is not dependent upon water.**Major Threats** The main threats are habitat loss due to logging, human settlement, and expanding agriculture.**Conservation Measures** It does not occur in any protected areas, making habitat protection a priority to ensure the long-term survival of this species. Further survey work is needed to determine its current population status.**Notes on taxonomy:** This genus is undergoing taxonomic revision (G. Parra-Olea and D. Wake pers. comm.).**Bibliography:** Brodie, E.D., Mendelson, J.R. and Campbell, J.A. (2002)**Data Providers:** Gabriela Parra-Olea, David Wake**EN** *Lineatriton orchimelas* Brodie, Mendelson and Campbell, 2002**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing**Geographic Range** This species is restricted to Los Tuxtlas, in coastal Veracruz, Mexico, occurring up to 1,000m asl.**Population** It is still quite an abundant species.**Habitat and Ecology** It is terrestrial and fossorial living in leaf-litter in lowland wet forest, and is not very tolerant of habitat disturbance. Breeding takes place by direct development and is not dependent upon water.**Major Threats** The main threat is deforestation, as a result of expanding subsistence farming and human settlements, and also logging.**Conservation Measures** It occurs in the Reserva de la Biósfera Los Tuxtlas, which affords a degree of protection, although there remains a need for more effective management of this area.**Notes on taxonomy:** This genus is undergoing taxonomic revision (G. Parra-Olea and D. Wake pers. comm.).**Bibliography:** Brodie, E.D., Mendelson, J.R. and Campbell, J.A. (2002)**Data Providers:** Gabriela Parra-Olea, David Wake**EN** *Nototriton barbouri* (K. Schmidt, 1936)**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Honduras**Current Population Trend:** Decreasing**Geographic Range** This species is known from five localities in north-central Honduras, in the departments of Atlantida, Yoro, and Cortes, at 860-1,990m asl.**Population** It is an uncommon species.**Habitat and Ecology** It lives in low vegetation, moss, and on the ground and tree trunks in premontane wet and lower montane forest. It is not a bromeliad specialist, but is occasionally found in them. It can survive in lightly degraded habitats. Breeding takes place by direct development and is not dependent upon water. Clutch sizes range from 5-19 eggs.**Major Threats** The main threat is forest loss due to expanding agriculture.**Conservation Measures** It occurs in Parque Nacional Pico Bonito, the Texiguat Wildlife Refuge, and Parque Nacional Pico Pijol.**Notes on taxonomy:** This species is probably a complex of several species (D. Wake and L.D. Wilson pers. comm.).**Bibliography:** García-París, M. and Wake, D.B. (2000), McCranie, J.R. (1996b), McCranie, J.R. and Wilson, L.D. (1992), McCranie, J.R. and Wilson, L.D. (1996), McCranie, J.R. and Wilson, L.D. (1997c), McCranie, J.R. and Wilson, L.D. (2002b), Papenfuss, T.J. and Wake, D.B. (1987), Schmidt, K.P. (1936b), Wake, D.B. (1987), Wake, D.B. and Elias, P. (1983)**Data Providers:** Gustavo Cruz, Larry David Wilson, Randy McCranie

VU *Nototriton gamezi* García-París and Wake, 2000**Vulnerable D2****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Costa Rica**Current Population Trend:** Stable

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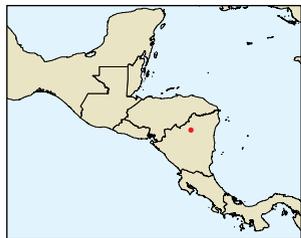
**Geographic Range** This species is known only from a small area around the type locality: Reserva Biológica Monteverde, Alajuela Province, in the Cordillera de Tilarán, Costa Rica, at 1,550-1,650m asl.**Population** Individuals occasionally are found in Monteverde.**Habitat and Ecology** It lives in terrestrial and arboreal moss banks and in bromeliads in premontane and lower montane rainforest. It breeds by direct development and is not dependent upon water.**Major Threats** There are no major threats known, and its habitat is well protected. Nonetheless, its restricted range renders it vulnerable to stochastic threatening processes.**Conservation Measures** Much of the known range is protected in the Reserva Biológica Monteverde. There is a need for close monitoring of the population status of this species.**Bibliography:** García-París, M. *et al.* (2000), García-París, M. and Wake, D.B. (2000), Savage, J.M. (2002)**Data Providers:** Alan Pounds, Federico Bolaños, David Wake, Jay Savage**VU** *Nototriton guanacaste* Good and Wake, 1993**Vulnerable D2****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Costa Rica**Current Population Trend:** Stable**Geographic Range** This species is known only from the Volcán Orosí and Volcán Cacao, these being the north-western most mountains of the Cordillera de Guanacaste, Province of Guanacaste, Costa Rica, 1,400-1,580m asl (Savage 2002).**Population** It is an uncommon species.**Habitat and Ecology** It is an arboreal species, usually found in moss mats and bromeliads in lower montane forest. It breeds by direct development and is not dependent upon water. There is no indication that the females attend the eggs.**Major Threats** There are no major threats known, and its habitat is well protected. Nonetheless, its restricted range renders it vulnerable to stochastic threatening processes.**Conservation Measures** The entire known range of this species is protected in Parque Nacional Guanacaste. There is a need for close monitoring of the population status of this species.**Bibliography:** García-París, M. *et al.* (2000), Good, D.A. and Wake, D.B. (1993), Savage, J.M. (2002)**Data Providers:** Federico Bolaños, David Wake, Jay Savage**CR** *Nototriton lignicola* McCranie and Wilson, 1997**Critically Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Honduras**Current Population Trend:** Decreasing**Geographic Range** This species is known only from Cerro de En Medio, Department of Olancho, north-central Honduras, at 1,760-1,780m asl.**Population** It is generally uncommon, although it can be found in reasonable numbers in suitable habitat.**Habitat and Ecology** It has been found inside rotten logs on the floor of lower montane wet forest. It is not known to what extent it can adapt to secondary habitats. It breeds by direct development and is not dependent upon water.**Major Threats** The only remaining habitat of this species is threatened by encroaching coffee cultivation, subsistence agriculture, and livestock.**Conservation Measures** The only known site is in the Parque Nacional La Muralla, which was declared as a protected area in 1987. However, this area is poorly protected, and habitat loss is continuing. Improved management of this protected area and ad-

ditional protection of the remaining habitat is urgently needed.

Bibliography: García-París, M. and Wake, D.B. (2000), McCranie, J.R. and Wilson, L.D. (1997c), McCranie, J.R. and Wilson, L.D. (2002b), McCranie, J.R., Wilson, L.D. and Polisar, J. (1998), Wake, D.B. and Campbell, J.A. (2000)**Data Providers:** Gustavo Cruz, Larry David Wilson, Randy McCranie**EN** *Nototriton limnospectator* McCranie, Wilson and Polisar, 1998**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Honduras**Current Population Trend:** Decreasing**Geographic Range** This species is known only from the Montana de Santa Barbara, in the department of Santa Barbara, west-central Honduras, at 1,640-1,980m asl. It probably occurs a little more widely than current records suggest.**Population** It is an uncommon species.**Habitat and Ecology** It lives on the ground in leaf-litter, and on low vegetation, in lower montane wet forest. It is not known to what extent it can adapt to secondary habitats. Breeding takes place by direct development and is not dependent upon water.**Major Threats** The major threat is continued forest loss due to expanding subsistence agriculture and forest fires. Prolonged dry seasons are an increasing problem.**Conservation Measures** It occurs in the 12,000-ha Parque Nacional Montana de Santa Barbara.**Bibliography:** García-París, M. and Wake, D.B. (2000), McCranie, J.R. and Wilson, L.D. (2002b), McCranie, J.R., Wilson, L.D. and Polisar, J. (1998)**Data Providers:** Gustavo Cruz, Larry David Wilson, Randy McCranie

VU *Nototriton saslaya* Koehler, 2002**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: Nicaragua
Current Population Trend: Stable



Geographic Range This species is known only from Cerro Sasalya and Cerro El Torro in Parque Nacional Saslaya, north-central Nicaragua, at 1,280-1,370m asl.

Population It is reasonably common in its small range.

Habitat and Ecology It lives in lower montane wet forest, and is arboreal, hiding in moss. It is not found in degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats There are no major threats known, and its habitat is well protected. Nonetheless, its restricted range renders it vulnerable to stochastic threatening processes.

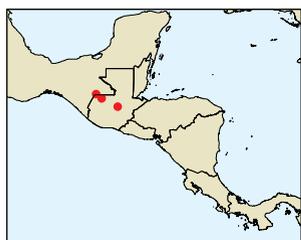
Conservation Measures The entire known range of this species is protected in Parque Nacional Saslaya. There is a need for close monitoring of the population status of this species.

Bibliography: Köhler, G. (2001), Köhler, G. (2002)

Data Providers: Gunther Köhler, David Wake

EN *Nyctanolis pernix* Elias and Wake, 1983**Endangered B1ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala, Mexico
Current Population Trend: Decreasing



© James Hanken

Geographic Range This highly distinctive species is known from just four localities: Parque Nacional Lagunas de Montebello, in southern Chiapas, Mexico; the north-eastern slopes of the Sierra de los Cuchumatanes, western Guatemala; the mountains of Alta Verapaz in central Guatemala; and the mountains of Baja Verapaz, also in central Guatemala. Its altitudinal range is 1,200-1,610m asl.

Population It is a very uncommon species; there is only a single record from Mexico.

Habitat and Ecology It lives in humid pine-oak forest and cloud forest, with specimens having been found under moss and bark; it is not found in disturbed habitat. Breeding takes place by direct development and is not dependent upon water.

Major Threats The major threat is habitat loss due to expanding agriculture and human settlements, together with logging.

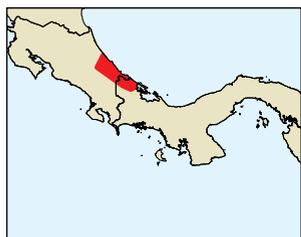
Conservation Measures It occurs in Parque Nacional Lagunas de Montebello and in a private reserve in Alta Verapaz, as well as in the proposed Parque Nacional Sierra de los Cuchumatanes. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Elias, P. (1984), Elias, P. and Wake, D.B. (1983), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake, Manuel Acevedo

VU *Oedipina alfaroi* Dunn, 1921**Vulnerable B1ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica, Panama
Current Population Trend: Decreasing



Geographic Range This species is known from the Atlantic versant of Costa Rica and extreme north-western Panama, at 19-850m asl (Savage 2002).

Population It is an uncommon species.

Habitat and Ecology It inhabits humid lowland and premontane forest areas, and old banana plantations, living in leaf-litter and fallen logs. It cannot survive in open habitats. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is opening up of its forest habitat for agriculture (crops and livestock), logging, and human settlement.

Conservation Measures It occurs in the Palo Seco Forest Reserve in Panama, but not in any protected areas in Costa Rica.

Bibliography: Brame, A.H. (1968), García-París, M. *et al.* (2000), García-París, M. and Wake, D.B. (2000), Ibáñez, R. *et al.* (2000), Savage, J.M. (2002), Wake, D.B. (1987), Young, B. *et al.* (1999)

Data Providers: Frank Solís, Roberto Ibáñez, Jay Savage, David Wake, Gerardo Chaves

CR *Oedipina altura* Brame, 1968**Critically Endangered B1ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica
Current Population Trend: Decreasing



Geographic Range This species is known only from the type locality, El Empalme, and another nearby site to the west, on the Pan-American Highway south of Cartago in the northern end of the Cordillera de Talamanca, Costa Rica, at 2,286-2,320m asl.

Population Only three individuals have ever been collected, and none since 1985.

Habitat and Ecology It lives in lower montane rainforest. One individual (the holotype) was collected under moss and another was discovered at the edge of degraded forest. It presumably breeds by direct development and is not dependent upon water.

Major Threats The major threat is likely to be habitat loss due to increased urbanization, and expanding smallholder farming and cattle ranching activities.

Conservation Measures It is not known from any protected area, and protection of the remaining habitat within the range is urgently required. Further survey work is also needed to determine the current population status of this species.

Bibliography: Brame, A.H. (1968), García-París, M. *et al.* (2000), García-París, M. and Wake, D.B. (2000), Good, D.A. and Wake, D.B. (1997), Savage, J.M. (2002), Wake, D.B. (1987)

Data Providers: Federico Bolaños, David Wake, Jay Savage

EN *Oedipina gephyra* McCranie, Wilson and Williams, 1993

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Honduras
Current Population Trend: Decreasing



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Geographic Range This species is known only from Cerro Bufalo in the department of Atlantida, and from near La Fortuna in the department of Yoro, north-central Honduras, at 1,580-1,810m asl.

Population It is an uncommon species.

Habitat and Ecology It lives inside rotten logs on the ground, and probably also in the soil, in lower montane wet forest. It breeds by direct development and is not dependent upon water.

Major Threats The main threats are expanding subsistence agriculture, forest fires, and small-scale cattle ranching.

Conservation Measures It occurs in Parque Nacional Pico Bonito and in the Texiguat Wildlife Refuge, but protection of these areas is very poor and there is a need for improved management.

Bibliography: García-París, M. and Wake, D.B. (2000), McCranie, J.R. (1996c), McCranie, J.R. and Wilson, L.D. (2002b), McCranie, J.R., Wilson, L.D. and Williams, K.L. (1993a)

Data Providers: Gustavo Cruz, Larry David Wilson, Randy McCranie

EN *Oedipina gracilis* Taylor, 1952

Endangered A2ac
Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica, Panama
Current Population Trend: Decreasing



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Geographic Range This species is known from the Atlantic lowlands of Costa Rica and extreme north-western Panama, at 3-710m asl.

Population It was formerly common, but is now very rare, though still surviving at several sites, including La Selva Biological Station in Costa Rica.

Habitat and Ecology It inhabits lowland rainforest, where it can be found in leaf-litter, under rotten logs, moss or rocks, on tree trunks or on the ground. It can tolerate very limited habitat degradation. Breeding takes place by direct development and is not dependent upon water.

Major Threats Habitat destruction due to expanding agriculture, logging and human settlements is probably the main cause of the decline.

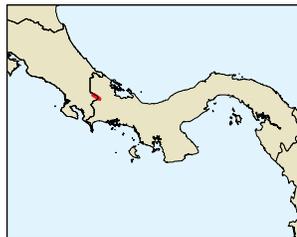
Conservation Measures It occurs in the La Selva Biological Station and Reserve in Costa Rica, but there are otherwise very few protected areas within its range. The species is in need of close population monitoring.

Bibliography: García-París, M. *et al.* (2000), García-París, M. and Wake, D.B. (2000), Good, D.A. and Wake, D.B. (1997), Savage, J.M. (2002)

Data Providers: Federico Bolaños, Jay Savage, David Wake, Roberto Ibáñez, Frank Solís

EN *Oedipina grandis* Brame and Duellman, 1970

Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica, Panama
Current Population Trend: Decreasing



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Geographic Range This species occurs in the Cordillera de Talamanca in extreme southern Costa Rica and immediately adjacent western Panama, at 1,810-1,950m asl.

Population It used to be common, but has undergone considerable declines across its range.

Habitat and Ecology It is a fossorial species inhabiting humid lower montane forest areas, and it is not found in degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is habitat loss caused by expanding smallholder farming, and logging.

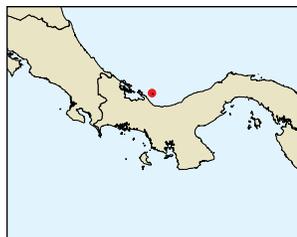
Conservation Measures It occurs in Parque Internacional La Amistad on the border of Costa Rica and Panama.

Bibliography: Brame, A.H. and Duellman, W.E. (1970), García-París, M. *et al.* (2000), García-París, M. and Wake, D.B. (2000), Ibáñez, R. *et al.* (2000), Lips, K.R. (1993c), Lips, K.R. (1998), Savage, J.M. (2002), Young, B. *et al.* (1999)

Data Providers: Frank Solís, Roberto Ibáñez, Jay Savage, David Wake, Gerardo Chaves

CR *Oedipina maritima* García-París and Wake, 2000

Critically Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Panama
Current Population Trend: Decreasing



Geographic Range This species is known only from the Isla Escudo de Veraguas in the Bocas del Toro Province, Panama. If it is restricted to this island, it is the only tropical salamander that is endemic to an island. It is found close to sea level.

Population It is known from only eight adult specimens and two clutches of eggs.

Habitat and Ecology It inhabits humid lowland forest and mangrove forest. Salamanders were collected in decaying fronds and associated moist litter near a fallen palm in a coconut palm grove in late March in 1991. The eggs were found inside a pile of coconut trash at the base of a tree (*Terminalia*) on the beach at Guayami Settlement. The eggs belonged to two clutches, each containing six embryos. The embryos began hatching on the way back to camp from the field. One newly hatched embryo measured 11.8 mm in total length and retained gills. The species breeds by direct development and is not dependent upon water.

Major Threats Forest clearance is taking place on the Isla Escudo de Veraguas, mainly due to people visiting the island to cut wood.

Conservation Measures It does not occur in any protected area, and some form of habitat protection is urgently needed on the Isla Escudo de Veraguas.

Bibliography: García-París, M. and Wake, D.B. (2000)

Data Providers: Frank Solís, Roberto Ibáñez, David Wake

CR *Oedipina paucidentata* Brame, 1968**Critically Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Costa Rica**Current Population Trend:** Decreasing

Geographic Range This species is known only from the type locality, near El Empalme (along the Pan-American Highway, south of Cartago) at the northern end of the Cordillera de Talamanca, Costa Rica, at about 2,286m asl (Savage 2002).

Population There is no information on current population status; no individuals have been collected since 1952 (Savage 2002), and it is possible that it is now Extinct.

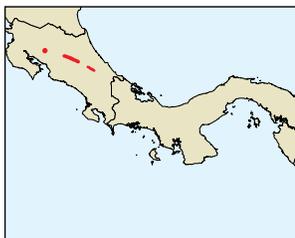
Habitat and Ecology It inhabits lower montane rainforest, and possibly lives below the ground. It breeds by direct development and is not dependent upon water.

Major Threats The major threat is likely to be loss of habitat due to increased urbanization, and expanding smallholder farming and cattle ranching activities.

Conservation Measures It is not known from any protected area, and habitat protection is urgently needed. Further survey work is also needed to determine the current population status of this species and whether or not it survives in the wild.

Bibliography: Brame, A.H. (1968), García-París, M. *et al.* (2000), García-París, M. and Wake, D.B. (2000), Savage, J.M. (2002), Wake, D.B. (1987)

Data Providers: Federico Bolaños, Gerardo Chaves, David Wake, Jay Savage

EN *Oedipina poelzi* Brame, 1963**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Costa Rica**Current Population Trend:** Decreasing

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Geographic Range This species occurs in the humid lower montane and premontane zones of the Cordillera de Tilarán, the Cordillera Central, and the Cordillera de Talamanca in Costa Rica, at 775-2,050m asl.

Population It used to be common, but appears to have undergone declines (although individuals continue to turn up in surveys conducted in appropriate habitat).

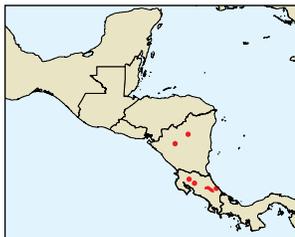
Habitat and Ecology It lives in moss mats near streams and under rocks and logs in premontane and lower montane rainforest. It is relatively aquatic, and is usually found close to streams, although it is not dependent upon water for breeding. It also occurs in road cuts and quarries, and in secondary habitat, provided that it is not too degraded and desiccated. Breeding takes place by direct development.

Major Threats The main threat is habitat loss due to smallholder farming activities (including livestock farming), wood collection, and human settlement. In addition, some of its habitat might be at risk of flooding due to the construction of a dam.

Conservation Measures It occurs in the Reserva Biológica Monteverde and in Parque Nacional Braulio Carrillo. The species is in need of close population monitoring.

Bibliography: Brame, A.H. (1963), García-París, M. *et al.* (2000), García-París, M. and Wake, D.B. (2000), Savage, J.M. (2002), Wake, D.B. (1987)

Data Providers: Federico Bolaños, Gerardo Chaves, David Wake, Jay Savage

EN *Oedipina pseudouniformis* Brame, 1968**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Costa Rica, Nicaragua**Current Population Trend:** Decreasing

Geographic Range This species occurs in Costa Rica and Nicaragua. It can be found on the Atlantic and Pacific slopes in northern Costa Rica and on the Atlantic slope of central Costa Rica, at 19-1,253m asl. In Nicaragua, it is known from two localities: Hacienda la Cumpiada (north-east of Matagalpa) at 730m asl; and Parque Nacional Saslaya, at 945m asl.

Population It was formerly very common, but has undergone serious declines (although individuals continue to turn up in surveys conducted in appropriate habitat).

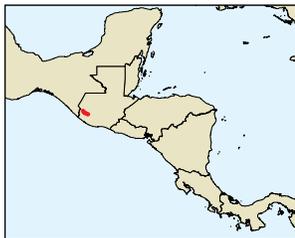
Habitat and Ecology It lives in moss banks and under logs in lowland and premontane wet forest, and can survive in somewhat degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is habitat loss due to smallholder farming activities, wood collection, and human settlement.

Conservation Measures It occurs in Parque Nacional Saslaya (in Nicaragua) and in Parque Nacional Arenal and several catchment forest reserves in Costa Rica. There is a need for close population monitoring of this species.

Bibliography: Brame, A.H. (1968), García-París, M. *et al.* (2000), García-París, M. and Wake, D.B. (2000), Savage, J.M. (2002), Wake, D.B. (1987)

Data Providers: Federico Bolaños, Gerardo Chaves, David Wake, Jay Savage, Gunther Köhler

EN *Oedipina stenopodia* Brodie and Campbell, 1993**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Guatemala**Current Population Trend:** Decreasing

Geographic Range This species is known only from the Pacific slope of south-western Guatemala in the departments of San Marcos and Quezaltenango, from 1,400-1,500m asl.

Population It is very uncommon, although it is probably difficult to find given its subterranean habits.

Habitat and Ecology It presumably once occurred in subtropical and lower montane wet forest, but this has largely been cleared within its range. Animals have been found under rotting logs and piles of dead vegetation, and in soil banks in recently cleared agricultural plantations, and in other disturbed areas (including shade-grown coffee habitats). It breeds by direct development and is not dependent upon water.

Major Threats The major threat is the conversion of areas of shade-grown coffee, and other shaded habitats, to more open environments.

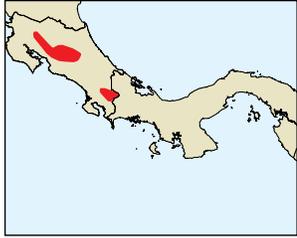
Conservation Measures It is not known from any formal protected areas, and any remaining suitable habitat in the range of the species requires urgent protection. Further survey work is needed to better determine the current population status of the species.

Bibliography: Brodie, E.D. and Campbell, J.A. (1993), Campbell, J.A. (2001), García-París, M. and Wake, D.B. (2000)

Data Providers: Manuel Acevedo, David Wake

VU *Oedipina uniformis* Keferstein, 1868

Vulnerable B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Costa Rica
Current Population Trend: Decreasing



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Geographic Range This species occurs from Volcán Tenorio, south through the cordilleras and Meseta Central to the Panama frontier, at 750-2,150m asl, in Costa Rica (Savage 2002). Its presence in Panama has not been confirmed.

Population It used to be very common, but is now greatly reduced in certain areas. It has not been seen since 1990 in the heavily surveyed Reserva Biológica Monteverde, but it is still common in several localities.

Habitat and Ecology It inhabits humid premontane and lower montane forest. It has been found living in leaf-litter, under decaying logs, and in moss banks. It has also been found in gardens and can withstand some habitat modification. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is probably destruction of natural forests for wood and human settlement. However, the disappearance from the Reserva Biológica Monteverde must be due to another reason, such as disease. Chytridiomycosis has been confirmed in some other amphibian species at Monteverde, though it usually affects species that are associated with water.

Conservation Measures It occurs in several protected areas, including Volcán Irazú, Volcán Turrialba, Parque Nacional Tapantí, Volcán Poás, Monteverde (at least formerly), and Volcán Tenorio. Further research is needed to determine the causes of the decline in undisturbed habitats, such as at Monteverde.

Bibliography: Brame, A.H. (1968), García-Paris, M. *et al.* (2000), García-Paris, M. and Wake, D.B. (2000), Good, D.A. and Wake, D.B. (1997), Ibáñez, R. *et al.* (2000), Savage, J.M. (2002), Wake, D.B. (1987), Young, B. *et al.* (1999)

Data Providers: David Wake, Jay Savage

EN *Parvimolge townsendi* (Dunn, 1922)

Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© courtesy of David Wake



Geographic Range This species occurs on the Sierra Madre Oriental around Cuautlan, in east-central Veracruz, Mexico, at 800-1,500m asl.

Population It was formerly common, but has undergone significant declines (although it can still be found).

Habitat and Ecology It inhabits cloud and oak forest, and is usually found living in bromeliads. This species is somewhat adaptable, and can survive in shaded coffee plantations provided that humidity levels are maintained, but it does not tolerate the opening up of the landscape (which leads to the drying out of its microhabitat). It breeds by direct development and is not dependent upon water.

Major Threats The major threat is habitat loss due to expanding agriculture and human settlements, and extraction of wood.

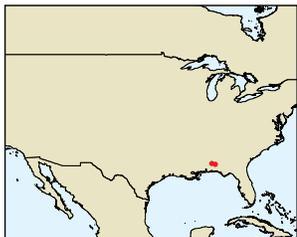
Conservation Measures It is not known from any protected areas, making habitat protection an urgent priority for this species. It is listed as "Threatened" (Amenazada) by the Mexican government.

Bibliography: Parra-Olea, G., García-Paris, M. and Wake, D.B. (1999), Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Phaeognathus hubrichti* Highton, 1961

Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Decreasing



© Erik Keirster



Geographic Range This species can be found in the Red Hills of south-central Alabama, USA, between the Alabama and Conecuh Rivers (Petranka 1998). It is restricted to Tallahatta and Hatchetigbee geological formations. It can also be found in Butler, Conecuh, Covington, Crenshaw, and Monroe Counties (Bury, Dodd and Fellers 1980; Dodd 1991).

Population It is not rare (K. Dodd pers. comm. 1995), although current evidence indicates significant losses over the 63,000 estimated acres of formerly occupied habitat. Local abundance varies considerably, and population estimates are difficult to arrive at due to the secretive (fossorial) habits of the species and the isolated locations of populations.

Habitat and Ecology The primary habitat is slopes of mesic shaded ravines dominated by hardwood trees (big-leaf magnolia and southern magnolia with mountain laurel and oak-leaf hydrangea). It is often found in moderately steep

areas with a northern exposure most often on high, steep, uncut slopes with high soil moisture content and full tree canopy (Dodd 1991). It lives in burrows that often open in leaf-litter-free areas near the base of trees or under siltstone outcroppings. Eggs are laid in cavities inside burrows (Means 2003). Embryos develop directly within the eggs. It can tolerate selective logging or clear-cutting as long as burrows are not destroyed mechanically, as by plowing, tilling, or other forms of intensive site preparation.

Major Threats The habitat of this species has been reduced by timber harvest; the conversion of mesic ravines to pine monocultures and the clearing of ridge tops above ravines destroys or degrades available habitat. Overcollecting may have caused a decline in some areas (Bury, Dodd and Fellers 1980; Jordan and Mount 1975). Nearly all habitats are on private timber company lands, and detrimental forestry practices continue (Dodd 1989, 1991), though some problems have been alleviated by management agreements (K. Dodd pers. comm. 1995). Feral pigs are a threat in some areas.

Conservation Measures It does not occur in any officially protected areas, although three areas (less than 15 acres) are set aside to support a limited population. Two areas are in public ownership: Lookout Hill Fire Tower (Alabama Forestry Commission) and Haines Island (US Army Corps of Engineers). Long-term protection is best assured through private landowner cooperation, and Dodd (1991) recommended a series of management actions that would help to maintain the integrity of salamander habitat. It is protected as threatened under the US Endangered Species Act and is listed as a protected non-game species by the state of Alabama.

Bibliography: Bailey, M.A. (1992c), Bailey, M.A. (1995b), Bakkegard, K.A. (2002), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Brandon, R.A. (1966), Bury, R.B., Dodd, J.R., C.K. and Fellers, G.M. (1980), Carroll, A. *et al.* (2000), Dodd, Jr, C.K. (1989), Dodd, Jr, C.K. (1990b), Dodd, Jr, C.K. (1991), Dodd, Jr, C.K. (2005a), French, T.W. and Mount, R.H. (1978), Frost, D.R. (1985), Gunzburger, M.S. and Guyer, C. (1998), Jordan, R. and Mount, R.H. (1975), LaClaire, L.V. (1995a), Matthews, J.R. and Moseley, C.J. (eds) (1990), McKnight, M.L., Dodd, C.K. Jr., and Spolsky, C.M. (1991), Means, D.B. (2003), Mount, R.H. (1975), Petranka, J.W. (1998), U.S. Fish and Wildlife Service (1980a), U.S. Fish and Wildlife Service (1983), U.S. Fish and Wildlife Service (1990a)

Data Providers: Geoffrey Hammerson, Kenneth Dodd

RED HILLS SALAMANDER**VU** *Plethodon amplus* Highton and Peabody, 2000

Vulnerable D2
Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



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jordani complex, Buncombe, Rutherford, and Henderson counties, North Carolina, USA; elevations range at least 1,109-1,116m asl (Highton and Peabody 2000).

Population Because this species was recently described, there are no specific population data available. Highton and Peabody (2000) listed two sampling localities. Based on the proximity of these localities to the transects worked by Petranka (1999), this salamander might have been sampled in the latter study, in which it was the second most abundant salamander in the study.

Habitat and Ecology It can be found in mesic forest, often under leaf-litter, logs, or mossy rocks. It is a terrestrial breeder that breeds by direct development.

Major Threats Clear cutting has been reported as a cause of the declines of local populations of the *P. jordani* complex (Petranka, Eldridge and Haley 1993; Petranka 1999). Data presented by Petranka might or might not apply specifically to *P. amplus*.

Conservation Measures It probably occurs within several protected areas (e.g., Bat Cave) and probably also receives some protection on lands in the Pisgah National Forest where the forest cover is maintained (D. Beamer pers. comm., 2003). Conservation activities that promote mature closed-canopy forests should benefit this species. It is not listed on state or federal endangered species lists. There is a need for continued close monitoring of the population status of this species.

Notes on taxonomy: This species was recently separated from *Plethodon jordani* (Highton and Peabody 2000).

Bibliography: Beamer, D.A. and Lannoo, M.J. (2005a), Highton, R. and Peabody, R.B. (2000), Mahoney, M.J. (2001), Petranka, J.W. (1999), Petranka, J.W., Eldridge, M.E. and Haley, K.E. (1993)

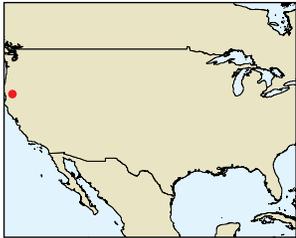
Data Providers: Geoffrey Hammerson, David Beamer

BLUE RIDGE GRAY-CHEEKED SALAMANDER

Geographic Range The range has not yet been clearly delineated for this recently split species, but as currently understood it occurs in Blue Ridge Mountains in the north-eastern part of the Blue Ridge isolate of the *Plethodon*

VU *Plethodon asupak* Mead, Clayton, Nauman, Olson and Pfrender, 2005**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



© Kenny Wray

Geographic Range This species is currently known only from 700-1,300m asl at Walker Gultch, and the Muck-a-Muck and Mill Creeks of the Scott River drainage, south of the Klamath River, Siskiyou County, California, USA. The species is not likely to be found much more widely.

Population There is no information on its population status.

Habitat and Ecology This species is found in old-growth, temperate rainforest near streams. The species is presumed to breed by direct development.

Major Threats The major threat to this species is logging of old-growth forest. While the species occurs within a National Forest, this allows logging under certain conditions. The range of this species has been proposed for logging in the past.

Conservation Measures The known range of this species is encompassed by the Klamath National Forest, and the Scott River is part of the Klamath Wild and Scenic River. A petition was put forward in 2004 that would safeguard this species under the Endangered Species Act, but this has not yet been processed. There is a need for continued close monitoring of the population status of this species.

Bibliography: Mead, L.S. *et al.* (2005)

Data Providers: Geoffrey Hammerson

SCOTTBAR SALAMANDER**VU** *Plethodon cheoah* Highton and Peabody, 2000**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Stable



Geographic Range This species occurs in an area of approximately 15 square kilometres in Cheoah Bald, Graham and Swain counties, North Carolina, USA; its elevational range is at least 975-1,524m asl (Highton and Peabody 2000).

Population This species is common in suitable habitat (six or more specimens can be found within a 1-2 hour search). The population is probably stable.

Habitat and Ecology It is found in mesic forest, often under leaf-litter, logs, or mossy rocks. It is a terrestrial breeder. Most of the species range includes second growth forest, so it must be somewhat tolerant of disturbance.

Major Threats Clear cutting strongly depletes local populations of other members of the *Plethodon jordani* complex (Petranka, Eldridge and Haley 1993); the time required for recovery is debatable, but is at least a few decades (Ash 1997; Petranka 1999; Ash and Pollock 1999).

Conservation Measures Part of the range of this species is within the Nantahala Game Lands, which offer some measure of protection because the forest is typically left intact. There is also an effort to declare much of the range as Wilderness, which, if successful, would further protect the species. The species does not appear on any state or federal list of endangered species. There is a need for continued close monitoring of the population status of this species.

Notes on taxonomy: This species was recently separated from *Plethodon jordani* (Highton and Peabody 2000).

Bibliography: Ash, A.N. (1997), Ash, A.N., and Pollock, K.H. (1999), Beamer, D.A. and Lannoo, M.J. (2005b), Highton, R. (1970), Highton, R. and Peabody, R.B. (2000), Mahoney, M.J. (2001), Petranka, J.W. (1999), Petranka, J.W., Eldridge, M.E. and Haley, K.E. (1993)

Data Providers: Geoffrey Hammerson, David Beamer

CHEOAH BALD SALAMANDER**VU** *Plethodon fourchensis* Duncan and Highton, 1979**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



© Stan Trauth

Geographic Range This species is found in the higher elevations of the Fourche and Irons Fork mountains, Polk and Scott counties, Arkansas, USA; it is present at 503-730m asl (Conant and Collins 1991).

Population It is apparently locally common and even relatively abundant in some areas (Warriner 2002b); Duncan and Highton (1979) collected several dozens of individuals from multiple locations.

Habitat and Ecology It inhabits moist, shady, hardwood and mixed deciduous pine forests; and lives under logs, forest litter, and rocks. It is a terrestrial breeder with direct development.

Major Threats It has probably been impacted by deforestation in the past, but its habitat is now better protected. Local populations are presumably still impacted by deforestation, but overall, it is probably relatively secure, although its restricted distribution renders it particularly susceptible to any new threats.

Conservation Measures Its entire known range is within the Ouachita National Forest, which affords some level of protection (Warriner 2002b). There is a need for continued close monitoring of the population status of this species.

Notes on taxonomy: This species is sometimes considered to be conspecific with *Plethodon ouachitae*, with which it integrates freely in its narrow zone of contact.

Bibliography: Anthony, C.D. (2005), Behler, J.L. and King, F.W. (1979), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Blair, A.P. and Lindsay, H.L. Jr. (1965), Conant, R. and Collins, J.T. (1991), Duncan, R. and Highton, R. (1979), Frost, D.R. (1985), Highton, R. (1986a), Mahoney, M.J. (2001), Petranka, J.W. (1998), Robison, H.W. and Allen, R.T. (1995), Taylor, C.L., Wilkinson, Jr., R.F., and Peterson, C.L. (1990), Trauth, S.E., Robison, H.W. and Plummer, M.V. (2004), Wake, D.B. and Jockusch, E.L. (2000), Warriner, M.D. (2002b)

Data Providers: Geoffrey Hammerson

FOURCHE MOUNTAIN SALAMANDER**VU** *Plethodon hubrichti* Thurow, 1957**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



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Geographic Range This species can be found in the Blue Ridge Mountains, north-east of Roanoke, Virginia, United States. Most of the known range is within the Jefferson National Forest and Blue Ridge Parkway. It is primarily known from localities along the Blue Ridge Parkway between miles 78 and 84 (Bedford and Botetourt counties) in the Sharp Top, Flat Top, Onion, and Apple Orchard mountains and vicinity. It occurs at elevations above 550m asl (Mitchell 1991); it is also reported as generally occurring above 760m asl (Bury, Dodd and Fellers 1980).

Population Although it has a patchy distribution, it is seasonally common and can be locally abundant (Kramer *et al.* 1993). Kramer *et al.* (1993) marked 250 Peaks of Otter Salamanders in a 10 x 10m plot and estimated a population size of 450 individuals; average density/field trip was 0.24 individuals/m².

Habitat and Ecology It can be found in mature Appalachian hardwood forest, mainly on north-facing slopes and in coves and shaded ravines, and also in rhododendron thickets; found primarily under downed logs and rocks, and among wet leaf-litter, in middle to late successional stages of oak-maple woodland (Bury, Dodd and Fellers 1980, Mitchell 1991). It often climbs into vegetation, especially ferns, during June-September at night during foraging (Kramer *et al.* 1993). It might be vulnerable to habitat fragmentation and clear cutting. It is a terrestrial breeder with direct development.

Major Threats There is a potential local threat due to firewood collection. Sattler and Reichenbach (1998) found that clear cutting significantly reduced populations, due to emigration and/or mortality; juveniles appeared to be particularly impacted. Shelterwood cuts did not have any overall adverse impacts. Mitchell, Wicknick and Anthony (1996) found that timber-harvesting practices do not eliminate this species but may diminish population size and diet quality. Because of very low dispersal rates, intensive timbering and habitat fragmentation could be highly detrimental (Kramer *et al.* 1993; Petranka 1998). Threats also include recreational development, defoliation by gypsy moths, and spraying to control gypsy moths (Mitchell 1991).

Conservation Measures Some populations are fully protected (Petranka 1998). Nearly the entire known range is within Jefferson National Forest and Blue Ridge Parkway, but the management of these is not necessarily compatible with the conservation of this species. Surveys are needed to establish the extent of the species' range on private lands. They are recognized as a Federal species At Risk by the U.S. Fish and Wildlife Service and listed as a Species of Concern by the Virginia Department of Game and Inland Fisheries. There is a need for continued close monitoring of the population status of this species.

Bibliography: Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), Frost, D.R. (1985), Highton, R. (1986c), Highton, R. and Larson, A. (1979), Kramer, P. *et al.* (1993), Mahoney, M.J. (2001), Mitchell, J.C. (1991), Mitchell, J.C. and Wicknick, J.A. (2005), Mitchell, J.C., Wicknick, J.A. and Anthony, C.D. (1996), Petranka, J.W. (1998), Sattler, P. and Reichenbach, N. (1998)

Data Providers: Geoffrey Hammerson, Joseph Mitchell

PEAKS OF OTTER SALAMANDER

VU *Plethodon meridianus* Highton and Peabody, 2000**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Stable



Geographic Range This species can be found in the South Mountains, in Burke, Cleveland, and Rutherford counties, in the Piedmont Province of North Carolina, USA; its elevational range is at least 543-823m asl (Highton and Peabody 2000).

Population It is common and relatively easily found even in areas that are not prime habitat (D. Beamer pers. comm., 2003).

Habitat and Ecology It is found in mesic forest, often under leaf-litter, logs, or mossy rocks. It is a terrestrial breeder with direct development in the same habitat. It tolerates some level of disturbance because much of its range occurs in second growth forest.

Major Threats Clear cutting has been reported to strongly deplete local populations of the *P. jordani* complex (Petranka, Eldridge and Haley 1993); the time required for recovery is debatable but is at least a few decades (Ash 1997, Petranka 1999, Ash and Pollock 1999). *Plethodon meridianus* appears to be somewhat tolerant of habitat degradation, since much of its range has been logged and is now

covered in second-growth forest (D. Beamer pers. comm., 2003). Some areas in the South Mountains are being used for residential development, so habitat destruction is a threat (D. Beamer pers. comm., 2003).

Conservation Measures Portions of the species' range are protected in South Mountain State Park. The species also occurs in South Mountain Game Lands where the forest is generally maintained intact (D. Beamer pers. comm.). The species does not appear on any state or federal list of endangered species. There is a need for continued close monitoring of the population status of this species.

Notes on taxonomy: This species was recently separated from *Plethodon jordani* (Highton and Peabody 2000).

Bibliography: Ash, A.N. (1997), Ash, A.N., and Pollock, K.H. (1999), Beamer, D.A. and Wake, D.B. (2005), Highton, R. and Peabody, R.B. (2000), Mahoney, M.J. (2001), Petranka, J.W. (1999), Petranka, J.W., Eldridge, M.E. and Haley, K.E. (1993)

Data Providers: Geoffrey Hammerson, David Beamer

SOUTH MOUNTAIN GRAY-CHEEKED SALAMANDER**VU** *Plethodon petraeus* Wynn, Highton and Jacobs, 1988**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Stable



© John B. Jensen

Geographic Range This species is limited to the Cumberland Plateau of extreme north-western Georgia, USA. All known populations occur on the eastern slope of Pigeon Mountain in Walker and Chattooga counties (Wynn, Highton and Jacobs 1988, Jensen 1999, Buhlmann 2001, Jensen, Camp and Marshall 2002). Sites occur at altitudes ranging from 220-570m asl (Wynn, Highton and Jacobs 1988).

Population Wynn, Highton and Jacobs (1988) reported the species as very abundant, far outnumbering other syntopic salamander species. Recent surveys at two of the known sites indicated no detectable change in their abundance (J.B. Jensen pers. obs.); however, Pigeon Mountain salamanders have become uncommon at one locality, possibly due to disturbance created by increased cave visitation and/or perhaps scientific over-collecting (Jensen 1999).

Habitat and Ecology Pigeon Mountain Salamanders are associated with limestone outcroppings, boulder fields, and caves (Wynn, Highton and Jacobs 1988). Those found in caves are rarely deeper than the twilight zone. Individuals are most often found in and around cracks and crevices within rocks. These microhabitats are embedded within mesic deciduous forests consisting of an over-storey comprised primarily of oak and hickory (Jensen 1999). However, Pigeon Mountain Salamanders are rarely encountered away from rock outcrops or caves (Jensen, Camp and Marshall 2002).

Major Threats The restricted distribution of Pigeon Mountain Salamanders makes them especially vulnerable to threats. Mineral rights to a portion of this property are leased to a mining company that has proposed quarrying operations, which might threaten both this species and Green Salamanders, another rare amphibian. Over-collection for scientific study and possibly the illegal pet trade, as well as disturbance from recreational cavers, might threaten populations. Loss or reduction of moisture-trapping canopy covers as a result of timber removal on private lands could pose a future threat. However, at present the species appears to be stable and the impacts of these threats is probably relatively limited.

Conservation Measures Most of the species' potential habitat is in the Crockford-Pigeon Mountain Wildlife Management Area. A request to list the species as "threatened" under the federal Endangered Species Act was submitted by John Jensen to the USFWS-Athens, GA Field Office. Private land within the range of the species should be considered for acquisition or the establishment of conservation easements. Timber harvest should be avoided in occupied habitats; if timber harvest does occur, it is important to retain a forested canopy surrounding significant rock-outcroppings and caves, as well as to retain a suitable amount of coarse woody debris. There is a need for continued close monitoring of the population status of this species.

Bibliography: Buhlmann, K.A. (2001), Carr, D.E. (1996), Collins, J.T. (1990), Highton, R. (1989), Highton, R. (1995), Jensen, J.B. (1999), Jensen, J.B. and Camp, C.D. (2005), Jensen, J.B. and White, M.R. (2000), Jensen, J.B., Camp, C.D. and Marshall, J.L. (2002), Mahoney, M.J. (2001), Petranka, J.W. (1998), Wynn, A.H., Highton, R. and Jacobs, J.F. (1988)

Data Providers: Geoffrey Hammerson

PIGEON MOUNTAIN SALAMANDER**VU** *Plethodon shenandoah* Highton and Worthington, 1967**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Stable



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Geographic Range There are three isolated populations on Hawksbill Mountain, The Pinnacles, and Stony Man Mountain (including Bushytop and a subpopulation below Hemlock Springs Overlook), Shenandoah National Park, Page and Madison counties, Virginia, USA, generally above 800m asl (914-1,143m asl). Reports from further south on the Blue Ridge (Thurow 1999) appear not to refer to this species (Sites *et al.* 2004).

Population Its abundance is uncertain. It apparently has not declined compared with its historical status, and probably is not declining significantly at the present time (R. Highton pers. comm., 1995).

Habitat and Ecology It can be found in the highest mountains of Shenandoah National Park; steep, northerly facing talus slopes in forested situations. It is tolerant of relatively dry conditions. It is mostly confined to pockets of soil and/or vegetative debris. Apparently, talus is sub-optimal habitat for this species, but it is excluded from forest habitat through competition with Eastern Red-backed Salamander *P. cinereus*. It is a terrestrial breeder, with direct development.

Major Threats Its range might be restricted by competition (inter-specific territoriality) with Eastern Red-backed Salamander, which excludes Shenandoah Salamander from moist deep soil adjacent to talus occupied by the latter (Griffis and Jaeger 1992). Deterioration of talus and the accumulation of organic matter might allow incursion of Eastern Red-backed Salamander into Shenandoah Salamander habitat. Recent work indicates that human-related factors, including acid deposition (direct effects and vegetation defoliation) and tree defoliation caused by introduced insect pests, such as gypsy moths and woolly adelgids, might be more important threats (draft recovery plan, 1994). Changes in climate could impact already marginal habitat and exceed salamander's tolerance.

Conservation Measures All sites are in National Park holdings. Shenandoah Salamanders are listed as Endangered by the Virginia Department of Game and Inland Fisheries, and as Endangered by the U.S. Fish and Wildlife Service. There is a need for continued close monitoring of the population status of this species.

Bibliography: Behler, J.L. and King, F.W. (1979), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), Frost, D.R. (1985), Griffis, M.R. and Jaeger, R.G. (1992), Highton, R. (1988b), Jacobs, J. (1994), Mahoney, M.J. (2001), Mitchell, J.C. (1991), Mitchell, J.C. (2005), Petranka, J.W. (1998), Sites Jr, J.W. *et al.* (2004), Thurow, G.R. (1999), U.S. Fish and Wildlife Service (1989b), U.S. Fish and Wildlife Service (1990a)

Data Providers: Geoffrey Hammerson, Joseph Mitchell

SHENANDOAH SALAMANDER**VU** *Plethodon sherando* Highton, 2004**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Unknown



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Geographic Range This recently described species from the Blue Ridge Mountains of the eastern USA is known only from 15 sites in a small area in the vicinity of Big Levels, Augusta County, Virginia, at elevations ranging from 579m asl (Lake Sherando) to 1,091m asl (at the top of Bald Mountain). It overlaps very narrowly with Eastern Red-backed Salamander *Plethodon cinereus* on the edge of its range.

Population It is believed to be common within its small range.

Habitat and Ecology It occurs in forest and on rocky talus slopes. It breeds by direct development.

Major Threats Very little is currently known on threats to this species. There is no information on its ability to adapt to logging of its forest habitat.

Conservation Measures Most of its range is within the George Washington National Forest, but the management of this is not necessarily compatible with the conservation of this species, perhaps especially when logging is permitted. There is a need for continued close monitoring of the population status of this species.

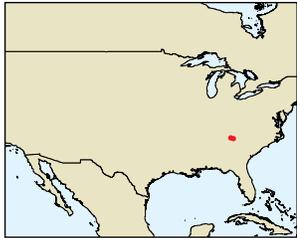
Bibliography: Highton, R. (2004)

Data Providers: Richard Highton; Joseph Collins

BIG LEVELS SALAMANDER

VU *Plethodon shermani* Stejneger, 1906**Vulnerable D2**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Stable



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Geographic Range This species can be found in Standing Indian, Wayah, Tusquitee, and Unicoi isolates of the *Plethodon jordani* complex, North Carolina and Tennessee, USA; it has an elevational range of at least 853-1,494m asl (Highton and Peabody 2000).

Population This species can be very common in portions of its range. It is probably stable at present.

Habitat and Ecology It can be found in mesic forest, often under leaf-litter, logs, or mossy rocks. It is at least somewhat tolerant of disturbance, because it is common in second growth forests that were at one time uprooted by wild pigs (Bishop 1928). It is a terrestrial breeder with direct development.

Major Threats Clear cutting strongly depletes local populations of other members of the *Plethodon jordani* complex (Petranka, Eldridge and Haley 1993); the time required for recovery is debatable, but is at least on the order of a few decades (Ash 1997, Petranka 1999, Ash and Pollock 1999).

Conservation Measures Much of the range occurs in the Nantahala National Forest, although some clear cutting occurs there. Conservation activities that promote mature closed-canopy forests should benefit this species. The species does not appear on any state or federal list of endangered species.

Notes on taxonomy: This species was recently separated from *Plethodon jordani* (Highton and Peabody 2000).

Bibliography: Ash, A.N. (1997), Ash, A.N., and Pollock, K.H. (1999), Beamer, D.A. and Lannoo, M.J. (2005c), Bishop, S.C. (1928), Highton, R. and Peabody, R.B. (2000), Mahoney, M.J. (2001), Petranka, J.W. (1999), Petranka, J.W., Eldridge, M.E. and Haley, K.E. (1993), Pope, C.H. (1928)

Data Providers: Geoffrey Hammerson, David Beamer

RED-LEGGED SALAMANDER**EN** *Plethodon stormi* Highton and Brame, 1965**Endangered B1ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Decreasing



Geographic Range This species is restricted to an area of about 377km² in the Siskiyou Mountains in southern Oregon (mostly upper Applegate River drainage, Josephine and Jackson Counties) and northern California (Siskiyou County: near Hutton Guard Station, the Cook and Green Guard Stations, along Joe and Dutch creeks in upper Applegate River drainage and along Seiad and Horse creeks in Klamath River drainage), USA (California Department of Fish and Game 1990). In Oregon, it is found at elevations of 490-1,463m asl (Leonard *et al.* 1993).

Population It is locally abundant in a few sites and moderately common at many others (R.B. Bury pers. comm. 2003).

Habitat and Ecology This species, as with its sister species (*P. elongatus*; Welsh and Lind 1995), is highly associated with rocky talus slopes in areas of dense mature and late-seral forest (Welsh and Lind 1995, Bury 1998; Ollivier, Welsh and Clayton 2001). Most individuals occur in talus and rocky soils or slopes and, occasionally, are found under logs, in leaf-litter, and under other substrates

if talus is nearby (Nussbaum, Brodie and Storm 1983, Bury 1998, Bury and Welsh 2005). Eggs (2-18) are laid on land apparently in cavities in talus (Nussbaum, Brodie and Storm 1983).

Major Threats The most serious threat appears to be gradual destruction of over story vegetation by clear-cutting in areas of rock outcrops and talus slopes, which results in drying out of the species' microhabitat (California Department of Fish and Game 1990).

Conservation Measures Almost all populations are on lands managed by the U.S. Forest Service. Some protection is afforded in Klamath National Forest by an "Interim Management Direction" that specifies normal stream course protection measures designed to maintain water quality and fisheries habitat (California Department of Fish and Game 1990). Once considered a Federal Candidate Species for listing, Siskiyou Mountains salamanders are recognized as a species of special concern by Oregon and California.

Notes on taxonomy: This species is morphologically somewhat similar to *Plethodon elongatus*, but it is genetically distinct.

Bibliography: Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Brodie, E.D. (1970), Brodie, E.D., Jr. (1971), Bury, R.B. (1973b), Bury, R.B. (1998), Bury, R.B. and Pearl, C.A. (1999), Bury, R.B. and Welsh, Jr, H.H. (2005), Bury, R.B., Dodd, Jr., C.K. and Fellers, G.M. (1980), California Department of Fish and Game (CDF&G). (1990), Clayton, D.R., Ollivier, L.M. and Welsh, H.H. (In press), Clayton, D.R., Ollivier, L.M. and Welsh, H.H. Jr. (1998), Diller, L.V. and Wallace, R.L. (1994), Frost, D.R. (1985), Highton, R. and Brame, A.H. (1965), Leonard, W.P. *et al.* (1993), Mahoney, M.J. (2001), Nussbaum, R.A. (1974), Nussbaum, R.A., Brodie, Jr., E.D. and Storm, R.M. (1983), Ollivier, L., Welsh Jr, H.H. and Clayton, D.R. (2001), Petranka, J.W. (1998), Stebbins, R.C. (1985b), Stebbins, R.C. (2003), Thomas, J.W. *et al.* (1993), Welsh Jr, H.H. and Lind, A.J. (1995), Welsh, H.H. and Lind, A.J. (1992), Welsh, H.H. and Lind, A.L. (1988)

Data Providers: Geoffrey Hammerson, Bruce Bury

SISKIYOU MOUNTAINS SALAMANDER**EN** *Plethodon welleri* Walker, 1931**Endangered B1ab(iii)**

Order, Family: Caudata, Plethodontidae
Country Distribution: United States of America
Current Population Trend: Decreasing



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Geographic Range This species is found in Whitetop, Mount Rogers, and Pine Mountain, Virginia, south-westward to Yancy County, North Carolina, extreme eastern Tennessee, and eastward to Grandfather Mountain, Caldwell County, North Carolina, USA (Pague 1991). Populations are apparently isolated from each other (Pague 1991). It occurs at elevations of 760m asl or more, but chiefly in spruce forests above 1,500m asl (Conant and Collins 1991).

Population Populations in North Carolina and Virginia are believed to be declining (H. LeGrand and S. Roble pers. comm. 1997). Grandfather Mountain (North Carolina) and Mount Rogers (Virginia) populations are large and probably stable (W. Van Devender pers. comm. 1997; D.A. Beamer pers. comm. 2003).

Habitat and Ecology It inhabits spruce-fir, birch-hemlock, and primarily deciduous forests, and is also found in grassy spots and boulder fields. It is usually found under rocks or logs, or in leaf-litter, during the day, and tends to be associated with rocky substrates. Breeding and non-breeding habitats are the same. The eggs are laid in small cavities in rotting conifer logs or beneath moss mats. It is apparently not tolerant of habitat disturbance.

Major Threats The major threat is habitat loss due to development and logging (Braswell 1989). Forest fragmentation, catastrophic fires, or forest die-off resulting from acid rain or spruce budworm could have significant adverse effects on the relatively small isolated populations (see Pague 1991). Most populations are protected to some degree by their occurrence at high elevations (Petranka 1998).

Conservation Measures In Virginia, much of the range occurs in the Mount Rogers National Recreation Area, primarily in zones designated as protected. However, fragmentation could threaten this population (Pague 1991). The Grandfather Mountain population currently receives adequate protection by the current landowner. Due to the generally small and isolated populations of this species, all populations are vulnerable to accidents or policy changes in land management (Braswell 1989). It is listed as a species of special concern in North Carolina and Virginia and as Wildlife in Need of Management in Tennessee.

Bibliography: Beamer, D.A. and Lannoo, M.J. (2005d), Behler, J.L. and King, F.W. (1979), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Braswell, A.L. (1989), Frost, D.R. (1985), Mahoney, M.J. (2001), Martof, B.S. *et al.* (1980), Mitchell, J.C. (1991), Pague, C.A. (1991), Petranka, J.W. (1998), Redmond, W.H. and Scott, A.F. (1996), Thurow, G.R. (1964)

Data Providers: Geoffrey Hammerson, David Beamer

WELLER'S SALAMANDER**EN** *Pseudoecycea altamontana* (Taylor, 1938)**Endangered B1ab(ii,iii,iv,v)**

Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Thomas Bille

Geographic Range This species is known only from central Mexico, in the extreme east of Mexico State, in southern Federal District, and in Morelos, at around 3,000m asl.

Population It used to be abundant, but it has recently disappeared from parts of its range.

Habitat and Ecology It lives in pine, pine-oak and fir forests, and is terrestrial, being found under the bark of logs and stumps; it does not tolerate serious habitat disturbance. It breeds by direct development and is not dependent upon water.

Major Threats The major threat is habitat loss, due to the heavy transformation and logging of forested areas along the transvolcanic belt of Mexico.

Conservation Measures It occurs in Parque Nacional Lagunas de Zempoala, but habitat loss is ongoing within this protected area and there is a need for improved management. The species is also in need of close population monitoring. It is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Flores-Villela, O. and McCoy, C.J. (1993), Uribe-Peña, Z., Ramirez-Bautista, R. and Cuadernos, G.C.A. (2000)

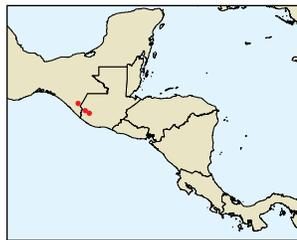
Data Providers: Gabriela Parra-Olea, David Wake

CR *Pseudoeurycea aquatica* Wake and Campbell, 2001**Critically Endangered B1ab(iii)+2ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing**Geographic Range** This species is known only from Totontepec, at 2,500m asl, in central-eastern Oaxaca, Mexico.**Population** It is known from only three specimens, last collected more than 20 years ago. There have been many subsequent unsuccessful searches for it, and it is likely to be extinct.**Habitat and Ecology** This is the only known aquatic plethodontid salamander in Mesoamerica, occurring in streams in cloud forest. It presumably breeds by direct development.**Major Threats** The cloud forest habitat of this species has been completely destroyed at the type locality due to wood extraction, farming, and human settlement. The resulting degradation of streams due to burned debris has probably also contributed to the species' disappearance.**Conservation Measures** It is not known from any protected areas. Further survey work is needed to establish whether or not this species might survive in the wild outside its only known locality.**Bibliography:** Wake, D.B. and Campbell, J.A. (2001)**Data Providers:** Gabriela Parra-Olea, David Wake**VU** *Pseudoeurycea bellii* (Gray, 1850)**Vulnerable A2ace****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Arnaud Jamin

**Geographic Range** This species' main distribution is along the western and southern margins of the Mexican plateau, with numerous isolated populations from the border area of central Sonora and Chihuahua, and from central Tamaulipas, to the mountains of central Guerrero. Its altitudinal range is from 750-3,300m asl.**Population** It was once common in many localities, but has become increasingly rare, and has disappeared from many places from which it was formerly known.**Habitat and Ecology** It inhabits pine and pine-oak forests at high elevations. It is terrestrial, commonly found beneath logs and rocks. It also occurs in degraded forest, coffee plantations, rural gardens, and very close to urbanized and highly disturbed areas. It breeds by direct development and is not dependent upon water.**Major Threats** The cause of its decline is unclear. Forest clearance for farming, urbanization and wood extraction are taking place in many parts of its range, but these do not seem to explain the level of decline that has been observed. Declines in suitable habitat could be the result of other threats such as climate change or disease (possibly chytridiomycosis, although this normally impacts species that are associated with water).**Conservation Measures** It occurs in many protected areas. This species is listed as "Threatened" (Amenazada) by the Mexican government.**Notes on taxonomy:** *P. boneti* has recently been resurrected from the synonymy of *P. bellii* (Parra-Olea et al. 2005b).**Bibliography:** Flores-Villela, O. and McCoy, C.J. (1993), Parra-Olea, G. et al. (2005b), Parra-Olea, G. et al. (2005b), Parra-Olea, G., García-París, M. and Wake, D.B. (1999), Uribe-Peña, Z., Ramírez-Bautista, R. and Cuadernos, G.C.A. (2000), Wake, D.B. (1987)**Data Providers:** Gabriela Parra-Olea, David Wake**BELL'S FALSE BROOK SALAMANDER****VU** *Pseudoeurycea boneti* Alvarez and Martín, 1967**Vulnerable A2a****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Jim Hendel

**Geographic Range** This species is known only from north-central Oaxaca State, southern Mexico.**Population** It was known to be common to very common 30 years ago, but is now rarely found (D. Wake pers. comm., 2005).**Habitat and Ecology** It is a species of pine and pine-oak forests at high elevations. It is terrestrial, found beneath logs and rocks. The species is presumed to breed by direct development.**Major Threats** Habitat loss does not appear to be at a scale large enough to explain observed declines, and chytrid fungus, a possible cause of disappearances, has so far not been recorded here (D. Wake pers. comm. 2005).**Conservation Measures** This species is not known from any protected areas. Research is needed to determine the reason for the apparent population declines in suitable habitat.**Notes on taxonomy:** This species was resurrected from the synonymy of *Pseudoeurycea bellii* by Parra-Olea et al. (2005b).**Bibliography:** Alvarez, T. and Martin, E. (1967), Parra-Olea, G. et al. (2005b)**Data Providers:** David Wake**EN** *Pseudoeurycea brunnata* Bumzahem and Smith, 1955**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Guatemala, Mexico**Current Population Trend:** Decreasing**Geographic Range** This species is known from Volcán Tacaná (in extreme eastern Chiapas, Mexico), discontinuously eastwards as far as Volcán Chicabal (in south-western Guatemala), at 2,400-2,800m asl.**Population** It was formerly extremely abundant, but has undergone extensive declines.**Habitat and Ecology** It inhabits pine-oak and upper cloud forest, where it is strictly terrestrial, and can tolerate only very limited habitat disturbance. It breeds by direct development and is not dependent upon water.**Major Threats** The main threat is habitat loss due to clear-cutting, urbanization, human settlement, and expanding agriculture (including livestock farming).**Conservation Measures** It is not known from any protected areas, making habitat protection an urgent priority. The species is in need of close population monitoring. It is protected by Mexican law under the "Special Protection" category (Pr).**Bibliography:** Campbell, J.A. (2001), Wake, D.B. (1987), Wake, D.B. and Lynch, J.F. (1976)**Data Providers:** Manuel Acevedo, David Wake

EN *Pseudoeurycea cochranae* (Taylor, 1943)

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Gabriela Parra-Olea

Geographic Range This species is restricted to the highlands of central and west-central Oaxaca, Mexico, at 2,200–2,700m asl.

Population It is fairly common, although it has not been seen at the type locality (Cerro San Felipe) for many years.

Habitat and Ecology It inhabits pine and pine-oak forests, and is terrestrial, hiding under bark and in leaf-litter. It can tolerate limited habitat disturbance, and is sometimes found in rural gardens and selectively logged lots. Breeding takes place by direct development and is not dependent upon water.

Major Threats The major threat is habitat loss due to extensive agricultural expansion, human settlements, and logging.

Conservation Measures It does not occur in any protected areas, and there is an urgent need for the protection of forest habitats of the Sierra de Juárez. This species is listed as “Threatened” (Amenazada) by the Mexican government.

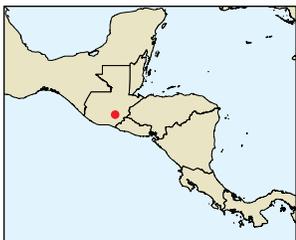
Notes on taxonomy: This form represents a species complex and is in need of taxonomic revision (G. Parra-Olea and D Wake pers. comm.).

Bibliography: Bogert, C.M. (1967), Parra-Olea, G., García-París, M. and Wake, D.B. (1999), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Pseudoeurycea exspectata* Stuart, 1954

Critically Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Guatemala
Current Population Trend: Decreasing



Geographic Range This species is known only from Miramundo in the highlands to the south-west of Jalapa, Departamento de Jalapa, Guatemala, at 2,530m asl. It might occur more widely on some of the isolated volcanic peaks of south-eastern Guatemala.

Population It used to be relatively common, but is now much less so in its tiny range.

Habitat and Ecology It inhabits broadleaf forest, and has been collected from inside and beneath rotting logs, and in bromeliads. It is now found only in degraded forest edges. It breeds by direct development and is not dependent upon water.

Major Threats The major threat to this species is continuing forest loss due to smallholder farming activities and logging.

Conservation Measures It is not known from any protected areas, and habitat protection is urgently required.

Bibliography: Campbell, J.A. (2001), Stuart, L.C. (1954), Stuart, L.C. (1963), Wake, D.B. (1987), Wake, D.B. and Lynch, J.F. (1976)

Data Providers: Manuel Acevedo, David Wake

EN *Pseudoeurycea firscheini* Shannon and Werler, 1955

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known only from Acultinzo town to the Tequila area, western-central Veracruz, Mexico, at 1,600–2,000m asl.

Population It is a rare species.

Habitat and Ecology It inhabits pine-oak forest to lower cloud forest, apparently requiring the presence of abundant bromeliads in mature trees and does not survive in heavily degraded habitats (though it is found at forest edge). Breeding takes place by direct development and is not dependent upon water.

Major Threats The major threat is the loss of large bromeliad-covered trees, particularly as habitat is being lost due to expanding agriculture, human settlements, and wood extraction.

Conservation Measures It may occur in Parque Nacional Canon del Río Blanco, although this requires confirmation. This species is protected by Mexican law under the “Special Protection” category (Pr).

Bibliography: Parra-Olea, G., García-París, M. and Wake, D.B. (1999), Shannon, F.A. and Werler, J.E. (1955b), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Pseudoeurycea gadovii* (Dunn, 1926)

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Arnaud Jamin

Geographic Range This species occurs in two localities in Mexico: on and around Volcán Pico de Orizaba, east-central Veracruz; and from the slopes of Volcán La Malinche on the Tlaxcala-Puebla border. It occurs at higher elevations than any other salamander, up to 5,000m asl, with a lower altitudinal limit of around 2,800m asl.

Population Although this has never been a common species, it has become increasingly rare in recent years.

Habitat and Ecology It lives terrestrially in pine-oak forest and in bunch grass above the timberline, and does tolerate some level of habitat disturbance. It breeds by direct development and is not dependent upon water.

Major Threats The habitat of this species has been heavily disturbed at lower elevations, especially due to logging. It might be more secure at higher elevations, where human impacts are less severe.

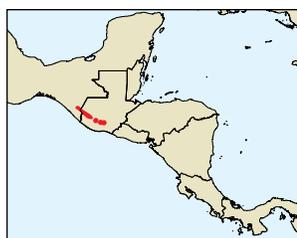
Conservation Measures This species occurs in Parque Nacional Pico de Orizaba. It is protected by Mexican law under the “Special Protection” category (Pr).

Bibliography: Flores-Villela, O. and McCoy, C.J. (1993)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Pseudoeurycea gigantea* (Taylor, 1939)**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

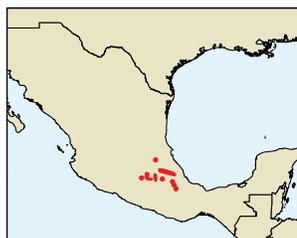
© Scientific Photographic Laboratory, courtesy of David Wake

**Geographic Range** This species is known from the eastern margins of the Mexican plateau at 1,000-2,000m asl (though it mainly occurs at higher elevations within its range).**Population** Formerly quite abundant, this species has become very hard to find in recent years. For example, a visit to the known locality of Cerro Loma Alta in 2003 yielded no records of this species, and while it used to be common at La Joya, it is now seldom seen.**Habitat and Ecology** This is a terrestrial species that inhabits the pine-oak-cloud forest interface, and is able to live in somewhat disturbed habitats. It breeds by direct development and is not dependent upon water.**Major Threats** Serious habitat destruction is taking place within its range as a result of logging, mining, agriculture, and human settlement. All areas surrounding La Joya have been highly disturbed as a result of extensive logging and mining, and the remaining available habitat at this locality was only about 15 ha in 2004. Another known locality, Cerro Loma Alta, which was visited in 2003, was found to have been virtually destroyed as a result of logging and invasive plants.**Conservation Measures** It is not known from any protected areas, making habitat protection for this species an urgent priority.**Notes on taxonomy:** This species was removed from the synonymy of *Pseudoeurycea bellii* by Parra-Olea, Papenfuss and Wake (2001).**Bibliography:** Parra-Olea, G. *et al.* (2005b), Parra-Olea, G., García-Paris, M. and Wake, D.B. (1999), Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001)**Data Providers:** Gabriela Parra-Olea, David Wake**EN** *Pseudoeurycea goebeli* (Schmidt, 1936)**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Guatemala, Mexico**Current Population Trend:** Decreasing

© Sean M. Rovito

**Geographic Range** This species occurs in the Soconusco area, in Chiapas, Mexico, eastward to the Volcán Ajua in Guatemala, at an altitude of 2,400-3,200m asl.**Population** It was formerly a common species, but has undergone declines in recent years.**Habitat and Ecology** It inhabits pine-oak and upper cloud forest, where it is strictly terrestrial and can tolerate only very limited habitat disturbance. It breeds by direct development and is not dependent upon water.**Major Threats** The main threat is the alteration and clear-cutting of its habitat, due to urbanization, human settlement (refugees), and agricultural expansion (including livestock farming).**Conservation Measures** It is not known from any protected areas, and there is an urgent need to ensure that its remaining habitat is adequately protected. This species is listed as "Threatened" (Amenazada) by the Mexican government.**Bibliography:** Campbell, J.A. (2001), Wake, D.B. (1987)**Data Providers:** Manuel Acevedo, David Wake**EN** *Pseudoeurycea juarezi* Regal, 1966**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© J.R. Mendelsohn

**Geographic Range** This species occurs south of the Valle Nacional on the Sierra de Juarez transect and above Cuajimoloyas, north-central Oaxaca, Mexico, at 2,400-3,000m asl.**Population** It used to be very common, but has undergone quite dramatic declines and is now uncommon.**Habitat and Ecology** It inhabits pristine moist forest habitats, and has been found under loose bark or fallen trees, or under moss on rocks and logs. It breeds by direct development and is not dependent upon water.**Major Threats** The major threat is habitat loss due primarily to logging, as well as agricultural expansion and human settlement.**Conservation Measures** It does not occur in any protected areas, and the protection of remaining forests of the Sierra de Juarez is urgently needed. This species is listed as "Threatened" (Amenazada) by the Mexican government.**Bibliography:** Parra-Olea, G., García-Paris, M. and Wake, D.B. (1999), Regal, P.J. (1966), Wake, D.B. (1987), Wake, D.B., Papenfuss, T.J. and Lynch, J.F. (1992)**Data Providers:** Gabriela Parra-Olea, David Wake**VU** *Pseudoeurycea leprosa* (Cope, 1869)**Vulnerable B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Arnaud Jamin

**Geographic Range** This species ranges from eastern Puebla and western Veracruz to Plaxcala, Estado de Mexico and Distrito Federal, Mexico. There is an isolated population in northern Hidalgo. Its altitudinal range is 2,500-3,200m asl.**Population** It used to be the commonest salamander on the Mexican Plateau. It is still present, but is far less abundant, although not uncommon.**Habitat and Ecology** It lives at high elevations in pine and pine-oak forests. It is terrestrial, and can withstand only limited disturbance to its habitat. It breeds by direct development and is not dependent upon water.**Major Threats** Its habitat is threatened by agriculture, forestry, and human settlement, as well as touristic activities within national parks.**Conservation Measures** It occurs in several protected areas, including Parque Nacional Cumbres del Ajusco, though many of these are in need of improved management for the benefit of biodiversity conservation. This species is listed as "Threatened" (Amenazada) by the Mexican government.**Bibliography:** Highton, R. (2000), Parra-Olea, G., García-Paris, M. and Wake, D.B. (1999), Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001), Uribe-Peña, Z., Ramírez-Bautista, R. and Cuadernos, G.C.A. (2000), Wake, D.B. (1987)**Data Providers:** Gabriela Parra-Olea, David Wake

EN *Pseudoeurycea longicauda* Lynch, Wake and Yang, 1983

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Arnaud Jämin

Geographic Range This species occurs in the volcanic belt of central-western Mexico at 2,850-3,000m asl. Two allopatric populations are known, one in north-eastern Michoacan and the other in north-western Mexico State.

Population This has never been a common species. Several animals were recently found at the type locality, following several years without any sightings.

Habitat and Ecology It is a terrestrial species, inhabiting highland coniferous forests, and living beneath logs, the bark of logs, rocks and other debris. It does not tolerate much disturbance of its habitat. Breeding takes place by direct development and is not dependent upon water.

Major Threats The major threat is habitat loss, mainly due to logging.

Conservation Measures It is not known from any protected areas, and improved protection of the forest habitat of this species in the trans-Mexican volcanic belt is urgently needed. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Lynch, J.F. and Wake, D.B. (1999a), Lynch, J.F., Wake, D.B. and Yang, S.Y. (1983)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Pseudoeurycea lynchi* Parra-Olea, Papenfuss and Wake, 2001

Critically Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Gabriela Parra-Olea

Geographic Range This species is known from the central Sierra Madre Oriental in Mexico: Cerro San Pedro Chiconquiaco, near La Joya, central Veracruz; and Quetzalan, Puebla. It ranges from 1,200-1,500m asl.

Population In the past it was not considered to be rare, and could be reliably found, but it appears to have declined. A brief search of Cerro San Pedro Chiconquiaco in 2003 was not successful in locating the species.

Habitat and Ecology It inhabits cloud forest, being found in decaying wood, under bark of logs, under moss, and under pine logs. Although not arboreal, it is often recovered off the ground. It survives in degraded forest, and rural gardens and has even been found in garbage. It breeds by direct development and is not dependent upon water.

Major Threats Despite its ability to tolerate some habitat degradation, extensive forest loss due to agriculture, logging, and mining are adversely affecting this species. All areas surrounding the type locality of La Joya are highly disturbed by extensive logging and mining. Between 2003 and 2004, the area of forest habitat available for this species was halved due to the expansion of mining activities. The remaining available habitat at this locality was only about 15ha in 2004. Another known locality, Cerro Loma Alta, was visited in 2003 and was found to be virtually destroyed by logging and invasive plants.

Conservation Measures It has not been found in any protected areas, such that the most important conservation measure required for this species is the protection and maintenance of its remaining native habitat.

Notes on taxonomy: This species was previously considered to be a synonym of *Pseudoeurycea nigromaculata*.

Bibliography: Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001)

Data Providers: Gabriela Parra-Olea, David Wake, Jean Raffaelli

EN *Pseudoeurycea melanomolga* (Taylor, 1941)

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Thomas Blitt

Geographic Range This species is restricted to the upper slopes of Cofre de Perote and nearby mountains, in the general vicinity of Antonio Limon town, west-central Veracruz, Mexico, at 2,400-4,000m asl.

Population It is an uncommon species.

Habitat and Ecology It inhabits pine forest and bunch grass above the timberline, and is usually found under rocks and logs on moist soils. It can tolerate some level of habitat disturbance, provided that this is not too serious. Breeding takes place by direct development and is not dependent upon water.

Major Threats The habitat of this species has been heavily disturbed at lower elevations, especially due to logging, agriculture, and human settlement. It might be more secure at higher elevations, where human impacts have been less severe. In 2003, pine forest at both the upper and lower elevations on Cofre de Perote were found to have been extensively cut for pastures for cattle, and as a result of logging.

Conservation Measures It is not known from any protected areas, and there is an urgent need for improved protection of the forest habitat of this species. It is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Parra-Olea, G., Garcia-Paris, M. and Wake, D.B. (1999), Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001)

Data Providers: Gabriela Parra-Olea, David Wake, Jean Raffaelli

EN *Pseudoeurycea mystax* Bogert, 1967

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known only from near Ayutla, east-central Oaxaca, Mexico, at 2,100m asl.

Population It is an uncommon species.

Habitat and Ecology It is a terrestrial inhabitant of pine-oak forest and madroño (arbutus forest). It can tolerate some habitat disturbance, as evidenced by the fact that a handful of small populations survive in several tiny fragments of remaining habitat. It breeds by direct development and is not dependent upon water.

Major Threats The major threat to this species is the extensive loss of habitat that has taken place due to agriculture, logging and human settlement, and only small fragments of original habitat remain.

Conservation Measures It is not known from any protected areas, and there is an urgent need for the protection of forested areas near Ayutla. This species is listed as "threatened" (Amenazada) by Mexican law.

Bibliography: Bogert, C.M (1967), Flores-Villela, O. and McCoy, C.J. (1993)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Pseudoeurycea naucampatepetl* Parra-Olea, Papenfuss and Wake, 2001

Critically Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© James Hanken

Geographic Range This species is known only from the Cofre de Perote and Cerro Volcancillo, two mountains located in the Sierra Madre Oriental, central Veracruz, Mexico. Its altitudinal range is from 2,500-3,000m asl.

Population There is very little information on population status. It is known from five specimens, and has not been seen for 20 years, despite searches (including very thorough surveys in 2003 and 2004), such that the species might already be extinct.

Habitat and Ecology It lives in pine-oak forests with abundant bunch grass. Its remaining habitat is very degraded, which might explain why it can no longer be found. It breeds by direct development and is not dependent upon water.

Major Threats Much of the original habitat of this species has been lost due to extensive logging, farming (especially potatoes), and expanding human settlements.

Conservation Measures It is not known from any protected areas, and protection of the forested areas that still remain in the Cofre de Perote area is a priority. Further survey work is also required to determine the current population status of the species, and whether or not it survives in the wild.

Bibliography: Parra-Olea, G. *et al.* (2005b), Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001)

Data Providers: Gabriela Parra-Olea, David Wake, Jean Raffaelli

CR *Pseudoeurycea nigromaculata* (Taylor, 1941)

Critically Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Thomas Billie

Geographic Range This species occurs in two sites in southern Veracruz, Mexico: the peak of Cerro Chichahuatla, Cuatlalpan, at 1,600m asl; and at 1,200-1,300m asl on Volcán San Martín. It is likely that this form consists of two separate species, one in each site.

Population Once relatively common, it is now very rare, if not extinct, and was last seen in the mid-1980s.

Habitat and Ecology It is arboreal in montane tropical forest (cloud forest,) living in bromeliads, an unusual habitat for a salamander in this genus. It breeds by direct development and is not dependent upon water.

Major Threats Most of the habitat of this species has disappeared or has been severely degraded as a result of logging, agriculture, and expanding human settlements.

Conservation Measures It is not known from any protected areas, and protection of the remaining habitat at the two known sites is urgently needed. Survey work is also needed to ascertain whether or not the species survives in the wild at either site. This species is protected by Mexican law under the "Special Protection" category (Pr).

Notes on taxonomy: It is likely that this form consists of two separate species (G. Parra-Olea and D. Wake pers. comm.).

Bibliography: Parra-Olea, G. (1998), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Pseudoeurycea praezellens* (Rabb, 1955)

Critically Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known from Hacienda El Potrero, near the city of Cordoba, west-central Veracruz, Mexico.

Population It is known only from the holotype.

Habitat and Ecology The holotype was collected in tropical humid forest, and it is not known whether or not it can adapt to secondary habitats. It presumably breeds by direct development and is not dependent upon water.

Major Threats It is doubtful that any suitable habitat for this species survives. In the last 50 years since it was discovered, Cordoba has undergone massive development and there has also been extensive agricultural expansion.

Conservation Measures It is not known from any protected area. Urgent fieldwork is needed in the vicinity of Cordoba to locate any habitats where this species might survive. It is listed as "Threatened" (Amenazada) by the Mexican government.

Bibliography: Parra-Olea, G., Garcia-Paris, M. and Wake, D.B. (1999), Rabb, G.B. (1955), Wake, D.B. and Elias, P. (1983), Wake, D.B. and Lynch, J.F. (1976)

Data Providers: Gabriela Parra-Olea, David Wake

VU *Pseudoeurycea robertsi* (Taylor, 1938)

Vulnerable D2
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Stable



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Geographic Range This species is known only from a small area in Parque Nacional Nevado de Toluca, near Toluca, Mexico, at 3,200-3,500m asl.

Population It is not uncommon, but has probably undergone declines.

Habitat and Ecology It lives in pine-fir forest, where it is terrestrial. It is not found in severely disturbed habitats, and can tolerate only very slight selective logging. It breeds by direct development and is not dependent upon water.

Major Threats The main threat to this species in the past has been logging. Although now confined to Parque Nacional Nevado de Toluca, this protected area is not well managed, and is subject to negative impacts from tourism.

Conservation Measures It occurs in the Parque Nacional Nevado de Toluca. This species is listed as "Threatened" (Amenazada) by the Mexican government. There is a need for close monitoring of the population status of this species.

Bibliography: Flores-Villela, O. and McCoy, C.J. (1993)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Pseudoeurycea saltator* Lynch and Wake, 1989**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

Geographic Range This species occurs on the northern slopes of the Sierra de Juarez, above Vista Hermosa and to the south of Valle Nacional, Oaxaca, Mexico. Its altitudinal range is 1,500-2,000m asl.

Population It is still a relatively common species.

Habitat and Ecology It inhabits evergreen cloud forests, and, although an arboreal bromeliad dweller, it is sometimes possible to find this species on the ground or under logs and bark. It is not found in degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats The major threat is habitat loss as a result of expanding agriculture (including livestock farming) and logging.

Conservation Measures It is not found in any protected areas, and protection of forest remnants in the Sierra de Juarez is now extremely urgent. This species is listed as "Threatened" (Amenazada) by the Mexican government.

Bibliography: Lynch, J.F. and Wake, D.B. (1989), Lynch, J.F. and Wake, D.B. (1998), Parra-Olea, G., García-París, M. and Wake, D.B. (1999)

Data Providers: Gabriela Parra-Olea, David Wake

VU *Pseudoeurycea scandens* Walker, 1955**Vulnerable D2****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Unknown

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Geographic Range This species is known only from caves in the Reserve de la Biosfera El Cielo in Tamaulipas in north-eastern Mexico, at about 1,050-1,800m asl.

Population It was formerly fairly common. It was last seen in the mid-1980s, and one search in the late 1990s did not locate it. It is not known whether or not it has declined, or whether or not the lack of records is a reflection of the lack of observer effort.

Habitat and Ecology It is a cave-dwelling species. It breeds by direct development and is not dependent upon water.

Major Threats This species would be at risk if there is disturbance of its cave micro-habitat, where it presumably relies on high humidity levels. However, the area where it occurs is currently well protected.

Conservation Measures It occurs in the Reserve de la Biosfera Rancho El Cielo which is quite well protected. There is a need for close monitoring of the population status of this species. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Liner, E.A. (1998b), Martin, P.S. (1958), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Pseudoeurycea smithi* (Taylor, 1938)**Critically Endangered A2ace****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Courtesy of David Wake

Geographic Range This species occurs only on the Sierra de Juarez, Cerro San Felipe and Sierra de Quatro Venados, north-western Oaxaca, Mexico, at 2,500-3,000m asl.

Population It used to be very abundant, but is now extremely rare suggesting that a massive decline has taken place.

Habitat and Ecology It inhabits pine forests, being terrestrial, living under the bark of logs, and is able to persist in somewhat disturbed habitat. It breeds by direct development and is not dependent upon water.

Major Threats This species has probably been negatively impacted by the expansion of agriculture, human settlements, and logging. However, these threats do not explain the level of decline that has been observed, since the habitat is still in quite good condition in some places. It is speculated that the adverse environmental impacts of a volcanic eruption might be the cause of the decline. Other possible explanations could be climate change and disease (possibly chytridiomycosis, although this more commonly impacts species that are associated with water).

Conservation Measures The species is known to occur in the Parque Nacional Benito Juárez. While continued and strengthened protection of the species' remaining habitat is required, additional research is required into the reasons for its dramatic decline. This species is listed as "Threatened" (Amenazada) by the Mexican government.

Bibliography: Parra-Olea, G., García-París, M. and Wake, D.B. (1999), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Pseudoeurycea unguidentis* (Taylor, 1941)**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

Geographic Range This species occurs in Cerro San Felipe, Cerro San Luis (the type locality), Llano de las Flores, and Cerro Machini, in north-central Oaxaca, Mexico, at 2,400-3,000m asl.

Population Formerly common, this species disappeared in the 1960s and 1970s, and, although it reappeared briefly, there have been no records since 1982 at the type locality. Animals that are believed to be this species have recently been found to be common on top of the Sierra de Juarez, though even here there is some evidence that they have undergone declines.

Habitat and Ecology This is a semi-arboreal species that inhabits pine-oak and fir forests, and has commonly been found under logs. It can live in somewhat disturbed forest. It breeds by direct development and is not dependent upon water.

Major Threats It is probably being negatively impacted by agricultural expansion, human settlements, and logging, all of which are taking place extensively within its range. However, these threats

do not explain the level of decline that has been observed, since the habitat is still in quite good condition in some places. It is speculated that the adverse environmental impacts of a volcanic eruption might be the cause of the decline. Other possible explanations include climate change, and disease (such as chytridiomycosis, although this normally impacts species that are associated with water).

Conservation Measures It occurs in Parque Nacional Benito Juárez. There is a need for further research to establish the cause of the declines observed in this species in suitable habitat. This species is listed as "Threatened" (Amenazada) by the Mexican government.

Bibliography: Bogert, C.M. (1967), Lynch, J.F. and Wake, D.B. (1999b), Lynch, J.F., Yang, S.Y. and Papenfuss, T.J. (1977), Parra-Olea, G., García-París, M. and Wake, D.B. (1999), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Pseudoeurycea werleri* Darling and Smith, 1954

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



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Geographic Range This species is known from the Sierra de Los Tuxtlas, southern Veracruz, Mexico, and from the northern slopes of the Sierra de Juarez above Vista Hermosa, northern Oaxaca, Mexico. It occurs up to 1,500m asl.

Population There is no information on its population status, possibly because it is very hard to find.

Habitat and Ecology It is a terrestrial species that inhabits tropical rainforest and cloud forest habitats, and lives in moss mats. It can survive in somewhat disturbed forest, provided there is plenty of shade. It breeds by direct development and is not dependent upon water.

Major Threats The major threat to the species is habitat loss due to subsistence agriculture, logging, and human settlement.

Conservation Measures It occurs in the San Martin and Santa Marta National Parks. Further survey work is needed to determine the current population status of the species. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Shannon, F.A. and Werler, J.E. (1955a), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

VU *Speleomantes flavus* (Stefani, 1969 "1968")

Vulnerable D2
Order, Family: Caudata, Plethodontidae
Country Distribution: Italy
Current Population Trend: Stable



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Geographic Range This species is endemic to the Monte Albo chain of north-eastern Sardinia (Italy). It has been collected between 40m and 1,050m asl.

Population It is locally common within its limited range; there are no reports of any major declines.

Habitat and Ecology The species is found in damp mountain regions, rocky outcrops, caves, crevices, and forested areas in the vicinity of streams. The preferred habitat often has a good covering of damp moss. It reproduces through the direct development of a few terrestrial eggs.

Major Threats There are no threats identified other than some localized loss of habitat. However, these threats are limited, and it is not believed to be significantly threatened.

Conservation Measures The species is listed on Appendix II of the Berne Convention and on Annex IV of the EU Natural Habitats Directive. It has been recorded from the Parco Geominerario, Storico ed Ambientale della Sardegna. There is a need for close monitoring of the population status of this species.

Bibliography: Anon. (1997), Arnold, E.N. (2003), Böhme, W., Grossenbacher, K. and Thiesmeier, B. (1999), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Lanza, B. (1986), Lanza, B. and Vanni, S. (1981), Lanza, B., Nascetti, G. and Bullini, L. (1986), Nardi, I. (1991), Nascetti, G. *et al.* (1996), Thorn, R. (1968), Voesenek, L.A.C.J., van Rooy, P.T.J.C. and Stribosch, H. (1987)

Data Providers: Roberta Lecis, Franco Andreone, Paul Edgar, Claudia Corti

MONTE ALBO CAVE SALAMANDER**VU** *Speleomantes genei* Temminck and Schlegel, 1838

Vulnerable B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Italy
Current Population Trend: Decreasing



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Geographic Range This species is endemic to the region of Sulcis-Iglesiente in south-western Sardinia (Italy). It has been collected between altitudes of 8 and 650m asl.

Population The species is generally common within its limited range, being only relatively uncommon within the Carbonia-Barbusi-Monte Tasua area (Gasc *et al.* 1997).

Habitat and Ecology It is found in humid rocky outcrops, caves, crevices, and forested areas in the vicinity of streams. The species reproduces through the direct development of a few terrestrial eggs.

Major Threats The major threat is general deforestation of suitable habitat, mineral extraction, urbanization, and over-collection of specimens, presumably for scientific purposes.

Conservation Measures The species is listed on Appendix II of the Berne Convention and is listed on Annex IV of the EU Natural Habitats Directive. It is present in at least four protected areas. There is a need for close monitoring of the population status of this species given its very limited range.

Bibliography: Anon. (1997), Arnold, E.N. (2003), Böhme, W., Grossenbacher, K. and Thiesmeier, B. (1999), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Lanza, B. (1986), Lanza, B. and Corti, C. (1993), Lanza, B. and Vanni, S. (1981), Lanza, B., Nascetti, G. and Bullini, L. (1986), Nardi, I. (1991), Nascetti, G. *et al.* (1996), Smith, H.M. and Wake, D.B. (1993), Thorn, R. (1968)

Data Providers: Franco Andreone, Roberta Lecis, Paul Edgar, Claudia Corti

GENE'S CAVE SALAMANDER**EN** *Speleomantes supramontis* (Lanza, Nascetti and Bullini, 1986)

Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Italy
Current Population Trend: Decreasing



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Geographic Range The species is endemic to central-eastern Sardinia around the Gulf of Orosei, occurring roughly between the valley of the Cedrino River and 40°N (in the province of Nuoro; Gasc 1997). It is found at altitudes between 100 and 1,360m asl.

Population Although the species has often been considered to be common, and even abundant, within suitable habitat (with recorded densities of as much as 300 animals per ha in some areas; Voesenek, van Rooy and Stribosch 1987), it recently appears to have undergone a decline and has become more difficult to observe in its limited range (R. Lecis pers. comm.).

Habitat and Ecology The species is found in humid rocky outcrops, limestone caves, crevices, and forested areas with a good growth of moss in the vicinity of streams. It reproduces through the direct development of a few terrestrial eggs.

Major Threats It is generally threatened by localized habitat loss as a result of agriculture and wood extraction.

Conservation Measures The species is listed on Appendix II of the Berne Convention, and it is also listed on Annexes II and IV of the EU Natural Habitats Directive. The species has been recorded from Parco Nazionale Gennargentu e Golfo di Orosei. Further research into the threats leading to the recent declines in this species is needed.

Bibliography: Anon. (1997), Arnold, E.N. (2003), Böhme, W., Grossenbacher, K. and Thiesmeier, B. (1999), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Lanza, B. (1986), Lanza, B. and Corti, C. (1993), Lanza, B. and Vanni, S. (1981), Lanza, B., Nascetti, G. and Bullini, L. (1986), Nardi, I. (1991), Nascetti, G. *et al.* (1996), Thorn, R. (1968), Voesenek, L.A.C.J., van Rooy, P.T.J.C. and Stribosch, H. (1987)

Data Providers: Franco Andreone, Roberta Lecis, Paul Edgar, Claudia Corti

SUPRAMONTE CAVE SALAMANDER

EN *Thorius arboreus* Hanken and Wake, 1994

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known only from the northern slopes of the Sierra de Juarez above Vista Hermosa, north-central Oaxaca, Mexico, at 1,500-2,200m asl.

Population This has always been a rare species.

Habitat and Ecology It is confined to cloud forests, where it is arboreal, commonly found in the leaf axils of bromeliads. It can tolerate a small amount of habitat disturbance provided that there is plenty of shade. It breeds by direct development and is not dependent upon water.

Major Threats The main threats to the species are the encroachment of agriculture (particularly livestock farming) and logging.

Conservation Measures It is not found in any protected areas, and the protection of forest remnants in the Sierra de Juarez is extremely urgent.

Bibliography: Hanken, J. and Wake, D.B. (1994), Highton, R. (2000), Parra-Olea, G., García-París, M. and Wake, D.B. (1999)
Data Providers: Gabriela Parra-Olea, David Wake

CR *Thorius aureus* Hanken and Wake, 1994

Critically Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Thomas Bille

Geographic Range This species is known from the highest peak of Cerro Pelon, and surrounding areas on the northern slopes of the Sierra de Juarez, north-central Oaxaca, Mexico, at 2,600-3,000m asl.

Population It used to be common, but now seems to have largely disappeared, despite several attempts to locate a population (there has been just one observation in the last few years).

Habitat and Ecology It is restricted to terrestrial situations in montane pine-oak-fir forests and upper cloud forest habitat, living under stones and logs; it does not adapt to secondary habitats. It breeds by direct development and is not dependent upon water.

Major Threats Although logging is taking place within the species' range, this is not sufficient to explain the extent of the decline. It is possible that, being a mountain top species; it might have been adversely affected by climate change. It might also have been affected by recent volcanic activity and possibly disease (such as chytridiomycosis, although this more commonly impacts species that are associated with water).

Conservation Measures It does not occur in any protected areas. While protection of the species' remaining habitat is obviously required, research is also needed into the reasons for its dramatic decline.

Bibliography: Hanken, J. and Wake, D.B. (1994), Parra-Olea, G., García-París, M. and Wake, D.B. (1999)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius boreas* Hanken and Wake, 1994

Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



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Geographic Range This species is known only from Cerro Pelon and Llano de las Flores in the Sierra de Juarez, north-central Oaxaca, Mexico, at 2,800-3,000m asl.

Population It used to be moderately common, but has undergone declines, especially on Cerro Pelon.

Habitat and Ecology It is a terrestrial inhabitant of pine-oak and fir forests. It does not adapt well to secondary habitats, but can be found in cleared areas provided these are adjacent to intact forest. It breeds by direct development and is not dependent upon water.

Major Threats Although logging is certainly taking place, this is not sufficient to explain the extent of the declines that have taken place. It is possible that, being a mountain top species, it might have been adversely affected by climate change. It may also have been affected by volcanic activity and possibly disease (such as chytridiomycosis, although this normally impacts species that are associated with water).

Conservation Measures It does not occur in any protected areas, making the protection of the remaining habitat within the range of this species an urgent priority. There is also a need for further research to investigate the reasons for the decline of the species in good habitat.

Bibliography: Hanken, J. and Wake, D.B. (1994), Highton, R. (2000), Parra-Olea, G., García-París, M. and Wake, D.B. (1999)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius dubitus* Taylor, 1941

Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known from the vicinity of the type locality near Puerto del Aire, which is around 3km west of the village of Acultzingo, in central Veracruz, adjacent to the border with Puebla, Mexico, at 2,475-2,800m asl.

Population It has never been common, and appears to have undergone declines.

Habitat and Ecology It inhabits pine-oak cloud forest, and is exclusively terrestrial, being found under wood chips, under and inside logs, under the bark of logs, and under rocks. It is able to survive in somewhat degraded forest. It breeds by direct development and is not dependent upon water.

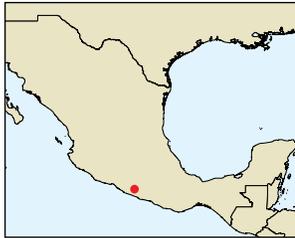
Major Threats The main threat is habitat degradation, due to the impacts of logging, livestock, and subsistence agriculture.

Conservation Measures It has not been found in any protected areas, though it may occur in Parque Nacional Canon del Río Blanco (but this requires confirmation). Protection of habitat around

the type locality is an urgent priority. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Hanken, J. and Wake, D.B. (1998), Parra-Olea, G., García-París, M. and Wake, D.B. (1999), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius grandis* Hanken, Wake and Freeman, 1999**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

Geographic Range This species is known only from Puerto del Gallo, in the Sierra Madre del Sur de Guerrero, north-east of Atoyac de Alvarez, central Guerrero, Mexico, at 2,800-3,000m asl.

Population It is still relatively abundant.

Habitat and Ecology It inhabits pine-fir and pine-oak-fir forests, and is usually found under logs or under the bark of fallen rotting logs. It can live in somewhat degraded forest. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is habitat loss as a result of logging and expanding agriculture.

Conservation Measures It has not been found in any protected areas, and there is an urgent need for forest protection along the Milpillas-Atoyac transect.

Bibliography: Hanken, J., Wake, D.B. and Freeman, H.L. (1999)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Thorius infernalis* Hanken, Wake and Freeman, 1999**Critically Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© James Hanken



Geographic Range This species is known only from a single site near Atoyac, in the Sierra Madre del Sur de Guerrero, central Guerrero, Mexico, at 1,400m asl.

Population Only two specimens are known, and it was probably never common. It has not been seen since the early 1980s, despite searches.

Habitat and Ecology The only known specimens were found in riparian vegetation along hillsides, presumably in forest. The species seems to be terrestrial, living under logs and bark. It is not known whether or not it can withstand habitat degradation. It breeds by direct development and is not dependent upon water.

Major Threats Most of the potential habitat is now under coffee cultivation, and the remaining forest is under severe pressure from expanding agriculture and human settlements.

Conservation Measures It has not been found in any protected area, and forest conservation along the Milpillas-Atoyac transect is urgently needed. Further survey work is needed to determine whether or not this species survives in the wild.

Bibliography: Hanken, J., Wake, D.B. and Freeman, H.L. (1999)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius lunaris* Hanken and Wake, 1998**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

Geographic Range This species is known only from a few localities on the southern and south-eastern flanks of the Volcán Pico de Orizaba, central Veracruz, Mexico, at 2,800-3,200m asl.

Population It was formerly very abundant, but has undergone massive declines and is now very rare.

Habitat and Ecology It inhabits pine-oak forest, living under the bark of stumps and fallen logs, in leaf-litter and in piles of wood chips. Specimens from Texmola were collected from within a small patch of pine-oak forest that was surrounded by cleared agricultural fields. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is habitat loss as a result of logging and expanding agriculture.

Conservation Measures It occurs in Parque Nacional Pico de Orizaba.

Bibliography: Hanken, J. and Wake, D.B. (1998)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius macdougalli* Taylor, 1949**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Thomas Billie



Geographic Range This species has a relatively wide distribution in the Sierra de Juárez and the mountains above Totontepec, north-central Oaxaca, Mexico, at 2,300-3,000m asl.

Population It was formerly very abundant, but has undergone declines and is now uncommon.

Habitat and Ecology It inhabits pine-oak forests and is almost completely terrestrial. It also occurs in degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats There is ongoing severe forest loss in its range due to clear-cutting and livestock grazing.

Conservation Measures It has not been recorded in any protected areas, and there is an urgent need for the protection of pine-oak forest habitat in the Sierra de Juárez. This species is protected by Mexican law under the "Special Protection" category (Pr).

Notes on taxonomy: This form probably consists of at least three species (G. Parra-Olea and D. Wake pers. comm.).

Bibliography: Hanken, J. and Wake, D.B. (1994), Highton, R. (2000), Parra-Olea, G., García-Paris, M. and Wake, D.B. (1999), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Thorius magnipes* Hanken and Wake, 1998

Critically Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Mario García París

Geographic Range This species occurs above Acultzingo, in central Veracruz, adjacent to the border with Puebla, Mexico, at 2,450-2,800m asl.

Population It has always been rare, but seems to have declined further, and has not been seen for 20 years, despite repeated searches.

Habitat and Ecology It inhabits pine-oak forest, and is terrestrial and arboreal, living in bromeliads, having been found in leaf axils and on the ground, under rocks and leaf-litter, and inside piles of wood chips. It is not found in degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is alteration of the original forest habitat, due to logging, livestock, and subsistence agriculture.

Conservation Measures It has not been found in any protected areas, and habitat protection and maintenance is an urgent priority. Further survey work is also needed to determine whether or not this species still survives in the wild.

Bibliography: Hanken, J. and Wake, D.B. (1998), Parra-Olea, G., García-París, M. and Wake, D.B. (1999)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Thorius minutissimus* Taylor, 1949

Critically Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known only from one site near Santo Tomas Tecpan, in the Sierra Madre del Sur de Oaxaca, south-central Oaxaca, Mexico, at 2,500m asl.

Population Recently rediscovered, this species is extremely rare, and very few specimens are known.

Habitat and Ecology It lives terrestrially in pine-oak forest, but not in degraded habitats. It breeds by direct development and is not dependent upon water.

Major Threats The forests where it is found have been severely altered as a result of logging, agriculture, and human settlement, and very little good habitat remains.

Conservation Measures Habitat protection is the most urgently needed conservation action for this species, since it is not known from any protected areas. It is protected by Mexican law under the "Special Protection" category (Pr).

Notes on taxonomy: There are taxonomic issues relating to this form. Other nearby populations of *Thorius* might belong to this species (G. Parra-Olea and D. Wake pers. comm.).

Bibliography: Parra-Olea, G., García-París, M. and Wake, D.B. (1999)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Thorius minydemus* Hanken and Wake, 1998

Critically Endangered B2ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known only from the mountains north and west of Jalapa City, central Veracruz, Mexico, at 2,100-2,300m asl.

Population It has apparently always been rare, although a very small number of specimens were found recently after intensive searching. A visit to the known locality of Cerro Loma Alta in 2003 yielded no salamanders.

Habitat and Ecology It inhabits cloud forest and pine-oak forest, with an abundance of bromeliads (especially in the oaks). It is terrestrial and can survive in somewhat degraded forest. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is deforestation and alteration of the original forest habitats as a result of logging, mining, agriculture, livestock ranching, and human settlement. One of the known localities, Cerro Loma Alta, was visited in 2003 and was found to be virtually destroyed as a result of logging and invasive plants.

Similarly, all areas surrounding La Joya are highly disturbed by extensive logging and mining. Between 2003 and 2004, the area of forest habitat available at this locality was halved due to the expansion of mining activities; the remaining available habitat was only about 15ha in 2004.

Conservation Measures It has not been found in any protected areas, and habitat protection for this species is urgently needed.

Bibliography: Hanken, J. and Wake, D.B. (1998), Parra-Olea, G., García-París, M. and Wake, D.B. (1999), Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius munificus* Hanken and Wake, 1998

Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



Geographic Range This species is known from a few sites above Las Vigas, central Veracruz, Mexico, at 2,400-2,600m asl.

Population The population of this species seems to have declined, since it was known to be abundant in the past but is now difficult to find. Surveys in 2003 and 2004 were unsuccessful in finding any animals in suitable habitat.

Habitat and Ecology It inhabits pine-oak and pine forest, woodlands, and madrone (arbutus forest) with abundant shrubby and ericaceous plants. It is generally found under bark and fallen logs, and in leaf-litter. It can tolerate some degradation, but requires reasonably good forest. It breeds by direct development and is not dependent upon water.

Major Threats The main threat is habitat loss and degradation as a result of logging, agriculture (including livestock farming), and human settlement.

Conservation Measures It has not been recorded in any protected areas, though it may be present in Parque Nacional Cofre de Perote (this requires confirmation). Certainly, remaining habitat in the range of this species is in urgent need of protection.

Bibliography: Hanken, J. and Wake, D.B. (1998), Parra-Olea, G., García-París, M. and Wake, D.B. (1999), Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001)

Data Providers: Gabriela Parra-Olea, David Wake, Jean Raffaelli

CR *Thorius narismagnus* Shannon and Werler, 1955

Critically Endangered B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



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Geographic Range This species is known only from Volcán San Martín, in the Sierra de Los Tuxtlas, southern Veracruz, Mexico, at 500-1,200m asl.

Population This species appears to have undergone a population collapse. It was never common, and was last seen in the 1980s despite attempts to find it.

Habitat and Ecology It inhabits lowland and intermediate tropical forest, where it is a terrestrial species, being found under rotten logs and among leaf-litter, and especially under fallen bromeliads. It breeds by direct development and is not dependent upon water.

Major Threats Serious habitat loss is taking place in the range of this species due to subsistence agriculture, logging, and human settlement. However, this might not be sufficient to explain its apparent disappearance, and it might also have been affected by disease (such as chytridiomycosis, although this more commonly impacts species that are associated with water).

Conservation Measures It occurs in Parque Nacional San Martín and Parque Nacional Santa Marta. While continued protection and maintenance of the species' remaining habitat is obviously required, research is also needed into the reasons for its dramatic decline.

Bibliography: Hanken, J. and Wake, D.B. (1998), Shannon, F.A. and Werler, J.E. (1955a)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Thorius narisovalis* Taylor, 1939

Critically Endangered A2ac; B1ab(iii,v)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© Gabriela Parra-Olea



Geographic Range This species is known from Cerro San Felipe and adjacent upland areas in the Sierra de Juárez, as well as in the mountains south of La Tlaxiaco, north-central Oaxaca, Mexico, at 2,600-3,000m asl.

Population Once extremely common, recent attempts to find the species have been unsuccessful.

Habitat and Ecology It inhabits cloud forest and mixed forests, living under bark or under fallen trees. It does not adapt well to significant degradation of its habitat. It breeds by direct development and is not dependent upon water.

Major Threats This species is probably being negatively impacted by agricultural expansion, human settlements, and logging, all of which are taking place extensively within its range. However, these threats do not explain the level of decline that has been observed, since the habitat is still in quite good condition in some places. It is speculated that the adverse environmental impacts of a volcanic eruption, or even disease (such as chytridiomycosis, although this more commonly impacts species that are associated with water), might be the cause of the decline.

Conservation Measures It occurs in Parque Nacional Benito Suárez, but there is still an urgent need to conserve the cloud forest remnants that remain in the Sierra de Juárez. Research is also needed to establish the reasons for the population decline. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Parra-Olea, G., García-Paris, M. and Wake, D.B. (1999), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius omitemi* Hanken, Wake and Freeman, 1999

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© James Hanken



Geographic Range This species is known only from Filo de Caballos, in the Sierra Madre del Sur de Guerrero, Guerrero, Mexico, at 2,500-2,950m asl.

Population It is relatively common.

Habitat and Ecology It inhabits pine-oak-fir cloud forest and pine-oak forest, living under the bark of fallen logs. It can survive in slightly degraded habitats, but has disappeared where the forest has been lost. It breeds by direct development and is not dependent upon water.

Major Threats The major threat is habitat loss due to subsistence agriculture, logging, and human settlement. All suitable habitat below 2,800m asl has now gone.

Conservation Measures The Parque Ecológico Estatal Omitemi, where this species occurs, has been degazetted, leaving the species unprotected throughout its range. Protection of remaining pine-oak forest habitat in the Filo de Caballos is needed.

Bibliography: Hanken, J., Wake, D.B. and Freeman, H.L. (1999)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius papaloe* Hanken and Wake, 2001

Endangered B1ab(iii)
Order, Family: Caudata, Plethodontidae
Country Distribution: Mexico
Current Population Trend: Decreasing



© James Hanken



Geographic Range This species is known only from Concepción Papalo at the northern end of the Sierra de Juárez, north-central Oaxaca, Mexico, at 2,500m asl.

Population It is a rare species.

Habitat and Ecology It is terrestrial and inhabits pine forest and cloud forest, living under logs and stones, and in leaf-litter. It can adapt to somewhat disturbed habitats. It breeds by direct development and is not dependent upon water.

Major Threats The major threat is habitat loss due to logging, human settlement, and cultivation of crops.

Conservation Measures It has not been found in any protected areas. There remains a large area of unsurveyed potential habitat where this species is very likely to occur, and so it is possibly not as threatened as other members of this genus. Further survey work is needed to better ascertain the limits of its distribution and its current population status.

Bibliography: Hanken, J. and Wake, D.B. (2001)

Data Providers: Gabriela Parra-Olea, David Wake

CR *Thorius pennatulus* Cope, 1869**Critically Endangered A2ac****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

Geographic Range This species is known only from central western Veracruz, from Soledad Atzompa in the south and west, east to Cerro Chichahuaxtla, north to Teocel, Mexico, generally 1,000-1,200m asl (although it is known as high as 2,000m asl).

Population Once very common, the species appears to have undergone a decline; it started to disappear in the 1980s, and there was one record in the late 1990s and one individual was observed in 2004.

Habitat and Ecology It inhabits cloud forest, and forest at lower altitudes. It requires moist situations such as crevices, and has been found under rocks, in leaf-litter and in and under rotting logs. It also occurs in shade coffee plantations where humidity is maintained. It breeds by direct development and is not dependent upon water.

Major Threats The main threat to the species is transformation of extensive forest areas into open unshaded agricultural habitats. The forests have suffered from logging, and from expanding human settlements as the area becomes increasingly urbanized. However,

these threats do not explain the level of decline that has been observed, since the habitat is still in quite good condition in a few places. It is speculated that the adverse environmental impacts of a volcanic eruption, or disease (such as chytridiomycosis, although this more commonly impacts species that are associated with water), might be the cause of the decline.

Conservation Measures It has not been found in any protected areas, and habitat protection and maintenance is urgently required; suitable closed habitat could be maintained through, for example, the use of more biodiversity-friendly agricultural practices, such as shade-grown coffee. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Hanken, J. and Wake, D.B. (1998), Parra-Olea, G., Garcia-Paris, M. and Wake, D.B. (1999), Parra-Olea, G., Papenfuss, T.J. and Wake, D.B. (2001)

Data Providers: Gabriela Parra-Olea, David Wake, Jean Raffaelli

EN *Thorius pulmonaris* Taylor, 1939**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Gabriela Parra-Olea

Geographic Range This species is known only from the Cerro San Felipe region, central Oaxaca, and from some upland areas south and west of Oaxaca City, Mexico, at 2,100-2,500m asl.

Population It used to be relatively common, but it appears to have undergone declines since it is now quite rare.

Habitat and Ecology It inhabits deciduous forest, including forest with some pines, living on the ground where it is usually found beneath leaves and bark. It can survive in degraded forest (in fact, this is all that remains within its known range).

Major Threats The major threat to the species is habitat loss due to subsistence agriculture (including livestock farming), logging, and human settlement. The remaining habitat in its range is already severely degraded.

Conservation Measures It might occur in Parque Nacional Benito Juárez, but there are, as yet, no confirmed records from this protected area. This species is protected by Mexican law under the "Special Protection" category (Pr).

Bibliography: Parra-Olea, G., Garcia-Paris, M. and Wake, D.B. (1999), Wake, D.B. (1987)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius schmidtii* Gehlbach, 1959**Endangered B1ab(iii)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Tim Burkhardt

Geographic Range This species occurs on the mountains surrounding the village of Zoquitlán, southern Puebla, Mexico, at 2,560-2,760m asl.

Population It is a relatively uncommon species.

Habitat and Ecology It is a terrestrial inhabitant of dense pine-oak forest, and occurs in leaf-litter. It breeds by direct development and is not dependent upon water.

Major Threats The forests near Zoquitlán are at risk from expanding agriculture and human settlements, as well as from logging. However, some pristine forest still remains.

Conservation Measures It has not been found in any protected areas, and the remaining pristine forests in southern Puebla are in urgent need of protection. This species is protected by Mexican law under the "Special Protection" category (Pr).

Notes on taxonomy: This form might comprise more than one species (G. Parra-Olea and D. Wake pers. comm.).

Bibliography: Gehlbach, F.R. (1959), Hanken, J. and Wake, D.B. (1998)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius spilogaster* Hanken and Wake, 1998**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

Geographic Range This species is known only from near the villages of El Berro and Xometla, south and south-east to the Volcán Pico de Orizaba, central Veracruz, Mexico, at 2,500-2,725m asl.

Population This species was very common in the past, but has undergone massive declines. After some 15 years without a record, a single specimen was collected in 2000 near Coiyachapa Veracruz, en route to Pico de Orizaba; surveys undertaken at the same time at other known localities (such as El Berro) failed to record the species.

Habitat and Ecology It inhabits pine-oak forest, living under the bark of stumps or fallen logs, or within piles of wood chips and shavings. At Xometla, they were found in partially cut-over pine forest. It is a species that breeds by direct development and that is not dependent upon water.

Major Threats The main threat is habitat loss as a result of logging and expanding agriculture.

Conservation Measures It occurs in Parque Nacional Pico de Orizaba. There is a need for further survey work to establish the current population status of this species.

Bibliography: Hanken, J. and Wake, D.B. (1998)

Data Providers: Gabriela Parra-Olea, David Wake

EN *Thorius troglodytes* Taylor, 1941**Endangered B1ab(iii,v)****Order, Family:** Caudata, Plethodontidae**Country Distribution:** Mexico**Current Population Trend:** Decreasing

© Arnaud Jämin

Geographic Range This species is known only from mountains near the village of Aculzingo, central Veracruz, Mexico, at 2,380-3,000m asl.**Population** It was formerly extremely common, but has recently undergone declines.**Habitat and Ecology** It inhabits pine-oak forest, and is terrestrial, living under bark, logs, in wood chips, and under rocks. It can survive in somewhat degraded forest. It breeds by direct development and is not dependent upon water.**Major Threats** The main threat is habitat loss, due to logging, livestock farming, and subsistence agriculture.**Conservation Measures** It has not been found in any protected areas, though it may occur in Parque Nacional Canon del Río Blanco (but this requires confirmation). Improved protection of the remaining pine-oak forest habitat of this species is needed. It is protected by Mexican law under the "Special Protection" category (Pr).**Bibliography:** Hanken, J. and Wake, D.B. (1998), Parra-Olea, G., García-Paris, M. and Wake, D.B. (1999)**Data Providers:** Gabriela Parra-Olea, David Wake

PROTEIDAE

EN *Necturus alabamensis* Viscosa, 1937**Endangered B2ab(iii)****Order, Family:** Caudata, Proteidae**Country Distribution:** United States of America**Current Population Trend:** Decreasing

© Michael Graziano

Geographic Range This species can be found in the upper (Appalachian) portions of the Black Warrior River drainage, Alabama, USA (Bart *et al.* 1997). Populations are known to occur in the Sipsey Fork and Brushy Creek, Winston County; Mulberry Fork, Blackwater Creek, and Lost Creek in Walker County; North River and Yellow Creek, Tuscaloosa County; and Locust Fork and Blackburn Fork in Blount County (Bailey 2005). This species can be expected to potentially inhabit the same streams as the threatened flattened musk turtle (*Sternotherus depressus*), which is also restricted to permanent streams above the fall line in the Black Warrior River basin (Mount 1975). More than 120 sites have been sampled for waterdogs since 1990 (Guyer 1997), and the species has been reported from only ten sites (equal to an eight per cent success rate) in four counties, despite surveys in 1990, 1991, 1992, 1994, 1996, 1997, and 1998 (Bailey 1995, Guyer 1997, 1998). Sites surveyed included all stream localities within the range of the species that approached or intersected roads and had appropriate habitat. Guyer (1997) did a statistical analysis of all waterdog field survey data. He concluded that waterdogs were unlikely to have been missed if they were present, especially at sites visited more than once. The data indicated that 200 additional surveys would be needed to discover a single new locality for the species.

Population It is rare with sporadic occurrences within the presumed geographic range (Guyer 1997). A 1990-1992 survey found only a few individuals in four localities. Collections included six adults and one larva in the Sipsey Fork, one adult in Lost Creek, one larva in North River, and one sub-adult in Yellow Creek (Bailey 1992). During a 1996-1997 survey a total of 18 individuals were collected from Sipsey Fork and 11 individuals from Brushy Creek (Guyer 1997). Even though it was extensively surveyed from 1990-1997, numbers collected are too low to determine population trends. Bailey (1992) stated that habitat degradation might have resulted in reductions or extirpations over much of the historical range.

ALABAMA WATERDOG

Habitat and Ecology It can be found in medium to large streams that have logs, submerged ledges, rocks, and other hiding places on the bottom (Ashton and Peavy 1986). Their historical range is thought to have included streams 10m wide or greater, with moderate flows and alternating pools and rapids (Ashton and Peavy 1986, Bailey 1992). Semi-permanent leaf beds (where they exist) are likely to be visited frequently (Ashton and Peavy 1986). Guyer (1997) analysed habitat to distinguish sites with waterdogs from those lacking the species. He found waterdogs to be associated with: clay substrates lacking silt, wide and/or shallow stream morphology; increased snail and *Desmognathus* (dusky salamander) abundance; and decreased *Corbicula* (Asiatic mussel) occurrence. Eggs are attached to the underside of objects in water.

Major Threats Water quality degradation due to industrial, mining, agricultural, and urban pollution are probably the primary reasons for the extirpation of this species over much of its historic range in the upper Black Warrior River system. The remaining Black Warrior waterdog populations are isolated from each other by unsuitable habitat created by impoundments, pollution, or other factors. The fragmentation of habitat renders populations vulnerable to catastrophic events such as flood, drought, or chemical spills. In addition, if stream quality improves within areas of the basin, impoundments and polluted reaches will act as barriers to the re-establishment of waterdog populations. Direct take for commercial, recreational, scientific, or educational purposes are not currently considered to be a threat. Disease and predation are not known to be factors in the decline. This information is based on a 1999 "Candidate and Listing Priority Assignment Form" by the U.S. Fish and Wildlife Service and Bailey (1995).

Conservation Measures The state of Alabama provides no protection for the species (J. Godwin, Alabama Natural Heritage Program pers. comm. 1999). The Federal Surface Mining Control and Reclamation Act of 1977 and the Clean Water Act of 1972 have been ineffective in preventing the continued decline of species in the Black Warrior basin (Dodd, Enge and Stuart 1986; Mettee *et al.* 1989, Hartfield 1990, Bailey and Guyer 1998, U.S. Fish and Wildlife Service 1998).

Notes on taxonomy: Bart *et al.* (1997) determined that the name *Necturus alabamensis* applies only to the waterdog in the upper Black Warrior River drainage. For years, the name had been mistakenly applied to a more common species of waterdog that occurs in the coastal plain. Further taxonomic revisions involving this species are likely (Petranka 1998). See Bart *et al.* (1997) for an account of the nomenclatural history of this and related species.

Bibliography: Ashton, R.E., Jr. and Peavy, B. (1985), Ashton, R.E., Jr. and Peavy, J. (1986), Bailey, K.A. and Guyer, C. (1998), Bailey, M.A. (1992a), Bailey, M.A. (1995a), Bailey, M.A. (2005), Bailey, M.A. and Moler, P.E. (2003), Bart, H.L., Jr. *et al.* (1997), Behler, J.L. and King, F.W. (1979), Bishop, S.C. (1943), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Brode, W.E. (1969), Conant R. (1975), Deutsch, W.G. *et al.* (1990), Dodd, C.K., Enge, K.M. and Stuart, J.N. (1986), Dodd, Jr, C.K. (1990a), Gunter, G. and Brode, W.E. (1964), Guttman, S.I. *et al.* (1990), Guyer, C. (1997), Guyer, C. (1998), Hartfield, P. (1990), Hecht, M.K. (1958), Maxson, L.R., Moler, P.E. and Mansell, B.W. (1988), Mettee, M.F. *et al.* (1989), Mount, R.H. (1975), Neill, W.T. (1963), Shepard, T.E., O'Neil, P.E. and McGregor, S.W. (1997), U.S. Fish and Wildlife Service (1990b), U.S. Fish and Wildlife Service (1998), U.S. Fish and Wildlife Service (1999c), Viosca Jr, P. (1937)

Data Providers: Geoffrey Hammerson, Mark Bailey

VU *Proteus anguinus* Laurenti, 1768

OLM

Vulnerable B2ab(ii,iii,v)**Order, Family:** Caudata, Proteidae**Country Distribution:** Bosnia and Herzegovina, Croatia, Italy (Native and Introduced), Slovenia, France (Introduced)**Current Population Trend:** Decreasing

© Jim McGuire



Geographic Range The species is restricted to subterranean aquatic habitats within the Dinaric Alps, ranging from southern Slovenia and adjoining north-east Italy through coastal Croatia and western Bosnia. It has yet to be officially recorded in western parts

of Montenegro despite considerable anecdotal evidence of its presence (Kalezic and Dzukic, 2001). The species has been introduced to a cave of the subterranean laboratory of the CNRS France in the Pyrenees (C. Miaud pers. comm.), and at least one of the north-eastern Italian populations is introduced (P. Edgar pers. comm.).

Population There is little information available on the abundance of this species, but it is apparently most common in Slovenia and Croatia. A decline has been observed in the populations of Gorizia (Italy) and Postojna (Slovenia) (Gasc *et al.* 1997). The number of individuals of the subspecies *P. a. parkelj* is very low.

Habitat and Ecology The species generally occurs in large subterranean aquatic karst systems formed in limestone and dolomite rocks, and may be found in cave entrances (especially during episodes of high rainfall and flooding) and abandoned mine workings. Many of the caves that the species occurs in are connected to rivers that run above ground for the first 50-100km and then disappear into the ground. Populations may be found close to the surface or

as much as 300m underground depending on the thickness of the Karstic formation. The species is found in waters ranging from 5°C to 15°C. Animals feed on detritus and endemic cave invertebrates and hide in crevices or bottom sediment when disturbed. In contrast to the nominate subspecies, *P. a. parkelj* is found in warmer surface waters. The species is long-lived (they are not sexually mature until they are 12 years of age) and reproduce very slowly. Females lay approximately 70 individual eggs on the undersides of aquatic stones; however, in some cases the eggs are retained within the body and two fully formed young are produced.

Major Threats The main threats to this species are changes to the forested and pastoral land above the subterranean systems, largely through tourism, economic changes, and increasing water pollution. These changes have a direct influence on the quality of the habitat available to the species. The species is highly dependent on clean water, and is therefore very susceptible to pollution. Other localized threats to this species might include water abstraction and hydroelectric schemes. There is some illegal collection of this species for the pet trade, but the extent of this is unknown.

Conservation Measures It is listed on Appendix II of the Berne Convention, and on Annexes II and IV of the EU Natural Habitats Directive. It is recorded in the Slovenian National Red List and is protected by national legislation in both Slovenia and Italy. In Slovenia the species is present in caves, which are protected by national legislation, and much of the distribution of this species is within proposed national or international protected areas (Kocevski and Kraski regional parks; NATURA 2000 sites). In Italy it is found in the Riserva Naturale Regionale dei Laghi di Doberdò e Pietrarossa. The subspecies *P. a. parkelj* is in need of protection, as its habitat is limited to only a few holes in connection with subterranean networks in a very small geographic area.

Notes on taxonomy: Most populations are assigned to the subterranean subspecies *Proteus anguinus anguinus*. Unlike the nominate form, the genetically similar subspecies *P. a. parkelj* from Bela Krajina in Slovenia is pigmented and might represent a distinct species.

Bibliography: Arnold, E.N. (2003), Arntzen, J.W. and Sket, B. (1996), Arntzen, J.W. and Sket, B. (1997), Böhme, W., Grossenbacher, K. and Thiesmeier, B. (1999), Briegleb, W. (1962), Dolce, S. and Pichl, E. (1982), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Grillitsch, H. and Tiedemann, F. (1994), Hervant, F., Mathieu, J. and Durand, J.-P. (2000), Hervant, F., Mathieu, J. and Durand, J.-P. (2001), Kalezic, M. and Dzukic, G. (2001), Kletek, E., Jalzi, B. and Rada, T. (1996), Sket, B. (1997), Sket, B. and Arntzen, J.W. (1994), Thorn, R. (1968), Vogrin, M. (2002), Vogrin, N. (1997)

Data Providers: Jan Willem Arntzen, Mathieu Denoël, Claude Miaud, Franco Andreone, Milan Vogrin, Paul Edgar, Jelka Crnobrnja Isailovic, Rastko Ajtic, Claudia Corti

RHYACOTRITONIDAE

VU *Rhyacotriton olympicus* (Gauge, 1917)

OLYMPIC TORRENT SALAMANDER

Vulnerable B1ab(iii)**Order, Family:** Caudata, Rhyacotritonidae**Country Distribution:** United States of America**Current Population Trend:** Decreasing

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Geographic Range This species can be found in the Olympic Peninsula in Clallam, Grays Harbor, Jefferson, and Mason counties, Washington, United States (Good and Wake 1992).

Population Recent surveys of Olympic National Park (Bury and Adams 2000) showed the species to be widespread, occurring in 41% of 168 streams and 47% of 235 seeps surveyed. They were more abundant in streams with northerly aspects and steep gradients.

Habitat and Ecology It can be found in coastal coniferous forests in small, cold mountain streams and spring seepages. Larvae often occur under stones in shaded streams. Adults also inhabit these streams or streambanks in saturated moss-covered talus, or under rocks in splash zone. Primarily in older forest sites, required microclimatic and microhabitat conditions generally exist only in older forests (Welsh 1990). Two *Rhyacotriton* were found in deep, narrow rock crevices; eggs were lying in cold, slow-moving water (Nussbaum, Brodie and Storm 1983).

Major Threats It is sensitive to increased temperature and sedimentation. Timber harvest negatively affects *Rhyacotriton* salamanders more than any other sympatric amphibians (Bury and Corn 1988b; Corn and Bury 1989); however, lower-gradient, higher-order streams, which might intrinsically provide poor habitat for this species are more often disturbed by timber harvest. Hence, the effects of timber harvest *per se* on torrent salamanders has probably been confounded with natural variation in habitat quality (Hayes and Jones 2005). Some populations are isolated by intervening areas of unsuitable habitat.

Conservation Measures They are protected in Olympic National Park. Conservation needs include retention of old-growth buffers around headwater streams (Petranka 1998). Population trends data are needed.

Notes on taxonomy: *Rhyacotriton variegatus*, *R. kezeri* and *R. cascadae* formerly were included in this species.

Bibliography: Anderson, J.D. (1968b), Behler, J.L. and King, F.W. (1979), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Bury, R.B. and Adams, M. J. (2000), Bury, R.B. and Corn, P.S. (1988b), Corn, P.S. and Bury, R.B. (1989), Good, D.A. and Wake, D.B. (1992), Good, D.A., Wurst, G.Z. and Wake, D.B. (1987), Hayes, M.P. and Jones, L.L.C. (2005), Leonard, W.P. *et al.* (1993), Nussbaum, R.A. and Tait, C.K. (1977), Nussbaum, R.A., Brodie, Jr., E.D. and Storm, R.M. (1983), Petranka, J.W. (1998), Stebbins, R.C. (1985b), Thomas, J.W. *et al.* (1993), Welsh Jr, H.H. (1990)

Data Providers: Geoffrey Hammerson

SALAMANDRIDAE

VU *Chioglossa lusitanica* Bocage, 1864**Vulnerable B2ab(ii,iii,iv)****Order, Family:** Caudata, Salamandridae**Country Distribution:** Portugal (Native and Introduced), Spain**Current Population Trend:** Decreasing

© Miguel Vences

Geographic Range This species is restricted to mountainous and hilly areas in north-western Spain (Galicia and Asturias) and northern and central Portugal with an annual precipitation of over 1,000mm. Its distribution is patchy because its required habitat is fragmented. It has been introduced to the Serra de Sintra, Portugal. It has an altitudinal distribution 100-1,000m asl (records above 1,000m asl require confirmation).

Population This is a localized species that can be abundant in suitable habitats (4-5 adults per metre of brook habitat). Eastern Spanish populations are found at lower population densities, and there have been reports of declines and extinctions of some populations in Galicia. In Portugal, populations are widespread and abundant (P. Arntzen pers. comm.) and not in any immediate danger, but they are considered to be vulnerable because of their specialized habitat requirements (Paulo 1997).

Habitat and Ecology The species is associated with clear, well-oxygenated, small- to medium-sized slightly acidic streams (although in Portugal it has been found in water with pH 7-8), with dense surrounding vegetation in mountainous and hilly areas. The species has also been recorded from caves and abandoned flooded mines. It is associated with broad-leaved oak forest, and occurs in secondary vegetation, but not in commercial plantations. The females lay approximately 12-20 eggs in shallow stream water, often attaching the eggs to the bottom substrate. It is often associated with areas of traditional farming practices, and is particularly found in dry stonewalls. Some populations in north-western Spain have disappeared following replacement of broad-leaved forest with other habitats.

Major Threats The major threats to the species are pollution of streams with agrochemicals, canalization, and water extraction from streams for agricultural purposes, and the loss of terrestrial habitats associated with the streams through conversion to forestry plantations (*Eucalyptus* and *Pinus* plantations). In Portugal, habitat is at risk from fire.

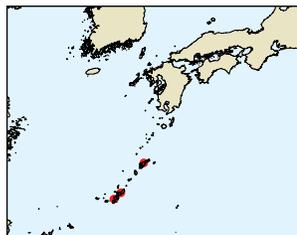
Conservation Measures It is listed on Appendix II of the Berne Convention, and is also listed on Annexes II and IV of the EU Natural Habitats Directive. It is protected by national legislation in both Portugal and Spain. It occurs in several protected areas including Picos de Europa National Park, Spain, and Peneda-Gerês National Park, Portugal.

Notes on taxonomy: Two genetically distinct forms are recognized, based on genetic data (Alexandrino *et al.* 2000, Alexandrino, Arntzen and Ferrand 2002), but these have yet to be formally described as subspecies.

Bibliography: Alexandrino, J. *et al.* (2000), Alexandrino, J., Arntzen, J.W. and Ferrand, N. (2002), Alexandrino, J., Ferrand, N. and Arntzen, J.W. (1997), Arnold, E.N. (2003), Arnold, S.J. (1987), Arntzen, J.W. (1981), Arntzen, J.W. (1984), Arntzen, J.W. (1994), Arntzen, J.W. (1995), Arntzen, J.W. (1999), Böhme, W., Grossenbacher, K. and Thiesmeier, B. (1999), Busack, S.D. (1976), Ferrand de Almeida, N. *et al.* (2001), Galán, P. (1999), Gasc, J.-P. *et al.* (eds.) (1997), Godinho, R. *et al.* (1999), Goux, L. (1957), Griffiths, R.A. (1996), Hartasánchez, R. *et al.* (1981), Lima, V., Arntzen, J.W. and Ferrand, N.M. (2000), Malkmus, R. (2004), Paulo, O. (1997), Pleguezuelos, J.M. (1997), Pleguezuelos, J.M. and Villafraña, C. (1997), Pleguezuelos, J.M., Márquez, R. and Lizana, M. (2002), Sequeira, F. *et al.* (1996), Sequeira, F. *et al.* (2001), Sequeira, F., Ferrand, N.M. and Crespo, E.G. (2003), Teixeira, J. *et al.* (1997), Teixeira, J. and Arntzen, J.W. (2002), Teixeira, J. and Ferrand, N. (2002), Teixeira, J., Ferrand, N. and Arntzen, J.W. (2001), Thorn, R. (1968), Vences, M. (1990), Vences, M. (1993), Vences, M. (2003)

Data Providers: Jan Willem Arntzen, Jaime Bosch, Mathieu Denoël, Miguel Tejado, Paul Edgar, Miguel Lizana, Iñigo Martínez-Solano, Alfredo Salvador, Mario García-Paris, Ernesto Recuero Gil, Paulo Sa-Sousa, Rafael Marquez

GOLDEN-STRIPED SALAMANDER

EN *Cynops ensicauda* (Hallowell, 1860)**Endangered B1ab(iii,v)****Order, Family:** Caudata, Salamandridae**Country Distribution:** Japan**Current Population Trend:** Decreasing

© Henk Wallays

Geographic Range This species is restricted to twelve islands in the Amami and Okinawa island groups, in the Ryukyus, Japan.

Population Its population is decreasing. In a site in southern Okinawajima, the number of animals recorded in the breeding season has decreased by 75% in 15 years.

Habitat and Ecology It occurs on wet forest floors and in grassland, and breeds in pools and streams, where the larvae also develop.

Major Threats The major threat to the species is habitat degradation and loss, due mainly to clear-cutting and human settlement. Other threats include reclamation of ponds, and construction of artificial concrete ditches. The species is also in the pet trade in Japan and is used for medicinal purposes in Taiwan, Province of China. It has further been affected by the introduction of invasive fish species.

Conservation Measures It probably occurs in some protected areas, but this requires confirmation. It is necessary to ensure that trade in this species is closely monitored and regulated.

Bibliography: Environment Agency (2000), Ota, H. (2000f), Sengoku, S. *et al.* (1996)

Data Providers: Yoshio Kaneko, Masafumi Matsui

SWORD-TAILED NEWT

EN *Cynops orphicus* Risch, 1983**Endangered B1ab(iii,v)+2ab(iii,v)****Order, Family:** Caudata, Salamandridae**Country Distribution:** China**Current Population Trend:** Decreasing

© Xie Feng

Geographic Range This species is known only from Jiexi County in north-eastern Guangdong Province, China, above 600m asl.

Population It is a rare species, and appears to be in decline.

Habitat and Ecology It inhabits and breeds in pools and small lakes, with the larvae developing in water. During hibernation it lives in terrestrial habitats, including forest and lightly degraded areas.

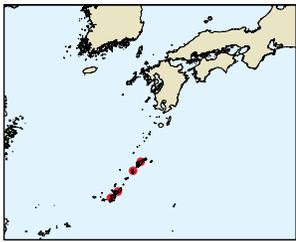
Major Threats The major threat is habitat loss and degradation, particularly due to infrastructure development for tourist activities.

Conservation Measures There are no known protected areas within the species' range, making habitat protection for this species an urgent priority.

Bibliography: MacKinnon, J. *et al.* (1996), Risch, J.-P. (1983)

Data Providers: Michael Wai Neng Lau, Bosco Chan

DAYANG NEWT

EN *Echinotriton andersoni* (Boulenger, 1892)**Endangered B1ab(iii)****Order, Family:** Caudata, Salamandridae**Country Distribution:** Japan, Taiwan, Province of China (Extinct)**Current Population Trend:** Decreasing

© Henk Wallays

Geographic Range This species is distributed on six Japanese islands: Amamioshima, Tokunoshima, Yorojima, Okinawajima, Sesokojima and Tokaskijima. There are old records (three museum specimens) from Mount Kuanyinshan, just north of Taipei, in Taiwan, Province of China (Zhao and Adler 1993), where the species is presumed to be extinct (Zhao 1998).

Population This is an uncommon species, and it is difficult to observe outside the breeding season. It is considered to be rare on Okinawa (Hayashi *et al.* 1992).

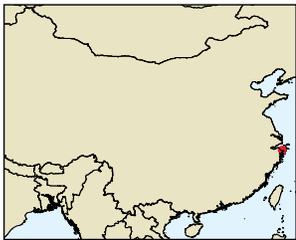
Habitat and Ecology This species occurs in broad-leaved evergreen forest, secondary forest, grassland and swamps. It inhabits vegetated areas with constantly humid substrates, and breeds in shaded still waters such as ponds and temporary pools in forests. On Tokunoshima the species occurs in and near sugar cane fields, at altitudes of 100-200m asl (Utsonomiya, Utsonomiya and Kawachi 1978). It is terrestrial, and while eggs are laid on land in one or several clutches, the larvae develop in water.

Major Threats Recent deforestation and other forms of land development, as well as road and drainage ditch construction, have been causing population declines on each island. It is also collected illegally for the pet trade.

Conservation Measures It is designated as a natural monument by Okinawa and Kagoshima Prefectures.

Bibliography: Hayashi, T. *et al.* (1992), Ota, H. and Toda, M. (2000a), Sengoku, S. *et al.* (1996), Utsonomiya, Y., Utsonomiya, T. and Kawachi, S. (1978), Zhao, E.-M. (1998), Zhao, E.-M. and Adler, K. (1993)

Data Providers: Yoshio Kaneko, Masafumi Matsui

ANDERSON'S CROCODILE NEWT**CR** *Echinotriton chinhaiensis* (Chang, 1932)**Critically Endangered B1ab(iii,iv)+2ab(iii,iv)****Order, Family:** Caudata, Salamandridae**Country Distribution:** China**Current Population Trend:** Decreasing

© Max Sparreboom

Geographic Range This species is only found in the Beilun area, east of Ningbo City in Zhejiang Province, China, from 100-200m asl. It is known from only three subpopulations, one of which has been extirpated already.

Population The population consists of about 300 mature individuals.

Habitat and Ecology This species inhabits forests in low hills. They lay small clumps of eggs on land close to small, sheltered pools and ponds. When hatched, larvae travel over land into water. They move onto land after metamorphosis, and never return to water again (courtship behaviour and fertilization all taking place on land). The species is very long-lived and slow breeding. Preliminary information from captive animals suggests that they do not become mature until they are at least 10 years old, and they are likely to live for at least 20 years, or probably even longer.

Major Threats Habitat destruction and degradation are major threats to this species, especially as a result of forestry activities and human settlement, and pollution of the breeding habitat is a serious threat. An additional potential threat is the over-collection of individuals for scientific collections.

Conservation Measures This species is listed as a Class II state major protected wildlife since 1988. The largest subpopulation is within the Ruiyansi Forest Park, which does not yet constitute an effective protected area for the species, but which has been relatively well monitored. There is a small captive-breeding programme, and some young individuals have been reintroduced to the wild.

Bibliography: Fei, L. (1992), Sparreboom, M., Feng, X. and Fei, L. (2001), Xie, F. *et al.* (2000), Zhao, E.-M. (1998)

Data Providers: Xie Feng, Gu Huiqing

CHINHAI SPINY NEWT**EN** *Euproctus platycephalus* (Gravenhorst, 1829)**Endangered B2ab(iii,iv)****Order, Family:** Caudata, Salamandridae**Country Distribution:** Italy**Current Population Trend:** Decreasing

© Jan Van Der Voort

Geographic Range This species is endemic to Sardinia, Italy, where it is mostly found in the eastern part of the island between the Limbara Mountains in the north and the Sette Fratelli Mountains in the south. There are only a few records from western Sardinia (i.e. Linas Mount) (Lecis and Norris 2003). Further information is needed on the range of the species in the south-west of the island. It is found at elevations of between 50 and 1,800m asl, although it is most often found at elevations of 400-800m asl.

Population This is generally a rare species that can be locally common in suitable habitat (e.g. over 400 specimens may be found in a single pool). The largest population of the species is in the Gola di Gorroppu. In one well-studied

population the sex ratio is largely male. The number of subpopulations is declining. Between 1999 and 2001 it was found in 14 sites, whereas around 1991 it was present in 30 sites (and even in 1991 it was absent from nine other sites where it had been previously observed).

Habitat and Ecology It is a montane species of permanent and temporary stagnant and running waters, which prefers calm areas of small or large rivers. Its terrestrial habitats are generally restricted to riverine scrub or woodland, and the species may also be found in cave systems. Its breeding sites are permanent pools, water holes, small lakes and streams. The eggs are deposited between stones or are buried in sand; the larvae develop in the streams (Griffiths 1996; Rimpp 1998). The species is quite adaptable and can be found in artificial pools.

Major Threats The major threats to the species are pollution of waterbodies, habitat fragmentation, predation by introduced trout, and prolonged drought (often caused by excessive water abstraction). During the 1950s, many populations were lost through the application of DDT to waterbodies. Recently, the Gola di Gorroppu population has become threatened through damage to its habitat caused by tourist activities.

Conservation Measures This species is listed on Appendix II of the Berne Convention and on Annex IV of the EU Natural Habitats Directive; it is also protected by regional legislation (Regional Law n. 23/1998 (art. 5, c. 3)). The Gola di Gorroppu has been designated as a Site of Community Importance under the Habitats Directive. In addition, a number of populations live in established and planned protected areas, including Parco Regionale Sette Fratelli, Parco Nazionale Gennargentu-Golfo di Orosei, and Parco Regionale Monte Limbara. Programmes to remove trout from the species' habitat would assist in the recovery of populations.

Bibliography: Alcher, M. (1975), Alcher, M. (1980a), Alcher, M. (1980b), Alcher, M. (1981), Arnold, E.N. (2003), Böhme, W., Grossenbacher, K. and Thiesmeier, B. (1999), Bovero, S. *et al.* (2003), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Lecis, R. and Norris, K. (2003a), Lecis, R. and Norris, K. (2003b), Lecis, R. and Norris, K. (2004), Puddu, F., Viarengo, M. and Ermineo, C. (1988), Read, A.W. (1998), Rimpp, K. (1998), Thorn, R. (1968), Van Rooy, P.T.J.C. and Stumpel, A.H.P. (1995), Voesenek, L.A.C.J. and van Rooy, P.T.J.C. (1984)

Data Providers: Franco Andreone, Roberta Lecis, Paul Edgar, Benedikt Schmidt, Claudia Corti

SARDINIAN BROOK SALAMANDER

EN *Lyciasalamandra antalyana* (Başoğlu and Baran, 1976)

Endangered B1ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: Turkey
Current Population Trend: Decreasing



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Geographic Range This species is endemic to Turkey where it is restricted to a small area in south-western Anatolia. It has an altitudinal range of 100-650m asl.

Population It is locally abundant. There are a total of eight adjacent populations.

Habitat and Ecology It is found in rocky areas in pine woodland and marquis scrub habitat. Animals have been found hiding under rock piles on hillsides. It is not present in modified habitats. The species is viviparous, the female giving birth to one or two fully metamorphosed young after a gestation period of around one year.

Major Threats Within its naturally restricted range, the major potential threat to this species is habitat loss caused by forest fires, and overcollection for scientific purposes. Currently, there is only limited habitat loss taking place, since the human population in its range is generally low, and there is little tourism in the area where it is found, but with ongoing development in the region habitat loss could become more severe.

Conservation Measures This species is found within Termessos National Park.

Notes on taxonomy: This taxon was formerly considered to be a subspecies of *Salamandra lushchani*. It has been elevated to species level, and assigned to the genus *Lyciaslamandra*, by Veith and Steinfartz (2004).

Bibliography: Başoğlu, M. and Baran, I. (1976), Veith, M. *et al.* (1998), Veith, M. *et al.* (2001), Veith, M. and Steinfartz, S. (2004), Weisrock, D.W. *et al.* (2001)

Data Providers: Varol Tok; Ismail H. Ugurtas, Murat Sevinç, Pierre-André Crochet, Theodore Papenfuss, Max Sparreboom, Sergius Kuzmin, Steven Anderson, Mathieu Denoël, Güven Eken, Tuba Kiliç, Engin Gem

EN *Lyciasalamandra atifi* (Başoğlu, 1967)

Endangered B1ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: Turkey
Current Population Trend: Decreasing



© Miguel Vences

Geographic Range This species is endemic to southern Anatolia, Turkey, where it has been recorded from Serik, Turbelinaz, Fersin, Dikmen, Manavgat, Gayi, Gollepe and Selge. It is present at altitudes of 190-1,500m asl.

Population It is common within its limited range.

Habitat and Ecology This species is found under stones in humid areas of pine forest. Animals are found in areas of limestone and also close to rivers. It has been recorded close to villages, but presumably does not occur in modified habitats. The species is viviparous, the female giving birth to one or two fully metamorphosed young after a gestation period of around one year.

Major Threats Within its naturally restricted range, the major potential threat to this species is habitat loss caused by forest fires, and overcollection for scientific purposes. Currently, there is only limited habitat loss taking place, since the human population in its range is generally low, and there is little tourism in the area where it is found, but with ongoing development in the region habitat loss could become more severe.

Conservation Measures This species is not known from any protected areas.

Notes on taxonomy: This taxon was formerly considered to be a subspecies of *Salamandra lushchani*. It has been elevated to species level, and assigned to the genus *Lyciaslamandra*, by Veith and Steinfartz (2004).

Bibliography: Arnold, E.N. (2003), Baran, I. and Atatür, M.K. (1998), Baran, I. and Ücuncü, S. (1994), Başoğlu, M. (1967), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Olgun, K., Miaud, C. and Gautier, P. (2001), Özeti, N. and Yilmaz, I. (1994), Steinfartz, S. and Mutz, T. (1999), Thorn, R. (1968), Veith, M. *et al.* (1998), Veith, M. *et al.* (2001), Veith, M. and Steinfartz, S. (2004), Weisrock, D.W. *et al.* (2001)

Data Providers: Varol Tok, Ismail H. Ugurtas, Murat Sevinç, Pierre-André Crochet, Theodore Papenfuss, Max Sparreboom, Sergius Kuzmin, Steven Anderson, Mathieu Denoël, Güven Eken, Tuba Kiliç, Engin Gem

CR *Lyciasalamandra billae* (Franzen and Klewen, 1987)

Critically Endangered B1ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: Turkey
Current Population Trend: Decreasing



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Geographic Range This species is restricted to the east slope of the Saricinar Daglari, south-west of Antalya, Turkey. It ranges from sea level to 200 m asl.

Population It is common in its restricted range.

Habitat and Ecology It is associated with rocky limestone outcrops, and is often found in maqui or pine woodlands. The species is live-bearing producing one or two fully metamorphosed young; the gestation period is about one year. The species does not occur in modified habitats.

Major Threats There is generally a low human population density and little tourism in the area where it is found, and limited habitat loss is taking place. However, a potential future threat is the loss of habitat due to ongoing development in the region and forest fires, as well as overcollection for scientific purposes.

Conservation Measures This species has been recorded from the Catlick Protected Area.

Notes on taxonomy: This taxon was formerly considered to be a subspecies of *Salamandra lushchani*. It has been elevated to species level, and assigned to the genus *Lyciaslamandra*, by Veith and Steinfartz (2004).

Bibliography: Arnold, E.N. (2003), Baran, I. and Atatür, M.K. (1998), Baran, I. and Ücuncü, S. (1994), Franzen, M. and Klewen, R. (1987), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Olgun, K., Miaud, C. and Gautier, P. (2001), Özeti, N. and Yilmaz, I. (1994), Steinfartz, S. and Mutz, T. (1999), Thorn, R. (1968), Veith, M. *et al.* (1998), Veith, M. *et al.* (2001), Veith, M. and Steinfartz, S. (2004), Weisrock, D.W. *et al.* (2001)

Data Providers: Varol Tok, Ismail H. Ugurtas, Murat Sevinç, Pierre-André Crochet, Theodore Papenfuss, Max Sparreboom, Sergius Kuzmin, Steven Anderson, Mathieu Denoël, Güven Eken, Tuba Kiliç, Engin Gem

EN *Lyciasalamandra fazilae* (Başoğlu and Atatür, 1974)

Endangered B1ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: Turkey
Current Population Trend: Decreasing



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Geographic Range This species is restricted to the southern Anatolian coast, Turkey, where it is found from north-east of Fethiye to the western shore of Koycegiz Golu. It ranges from sea level up to 1,000m asl.

Population It is not very common.

Habitat and Ecology It is associated with rocky limestone outcrops, and is usually found in marquis scrub or pine woodland (and not in modified habitats). The species is viviparous, producing one or two fully metamorphosed young; the gestation period is about one year.

Major Threats Within its naturally restricted range, the major potential threat to this species is habitat loss caused by forest fires, and overcollection for scientific purposes. Currently, there is only limited habitat loss taking place, since the human population in its range is generally low, and there is little tourism in the area where it is found, but with ongoing development in the region habitat loss could become more severe.

Conservation Measures It is present in some protected forests, although these are not national parks.

Notes on taxonomy: This taxon was formerly considered to be a subspecies of *Salamandra lushchani*. It has been elevated to species level, and assigned to the genus *Lyciaslamandra*, by Veith and Steinfartz (2004).

Bibliography: Arnold, E.N. (2003), Baran, I. and Atatür, M.K. (1998), Baran, I. and Ücuncü, S. (1994), Başoğlu, M. and Atatür, M. (1974), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Olgun, K., Miaud, C. and Gautier, P. (2001), Özeti, N. and Yilmaz, I. (1994), Steinfartz, S. and Mutz, T. (1999), Thorn, R. (1968), Veith, M. *et al.* (1998), Veith, M. *et al.* (2001), Veith, M. and Steinfartz, S. (2004), Weisrock, D.W. *et al.* (2001)

Data Providers: Varol Tok, Ismail H. Ugurtas, Murat Sevinç, Pierre-André Crochet, Theodore Papenfuss, Max Sparreboom, Sergius Kuzmin, Steven Anderson, Mathieu Denoël, Güven Eken, Tuba Kiliç, Engin Gem

EN *Lyciasalamandra flavimembris* (Mutz and Steinfartz, 1995)

Endangered B1ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: Turkey
Current Population Trend: Decreasing



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Geographic Range This species ranges between Marmaris and Ula along the south-west Anatolian coast, Turkey, from sea level up to 600m asl.

Population It appears to be a rare species.

Habitat and Ecology It is associated with rocky limestone outcrops, and is often found in marquis scrub or pine woodlands (and not in modified habitats). The species is viviparous, producing one or two fully metamorphosed young; the gestation period is about one year.

Major Threats Within its naturally restricted range, the major potential threat to this species is habitat loss caused by forest fires, and overcollection for scientific purposes. Currently, there is only limited habitat loss taking place, since the human population in its range is generally low, and there is little tourism in the area where it is found.

Conservation Measures It is present in some protected forests, although these are not national parks.

Notes on taxonomy: This taxon was formerly considered to be a subspecies of *Salamandra lushchani*. It has been elevated to species level, and assigned to the genus *Lyciasalamandra*, by Veith and Steinfartz (2004).

Bibliography: Arnold, E.N. (2003), Baran, I. and Atatür, M.K. (1998), Baran, I. and Ücücü, S. (1994), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Mutz, T. and Steinfartz, S. (1995), Olgun, K., Miaud, C. and Gautier, P. (2001), Özeti, N. and Yilmaz, I. (1994), Steinfartz, S. and Mutz, T. (1999), Thorn, R. (1968), Veith, M. *et al.* (1998), Veith, M. and Steinfartz, S. (2004), Weisrock, D.W. *et al.* (2001)

Data Providers: Varol Tok, Ismail H. Ugurtas, Murat Sevinç, Pierre-André Crochet, Theodore Papenfuss, Max Sparreboom, Sergius Kuzmin, Steven Anderson, Mathieu Denoël, Güven Eken, Tuba Kiliç, Engin Gem

VU *Lyciasalamandra helverseni* (Pieper, 1963)

Vulnerable D2
Order, Family: Caudata, Salamandridae
Country Distribution: Greece
Current Population Trend: Stable



© Jan Van Der Voort

Geographic Range This species is endemic to Greece, where it occurs only on the islands of Karpathos and Kasos in the south-east Aegean Sea.

Population It is a fairly common species within its restricted range.

Habitat and Ecology It lives in Mediterranean rocky shrubby vegetation. It is viviparous, giving birth to fully developed young on land, and it is not associated with water.

Major Threats No major threats are known, though local populations might be impacted by loss of habitat. Harvesting for the international pet trade takes place, but not at a level sufficient to threaten the species.

Conservation Measures It occurs in some protected areas. There is a need for close monitoring of the population status of this species.

Notes on taxonomy: This species was separated from *Lyciasalamandra lushchani* by Veith and Steinfartz (2004).

Bibliography: Arnold, E.N. (2003), Böhme, W., Grossenbacher, K. and Thiesmeier, B. (1999), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Steinfartz, S. and Mutz, T. (1999), Thorn, R. (1968), Veith, M. *et al.* (1998), Veith, M. *et al.* (2001), Veith, M. and Steinfartz, S. (2004), Weisrock, D.W. *et al.* (2001)

Data Providers: Petros Lymberakis, Ismail H. Ugurtas, Theodore Papenfuss, Max Sparreboom, Sergius Kuzmin, Steven Anderson, Mathieu Denoël, Güven Eken, Tuba Kiliç, Engin Gem

EN *Lyciasalamandra lushchani* (Steindachner, 1891)

Endangered B1ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: Greece, Turkey
Current Population Trend: Decreasing



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Geographic Range This species ranges from Fethiye to Finiki, in south-western Anatolia, Turkey, where it apparently has a fragmented distribution. An endemic subspecies (*Lyciasalamandra lushchani basoglu*) is found on the nearby Greek island of Kastellorizo (= Megisti).

Population It is common to fairly abundant.

Habitat and Ecology It is associated with rocky limestone outcrops, and is often found in marquis scrub or pine woodlands (and not in modified habitats). The species is viviparous, producing one or two fully metamorphosed young; the gestation period is about one year.

Major Threats Within its naturally restricted range, the major potential threat to this species is habitat loss caused by forest fires, and overcollection for scientific purposes. Currently, there is only limited habitat loss taking place, since the human population in its range is generally low, and there is little tourism in the area where it is found, but with ongoing development in the region habitat loss could become more severe.

Conservation Measures This species is present within a protected area in Greece, and is found in some protected forests in Turkey.

Notes on taxonomy: Formerly included in the genus *Salamandra*, this taxon was assigned to the genus *Lyciasalamandra* by Veith and Steinfartz (2004).

Bibliography: Arnold, E.N. (2003), Baran, I. and Atatür, M.K. (1998), Baran, I. and Ücücü, S. (1994), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Olgun, K., Miaud, C. and Gautier, P. (2001), Özeti, N. and Yilmaz, I. (1994), Steinfartz, S. and Mutz, T. (1999), Thorn, R. (1968), Veith, M. *et al.* (1998), Veith, M. *et al.* (2001), Veith, M. and Steinfartz, S. (2004), Weisrock, D.W. *et al.* (2001)

Data Providers: Petros Lymberakis, Varol Tok, Ismail H. Ugurtas, Murat Sevinç, Pierre-André Crochet, Theodore Papenfuss, Max Sparreboom, Sergius Kuzmin, Steven Anderson, Mathieu Denoël, Güven Eken, Tuba Kiliç, Engin Gem

VU *Mertensiella caucasica* (Waga, 1876)

Vulnerable B2ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: Georgia, Turkey
Current Population Trend: Decreasing



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Geographic Range This species is restricted to north-east Anatolia (the Vilayets of Giresun, Rize, Trabzon, Artvin, Kars, Bayburt, and Gumushane), Turkey, and the western spurs of the Trialeti Mountain Ridge, Meskhetian and Lazistanian ridges, Georgia. It is present at altitudes of 400-2,800m asl.

Population It is generally rare (but can be locally common) within suitable habitat. Populations of this species in Georgia display significant fluctuations, and the population in Turkey has probably declined significantly over the past decade.

Habitat and Ecology It is a habitat specialist, found mainly in beech (*Fagus orientalis*), coniferous (*Abies nordmanniana* and *Picea orientalis*), mixed forests, the subalpine belt and in alpine meadows. The species tends to avoid large streams and lives mainly in the tributaries of rivers, usually no more than 1-1.5m in width and about 20-30cm in depth in spring. These brooks flow in dense shade and their banks are covered with dense arboreal and herbaceous vegetation (including the large fern *Mateuccia struthiopteris*). The banks contain a thick layer of leaf and branch litter, dense moss, and grass. It breeds in the streams. In general, this salamander avoids anthropogenically altered landscapes.

Major Threats In Georgia, the destruction of forests (tree felling), use of brooks as roads for the transportation of cut trees, and destruction of habitats by cattle are known causes of population declines. In Turkey, only around 12% of suitable forest habitat remains within the species range (Özhatay, Byfield and Atay 2003), and suitable subalpine and alpine meadows are being degraded through road construction and "summer house" tourism in the Eastern Black Sea Mountains (Magnin and Yazar 1997). Additionally, several dams are being constructed on streams used by this species.

Conservation Measures In Georgia, the species occurs in two protected areas; three national parks are present within the Turkish range. The species is listed in the Red Data Books of the USSR and Georgia.

Notes on taxonomy: The taxon *Mertensiella caucasica* includes two allopatric phylogenetic species (yet to be formally described), reciprocally monophyletic, separated since the Pliocene. *Mertensiella* sp.1 lives in the basin of the Kura River, *Mertensiella* sp.2 in the basin of the Black Sea. The validity of the subspecies *M. caucasica djabaschvili* is in doubt (S. Kuzmin pers. comm.).

Bibliography: Bannikov, A.G. *et al.* (1977), Baran, I. and Atatür, M.K. (1998), Demirsoy, A. (1996), Franzen, M. (1999), Kuzmin, S.L. (1992), Kuzmin, S.L. (1995), Kuzmin, S.L. (1996), Kuzmin, S.L. (1999), Kuzmin, S.L., Dodd Jr, C.K. and Pkvik, M.M. (1995), Magnin, G. and Yazar, M. (1997), Özeti, N. and Yilmaz, I. (1994), Özhatay, N., Byfield, A. and Atay, S. (2003), Tarkhnishvili, D.N. (1994), Tarkhnishvili, D.N. and Gokhelasvili, R.K. (1999), Tarkhnishvili, D.N., Thorpe, R.S. and Arntzen, J.W. (2000), Tartarashvili, R.V. and Bakradze, M.A. (1989), Thorn, R. (1968)

Data Providers: Theodore Papenfuss, Sergius Kuzmin, David Tarkhnishvili, Boris Tuniyev, Max Sparreboom, Ismail Ugurtas, Steven Anderson, Güven Eken, Tuba Kiliç, Engin Gem

CAUCASIAN SALAMANDER

VU *Neurergus crocatus* Cope, 1862

Vulnerable B2ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: Iran, Iraq, Turkey
Current Population Trend: Decreasing



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Geographic Range This species is present in the vicinity of Beytussebbap (Vilayet Hakkari), south-east Anatolia, Turkey, in the Kurdish region of northern Iraq, and also in north-western Iran. It has an altitudinal range of 1,500-2,000m asl.

Population It is relatively common in Iran; there is no information on its population status for Turkey or Iraq.

Habitat and Ecology It breeds in montane streams (egg laying) during the spring. Adults are known to leave the streams for surrounding areas after breeding, but the terrestrial habitat remains unknown. It is presumed that the adults occur under rocks and other cover during the winter.

Major Threats It is considered to be relatively susceptible to habitat change. Populations in Iran might be threatened by habitat loss, pollution, drought, and collection for the pet trade. In Turkey, the construction of several dams is planned within the species range. The area of distribution in Turkey is expected to undergo significant development over the next 10 years, and presumably the species will be impacted by these changes.

Conservation Measures The species does not occur in any protected areas in Turkey; it is not known if the species occurs in protected areas in other parts of its range. It is protected by national legislation in Iran.

Bibliography: Anderson, S.C. (1963), Baloutchi, M. and Kami, H.G. (1995), Baran, I. and Atatür, M.K. (1998), Baran, I. and Öz, M. (1986), Demirsoy, A. (1996), Khalaf, K.T. (1959), Leviton, A.E. *et al.* (1992), Özeti, N. and Yilmaz, I. (1994), Schmidtler, J.F. (1994), Schmidtler, J.J. and Schmidtler, J.F. (1975), Steinfartz, S. (1995), Steinfartz, S. *et al.* (2002b), Thorn, R. (1968)

Data Providers: Theodore Papenfuss, Max Sparreboom, Ismail Ugurtas, Nasrullah Rastegar-Pouyani, Sergius Kuzmin, Steven Anderson, Güven Eken, Tuba Kiliç, Engin Gem

CR *Neurergus kaiseri* Schmidt, 1952

Critically Endangered B1ab(iii,v)+2ab(iii,v)
Order, Family: Caudata, Salamandridae
Country Distribution: Iran
Current Population Trend: Decreasing



© Tivan Leenders

Geographic Range This species is endemic to three streams within a restricted area of the southern Zagros Mountains, Lorestan (most of the population) and Khuzestan Provinces, Iran. It has an altitudinal range of 500-1,430m asl.

Population It is locally abundant to rare within its restricted range. One of the populations has now disappeared and it is now only known from two spring-fed streams. The population is estimated to number fewer than 1,000 mature individuals.

Habitat and Ecology Although the species leaves water outside the breeding season, the terrestrial habitat is unknown. The streams are mostly surrounded by very arid scrubland.

Major Threats Habitat loss as a result of wood extraction for small-scale subsistence use, coupled with the effects of recent severe droughts, are the major threats to the species (N. Rastegar-Pouyani pers. comm.). Damming of the few known inhabited streams is a serious potential threat to the species. A few animals have been observed for sale in the Tehran market, presumably for local use in aquaria (T. Papenfuss pers. comm.). However, of greater concern is the current growing trade in the species for the international pet trade. At present it appears that individuals caught in the wild are being illegally exported out of Iran, and are finding their way into the pet trade. Some of the individuals in the trade are reportedly captive-bred but this requires confirmation.

Conservation Measures The species is protected by Iranian national legislation. The area that the species is known from is close to the Zagros Oak Forest protected area. Actions need to be taken immediately to prevent the illegal export of this species for the international pet trade. A captive-breeding programme almost certainly needs to be established.

Bibliography: Anderson, S.C. (1963), Baloutchi, M. and Kami, H.G. (1995), Schmidtler, J.F. (1994), Schmidtler, J.J. and Schmidtler, J.F. (1975), Steinfartz, S. *et al.* (2002a), Thorn, R. (1968)

Data Providers: Theodore Papenfuss, Steven Anderson, Sergius Kuzmin, Nasrullah Rastegar-Pouyani

EN *Neurergus microspilotus* (Nesterov, 1916)

Endangered B1ab(iii,iv,v)+2ab(iii,iv,v)
Order, Family: Caudata, Salamandridae
Country Distribution: Iran
Current Population Trend: Decreasing



© Günther Schultschik

Geographic Range This species is restricted to the Avroman Mountains on the Iraq-Iran-Turkey border (Leviton *et al.* 1992) where it was known from five streams, but is now restricted to only four. Within Iran it is found in Kermenshah

and (southern parts of) Kurdistan Provinces; it has not been confirmed from Turkey or Iraq. It has an altitudinal range of 1,300-1,400m asl.

Population It is a reasonably common species in suitable habitat. A number of populations have become extirpated, presumably through recent severe drought or illegal harvesting for the pet trade.

Habitat and Ecology It is known only from small streams and its terrestrial habitat is unknown. The area surrounding the streams is a dry canyon, with open oak forest and grassland. The species breeds, and larval development takes place, in streams. It is considered to be susceptible to habitat disturbance.

Major Threats The breeding habitat of this species in the Zagros Mountains has recently been impacted by severe droughts which has led to the extirpation of some populations. Water contamination close to villages and small townships (largely by agrochemicals) is leading to a decline in nearby populations. It is sometimes seen in the illegal pet trade which is an increasing threat to the species.

Conservation Measures It occurs within the Zagrosian Oak Forest, which is generally protected. Local people have been engaged in projects looking for alternative solutions to alleviate water pollution. It is protected by national legislation in Iran, but this requires better enforcement. Actions need to be taken immediately to prevent the illegal export of this species for the pet trade. Captive breeding may have an important role to play in the conservation of this species.

Bibliography: Baloutchi, M. and Kami, H.G. (1995), Leviton, A.E. *et al.* (1992), Rastegar-Pouyani, N. (2003a), Rastegar-Pouyani, N. (2003b), Schmidtler, J.F. (1994), Schmidtler, J.J. and Schmidtler, J.F. (1975), Steinfartz, S. *et al.* (2002a), Thorn, R. (1968)

Data Providers: Theodore Papenfuss, Steven Anderson, Sergius Kuzmin, Nasrullah Rastegar-Pouyani

VU *Neurergus strauchii* (Steindachner, 1887)

Vulnerable B1ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: Turkey
Current Population Trend: Decreasing



© Pierre-André Crochet

Geographic Range This species is currently known only from Vilayets Mus, Bitlis and Malatya in Eastern Anatolia, Turkey. There are recent unpublished records of this species occurring between the localities of the two known

subspecies (M. Sparreboom pers. comm.). Of the two confirmed subspecies, *N. s. strauchii* is found in the streams surrounding Lake Van, and *N. s. barani* is restricted to Kubbe Mountain on the Malatya-Puturge road. It is present at altitudes of 1,500-2,000m asl.

Population This species is locally common within suitable habitat.

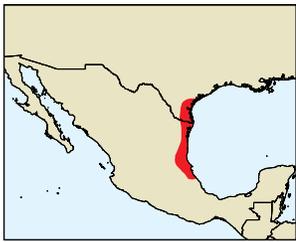
Habitat and Ecology It is known only from the small, cool mountain streams in which it breeds. The borders of these streams may or may not be wooded. Animals spend the winter months on land under stones and in burrows. The terrestrial habitat of this species is not well known. The female lays between 10 and 20 eggs in a clutch. It is presumed to be susceptible to changes in habitat.

Major Threats In general, this species lives at high elevations where there is a low human population and few threats. In the eastern part of the species range, close to Bitlis, the species is presumably threatened by pollution of streams and rivers with domestic detergents and possible modification of habitats. Construction of a dam is planned on the river catchments where the western subspecies in the Kubbe Dagi occurs (G. Eken pers. comm.). This species has been recorded in the pet trade, although it is not known if this is a threat to wild populations.

Conservation Measures It is not known from any protected areas in Turkey. There is a need to develop national legislation to mitigate the pollution of stream habitats in eastern Turkey.

Bibliography: Baran, I. and Atatür, M.K. (1998), Demirsoy, A. (1996), Öz, M. (1994), Özeti, N. and Yilmaz, I. (1994), Schmidtler, J.F. (1994), Schmidtler, J.J. and Schmidtler, J.F. (1975), Steinfartz, S. (1995), Steinfartz, S. *et al.* (2002b), Thorn, R. (1968)

Data Providers: Theodore Papenfuss, Max Sparreboom, Varol Tok, Ismail H. Ugurtas, Murat Sevinç, Sergius Kuzmin, Steven Anderson, Güven Eken, Tuba Kiliç, Engin Gem

EN *Notophthalmus meridionalis* (Cope, 1880)**Endangered B2ab(iii,iv,v)****Order, Family:** Caudata, Salamandridae**Country Distribution:** Mexico, United States of America**Current Population Trend:** Decreasing

© Tim Burkhardt

Geographic Range This species ranges from the Gulf Coastal Plain, from south of the San Antonio River in Texas, USA, southward along the Atlantic versant to Tamaulipas, northern Veracruz and south-eastern San Luis Potosi, Mexico. It has never been found more than 130km inland. It occurs from sea level up to 800m asl. Many historical occurrences are no longer extant. The USFWS survey in the mid-1980s reported five localities, two in Texas and three in Mexico, of 221 surveyed. The localities in Mexico are few and far between, and it now seems to be absent from two of the three known localities in Mexico. It still exists in Siberia in northern Veracruz.

Population The species has never been found to be abundant at any locality. A maximum of 25 individuals has been found at one site. It was once rather common in Texas, but is now seldom seen (Bartlett and Bartlett 1999). It is apparently still declining in Texas (Bartlett and Bartlett 1999), but much of the range includes private land where herpetological surveys have not been conducted. The populations of this species in Mexico also seem to be very small and declining, but more fieldwork is needed to verify the status of the species in the country.

Habitat and Ecology Adults, juveniles, and larvae inhabit permanent and temporary ponds, roadside ditches, and quiet stream pools, habitats that are relatively uncommon in at least the northern part of the range. It is usually found among submerged vegetation, and it is found under rocks and other shelter when ponds dry up. The eggs are attached to submerged vegetation in shallow water (Garrett and Barker 1987). The species is generally intolerant of habitat disturbance except that it has been found in ditches along railroad rights-of-way.

Major Threats Extensive habitat alteration for agriculture and infrastructure development in Texas and north-eastern Mexico has had a severe impact on this newt. It has also become endangered in Texas due to insecticide and herbicide use (Dixon 1987), and water pollution is also a major problem in Mexico.

Conservation Measures It is not known to occur in any protected areas in Mexico, but these are needed where the species is still found to survive. The species has been reported from the Laguna Atascosa and Santa Ana National Wildlife Refuges, and from the Audubon Sabal Palm Grove Sanctuary in Texas, and may occur in other protected areas. This species is listed as threatened by the Texas Parks and Wildlife Department and endangered by the Mexican government. Research is needed on its demography, the water quality requirements of aquatic stages, what its terrestrial habitat requirements are, and its diet. Potential habitat needs to be surveyed for specimens at optimal times of the year (early spring or after rains).

Bibliography: Bartlett, R.D. and Bartlett, P.P. (1999), Behler, J.L. and King, F.W. (1979), Blackburn, L., Nanjappa, P. and Lannoo, M.J. (2001), Conant, R. and Collins, J.T. (1991), Dixon, J.R. (1987), Dixon, J.R. (2000), Frost, D.R. (1985), Garrett, J.M. and Barker, D.G. (1987), Meham, J.S. (1968b), Petranka, J.W. (1998), Reilly, S.M. (1990)

Data Providers: Oscar Flores-Villela, Gabriela Parra-Olea, Geoffrey Hammerson, David Wake, Kelly Irwin

BLACK-SPOTTED NEWT**VU** *Paramesotriton deloustali* (Bourret, 1934)**Vulnerable B2ab(iii,v)****Order, Family:** Caudata, Salamandridae**Country Distribution:** Viet Nam**Current Population Trend:** Decreasing

© Henk Wallays

Geographic Range This species was originally known only from the Tam Dao mountain ridge in northern Viet Nam. It has now been found in more than ten localities in Bac Kan, Ha Giang, Yen Bai, Tuyen Quang, Tay Nguyen, and Lao Cai Provinces, all in Viet Nam. It occurs from about 600-1,200m asl.

Population Its population apparently is relatively stable, and it is not particularly rare locally.

Habitat and Ecology It inhabits streams in evergreen hill forest, including small natural and artificial impoundments. It breeds in small pools in streams where larval development takes place.

Major Threats Habitat loss, due to agriculture and human settlement, pollution, and harvesting for food, medicine and the pet trade, are threats to this species.

Conservation Measures This species is found in Tam Dao, which is an undefined National Park, and has also been found in Ba Be National Park. There are two locations west of the Red River, Lao Cay and Yen Bai that are in a region proposed for a National Park. It is included under Viet Nam protective legislation. Setting up managed *ex-situ* assurance colonies among zoos and competent hobbyists is recommended.

Bibliography: Birdlife International (2001), Bourret, R. (1934), Darevsky, I.S. and Salomantina, N.I. (1989), Tran, K. *et al.* (1992)

Data Providers: Peter Paul van Dijk, Nguyen Quang Trung, Henk Wallays

TAM DAO SALAMANDER**VU** *Paramesotriton fuzhongensis* Wen, 1989**Vulnerable B1ab(iii,v)****Order, Family:** Caudata, Salamandridae**Country Distribution:** China**Current Population Trend:** Decreasing

© Henk Wallays

Geographic Range This species is only known from north-eastern Guangxi Province (Zhongshan, Fuchuan and Gongchen Counties) in China, from 400-1,200m asl.

Population It is a rare species.

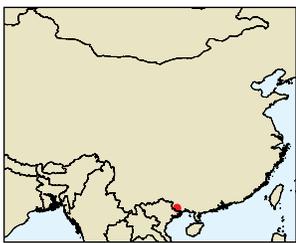
Habitat and Ecology It inhabits low-gradient streams in broadleaf forests. Breeding and larval development take place in streams.

Major Threats The major threats to this species include habitat loss due to subsistence wood collection, and over-harvesting for the pet trade.

Conservation Measures A few protected areas are present within the range of this species. Some European herpetologists have successfully bred the species in captivity.

Bibliography: MacKinnon, J. *et al.* (1996), Wen, Y.T. (1989), Zhang, Y. and Wen, Y. (2000), Zhao, E.-M. and Adler, K. (1993)

Data Providers: Zhao Ermi, Yuan Zhigang

WANGGAO WARTY NEWT**EN** *Paramesotriton guanxiensis* (Huang, Tang and Tang, 1983)**Endangered B1ab(iii)+2ab(iii)****Order, Family:** Caudata, Salamandridae**Country Distribution:** China**Current Population Trend:** Decreasing

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Geographic Range This species is only known from Paiyangshan, Ningming County, in Guangxi Province, China, at around 470m asl.

Population It is known from only a handful of localities.

Habitat and Ecology It inhabits low-gradient streams and surrounding habitats. It probably breeds in streams.

Major Threats The major threat to this species is habitat loss and degradation due to agriculture.

Conservation Measures The range of this species does not include any protected areas, and habitat protection for this species is urgently needed.

Bibliography: Fei, L. *et al.* (1999), Huang, Z.Y., Tang, Z.Y. and Tang, Z.M. (1983), MacKinnon, J. *et al.* (1996), Zhang, Y. and Wen, Y. (2000)

Data Providers: Yuan Zhigang, Zhao Ermi, Lu Shunqing

GUANGXI WARTY NEWT

VU *Pleurodeles nebulosus* (Guichenot, 1850)**Vulnerable B2ab(iii)****Order, Family:** Caudata, Salamandridae**Country Distribution:** Algeria, Tunisia**Current Population Trend:** Decreasing

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Geographic Range This species ranges from northern Algeria, east to western Tunisia, but is absent from the Edough Peninsula in northern Algeria. The distribution map for this species largely follows the map presented in Veith *et al.* (2004), but its occurrence within this range is very limited due to fragmented habitat. The altitudinal range of the species is not known.

Population It is a rare and declining species.

Habitat and Ecology This is presumed to be a largely aquatic species dependent upon cisterns, ponds, swamps, and other wetlands. It is not clear if this salamander uses terrestrial habitats. This species has a similar breeding strategy to *Pleurodeles waltli*, depositing its eggs and completing larval development within water.

Major Threats The species is threatened by pollution of natural breeding ponds (dayas), through expansion and intensification of agriculture (livestock) in the region (Schleich, Kästle and Kabisch 1996). There is only limited suitable habitat within its range, suggesting that its populations could be small and severely fragmented.

Conservation Measures It is not known whether or not the species occurs in any protected areas.

Notes on taxonomy: Carranza and Wade (2004) showed that most of the animals from North Africa previously referred to as *Pleurodeles poireti* actually belong to *Pleurodeles nebulosus*, true *P. poireti* being restricted to the Edough Peninsula in northern Algeria.

Bibliography: Carranza, S. and Wade, E. (2004), Pasmans, F. *et al.* (2002), Pasmans, F. and Bogaerts, S. (2001), Salvador, A. (1996), Schleich, H.H., Kästle, W. and Kabisch, K. (1996), Thorn, R. (1968), Thorn, R. and Raffaëlli, J. (2001), Veith, M. *et al.* (2004)

Data Providers: David Donaïre-Barroso, Alfredo Salvador, Tahar Slimani, El Hassan El Mouden, Philippe Geniez, Jose Mateo

ALGERIAN RIBBED NEWT**EN** *Pleurodeles poireti* (Gervais, 1836)**Endangered B1ab(ii)+2ab(iii)****Order, Family:** Caudata, Salamandridae**Country Distribution:** Algeria**Current Population Trend:** Decreasing

Geographic Range This poorly known species is recorded only from Edough Peninsula in northern Algeria. Its altitudinal range is not known.

Population There is no information on its current population status.

Habitat and Ecology It is presumed to be largely aquatic and dependent upon cisterns, ponds, swamps and other wetlands. It is not clear if this salamander uses terrestrial habitats. It presumably has a similar breeding strategy to *P. nebulosus*, depositing its eggs, and completing larval development, within water.

Major Threats There is no direct information on threats to the species. However, if the threats are similar to those facing *P. nebulosus*, then it is probably threatened by pollution of natural breeding ponds (dayas), as a result of the expansion and intensification of agriculture (livestock farming).

Conservation Measures It is not known whether it occurs in any protected areas. This species is in urgent need of further survey work to establish its current population status.

Notes on taxonomy: Carranza and Wade (2004) showed that most of the animals from North Africa previously referred to as *Pleurodeles poireti* actually belong to *P. nebulosus*, true *P. poireti* being restricted to the Edough Peninsula in northern Algeria.

Bibliography: Carranza, S. and Wade, E. (2004), Salvador, A. (1996), Schleich, H.H., Kästle, W. and Kabisch, K. (1996), Thorn, R. (1968), Thorn, R. and Raffaëlli, J. (2001), Veith, M. *et al.* (2004)

Data Providers: Philippe Geniez, Jose Mateo

POIRET'S NEWT**VU** *Salamandra algira* Bedriaga, 1883**Vulnerable B1ab(iii)+2ab(iii)****Order, Family:** Caudata, Salamandridae**Country Distribution:** Algeria, Morocco, Spain**Current Population Trend:** Decreasing

© Wouter Beukema

Geographic Range This species is restricted to north-west Africa, with a fragmented range in parts of northern Morocco (Rif and Moyen Atlas), Ceuta (Spain), and northern Algeria (coastal mountain ranges). There is an uncertain record (based on a museum voucher specimen) of this species from northern Tunisia; the presence of *Salamandra algira* in Tunisia requires further verification. The species has an altitudinal range of approximately 80-2,450m asl.

Population This is generally a very rare species, especially in Algeria. However, it is locally common in the central

and western Rif Mountains in Morocco. It is possibly extinct on Beni Snassen Mountain in north-eastern Morocco.

Habitat and Ecology It is generally restricted to humid montane forests where it is found under stones and beneath roots in Cedar (*Cedrus*) and Oak (*Quercus*) woodland. It has also been observed in caves in parts of its range. This salamander appears to be ovoviviparous over most of its distribution (8-50 eggs are produced), but viviparous in the Tangitana region of Morocco. In general, the females produce 15-16 larvae; the larvae may be deposited in either cisterns or small streams.

Major Threats The species occurs in small relict populations that are heavily threatened by deforestation, overgrazing by domestic livestock, and channelization of water sources for irrigation. The species is locally threatened by mortality on roads, and there is some collection of this species in small numbers for the international pet trade; further investigations are needed to determine the impact of trade on populations.

Conservation Measures The species is listed on Appendix III of the Berne Convention and is protected by national legislation in Spain. It is not known if this species occurs in any protected areas.

Notes on taxonomy: Recent morphological, ecological and genetic studies on *Salamandra algira* indicate that there are at least three differentiated phenotypes and genotypes with parapatric distribution. *Salamandra algira* must be considered a complex of more than one species. A taxonomic revision of this complex is needed (Bogaerts and Donaïre-Barroso 2003).

Bibliography: Arano, B. *et al.* (1998), Bogaerts, S. (2000), Bogaerts, S. and Donaïre-Barroso, D. (1999), Bogaerts, S. and Donaïre-Barroso, D. (2003), Bons, J. (1972), Bons, J. and Geniez, P. (1996), Donaïre Barroso, D. and Bogaerts, S. (2001), Donaïre Barroso, D., Bogaerts, S. and Herbert, D. (2001), Donaïre, D. and Bogaerts, S. (2003), Martínez, J.F., Ruiz, J.L. and Mohamed, L. (1997), Mateo, J.A. *et al.* (2003), Pasteur, G. and Bons, J. (1959), Pleguezuelos, J.M. (1997), Pleguezuelos, J.M., Márquez, R. and Lizana, M. (2002), Salvador, A. (1996), Schleich, H.H., Kästle, W. and Kabisch, K. (1996), Steinfartz, S., Veith, M. and Tautz, D. (2000), Thorn, R. (1968)

Data Providers: David Donaïre-Barroso, Iñigo Martínez-Solano, Alfredo Salvador, Mario García-París, Ernesto Recuero Gil, Tahar Slimani, El Hassan El Mouden, Philippe Geniez, Tahar Slimani, Jose Mateo

NORTH AFRICAN FIRE SALAMANDER**VU** *Salamandra lanzai* Nascetti, Capula and Bullini, 1988**Vulnerable D2****Order, Family:** Caudata, Salamandridae**Country Distribution:** France, Italy**Current Population Trend:** Stable

© Jeroen Speybroeck

Geographic Range This species occurs only in a very small area of the western Alps on the border of Italy and France. It is distributed in the valleys of Po, Pellice, and Germanasca in Italy, and in the Guil Valley in France. It has also been reported to be (or have been) present on the Maritime Alps, in Cuneo Province. This finding is based upon a single specimen housed in Florence Museum, and with a label indicating its provenance as "Antracque", which is a mistake for Entracque, Valdieri (Cuneo), Italy. The species has not been found again at Entracque or nearby sites. Ribéron (2003) concluded that the species' distribution is decreasing, but this assertion is based solely on the

Entracque specimen. The altitudinal range is from 1,200m (perhaps less) to around 2,600m asl; the altitude record of 2,800m asl and corresponding locality (Lago delle Forciolline), is most likely erroneous (Andreone and Sindaco 1999; Vences *et al.* 2003b; Andreone *et al.* 2004).

Population The small known populations of this species are considered to be stable. The Germanasca Valley (Torino Province) population was reduced during 2000 because of habitat changes caused by unusually high levels of precipitation.

Habitat and Ecology It is associated with rocky alpine meadows and scree slopes, often close to small streams, usually above the tree line. The known sites of this species at lower elevations may have mixed or coniferous forest. It gives birth to one to six fully metamorphosed young on land (Noellert and Noellert 1992), and is not associated with water. This species hides beneath rocks and stones when inactive and may be found in pastureland and other slightly modified habitats.

Major Threats While there are no major threats to this species, some localized development for tourism might be disturbing the habitat.

Conservation Measures It is listed on Annex IV of the EU Natural Habitats Directive and on Appendix II of the Berne Convention under *Salamandra atra*. There is a need to maintain traditional forest and alpine management within the species' range. It is found in protected areas in both Italy and France.

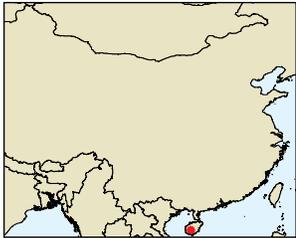
Bibliography: Andreone, F. (1992a), Andreone, F. *et al.* (2004), Andreone, F. and Luiselli, L.M. (2000), Andreone, F. and Sindaco, R. (1999), Andreone, F., Clima, V. and De Michelis, S. (1999), Bergo, P. and Andreone, F. (2002), Böhm, W., Grossenbacher, K. and Thiesmeier, B. (1999), Gasc, J.-P. *et al.* (eds.) (1997), Griffiths, R.A. (1996), Miaud, C. *et al.* (2001), Nascetti, G. *et al.* (1989), Noellert, A. and Noellert, C. (1992), Ribéron, A. (2003), Ribéron, A. *et al.* (2001), Ribéron, A. and Miaud, C. (2000), Steinfartz, S., Veith, M. and Tautz, D. (2000), Thorn, R. (1968), Vences, M. *et al.* (2003b)

Data Providers: Franco Andreone, Claude Miaud, Marc Cheylan, Claudia Corti, Philippe Geniez

LANZA'S ALPINE SALAMANDER

EN *Tylotriton hainanensis* Fei, Ye and Yang, 1984

Endangered B1ab(iii)+2ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: China
Current Population Trend: Decreasing



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Geographic Range This species is only known from Wuzhishan, Diaoluoshan, and Jianfengling in Hainan Province, China, from 770-950m asl.

Population It is uncommon.

Habitat and Ecology It inhabits forests and breeds in pools and seepage pools. The larvae develop in water.

Major Threats The major threat to this species is habitat loss and degradation due to agriculture, clear-cutting and infrastructure development for tourist activities.

Conservation Measures All three known locations of this species are within protected areas: Wuzhishan, Jianfengling and Diaoluoshan National Nature Reserves.

Notes on taxonomy: The taxonomic validity of this species is disputed.

Bibliography: Fei, L. *et al.* (1999), Fei, L., Ye, C.-Y. and Yang, R.S. (1984), MacKinnon, J. *et al.* (1996), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993)

Data Providers: Shi Haitao, Bosco Chan

HAINAN KNOBBY NEWT**VU** *Tylotriton kweichowensis* Fang and Chang, 1932

Vulnerable B2ab(iii,v)
Order, Family: Caudata, Salamandridae
Country Distribution: China
Current Population Trend: Decreasing



© Henk Wallays



Geographic Range This species is found in western Guizhou and north-eastern Yunnan provinces, China, from 1,500-2,400m asl.

Population There is little information on the population of this species, but it is probably common in its known localities. However, it is believed to be in decline.

Habitat and Ecology It inhabits low shrub and grass covered hills. Breeding and larval development take place in pools and ponds.

Major Threats Habitat destruction and degradation caused by industry (brick factories) and mining are major threats to this species. It is also collected for use in traditional Chinese medicine. A small number of individuals are also traded in the international pet markets.

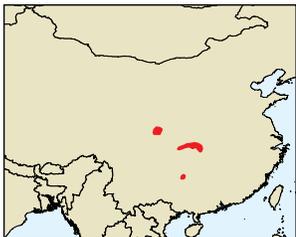
Conservation Measures This species is a Class II State Major Protected Wildlife in China. Its range overlaps with a few small protected areas. It is bred in captivity in both China and Europe.

Bibliography: Fei, L. *et al.* (1999), MacKinnon, J. *et al.* (1996), Wu, L., Dong, Q. and Xu, R.-H. (1987), Yang, D.-T. (1991b), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993), Zhao, E.-M. (1998)

Data Providers: Yang Datong, Lu Shunqing, Wu Guanfu

RED-TAILED KNOBBY NEWT**VU** *Tylotriton wenxianensis* Fei, Ye and Yang, 1984

Vulnerable B2ab(iii)
Order, Family: Caudata, Salamandridae
Country Distribution: China
Current Population Trend: Decreasing



© Xie Feng



Geographic Range This species is found in Wenxian in southern Gansu, Pingwu and Qingchuan in northern Sichuan, Leishan in eastern Guizhou, Zhongxian, Yunyang, Fengjie counties of Chongqing municipality and Shangzhi county of Hunan Province, China, from 650-2,500m asl.

Population It is not a common species, and is known from only four locations.

Habitat and Ecology It inhabits forests near streams and pools in hilly areas. It probably breeds in pools.

Major Threats The major threat is habitat loss and degradation due to smallholder farming activities and subsistence wood collection.

Conservation Measures Much of the range of this species is within protected areas.

Bibliography: Fei, L. *et al.* (1999), Fei, L., Ye, C.-Y. and Yang, R.S. (1984), MacKinnon, J. *et al.* (1996), Wang, X.-T. (1991), Ye, C.-Y., Fei, L. and Hu, S.Q. (1993)

Data Providers: Fei Liang, Ye Changyuan

WENXIAN KNOBBY NEWT**GYMNOPHIONA****CAECILIIDAE****CR** *Boulengerula niedeni* Müller, Measey, Loader and Malonza, 2005

Critically Endangered B1ab(iii)
Order, Family: Gymnophiona, Caeciliidae
Country Distribution: Kenya
Current Population Trend: Decreasing



© John Measey



Geographic Range This species is known only from c. 1,080 m on Sagala Hill, in the Taita Hills, south-eastern Kenya. This mountain block is isolated from other similar habitat by the arid Tsavo plains, and so the range of this species is believed to be restricted to the c. 29km² within this block that are above 1,000 m asl.

Population The species is considered to be common in suitable habitats within its small range. At one site, 16 specimens were dug up in one hour in an area of 30m².

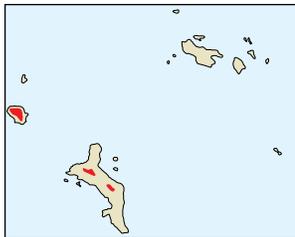
Habitat and Ecology Presumably originally a montane forest species, all specimens found were dug up from shambas (smallholder farms), usually in soil underneath banana plants or under decomposing organic debris. The species thus seems tolerant of small-scale farming activities. However, the density of animals is much higher near streams than in shambas away from streams, so the area of optimal habitat is very small. The species appears to be completely absent from eucalyptus plantations (which cover much of the Sagala Hill area), and is also missing from the small remaining area of natural forest on the ridge of Sagala Hill (perhaps because it is above the elevation level of this species, or because of the absence of suitable streamside habitat). It is presumed to breed by direct development.

Major Threats Very little natural forest remains on Sagala Hill, but it is not clear whether or not these caecilians might sometimes benefit from anthropogenically disturbed habitat. Although tolerant of small-scale farming activities, the continued expansion of these has in recent years led to the removal of streamside vegetation. This has resulted in severe flooding, and an increase in the erosion of river banks (with serious loss of soil) where this species is known to breed, and occur at its highest densities. Pesticides might also pose a threat.

Conservation Measures This species is not known from any protected areas. It is an urgent priority to restore the vegetation along stream banks in order to minimize erosion and loss of soil. Plans to remove the eucalyptus plantations in the area might be beneficial for the species, providing that this is done carefully, and does not result in even more widespread soil erosion.

Bibliography: Müller, H. *et al.* (2005)

Data Providers: John Measey, Patrick Malonza, Hendrik Mueller

EN *Grandisonia brevis* (Boulenger, 1909)**Endangered B1ab(iii)+2ab(iii)****Order, Family:** Gymnophiona, Caeciliidae**Country Distribution:** Seychelles**Current Population Trend:** Decreasing

Geographic Range This species from the Seychelles occurs in a few scattered localities on Mahé Island, where it seems to be restricted to higher elevations (above 400m asl), and on Silhouette Island (where it is widespread above 100m asl).

Population It appears to be uncommon, and is only rarely collected.

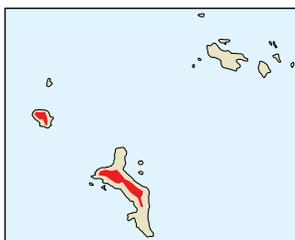
Habitat and Ecology It lives in rainforest, where it burrows in moist soil and leaf-litter. It is not encountered in highly disturbed sites, so appears not to be very adaptable to habitat change. It probably breeds by larval development in streams and pools, but this has not been confirmed.

Major Threats The main threat is habitat degradation, mainly due to fire and invasive species.

Conservation Measures It occurs in one protected area on Mahé and at the site of a conservation project on Silhouette.

Bibliography: Gower, D.J. and Wilkinson, M. (2005), Hass, C.A., Nussbaum, R.A. and Maxson, L.R. (1993), Hedges, S.B., Nussbaum, R.A. and Maxson, L.R. (1993), Nussbaum, R.A. (1984), Nussbaum, R.A. and Ducey, P.K. (1988), Taylor, E.H. (1968)

Data Providers: Ronald Nussbaum, Justin Gerlach

VU *Praslinia cooperi* Boulenger, 1909**Vulnerable D2****Order, Family:** Gymnophiona, Caeciliidae**Country Distribution:** Seychelles**Current Population Trend:** Unknown

Geographic Range This species from the granitic Seychelles occurs on Mahé and Silhouette Islands. An old record for Praslin might be erroneous, and is not mapped. On Mahé and Silhouette, it has been found only above 280m asl and usually higher in areas that are relatively undisturbed. It is known from only ten localities (excluding Praslin). The area of occupancy is estimated to be less than 20km².

Population It is not a common species and it is rarely found.

Habitat and Ecology It lives in relatively undisturbed, usually forested, sites. It burrows in damp soil and leaf-litter. It is not recorded from near urban areas or houses. It probably breeds by larval development in streams and pools, but this is not confirmed.

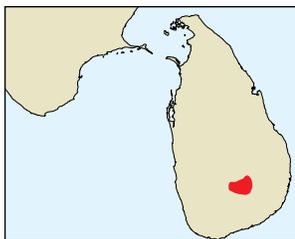
Major Threats The main threat is habitat degradation, mainly due to fire and invasive species.

Conservation Measures It occurs in the Morne Seychellois National Park, and in the site of a conservation project on Silhouette. There is a need for close monitoring of the population status of this species given its very limited range.

Bibliography: Gower, D.J. and Wilkinson, M. (2005), Hass, C.A., Nussbaum, R.A. and Maxson, L.R. (1993), Hedges, S.B., Nussbaum, R.A. and Maxson, L.R. (1993), Nussbaum, R.A. (1984), Nussbaum, R.A. and Ducey, P.K. (1988), Taylor, E.H. (1968)

Data Providers: Ronald Nussbaum, Justin Gerlach

ICHTHYOPHIIDAE

VU *Ichthyophis orthoplicatus* Taylor, 1965**Vulnerable B1ab(iii)****Order, Family:** Gymnophiona, Ichthyophiidae**Country Distribution:** Sri Lanka**Current Population Trend:** Unknown

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Geographic Range This species is endemic to the mountains of south-central Sri Lanka. It has been recorded at elevations between 460 and 1,800m asl.

Population There is no information on the population status of this species, but it does not appear to be common.

Habitat and Ecology It is a subterranean species present in evergreen forests, rubber plantations, tea plantations, paddy fields, rural gardens and farms, wetlands (boggy areas), and cattle pastureland. However, it appears to be less adaptable than *Ichthyophis glutinosus*. The adults are often found in humus. It is assumed to be oviparous with terrestrial eggs and aquatic larvae.

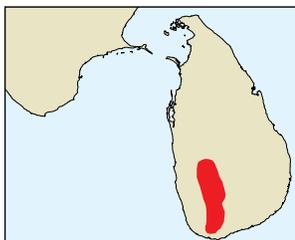
Major Threats The species might be threatened locally by extreme habitat loss, due to agroindustry and clear cutting, and agro-chemical pollution (land and water-based).

Conservation Measures It has been recorded from the Namunakula Reserve Forest and Horton Plains National Park.

Notes on taxonomy: Specimens from Welegama resemble *Ichthyophis glutinosus*, but appear to be more closely related to *I. orthoplicatus*. They could represent an undescribed cryptic species (Gower *et al.* 2005).

Bibliography: Breckenridge, W.R. (1994), Dutta, S.K. and Manamendra-Arachchi, K. (1996), Gower, D.J. *et al.* (2005), Gower, D.J. and Wilkinson, M. (2005), Nussbaum, R.A. and Gans, C. (1980), Seto, T. and Nussbaum, R.A. (1976), Taylor, E.H. (1965), Taylor, E.H. (1968)

Data Providers: Kelum Manamendra-Arachchi, Anslém de Silva, David Gower, Mark Wilkinson, Oommen V. Oommen, Mark Wilkinson, David Gower, Alex Kupfer

VU *Ichthyophis pseudangularis* Taylor, 1965**Vulnerable B1ab(iii)****Order, Family:** Gymnophiona, Ichthyophiidae**Country Distribution:** Sri Lanka**Current Population Trend:** Unknown

Geographic Range This species is endemic to south-western Sri Lanka. It has been recorded at elevations of 20-1,525m asl.

Population It appears to be less common than *Ichthyophis glutinosus*. It is not known from many specimens.

Habitat and Ecology It is a subterranean species present in forests, rubber plantation areas, paddy fields, rural gardens and farms, wetlands (boggy and muddy areas), and pastureland. Adults are often found in humus and other rotten vegetation. It is oviparous with terrestrial eggs and aquatic larvae in streams.

Major Threats The species might be threatened locally by extreme habitat loss, due to agroindustry, and agro-chemical pollution (land and water based).

Conservation Measures It has been recorded from Peak Wilderness Forest Reserve and Sinharaja Forest Reserve, which is a World Heritage Site.

Bibliography: Dutta, S.K. and Manamendra-Arachchi, K. (1996), Gower, D.J. and Wilkinson, M. (2005), Nussbaum, R.A. and Gans, C. (1980), Taylor, E.H. (1965), Taylor, E.H. (1968)

Data Providers: Kelum Manamendra-Arachchi, Anslém de Silva, David Gower, Mark Wilkinson, Oommen V. Oommen