

Comment on “Status and Trends of Amphibian Declines and Extinctions Worldwide”

Threatened species lists are often used to evaluate the conservation status of species and habitats. Specialists are always consulted to yield and update lists and, as a rule, their opinions are respected and properly used. The lists produced are, therefore, reliable documents based on all information available. However, lists alone are being used to guide conservation efforts and to assess the health of the environment. One of the most serious problems regarding the misuse of such lists concerns data interpretation (1).

Stuart *et al.* (2) recently reported results from the Global Amphibian Assessment (GAA) (3), which indicate that 1856 species are being threatened worldwide [also see (4)]. However, the results published for Brazilian species largely differ from the categorization indicated by specialists (3, 5) [Science Online Material (SOM) Text]. Specialists indicate 24 Brazilian species as threatened, whereas the GAA shows 110 species (3, 5) (Table 1 and SOM Text). This overestimation occurred as a result of the misuse of IUCN–The World Conservation Union Red List criteria (6) during a “reevaluation” later performed by the GAA coordinating team (3, 5) (SOM Text).

The GAA team changed the specialists’ categorization of 95 Brazilian species by using the criteria based on geographic range (3). However, the GAA ignored the IUCN recommendation of using different thresholds for distribution range depending on the taxa in question and used the default values instead (6). These values were set by using taxa with broad and well-known distribution ranges (e.g., mammals and birds) and cannot be applied to animals in general without adjustments. The minimal area for a tiger, for example, is almost an endless space for a tiny leaf-litter frog. Moreover, the current knowledge on species’ distribution hinders this kind of assessment. Brazil houses the richest amphibian fauna of the world, with 776 species (7). Almost half of all species were described in the past 40 years (Fig. 1) (7). Before 1999, 101 species were known only from their type locality (the place where the original specimens were found). From 1999 to 2004, 29 species had their distributions expanded, but the description or revalidation of 86 species increased the number of restricted species to 109 (SOM Text). In just the past 2 years, four

species have been rediscovered (8–11). Even in areas that are frequently explored, new species are still being discovered (12–15). If the available data on taxonomy and distribution of Brazilian amphibians are deemed enough for making a detailed assessment of their conservation status, why do wider range extensions and many new species continue to be described?

Another problem with the Stuart *et al.* (2) analysis is related to the estimates of “rapidly declining” species (16). The use of threatened species lists to indicate changes in the state of populations is reliable only when comprehensive data on well-studied groups are maintained and continuously updated, thus allowing robust comparisons over time and space (17). That is not the case with Brazilian amphibians, as exemplified by two “rapidly declining species” indicated by the GAA (16). *Bokermannohyla claresignata* is known to exist in Serra dos Órgãos and Serra da Bocaina (18). However, this species is difficult to find because of its habit of occupying epiphyte bromeliads attached to tall, slender trees (18). Furthermore, recent extensive surveys at Serra da Bocaina have never been conducted, so it

is currently impossible to estimate population reductions. *Scinax heyeri* is known only from the four type specimens (specimens that identify a species) (19, 20). How can we evaluate its population trend if there is no information available? If the criterion used to include *S. heyeri* among the rapidly declining species were strictly followed, at least 55 other species of Brazilian amphibians known only from the type specimens (SOM Text) should also be considered as rapidly declining.

The existence of many different threatened species lists could have serious implications. First, multiple lists may affect the credibility of individual ones. Second, the extensive application of threatened species lists could cause the override of scientifically based criteria by economic or social criteria (17). Funding programs for research on threatened species are commonly carried out, but programs for “data-deficient” (DD) species have never been implemented, contradicting IUCN’s recommendation to give them the same degree of attention as threatened taxa (16). Using lists as the only tool for setting resource allocation priorities and favoring threatened species over DD forms may lead researchers to “inflate” the lists. The number of DD species is very large (22.5% of all species) (2), making it impossible to evaluate the real status of amphibians. Researchers should demand and support the creation of funding programs that focus on studying the taxonomy and distribution of DD species as well as threatened species. Third, in countries with restrictive laws concerning the study of wildlife, like Brazil, an

Table 1. Results of the three threatened amphibian lists available for Brazil. EX, extinct; CR, critically endangered; EN, endangered; VU, vulnerable; NT, near threatened; LC, least concern; DD, data deficient.

Category	Government list	Workshop Brazil	GAA evaluators
EX	1	1	1
CR	9	6	20
EN	3	6	38
VU	3	12	52
NT	—	21	21
LC	—	477	437
DD	90	205	159

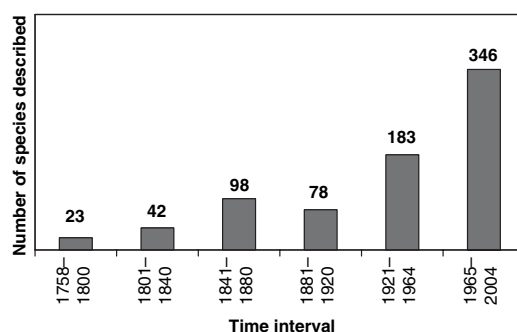


Fig. 1. Number of descriptions of amphibian species occurring in Brazil separated into ~40-year intervals. Almost half of all species were described between 1965 and 2004.

inflated list may cause a reduction in the study of threatened species, eventually precluding a realistic evaluation of their conservation status.

Gärdenfors (*1*) noted that the production of threatened species lists following the Red List Criteria would lead to a paradoxical situation: Biologists would not be needed to produce lists, because the lists could be produced by bureaucrats or other interested parties. However, if the task were left to nonspecialists, distortions could arise as a result of lack of experience and/or conflict of interest. Enhancement of the bidirectional transfer of information between specialists and conservationists could avoid misclassifications on threatened species lists.

The extensive problems observed on the categorization of Brazilian species put the conclusions of the GAA study in question. Megadiversity and high levels of endemism are characteristics shared by Brazil and other South American countries. Assuming that the data of all these other countries were also analyzed based on inadequate geographic range thresholds, we surmise that the number of threatened species worldwide has been overestimated. The results of the GAA study should be reviewed following IUCN's recommendation for the adequacy of thresholds. The use of the criteria as adopted by the GAA is a straitjacket that has artificially forced a great number of healthy species/populations into threatened categories. A proper assessment should take into account the ecological specificities of naturally endemic species that occupy a more restricted area, so as to mirror more realistically what probably is or is not a threatened species.

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References and Notes

1. U. Gärdenfors, *Trends Ecol. Evol.* **16**, 511 (2001).
2. S. N. Stuart et al., *Science* **306**, 1783 (2004).
3. IUCN Species Survival Commission, Conservation International Center for Applied Biodiversity Science, NatureServe, *IUCN Global Amphibian Assessment* (www.globalamphibians.org) (2004).
4. B. E. Young, S. N. Stuart, J. S. Chanson, N. A. Cox, T. M. Boucher, "Disappearing Jewels: The Status of NewWorld Amphibians" (NatureServe, Arlington, Virginia, 2004) (www.natureserve.org/publications/disappearing_jewels.pdf).
5. A *Global Species Assessment*, J. E. M. Baillie, C. Hilton-Taylor, S. N. Stuart, Eds. (IUCN, Gland, Switzerland, and Cambridge, UK, 2004).
6. IUCN—The World Conservation Union, *IUCN Red List Categories and Criteria* (IUCN, Gland, Switzerland, and Cambridge, UK, 2001).

7. Sociedade Brasileira de Herpetologia, *Lista de espécies de anfíbios do Brasil* (www.sbherpetologia.org.br) (Sociedade Brasileira de Herpetologia, 2004).
8. R. N. Feio, B. V. S. Pimenta, D. L. Silvano, *Amphibia-Reptilia* **24**, 108 (2003).
9. M. Dixo, *Phyllomedusa* **3**, 77 (2004).
10. U. Caramaschi, O. L. Peixoto, M. T. Rodrigues, *Arq. Mus. Nac.* **62**, 191 (2004).
11. H. Zaher, E. Aguiar, J. P. Pombal Jr., *Arq. Mus. Nac.*, in press.
12. C. A. G. Cruz, U. Caramaschi, A. G. Dias, *Bol. Mus. Nac. N.S. Zool.* **434**, 1 (2000).
13. L. B. Nascimento, C. F. B. Haddad, J. P. Pombal Jr., *J. Zool.* **254**, 4 (2001).
14. C. F. B. Haddad, I. Sazima, *Zootaxa* **479**, 1 (2004).
15. A. Pugliese, J. P. Pombal Jr., I. Sazima, *Zootaxa* **688**, 1 (2004).
16. For further details, refer to the Supporting Online Material for (2).
17. H. P. Possingham et al., *Trends Ecol. Evol.* **17** (11), 505 (2002).
18. B. Lutz, *Brazilian Species of Hyla* (Univ. of Texas Press, Austin, 1973).
19. O. L. Peixoto, P. Weygoldt, *Senck. Biol.* **68** (1/3), 1 (1987).
20. D. R. Frost, *Amphibian Species of the World: An Online Reference*; <http://research.amnh.org/herpetology/amphibia/index.html> (American Museum of Natural History, New York, 2004).
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Supporting Online Material

www.sciencemag.org/cgi/content/full/309/5743/1999b/DC1
SOM Text
Tables S1 to S5
Appendices S1 to S3
References and Notes

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Supporting Online Material for

Comment on “Status and Trends of Amphibian Declines and Extinctions Worldwide”

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Supporting Online Material

Comment on "Status and Trends of Amphibian Declines and Extinctions Worldwide" by Pimenta *et al.*

1. The “2003 Official List of the Brazilian Fauna Threatened Species - Amphibians”: methods and main results.

After several earlier meetings, that started in August 1999, to establish the methods for gathering data, the “2003 Official List of the Brazilian Fauna Threatened Species - Amphibians” was finally produced during a workshop in Belo Horizonte, state of Minas Gerais, Brazil, from 9 to 12 December, 2002. This list was produced by a group of invited researchers that attended the meeting (Table S1). This group analyzed the situation of all known Brazilian amphibians, as well as the suggestions made via Web by specialists interested in contributing to the preparation of the list. Prior to the meeting, any interested specialist could enter the web and suggest one or more species they considered to be threatened. Forty-eight species were suggested as threatened in this preliminary list according to the evaluation of 18 specialists (Table S2).

The IUCN Red List Categories and Criteria were tentatively used, but they showed no precision to categorize amphibians due to the extensive lack of information on distribution, taxonomy, and habits of most species. Knowledge on these issues is being improved every year, but is still far from good. The information gathered on the last six years (1999-2004) illustrates this situation very well: among the 98 species previously known only from their type-locality, 29 species had their distributions expanded on this period (Appendix S1). However, the description or revalidation of 86 species slightly increased the number of restricted species, which is currently 109 (Appendix S2). Additionally, a large number of species is known only from the type-specimens (Appendix S3), which does not provide data for evaluation of their status or population trends. For these reasons, a conservative approach was adopted, listing species as threatened only if evidence for this was available.

More than 700 amphibian species known for Brazil were analyzed. Ninety were considered as “Data Deficient” (DD). One species of anuran was considered as “Near Threatened” (NT), three species as “Vulnerable” (VU), three as “Endangered” (EN), nine as “Critically Endangered” (CR), and one as “Extinct” (EX) (Table S3, S1).

The high number of species considered as DD is a consequence of the extensive lack of information on distribution, taxonomy, and habits of most species. It is important to emphasize that several DD species may be in fact “least concern” (LC), NT, VU, EN, CR, or even EX. Therefore, a great effort is necessary in order to evaluate the real situation of the DD species in nature. Some CR species may be extinct, but intensive field work is necessary to confirm this supposition.

All amphibians considered as NT, VU, EN, CR, and EX belong to the order Anura (frogs). The family Leptodactylidae showed the highest number of threatened species (Table S4). Southeastern Brazil is the region with the greatest amount of species that deserve attention (Table S5).

All species considered as NT, VU, EN, CR, and EX, as well as the majority of the DD species belong to the Atlantic Forest formation. The explanation for this pattern is the

high species richness in the Atlantic Forest associated to the almost complete destruction of this ecosystem, promoted by men in the last century. It is almost certain that the destruction of this ecosystem is the main factor responsible for putative population declines, extinction threats, and extinction of many species. In addition, other human activities, like pollution, climatic changes, disease propagation, and others, are probably contributing to the elevation of the extinction risk of the amphibian species. Another explanation for this pattern could be that the Atlantic forest occurs in southeastern and southern Brazil, which are the best studied regions in the country as a consequence of the high concentration of Universities and research centers.

Since 1992, when the previous “Official List of the Brazilian Fauna Threatened Species” was prepared, our knowledge about amphibians has improved, which contributed to the refinement of the present list. However, it is important to emphasize that basic studies on taxonomy and geographic distribution of amphibians are still needed. Without a reasonable comprehension of taxonomy it is not possible to access the real diversity of organisms, which makes conservation efforts difficult or almost impossible. The lack of information on geographic distribution certainly inflates the DD list in detriment of all other categories.

2. The disagreement between Brazilian specialists and the GAA coordinating team

A few months after the workshop that yielded the Brazilian Official List, 27 Brazilian specialists (not 30 as published (S2): Célio F.B. Haddad, José P. Pombal Jr., and Ulisses Galatti could not participate) met again during one of the GAA workshops, and decided to adopt the same approach used in the Brazilian List to categorize species, exposing their reasons to the GAA coordinating team. Coordinators allowed specialists to categorize amphibian species according to the current knowledge, without strictly following Red List criteria. The results of these analyses were later evaluated, through a “consistency check”, by a team of non-specialists (S2). Brazilian specialists were told, prior to the publication of the GAA results, that this procedure would change the categorization of species where the evaluators found that the IUCN Red List criteria were not “consistently” applied. Brazilian specialists expressed their disagreement through a letter sent to the GAA Coordinating team by the Brazilian Society of Herpetology (SBH). The Coordinating team proposed the inclusion of a note for each species where IUCN Red List criteria were not rigorously applied, and again the SBH refused to accept their attempt to change the categorizations agreed at the GAA workshop. However, the GAA results were published with the addition of the notes (S3, S4). The GAA evaluators, a team of non-specialists, contested and changed the categorization of 114 species (Table S1) through these notes. Unfortunately, no Brazilian specialist was heard during the “consistency check”, since none of their names appear among the evaluation team. Notes were added only to Brazilian species (S3, S4), and published without any agreement having been reached. The 2004 IUCN Red List, conversely, respected the opinion of Brazilian specialists and published the results that were agreed to at the workshop (S5).

Table S1 - Invited researchers that attended to the “2003 Official List of the Brazilian Fauna Threatened Species - Amphibians”

Carlos A. G. Cruz - Museu Nacional/UFRJ, Rio de Janeiro, RJ
Célio F. B. Haddad (Coordinator) - Universidade Estadual Paulista, Rio Claro, SP
Débora Silvano - Ministério do Meio Ambiente, Brasília, DF
Diva Ma. Borges-Nojosa - Universidade Federal do Ceará, Fortaleza, CE
Jaime Bertoluci - Escola Superior de Agricultura Luiz de Queiroz, USP, Piracicaba, SP
José P. Pombal Jr. - Museu Nacional/UFRJ, Rio de Janeiro, RJ
Luciana Barreto Nascimento - Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, MG
Magno Segalla - Mater Natura – Instituto de Estudos Ambientais, Curitiba, PR
Paulo C. A. Garcia - Universidade de Mogi das Cruzes, Mogi das Cruzes, SP
Renato N. Feio - Universidade Federal de Viçosa, Viçosa, MG
Rogério P. Bastos - Universidade Federal de Goiás, Goiânia, GO

Table S2 - Specialists who contributed via Web indicating names of species to be evaluated as threatened.

Web Collaborator	Institution
Carlos Alberto Gonçalves da Cruz	Museu Nacional/UFRJ, Rio de Janeiro, RJ
Célio F. B. Haddad	Universidade Estadual Paulista, Rio Claro, SP
Cynthia Peralta de Almeida Prado	Universidade Estadual Paulista, Rio Claro, SP
Denise de C. Rossa-Feres	Universidade Estadual Paulista, São José do Rio Preto, SP
Débora Leite Silvano	Ministério do Meio Ambiente, Brasília, DF
Diva Maria Borges-Nojosa	Universidade Federal do Ceará, Fortaleza, CE
Eloisa M. Wistuba	Centro Universitário Campos de Andrade, Curitiba, PR
Itamar Alves Martins	Universidade de Taubaté, Taubaté, SP
Jaime Bertolucci	Escola Superior de Agricultura Luiz de Queiroz, USP, Piracicaba, SP
Luciana Barreto Nascimento	Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, MG
Luciano Mendes Castanho	Pontifícia Universidade Católica, Sorocaba, SP
Magno Vicente Segalla	Mater Natura-Instituto de Estudos Ambientais, Curitiba, PR
Marcelo Felgueiras Napoli	Universidade Federal da Bahia, Salvador, BA
Paulo C. A. Garcia	Universidade de Mogi das Cruzes, Mogi das Cruzes, SP
Renato Neves Feio	Universidade Federal de Viçosa, Viçosa, MG
Rodrigo Lingnau	Universidade Federal de Goiás, Goiânia, GO
Rogério Pereira Bastos	Universidade Federal de Goiás, Goiânia, GO
Ulisses Caramaschi	Museu Nacional/UFRJ, Rio de Janeiro, RJ

Table S3 - Near threatened (NT), threatened (VU, EN, and CR), and extinct (EX) species of the “2003 Official List of the Brazilian Fauna Threatened Species - Amphibians”

Species	Category	Brazilian states where it occurs
<i>Adelophryne baturitensis</i>	VU	CE
<i>Adelophryne maranguapensis</i>	EN	CE
<i>Bokermannohyla izecksohni</i>	CR	SP
<i>Holoaden bradei</i>	CR	MG, RJ
<i>Hylomantis granulosa</i>	CR	PE
<i>Hypsiboas cymbalum</i>	CR	SP
<i>Melanophryniscus dorsalis</i>	VU	RS, SC
<i>Melanophryniscus macrogranulosus</i>	CR	RS
<i>Odontophrynus moratoi</i>	CR	SP
<i>Paratelmatobius lutzii</i>	CR	MG
<i>Phrynomedusa fimbriata</i>	EX	SP
<i>Phyllomedusa ayeaye</i>	CR	MG
<i>Physalaemus soaresi</i>	EN	RJ
<i>Scinax alcatraz</i>	CR	SP
<i>Thoropa lutzii</i>	VU	ES, MG, RJ
<i>Thoropa petropolitana</i>	EN	ES, RJ
<i>Thoropa saxatilis</i>	NT	RS, SC

Table S4. Number of anuran species considered as NT, Threatened (VU, EN, and CR), and EX by the “2003 Official List of the Brazilian Fauna Threatened Species - Amphibians”.

Families	NT	Threatened	EX
Bufonidae	0	2	0
Hylidae	0	5	1
Leptodactylidae	1	8	0
Totals	1	15	1

Table S5. Number of anuran species considered as NT, Threatened (VU, EN, and CR), and EX, distributed in the five Brazilian regions. Extracted from the results of the “2003 Official List of the Brazilian Fauna Threatened Species - Amphibians”.

Regions	NT	Threatened	EX
North	0	0	0
Northeastern	0	3	0
Central Brazil	0	0	0
Southeastern	0	10	1
South	1	2	0
Totals	1	15	1

Appendix S1 - Species whose distribution ranges were expanded in the last six years (1999-2004):

Aparasphenodon bokermanni (S6), *Aplastodiscus ehrhardti* (S7), *Aplastodiscus weygoldti* (S8), *Bokermannohyla carvalhoi* (S9), *Bokermannohyla ibitipoca* (S10), *Cycloramphus migueli* (S11), *Dendropsophus nahdereri* (S12), *Eleutherodactylus bilineatus* (S13), *Holoaden bradei* (S14), *Hylodes heyeri* (S15, S16), *Hylodes sazimai* (S17), *Hylomantis aspera* (S18), *Hylomantis granulosa* (S19), *Hyophryne histrio* (S20), *Hypsiboas atlanticus* (S21), *Leptodactylus viridis* (S22), *Paratelmatobius gaigeae* (S23), *Phasmahyla exilis* (S24), *Phasmahyla jandaia* (S25), *Phyllodytes acuminatus* (S26), *Phyllodytes kautskyi* (S27), *Phyllodytes melanomystax* (S28), *Physalaemus aguirrei* (S29), *Proceratophrys schirchi* (S30), *Rhynchophryne proboscidea* (S31), *Scinax agilis* (S32), *Scinax canastrensis* (S33), *Sphaenorynchus palustris* (S34), and *Sphaenorhynchus prasinus* (S35).

Appendix S2 - Species currently known only from the type-locality:

Aplastodiscus musicus, *Aplastodiscus flumineus*, *Bokermannohyla ahenea*, *Bokermannohyla clepsydra*, *Bokermannohyla feioi*, *Bokermannohyla gouveai*, *Bokermannohyla izecksohni*, *Bokermannohyla lucianae*, *Bokermannohyla ravida*, *Brachycephalus brunneus*, *Brachycephalus hermogenesi*, *Brachycephalus izecksohni*, *Brachycephalus pernix*, *Bufo scitulus*, *Chiasmocleis cordeiroi*, *Chiasmocleis crucis*, *Chiasmocleis gnoma*, *Chiasmocleis jimi*, *Chthonerpeton noctinectes*, *Colostethus caeruleodactylus*, *Colostethus nidicola*, *Crossodactylodes bokermanni*, *Crossodactylodes izecksohni*, *Crossodactylus aeneus*, *Crossodactylus bokermanni*, *Crossodactylus dantei*, *Crossodactylus grandis*, *Crossodactylus lutzorum*, *Cycloramphus bandeirensis*, *Cycloramphus carvalhoi*, *Cycloramphus catarinensis*, *Cycloramphus cedrensis*, *Cycloramphus duseni*, *Cycloramphus jordanensis*, *Cycloramphus juimirim*, *Cycloramphus ohausi*, *Cycloramphus stejnegeri*, *Dendropsophus cachimbo*, *Dendropsophus jimi*, *Dendropsophus limai*, *Dendropsophus rhea*, *Dendropsophus ruschii*, *Dendropsophus studerae*, *Eleutherodactylus epipedus*, *Eleutherodactylus erythromerus*, *Eleutherodactylus gualteri*, *Eleutherodactylus hoehnei*, *Eleutherodactylus nigriventris*, *Eleutherodactylus octavioi*, *Eleutherodactylus oeus*, *Eleutherodactylus paranaensis*, *Eleutherodactylus pusillus*, *Eleutherodactylus randorum*, *Eleutherodactylus sambaqui*, *Eleutherodactylus spanios*, *Gastrotheca albolineata*, *Hylodes amnicola*, *Hylodes glaber*, *Hylodes magalhaesi*, *Hylodes ornatus*, *Hylodes otavioi*, *Hylodes perplicatus*, *Hylodes regius*, *Hylodes vanzolinii*, *Hypsiboas beckeri*, *Hypsiboas buriti*, *Hypsiboas cymbalum*, *Hypsiboas ericae*, *Hypsiboas freicanecae*, *Hypsiboas phaeopleura*, *Hypsiboas secedens*, *Hypsiboas stenocephala*, *Leptodactylus hylodes*, *Megaelosia apuana*, *Melanophryniscus cambaraensis*, *Melanophryniscus macrogranulosus*, *Melanophryniscus moreirae*, *Melanophryniscus simplex*, *Melanophryniscus spectabilis*, *Odontophrynus moratoi*, *Paratelmatobius lutzii*, *Phrynomedusa marginata*, *Phyllodytes brevirostris*, *Phyllodytes punctatus*, *Phyllodytes tuberculosus*, *Phyllomedusa ayeaye*, *Physalaemus barrioi*, *Physalaemus bokermanni*, *Physalaemus deimaticus*, *Physalaemus erythros*, *Physalaemus maximus*, *Physalaemus obtectus*, *Physalaemus rupestris*, *Physalaemus soaresi*, *Proceratophrys concavitympanum*, *Proceratophrys cururu*, *Proceratophrys palustris*, *Proceratophrys phyllostomus*, *Proceratophrys subguttata*, *Pseudopaludicola canga*, *Scinax ariadne*, *Scinax heyeri*, *Scinax*

jureia, *Scinax meloi*, *Sphaenorynchus bromelicola*, *Sphaenorynchus pauloalvini*, *Thoropa lutzi*, *Trachycephalus lepidus*, and *Zachaenus carvalhoi*.

Appendix S3 - Species currently known only from type-specimen(s):

Aplastodiscus flumineus, *Bokermannohyla ahenea*, *Bokermannohyla feioi*, *Bokermannohyla lucianae*, *Bufo scitulus*, *Chiasmocleis cordeiroi*, *Chiasmocleis crucis*, *Chiasmocleis gnoma*, *Chiasmocleis jimi*, *Chthonerperton exile*, *Chthonerperton perissodus*, *Chthonerperton noctinectes*, *Crossodactylus dantei*, *Crossodactylus lutzorum*, *Cycloramphus bandeirensis*, *Cycloramphus carvalhoi*, *Cycloramphus catarinensis*, *Cycloramphus cedrensis*, *Cycloramphus jordanensis*, *Cycloramphus valae*, *Dendropsophus cachimbo*, *Dendropsophus limai*, *Eleutherodactylus epipedus*, *Eleutherodactylus erythromerus*, *Eleutherodactylus paranaensis*, *Eleutherodactylus pusillus*, *Eleutherodactylus randorum*, *Eleutherodactylus sambaqui*, *Eleutherodactylus spanios*, *Hylodes amnicola*, *Hylodes babax*, *Hylodes glaber*, *Hylodes regius*, *Hylodes vanzolinii*, *Hypsiboas beckeri*, *Hypsiboas buriti*, *Hypsiboas freicanecae*, *Leptodactylus hylodes*, *Megaelosia apuana*, *Megaelosia bocainensis*, *Melanophryniscus simplex*, *Melanophryniscus spectabilis*, *Melanophryniscus pachyrhynus*, *Microcaecilia supernumeraria*, *Mimosiphonops reinhardti*, *Oscaecilia hypereumeces*, *Phrynomedusa bokermanni*, *Phyllodytes punctatus*, *Physalaemus erythros*, *Proceratophrys phyllostomus*, *Scinax heyeri*, *Scinax jureia*, *Siphonops leucoderus*, *Trachycephalus lepidus*, and *Zachaenus carvalhoi*.

References and Notes

1. Brasil - Ministério do Meio Ambiente, *Diário Oficial da União* (**101**), 88 (2003).
2. For further details, refer to the Supporting Online Material of S. N. Stuart, J. S. Chanson, N. A. Cox, B. E. Young, A. S. L. Rodrigues *et al.*, *Science* **306**, 1783 (2004).
3. IUCN, Conservation International, NatureServe. *Global Amphibian Assessment*, <http://www.globalamphibians.org> (2004).
4. B. E. Young, S. N. Stuart, J. S. Chanson, N. A. Cox, T. M. Boucher. *Joyas que están desapareciendo. El estado de los anfibios en el Nuevo Mundo* (NatureServe, 2004).
5. IUCN. *2004 IUCN Red List of Threatened Species*. <http://www.redlist.org> (IUCN, 2004).
6. G. Woehl-Jr., E. N. Woehl, *Herp. Rev.* **34** (**4**), 379 (2003).
7. J. Faivovich, C. A. G. Cruz, O. L. Peixoto, *J. Herpetol.* **36** (**2**), 325 (2002).
8. One specimen of *Aplastodiscus weygoldti* (MNRJ 38930) was found in the state of Bahia (Fazenda Palmeira - 15°56'S, 39°38'W - Itapebi municipality), extending its range in ca. 450km north from the type-locality, Santa Teresa, ES.
9. M. F. Napoli, *Herp. Rev.* **33** (**3**), 220 (2002).
10. R. N. Feio, P. L. Ferreira, D. L. Pantoja, *Herp. Rev.* **34** (**3**), 258 (2003).
11. D. L. Silvano, B. V. S. Pimenta, *Herp. Rev.* **33**(**2**), 145 (2002).
12. M. Dixon, V. K. Verdade, *Herp. Rev.* **35** (**3**) 280 (2004).
13. R. A. Machado, C. E. Conte, *Herp. Rev.* **32** (**2**), 114 (2001).
14. B. V. S. Pimenta, D. L. Silvano, *Herp. Rev.* **33** (**2**), 144 (2002).
15. J. P. Pombal-Jr., pers. obs.
16. R. Lingnau, *Herp. Rev.* **31** (**4**), 251 (2000).
17. L. F. Toledo, R. Lingnau, *Herp. Rev.* **33** (**4**), 317 (2002).
18. P. A. S. Nuin, P. C. A. Garcia, *Herp. Rev.* **33** (**3**), 221 (2002).
19. D. L. Silvano, B. V. S. Pimenta, in: *Corredor de Biodiversidade da Mata Atlântica do Sul da Bahia*, P. I. Prado, E. C. Landau, R. T. Moura, L. P. S. Pinto, G. A. B. Fonseca, K. Alger, Orgs., (IESB/CI/CABS/UFGM/UNICAMP, Ilhéus, 2003).
20. A. C. O. Q. Carnaval, O. L. Peixoto, E. M. Santos, *Herp. Rev.* **34** (**4**), 381 (2003).
21. M. Dixon, *Phyllomedusa* **3** (**1**), 77 (2004).
22. D. L. Silvano, B. V. S. Pimenta, *Herp. Rev.* **33** (**2**), 145 (2002).
23. D. L. Silvano, B. V. S. Pimenta, *Herp. Rev.* **33** (**3**), 221 (2002).
24. H. Zaher, E. Aguiar, J. P. Pombal-Jr., *Arq. Mus. Nac.*, in press.
25. B. V. S. Pimenta, D. L. Silvano, *Herp. Rev.* **33** (**3**), 221 (2002).
26. U. Caramaschi, C. A. G. Cruz, R. N. Feio, *Herp. Rev.* **31** (**4**), 251 (2000).
27. O. L. Peixoto, U. Caramaschi, E. M. X. Freire, *Herpetologica* **59** (**2**), 235 (2003).
28. O. L. Peixoto, U. Caramaschi, *Herp. Rev.* **33** (**4**), 318 (2002).
29. U. Caramaschi, O. L. Peixoto, *Herp. Rev.* **32** (**4**), 271 (2001).
30. M. Van-Sluys, *Herp. Rev.* **29** (**1**), 49 (1998).
31. B. V. S. Pimenta, D. L. Silvano, *Herp. Rev.* **32** (**4**), 272 (2001).
32. R. N. Feio, B. V. S. Pimenta, D. L. Silvano, *Amphibia-Reptilia* **24** (**1**), 108 (2003).
33. O. L. Peixoto, M. R. Gomes, S. P. Carvalho-e-Silva, *Herp. Rev.* **34** (**2**), 163 (2003).
34. J. C. Oliveira-Filho, M. N. C. Kokubum, *Herp. Rev.* **34** (**2**), 163 (2003).
35. B. V. S. Pimenta, D. L. Silvano, *Herp. Rev.* **32** (**4**), 273 (2001).
36. R. N. Feio, P. S. Santos, U. Caramaschi, *Herp. Rev.* **30** (**1**), 56 (1999).