IUCN/SSC

Declining Amphibian Populations Task Force

Working Document No. 1

THE STATUS OF AMPHIBIAN POPULATIONS

A COMPILATION AND ANALYSIS

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TABLE OF CONTENTS

INTRODUCTION

This report of the Declining Amphibian Populations Task Force (DAPTF), for convenience entitled "Working Document No. 1," provides a synopsis and analysis of data on declining amphibian populations gathered by the Coordinator's Office, from the time of its activation in July 1991, to date, i.e. December 1993.

Most of the included data represent the contributions of nearly 100 DAPTF Working Group collaborators from more than 40 regions throughout the world. Their original documents, listed in the reference section as "Unpublished regional report to DAPTF," are maintained as hard copies in the Coordinator's Office files and are available for scrutiny by interested parties. Other sources include primary materials from scientific journals, technical reports of non-governmental organizations (NGOs) and governmental organizations (GOs), symposium presentations, and abstracts of papers presented at professional meetings.

Although only a fraction of the more than 4,500 known amphibian species are represented, the content provides what we believe to be a significant point of reference as the status of population declines and, hopefully, a foundation upon which future work will build.

The term "decline" as used here is defined as a definite downward trend in numbers over a span of time appropriate to the species' life history, shown to be in excess of the normal fluctuations in population size. Our information on both species and habitats is for the greater part based on short-term, anecdotal observations. Quantitative evidence needed to determine the real character of trends in population ecology, i.e. comparisons of a single population at the same site over time, among populations of the same species at different sites, or among species, can only be achieved by long-term investigations using recurrent, standardized protocols. Among all amphibian species such studies are precious few.

Additionally, detection of any trends or documentation of the relative extent of amphibian declines is often limited by lack of information as to the total number of species present in a given political unit or geographic area. In some cases it has been possible to compare the present status of habitats and amphibian populations with data from previous studies dating back over a number of years; however, these historical references are scarce.

Status classifications (e.g., Sensitive, Threatened, Endangered) for species of concern can vary regionally and with the biology of the organism. In numerous cases the status of a species may be a manifestation of natural rarity, secretive habits, and/or very restricted distribution range. Among countries, states, provinces, or other politically defined regions, criteria for risk categories may be uniform only within that entity. Likewise, within regions, the same terminology applied by different agencies may not represent equal imperilment. Although an attempt has been made to apply uniformly the World Conservation Union's (IUCN) criteria and categories, it was not feasible to synonymize or cross-reference the variant classifications. In these cases we have followed the designation given in published documents or investigators' reports.

In spite of these constraints, and recognizing that conclusions based upon the existing data must be tentative, there is a degree of legitimacy to the evidence presented here that cannot be denied.

Every DAPTF Regional Working Group is made up of trained field biologists, mostly experienced, professional herpetologists, who have undertaken to survey and determine the status of amphibian assemblages in defined geographic areas.

For all species mentioned in the narrative there is at least one reason for inclusion. They have, for example, demonstrated marked absolute and/or relative declines, are apparently now absent regionally or locally, are being subjected to hazardous environmental impact, or have an agency classification at some level of risk. In contrast, others are included because they are reported to exhibit stasis, an increase in numbers or range expansions.

The narrative section is thus a collation and summary of information gathered from the previously listed sources. To provide the optimum arrangement for analyses of any regional patterns or trends, political and geographic units are grouped first by Faunal Region (e.g., Nearctic, etc.) and second, by latitude from north to south. For each country or region the analyses are arranged as:

A. estimated numbers and percentages of declining species
B. status and factors relating to population numbers
C. reasons for positive or negative trends - probable and/or suspected causes

The geographic arrangement of the Appendix corresponds with that of the narrative. Within this format the data are listed by region and reporter, target species (those noted as declining or have an agency designated status), locations, and critical habitats (those of noted fragility or limited distribution in which amphibian communities are known to occur).

Categories used for designating the status of species are keyed on the last page of the Appendix.

The report in its present form is a revision of the "Preliminary Report on the Status of Amphibian Populations," issued as a "not to be referenced or cited" document on August 2, 1993. One hundred and eight copies of the first draft were distributed among DAPTF Working Group Chairs, Coordinators and contributors. with a request for editorial review and evaluation.

The following persons made substantial contributions to the review process.

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NEARCTIC REGION

Canada

A. In separate reports from six provinces, a total of 14 species were listed as declining, Endangered or Rare (Roberts, 1992; Orchard, 1992; Koonz, 1992; Oldham, 1992; Berrill et al., 1992; Bonin, 1992; and Seburn, 1992). Of the 42 recognized species in Canada (Bishop et al., 1993), this represents 33%. Canada has no endemic amphibians, but rather native species at the northern limits of their hemispheric distribution. (See Appendix pp. 57-58 for listings.)

B. Population fluctuations with an overall stasis in numbers were found in an eight year study of *Rana catesbeiana* (Bishop et al., 1993).

Seburn (1992) reported that *R. pipiens* populations are beginning to recover in some areas of Saskatchewan after experiencing a low in the early to mid-1970s. In Manitoba some populations of *R. pipiens* began to recover in 1983 but are still much more sparsely distributed over their previous range and less abundant (Koonz, 1992). Green (1992) surveyed the abundance of *Bufo woodhousii fowleri* for four consecutive years at Long Point, Ontario, and found it to be increasing. He noted no changes in human disturbance during that period. It is probable that immigration from a separate *Bufo* population has occurred. (See discussion on metapopulations in paragraph three, p. 39.)

C. Studies are currently underway to determine the cause of increased rates of deformities in Mudpuppies (*Necturus* sp.) in sites on the St. Lawrence River, organophosphate pesticide effects on reproduction in ranids, and the effects of spraying fenitrothion in forests of New Brunswick where Mink Frog (*Rana septentrionalis*) populations have significantly declined (Bishop et al., 1993). Fenitrothion spraying of a million or more hectares annually since 1965 to control spruce budworm infestation was believed not to have any direct lethal effects on amphibians, based on studies in 1969, 1970, and 1975. However, more recent research on aquatic invertebrates following fenitrothion spraying showed that responses in forest streams and ponds were quite variable (Fairchild and Eidt, 1988 cited in McAlpine, 1992); freshwater benthic arthropod populations in bog ponds may be reduced by 50% and take more than 12 months to recover (Fairchild, 1990 cited in McAlpine, 1992). Thus, aquatic amphibians can be impacted indirectly due to a reduction in prey species. In a 1991 survey by the Canadian Wildlife Service, Mink Frog densities were negatively correlated with frequency of fenitrothion spraying in previous years, and the amount of sulfate in the water (McAlpine, 1992).

Trends in common species of frogs are poorly known in Quebec. Causes of "reported declines" (by some frog hunters) in local populations are not yet documented, but overhunting and changes in agricultural practices are probably major causes for the declines of common species (Bonin, 1992). In British Columbia, Orchard (1992) suggested that declines in *R. pipiens* and *R. pretiosa* may be due to predation by, and competition with, *R. catesbeiana,* introduced fish and managed populations of native waterfowl.

For five Ontario species Orchard (1992) attributed the declines to habitat destruction. Oldham (1992) reported that the reasons for the decline of *Acris crepitans blanchardi* in Ontario remain unclear, but are probably largely linked to habitat disturbance and destruction. In Alberta, Roberts (1992) documented the total disappearance of *R.*

pipiens, beginning in 1979, from all sites north of 51°N latitude, and of isolated populations to the south. He identifies declines in *Bufo cognatus* with habitat loss due to land use practices.

United States

Pacific Northwest (Alaska, Oregon, Washington)

A. Most amphibian species in Oregon or Washington are either endemic or have the greater part of their distribution in the region (Nussbaum et al., 1983). Of the 31 native species, 22 (71%) are listed as Sensitive Species or as Candidate Species (Leonard et al., 1993; Marshall, 1992; Olson, 1992). Only 5% of these 22 are at the periphery of their distribution (Nussbaum et al., 1983). Thirteen of the 22 rely on aquatic habitat (streams, ponds, lakes): nine are terrestrial. Almost all species occur in forest ecosystems, one of which (*Rana cascadae*) is restricted to high altitude habitats. (Refer to Appendix pp. 58-59 for listings.)

We have received no data on Alaska.

B. Three qualitative risk assessments addressed the viability of amphibians in late-successional forests. First, in what has come to be known as the "Gang of Four" report (Johnson, K.N., J.F. Franklin, J.W. Thomas, and J. Gordon, 1991), five amphibian species are listed as "closely associated" and 16 "associated" with late-successional ("old-growth") forests. Of the five "closely associated" species, three are listed as species of concern. Second, Thomas et al. (1993) evaluated 28 amphibian species as to their association with Pacific northwest old-growth forests within the range of the Northern Spotted Owl, and conducted viability assessments with regard to land management options for 18 of these species. Third, the 1993 report of the

Forest Ecosystem Management Assessment Team (FEMAT) also included risk assessments for the latter. Three species (all endemics) were found to have a relatively high risk (equal to or greater than 20% likelihood) of extinction (FEMAT, 1993).

A quantitative risk assessment of those vertebrates associated with late successional old growth forests in the northwest was conducted by Lehmkuhl and Ruggiero (1991). Among 93 vertebrate species ranked, seven amphibians top the list as being at greatest risk of local extinction. Seven more amphibians were ranked as being at medium to high risk.

Recent inventories in the state of Washington at Mount Rainier National Park (Pidgeon et al., 1991, 1992) and Wanatchee National Forest (Darda and Kelley, 1992) provide valuable baseline data. McAllister and Leonard's (1990, 1991) surveys of *Rana pretiosa* historic sites have documented declines in western Washington. An ongoing 12 year study of Cascade Range anuran breeding populations has revealed fluctuating abundances (e.g., Olson, 1992).

C. Causal factors for population reductions include habitat destruction and fragmentation, introduced Bullfrogs or game fish, and chemical pollution of streams and temporary ponds due to agricultural practices (e.g., McAllister and Leonard, 1991; Marshall, 1992). The negative impact of timber harvest to amphibian populations was illustrated by the number of Pacific northwest species with abundances associated with forest age-class (Walls, et al., 1992). (Also see papers in Ruggiero et al., 1991.) Additionally, many northwestern amphibians have limited dispersal and small, patchy microhabitat distribution patterns which can increase susceptibility to losses

(Lehmkuhl and Ruggiero, 1990, Welsh, 1990, Olson, 1992). Anuran mass mortality episodes have been documented in the Oregon Cascade Range, resulting from drought-related conditions (Blaustein and Olson, 1991). Raven predation (on *Bufo boreas*, Olson, 1989) and possibly disease, also diminish populations.

Rocky Mountains (Colorado, Idaho, Montana, Utah, Wyoming)

A. Bury and Corn (1992) and Corn (1993) have compiled a great amount of data documenting the status of amphibian declines in the western U.S. In the Rocky Mtn. region they report declines in seven species. (See Appendix p. 60.)

B. The species for which declines are least understood are *Bufo boreas, B. hemiophrys baxteri* and *Rana pretiosa* (Corn, 1993). *B. boreas* has declined in distribution 80-90%. Its range includes high elevation (>2400 m), undisturbed habitats where predation from introduced frogs or fish and pollution effects are very unlikely to occur. *Rana pipiens* in this region now occurs in less than 20% of its previous range (Corn, 1993).

C. Acidification is unlikely to have caused declines in *B. boreas, B. hemiophrys baxteri,* or *R. pipiens* (Corn and Vertucci, 1992; Corn et al., 1989; Corn and Bury, 1993; Vertucci and Corn, 1993). The observations of Wissinger and Whiteman (1992) conflict with an earlier report by Harte and Hoffman (1989), in which the latter attributed acidic deposition effecting decline in a Rocky Mountain population of the salamander, *Ambystoma tigrinum nebulosum*. Mortalities of salamander embryos have been associated with pH in vernal pools in northern Colorado (Kiesecker, 1991).

Declines of other species in this region have been tied to drought, floods, predation by exotic species, commercial exploitation, habitat alteration and destruction (Metter, 1968; Bury and Corn, 1992). Carey (1993) hypothesized an immunosuppression/disease character to the regional extinction of *Bufo boreas* populations.

Northern Plains (Kansas, Nebraska, North Dakota, South Dakota)

B. No amphibian declines have been reported in the four state region (Platz, 1993).

Central Region (Iowa, Illinois, Indiana, Ohio, Missouri)

A. Lannoo (1993) reported that among amphibian species in these central U.S. states, 12 are listed as Endangered, four as Rare, two as Threatened, three as of Special Concern at the state level, and three as of regional concern (see Appendix pp. 60-61). Only one species, *Acris crepitans blanchardi,* is reported being in general decline; another, *Rana areolata,* has not been seen in Iowa since 1940.

C. In Missouri, *Pseudacris streckeri illinoensis* is found only on extensive, heavily used agricultural lands and is thought to be negatively affected by chemicals and pesticides (T. Johnson, 1992).

Great Lakes (Michigan, Minnesota, Wisconsin)

A. In the Great Lakes region, *Acris crepitans blanchardi* is the only impacted species reported by Casper (1992), with declines in all three states. In Wisconsin, Huff (1991) reported on the results of a volunteer annual survey that has been conducted since 1984. His analysis indicated declines in four of the 12 (33%) native anurans. (See Appendix p. 62.)

Northeast (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Washington D.C.)

A. Wyman (1992) compiled a list of 26 of 43 (60%) amphibian species in the region at some level of risk in the Northeast, i.e. 65% of salamanders (15 of 23) and 55% of anurans (11 of 20). (See Appendix pp. 62-63.)

B. The majority of declining species breed in streams and ephemeral pools and tend to be more fecund than non-listed species (Wyman, 1992). He observed that declines involved species of salamanders throughout the region, while more species of frogs and toads were affected in the southern portion. In the "top group" of amphibians listed, all are ambystomatid salamanders (Wyman, 1993).

C. Potential causes are habitat destruction, soil and water pollution, forestry practices, hydrologic/climatic changes and hybridization. The aquatic habitats (vernal pool and temporary streams) are rarely protected by states in this region.

Appalachia (Kentucky, North Carolina, Tennessee, Virginia, West Virginia)

A. Seven Virginian species of amphibians, five caudates and two anurans, are listed by J. Mitchell (*in* Bruce, 1993) as Endangered, Threatened, or of Special or Local Concern. This represents about 13% of approximately 56 species in the areas he sampled. In North Carolina, Braswell (1993) completed a resurvey of 20 historical sites, dating between 1933 and 1987, for *Rana capito capito*, a state species of Special Concern, in which he recommended retention of state status as Threatened. (See Appendix pp. 63-64.)

C. Suggested causes for declines in Virginia are habitat destruction and fragmentation due to land development and logging. In the case of *Plethodon punctatus*, past clear-cutting along with the more recent loss of canopy trees and oaks due to gypsy moth defoliation, and hemlock trees succumbing to the wooly adelgid (both introduced insect pests), are serious threats (J. Mitchell, *in* Bruce, 1993).

Braswell (1993) found that 16% of the historical sites of *R. c. capito* have been destroyed. Fragmentation and alteration of aquatic and terrestrial habitats are affecting the remaining populations.

In North Carolina, Petranka et al. (1993) found the average number of salamander species in mature forests (>50 years) to be nearly twice that in recent clear-cuts (<10 years), and the difference in relative abundance to be a ratio of nearly 5:1. They reported "all major taxonomic" groups as being negatively affected.

Southeast (Alabama, Florida, Georgia, South Carolina)

A. Six species are reported as declining: five caudates and one anuran (Dodd, 1992). (See Appendix p. 64.)

B. In a seven year study of a xeric upland habitat in Florida, Mushinsky et al. (1993) found considerable annual variation in numbers among 13 anuran species, but observed no declines during the period between 1982-1988.

In South Carolina, a 12 year study by Pechmann et al. (1991) showed substantial fluctuations in size of amphibian breeding populations and recruitment of juveniles. Periods of drought were correlated with recruitment failures. Breeding populations showed no trends toward declines in two species of *Ambystoma* (*talpoideum* and *t.*

tigrinum) and a frog, *Pseudacris ornata*, while a third salamander, *A. opacum*, increased in numbers.

C. Although relatively few declines are reported, clear-cutting in the coastal plain and mountain regions are resulting in habitat destruction and fragmentation (Dodd, 1992).

Mississippi Delta (Arkansas, Mississippi, Louisiana)

A. Stan Trauth (1993) has been monitoring amphibian populations in Arkansas since 1984. He listed eight salamanders and four anurans as species of concern (see Appendix p. 65).

Southern Plains (Oklahoma, Texas)

A. One toad, *Bufo houstonensis*, is listed by the federal government as Threatened, and by Texas as Endangered (Bury and Corn, 1992). (See Appendix p. 65.)

B. In a questionnaire survey reported to Caldwell (1992) by participants in the Southern Plains Working Group, the following observations were submitted: The densities of *Bufo woodhousii* at the University of Oklahoma Biological Station (Lake Texoma) have fluctuated over the years with high peaks in 1955, 1966 and 1991. In Collie and North Dallas counties (Texas), among frog species only *Rana catesbeiana, R. pipiens* (?), *Acris crepitans* and *B. woodhousii* remain, but in low numbers; at the same time *Ambystoma texanum* appears to be increasing. In six other counties in Texas there are healthy, viable populations of *A. crepitans, Bufo houstonensis* (recorded at five new sites), *Bufo valliceps, Hyla versicolor/chrysocelis, H. cinerea, Gastrophryne carolinensis, Rana berlandieri, Scaphiopus holbrooki, Syrrhophus marnockii, Eurycea neotenes, Eurycea* sp. 1 and *Eurycea* sp. 2. During the 1992 breeding season at

Sherman, Texas, "huge" choruses of *H. versicolor* and *A. crepitans* were recorded, although there was a decline in ranids and bufonids; *B. valliceps* is common around the city of Austin, Texas; in central Oklahoma *A. crepitans* and *R. sphenocephala* were abundant. Except for two long-term monitoring studies in Texas, these reports, though anecdotal, reveal numerous healthy populations in Texas and Oklahoma. Amphibians were less common than usual in some localities, but recent droughts may have contributed to these reductions. Caldwell (1992) cautioned against deriving early conclusions from unsystematically collected data.

Southwest (Arizona, New Mexico)

A. A total of nine species have been reported as declining in Arizona and New Mexico (Bury and Corn, 1992; Howland and Sredl, 1992). (See Appendix p. 66.)

C. No specific causal agents have been identified, though potential threats are believed to be similar to those in the Rocky Mountain region. Scott (1993) postulates a "Postmetamorphic Death Syndrome" as a potential factor.

California/Nevada

A. Of 64 amphibian species in the two states, 47 (72%) are either listed, are candidates for listing, and/or are at risk of declining (Fellers, 1992; Bury and Corn, 1992). Within this total, 39 (61%) are state or federally listed, or are candidates for listing. An additional eight (13%), are suggested as species threatened with declines. (See Appendix pp. 66-69.)

In a recent re-survey of Yosemite National Park sites first reported on 75 years ago, Drost and Fellers (1993) and Fellers and Drost (1993a) found 42% of historic populations have disappeared. Significant declines have occurred in five of six species in remaining populations. This report was the first and is the only one to note declines in *Pseudacris (Hyla) regilla.*

C. The two main causes of declines according to Fellers (1992) are: (1) "habitat loss or alteration, e.g. housing developments in southern California, logging of old growth forests in northern California, and changes in meadow and forest dynamics due to long term fire suppression"; and (2) "competition from non-native fish and frogs." Of the total number of species, 45% are threatened by one or both of these factors, and of the listed or candidate species 58% are likewise threatened.

Kupferberg (1993) monitored an invasion of Bullfrogs into a pristine California river dominated by native *Rana boylii* and *Pseudacris (Hyla) regilla.* Where Bullfrogs were well established, natives were rare. In tests of larval competition, Bullfrog tadpoles caused a 48% reduction in survivorship of *R. boylii* and a 24% reduction in mass at metamorphosis. In contrast, there was no significant effect upon survivorship of *P. (H.) regilla* and but a 16% reduction in size at metamorphosis.

Mexico (North of the Isthmus of Tehuantepec)

A. Lazcano-Barrero et al. (1988) identified seven salamanders and one frog as being in danger of extinction in Mexico. All of these are species endemic to the central highland lakes.

In reports of national scope, Flores-Villela and Gerez-Fernandez (1988, 1989) listed 284 amphibian species occurring in Mexico, of which 173 are endemic. Only four of the total, three of the *Ambystoma* species noted by Lazcano-Barrero et al. (1988) and one *Bufo,* are listed as threatened. The differences may be that Flores-Villela and Gerez-Fernandez utilized IUCN criteria and classifications. Unfortunately, those states with high levels of vertebrate endemism include few of Mexico's current protected areas (Flores-Villela and Gerez-Fernandez, 1989). (See Appendix p. 69.)

PALEARCTIC REGION

Commonwealth of Independent States

A. Kuzmin et al. (1993) reported on the various regions of the CIS, listing 26 species as Rare, Vulnerable, Endangered, and/or declining in part of their ranges. Misyura (1993) listed two additional species in the Ukraine. In the Ukraine (only), eight of the 16 amphibian species in that country are Rare or in decline (Misyura, 1993). (See Appendix pp. 69-72.)

B. For the most part, caudates are more vulnerable than anurans. Montane species, many of which are endemics, appear especially sensitive. Among those widespread, *Triturus cristatus* has displayed the greatest overall decline in numbers . Declines at geographic range margins are primarily along the northern boundaries (Kuzmin, 1993; Kuzmin et al., 1993).

Among widely distributed species, except where habitat conditions have deteriorated, few are negatively affected throughout their ranges. *Rana ridibunda* and *Bufo viridus* appear to be expanding habitat occupancy, adapting to some kinds of anthropogenic changes (Kuzmin et al., 1993).

Pawley (1992) reported his observations on amphibian populations in the CIS during the spring of 1991. In sum, he found eight common species to be healthy and numerous at all sites he visited, whether urban or agrarian.

C. The main cause of local declines of amphibians in the CIS is attributable to anthropogenic influence - primarily urbanization, pollution, destruction and fragmentation of habitat (Kuzmin et al., 1993). Deforestation and logging are especially hazardous for endemic montane species, whereas fish introductions have affected mainly the newts. Long-term amphibian declines and expansions due to climatic changes were revealed from paleontological and historical data (Kuzmin, 1993).

People's Republic of China

A. Four anurans may be considered as Threatened or Endangered: three of these are known only from type localities and the forth is subjected to hunting for human consumption (Zili and Jinzhong, 1992). Wen-fa Cheng (1993) reported that *Andrias davidianus*, the Chinese Giant Salamander, is now Endangered. (See Appendix pp. 72-73.)

B. Among the common species surveyed in 1992 (17 anurans and four caudates), no notable declines were reported in China, with the exception of "some in extremely polluted" areas, or where pesticides were used (Zili and Jinzhong, 1992).

C. The introduction of the American frogs *Rana catesbeiana* and *R. grylio* to southern China are of great concern as a threat to endemic species (Zili and Jinzhong, 1992).

Estonia

A. Most of the ten species occurring in Estonia may be at the northern limits of their ranges. Four species are listed as Rare or Vulnerable. One is noted as now Extinct. "Most local populations" are reported as having declined during the past 10-20 years (Talvi, 1991). (See Appendix p. 73.)

Romania

A. Of the 20 species and subspecies of amphibians inhabiting Romania, 10 (50%) are classified as Vulnerable, three (17%) are Endangered, one is of undetermined status, and one not evaluated. Only five species are not considered Threatened (see Appendix pp. 73-74). Locally all species are declining (Cogălniceanu, 1993).

C. The damming and draining of the main rivers and wetlands has destroyed 80% of the Danube flood plain and 17% of the Danube Delta, main habitats of *Triturus dobroqicus* and *Pelobates syriacus balcanicus*. Damming of the Erului Valley in the 1960s eliminated many populations of *Rana arvalis*. Deforestation during the last hundred years has reduced to half (from 50% to 25% of the total area of Romania) the area covered by forests, while reforestation with exotic tree species has altered many natural habitats through changes in soil structure, fauna and flora. Transformation of steppe and forest steppe areas into agriculture land, mainly in Dobrogea and Baragan has destroyed hundreds of thousands of hectares of natural habitat. The introduction of foreign salmonid fish in many alpine lakes has eliminated a large number of amphibian populations. Although frog legs are not a popular food in Romania, large quantities of Green Frogs (*Rana ridibunda* and *R. esculenta*) are exported every year to western Europe and an unknown number is used for research and education (Cogălniceanu, 1993).

Western Europe (Belgium, France, Netherlands, Portugal and Spain)

A. Twenty-one of the 33 amphibian species (64%) are listed as Endangered, Threatened, Vulnerable or declining in the region (Zuiderwijk, 1992). (See Appendix pp. 74-76.)

C. According to Zuiderwijk (1992), habitats of all Endangered species need to be managed. Critical habitats include water courses and lakes in the Spanish Pyrenees, Cantabrians, and Septentrional Mountains; south and northwestern France; and central and southern Netherlands.

In Portugal there seems to be a general decline of amphibians due to habitat destruction or degradation by recent human activities. Some areas are particularly important for amphibian conservation, such as the National Parks of Peneda-Gerês, Serra da Estrela, and Serra de S. Mamede (O. Paulo, in litt.). (See Appendix p. 76)

United Kingdom

A. Two amphibians are listed as Sensitive in the U.K., one caudate, *Triturus cristatus*, and one anuran, *Bufo calamita* (Halliday, 1992); 33% of the six native species. (See Appendix p. 76.)

B. A three-year study (1989-1992) of the distribution and abundance of five "widespread" amphibian species in the U.K. by Swan and Oldham (1993) provides valuable baseline data. They analyzed trends in habitat requirements and correlates between species presence and various land-use types for all natives except *Bufo calamita*.

Arable land is inimical to the Common Frog, *Rana temporia*, whether the predominant landscape feature or merely in patches. Water features were correlated with frog abundance. This may in part explain low densities in arable land, which is generally well drained, combined with the negative effects of agricultural chemicals.

Pond size (>100 m^2) and quality (those not heavily encroached by vegetation but with adequate terrestrial cover) were associated with numbers in the Common Toad, *Bufo bufo*. The "presence of woodland, neighboring ponds and flowing water within 500 m of sites was correlated with increases in toad status" (Swan and Oldham, 1993).

The Smooth Newt (*Triturus vulgaris*) and the Palmate Newt (*T. helveticus*) share a preference for relatively small ponds that are not heavily vegetated, and which desiccate occasionally, perhaps benefiting from the consequent reduction in aquatic predators. The abundance of Smooth Newts increases in ponds on arable land where woodland or rough grassland cover is present within 500 meters. The Crested Newt (*Triturus cristatus*), noted above as a sensitive species, is unlikely to occur in areas in which pond density is less than 0.7 per km^2 (Swan and Oldham, 1993).

ETHIOPIAN REGION

Kenya

A. Drewes (1992) reported that a survey conducted in 1992 on populations in the Arabuko-Sokoke Forest of the northern Kenya coast "appeared to be consistent with ... earlier observations (beginning in 1987)." At Lake Mbaratumu, however, numbers of individuals were clearly depressed relative to earlier years, possibly due to draining and high use by humans and livestock. (No specific declines were listed, therefore Kenya is not included in the Appendix.)

Zambia

B. The lack of studies on the majority of the amphibian species in Zambia precludes any quantification of declines at this time (Simbotwe, 1993); however, he listed nine species as Vulnerable (see Appendix pp. 76-77).

C. Seven species and three genera are listed as either limited in distribution or Vulnerable to the effects of habitat destruction and fragmentation, or drought.

Five critical habitats were assessed, with the corresponding threats to each: (1) islands - the islands of Kariba Lake, Itezhi-Tezhi Lake, and Banweulu basin wetland; threatened by pollution, fishing practices, and large human population; (2) montane forests (1830-2185 m) - Nyika plateau, Mafinga and Makutu mtns., and Makwi watershed; threatened by logging, hunter gathering and wild fires; (3) wetlands - river basins of the Kafue, Zambezi, Luangwa, Luapula rivers; Kariba and Itezhi-Tezhi lakes; threatened by chemical and solid waste pollution, damming, extraction for mining and agriculture; (4) deserts - Kalahari ecosystem, Western Province and SW of southern Zambia; threatened by habitat destruction, logging and drought; and (5) evergreen forests (over 1000 m) - rainforests of Mwinilunga, Chipya Woodlands, central, northern and copperbelt provinces; threatened by logging, hunter gathering and wild fires (Simbotwe, 1993).

ORIENTAL REGION

United Arab Emirates

B. With no historical data on distribution and abundance of the two toads, *Bufo arabicus* and *B. dhufarensis*, that live within the U.A.E., Reza Khan (1992) of the Dubai Zoo, was unable to make any judgments as to possible declines. A DAPTF Working Group is currently conducting a survey on the toads of the U.A.E. and the bordering areas of the Sultanate of Oman.

Indian Sub-continent

A. Dutta (1992) reported that three species are Sensitive and Vulnerable, three are included on the Red List for 1990, and another nine are proposed as indeterminate, totaling 15 species. In the district of Howrah, West Bengal, Mallick (1992) listed six out of 14 species (43%) as declining. (See Appendix pp. 77-78.)

B. Daniels (1992) noted that of 117 species of frogs, toads, and caecilians inhabiting the Western Ghats, 89 are endemic. About one half the total are localized or show patchy distribution as a result of habitat destruction and fragmentation.

C. Dutta (1992) considered three species as "Sensitive and Vulnerable" due to commercial exploitation: one salamander, which is collected for both food and museum exhibits, and two frogs, one of which is used extensively for "laboratory purposes." Both frogs are edible (though frogleg export is banned). Deforestation and habitat destruction, both resulting from the increase in human population, along with pollution from insecticides and "house-wastes," are cited as the main causal factors in West Bengal (Mallick, 1992). Daniels (1991) cites removal of leaf litter, upstream chemical pollution and collection of specimens as being important "subtle" factors in the Western Ghats.

Indo-Malayan

B. On the island of Borneo, Inger and Voris (1993) have reported there is no evidence of a consistent decline in frog populations based on data from Sarawak in 1962, 1970 and 1984, and Sabah in 1986, 1989, and 1990. However, asynchronous population fluctuations were observed in more than 20 species of stream breeding frogs at these two "pristine" lowland tropical rain forest sites. (No specific declines were listed, therefore the Indo-Malayan region is not included in the Appendix.)

Taiwan, Republic of China

A. Lue (1992) and Lue et al. (1991) reported that one anuran and two caudates are listed as Endangered and three anurans are listed as Threatened, 17% of Taiwan's 30 amphibian species. (See Appendix p. 78.)

NEOTROPICAL REGION

Puerto Rico

A. Joglar and Burrowes (1993) have gathered evidence of declines of 11 species in Puerto Rico. Of the 18 endemic species, this represents 61% in decline. Three species which are listed as Threatened, *Eleutherodactylus karlschmidti, E. jasperi,* and *E. eneidae,* are probably extinct, not having been seen in 21, 12 years and 3 years respectively. *E. richmondi* disappeared from all localities above 500 m at El Yunque, Sierra de Luquillo, between 1983 and 1986. It remains in low numbers in three locations (Joglar and Burrowes, 1993). According to R.R. Johnson (1990)

Peltophryne lemur populations are now found only in a narrow coastal band in the Quebradillas area and one locality near Guanica. (See Appendix pp. 79-80.)

B. Data on *Eleutherodactylus coqui* and *E. unicolor* do not suggest declines. There is no available data on five species (NE: Not Evaluated): *Eleutherodactylus antillensis, E, brittoni, E. cochranae, E. monensis, and Leptodactylus albilabris.* Except for *E. monensis*, these species are generalists with wide distributions within Puerto Rico and are probably not declining (Joglar and Burrowes, 1993). R.R. Johnson (1990) reported no more than 300 individuals of *Peltophryne lemur* have been seen since a 1985 hurricane, a 90% loss of the original population estimate.

C. There are some common denominators on the amphibian declines in Puerto Rico. All the declining *Eleutherodactylus* are highly specialized, terrestrial to semi-terrestrial species and all occur in high elevation habitats. Sierra de Luguillo (=El Yunque) seems to be more seriously affected than any other geographic area in Puerto Rico. The causes of these declines in Puerto Rico have not been identified. Probable and suspected causal factors are a combination of deforestation, destruction and fragmentation of habitat, pollution and several intrinsic factors such as overspecialization (morphological and ecological), small population size, and other characteristics that are usually present in island populations (R.R. Johnson, 1990; Joglar and Burrowes, 1993).

Greater Antilles

A. Two species in Hispaniola appear to have declined. In Jamaica five of 22 species (23%) are considered of possible concern due to recent absence or low abundance (Hedges, 1993). (See Appendix p. 80.)

B. No "general" declines have been noted among the 156 amphibian species (all anurans) in the West Indies; among them, seven "have not been seen recently" (Hedges, 1993).

C. According to Hedges (1993) the single major factor responsible for declines is habitat destruction resulting from deforestation. Globally, approximately 65% of the tropical forests have been destroyed (i.e. 35% cover remains). In the Greater Antilles present forest cover estimates are: Cuba - 20%, Dominican Republic - 10%, Puerto Rico - 10%, Jamaica - 6%, and Haiti - 1% (T.H. Johnson, 1988; Caribbean/Central American Action, 1989; Paryski et al., 1989; World Resources Institute, 1992; Perera, pers. comm., cited in Hedges, 1993). Because of a high level of endemism and extremely low level of forest cover, "Haiti may become the Earth's first major biodiversity disaster" (Hedges, 1993).

Lesser Antilles

A. Four species are reported as declining in the Lesser Antilles by Henderson and Kaiser (1993), of a total of nine (Schwartz and Henderson, 1985), or 44%. (See Appendix pp. 80-81.)

C. Two endemic species, *Eleutherodactylus euphronides* on Grenada and *E. shrevei* on St. Vincent, are threatened by a combination of the introduction of a "robust ecological generalist that inhabits disturbed and degraded habitat," *E. johnstonei*, and habitat destruction. *Leptodactylus fallax* is threatened by human consumption on Montserrat, and on Montagne Pelee a newly identified *Colostethus* species is considered sensitive because of its limited distribution, increasing habitat destruction and pollution (Henderson and Kaiser, 1993).

Honduras

A. A survey by McCranie (1992) of the Parque Nacional Cusuco region revealed the complete absence of four previously observed species, and no tadpoles were found in streams above 1485 m elevation. (See Appendix pp. 81-82.)

B. Because of the absence of baseline data on amphibian abundances over time, Wilson and McCranie (1992) have devised an environmental vulnerability score, which they used to rank 18 of the 85 species in Honduras (or 21%) as "most vulnerable."

C. Habitat destruction commensurate with human population growth is considered to be the most significant threat to amphibians in Honduras (Wilson and McCranie, 1992).

Costa Rica/Panamá

A. In the organizational report of the Task Force's first Working Group, 12 species were listed as declining or locally absent, four species in Costa Rica and eight in Panamá (Savage et al., 1991). (See Appendix pp. 82-83.)

C. In Costa Rica, Savage et al. (1991) attributed the main impact to local factors, especially acid rain from refinery activities and the introduction of trout. The dramatic declines and apparent disappearances in the Monteverde Cloud Forest are possibly linked to changes in local moisture levels and cycles due to El Niño and global warming; however, Crump, et al. (1992) did not discount normal responses to an "unpredictable" environment, and possible a priori environmental degradation, Three localities are of special concern in Costa Rica: Bajo La Hondura (1,200 m), Paso La Palma (1,500 m), and Cerro Chompipe (2,200 m). Panamá's declines are believed to be largely the result of habitat fragmentation and resulting insularization, along with pesticide use (Savage et al., 1991).

Venezuela

A. La Marca and Reinthaler (1991) identified five species of highland frogs in decline. Of the 56 amphibian species Péfaur (1992b) listed as Threatened or Endangered, 54 are anurans (three of the latter are included in La Marca and Reinthaler). Péfaur (1992b) enlarged the total number of Venezuelan species to 209 (confer La Marca, 1992), thus 27% are of concern. (See Appendix pp. 83-85.)

C. Destruction of habitats, floods, road kills, introduced species and overcollection are among causal factors of species declines (La Marca and Reinthaler, 1991).

Ecuador

A. In Ecuador, 402 amphibian species were listed by Almendáriz (1991). Those inhabiting the cloud forests and páramos of the high Andes are being severely impacted: four species appear to be recently extinct and at least another four are experiencing dramatic declines (Puertas et al., 1992). (See Appendix p. 85.)

Peru

A. Of the 292 species in Peru, six (2%) were considered "critical," declining species (Salas and Jimenez, 1993). (See Appendix p. 86.)

B. Rodriguez (1992), in a 13 month study of Cocha Cashu National Park, encountered no declines in an assemblage of 81 species. Duellman (1993) in a six year study including 65 anuran species in southern Amazonian Peru detected no declines in the numbers of individuals or species.

Brazil

A. Heyer et al. (1988, 1990) examined temporal frog species distribution in Boracéia, state of São Paulo, Brazil, and compared their observations with others made as early as the 1940s. Seven species of frogs common through mid-1979 became rare or locally absent by 1982. During this same period, five additional species disappeared completely. (See Appendix pp. 86-87.)

While detailed records were available only for the assemblages at Boracéia, observations suggested that during the same period populations crashed at other locations in the Atlantic Forests of Brazil: In 1982 *Cycloramphus duseni* was absent from its type locality in Paraná; the once common *C. granulosa* , *Hylodes glabrus, Thoropa petropolitana,* and *Phyllomedusa guttata* could not be found.

B. The abundance of some species was unchanged. Pond breeders such as *Bufo crucifer, B. ictericus, Hyla faber, H. microps, H. minuta, H. pardalis, H. polytaenia, Ololygon crospedospila, O. hayii, Physalaemus cuvieri* and *P. olfersi,* as well as the forest species *Hyla albofrenata, H. astartea, H. hylax, H. leucopygia* and *Eleutherodactylus randorum* remained about equally abundant from the 1940s to 1984. One species, *Hyla albopunctata* increased in numbers (Heyer et al., 1990).

C. The most dramatic impact at Boracéia occurred between March 1979 and January 1982. Two causes seem probable: a one-time pollution event and/or an "unusual climatic change." Other factors argue against chronic pollution. A synchronous change over a very large area was most likely caused by the hard frosts in 1979, reported as being the worst in 100 years (Heyer et al., 1990).

Bolivia

A. Of the 118 species occurring in Bolivia, only *Telmatobius culeus* is listed as "critical" and three localities are considered "critical areas" (De la Riva, 1990; Ergueta and Sarmiento, 1992). (See Appendix p. 87.)

Uruguay

A. Six species of the 40 total found in Uruguay (15%) were considered to be "critical" (Klappenbach and Langone, 1992). (See Appendix p. 87.)

Chile

A. Veloso and Navarro (1988) listed 41 amphibian species in Chile. Of these, Ortiz (1992) reported 30 (73%) are considered either Endangered, Vulnerable or Rare according to federal or regional designation. (See Appendix pp. 87-89.)

C. The central and southern regions of Chile are those most densely populated by humans and have suffered serious damage to natural vegetation due to forestry practices, which include introduction of exotic tree species. Also cited as possible effects are drainage or filling of freshwater areas, deforestation, monocrops, exports of amphibians as pets, and human consumption (Ibarra-Vidal, 1989; Ortiz, 1992). A. Veloso (in litt.), citing Ortiz (1988) notes the tremendous impact upon native herpetofauna caused by amphibian exportation. Recently laws have been passed to curb greatly this activity.

Argentina

A. In 1984, Miguel Christie reported on the status of amphibians in two national parks, Lanin and Nahuel Huapi. A total 18 species were registered, including five listed as "marginal." Among the remaining 13, seven are Vulnerable and six are Safe/Low Risk. According to Lavilla (1993), Argentina has a total of 161 amphibians. He listed only three species and five localities as "critical" (see Appendix pp. 89-90).

AUSTRALIAN REGION

Australia

A. Tyler has listed 44 species, of an estimated 194 amphibian species in Australia, in various stages of decline (1991, 1992). Ehmann (1992) and Mahony (1993) reported declines in another 13 species from New South Wales. The total (57) represents 29%, or nearly one-third of all Australian amphibians. (See Appendix pp. 90-97.)

B. Tyler (1991) stated that all of the declines were within the southern half of the continent, with most bordering the Great Dividing Range in the east and southeast. There are isolated declines in the SW of Western Australia (Tyler, 1992; Wardell-Johnson and Roberts, 1991). Richards et al. (1992, 1993) analyzed trends that emerged from their studies in the Wet Tropics Biogeographic Region as follows: (1) declines have occurred primarily in high elevation, upland regions (>300m); and (2) stream dwelling species are the most effected. K. McDonald (1990) reported that declines are known from northeastern, eastern and southern Australia in the absence of pollution and disturbance.

C. Habitat destruction has been cited by Tyler (1992) as the most obvious cause for declines in *Litoria brevipalmata* and *Geocrinia alba*. In the case of *L. spenceri*, the process of eductor dredging that uses hydraulic suction devices to sift for gold in alluvial sediments is considered the most serious threat, although others may be contributing (Hall, 1988 in Tyler, 1992). Declines in *Heleioporus albopunctatus* are largely attributable to increased soil salinity (Main, 1990 cited in Tyler, 1992). For the much publicized gastric brooder, *Rheobatrachus silus*, drought, creek silting due to logging, illegal gold panning, and specimen collection have all been suggested as agents, but no evidence supports any single cause for the disappearance of this species (Tyler, 1992).

Czechura and Ingram (1990) emphasized the catastrophic, unexplained nature of the disappearances of *Taudactylus diurnus, T. eungellensis, Rheobatrachus silus,* and *R. vitellensis.*

The disappearance of *L. raniformes* and *L. aurea* in the Australian Capital Territory (ACT) occurred in locales unaffected by drought or changes in water quality and have not been explained; *Pseudophryne* sp. is apparently more susceptible than other species to drought, which has locally reduced its breeding habitat (Osborne, 1990, 1991). An interesting observation was made by Tyler (1992) on certain declining taxa in SE Australia: *Litoria raniformes, L. aurea, L. flavipunctata,* and a possible undescribed subspecies of *L. flavipunctata* all share the habit of sun basking.

Richards et al. (1992, 1993) analyzed rainfall variability in Queensland and reported no correlation that could explain declines in that area. An analysis of water quality also failed to identify any toxic agents in upland streams.

The problem of salinization is widespread in parts of Australia and the cause of apparent disappearances of species at certain localities in Western Australia. Aquatic larvae are the most vulnerable, whereas tolerance levels of adults appear associated with skin thickness (Tyler, 1991).

New Zealand

B. Only six species of frogs inhabit New Zealand, none of which are known to have suffered significant declines; however, the three native and endemic species are considered Sensitive or Vulnerable (Cree, 1992). (See Appendix p. 97.)

C. Major threats to the two mainland natives are habitat disturbance and destruction from mining, and introduced mammals. The two small island populations of the third endemic, *Leiopelma hamiltoni*, are considered Endangered and Sensitive due to low numbers, habitat modification and "inbreeding depression" (Cree, 1992).

ANALYSIS OF TRENDS

At this time we do not have adequate quantitative data to determine the actual number of amphibian species demonstrating declines (as earlier defined). Most of the limitations result from the absence of base-line references for comparisons, and lack of accurate information as to the total number of amphibian species inhabiting many of the named geographic/political regions.

Geographical patterns

Because they exist near limits of ecological tolerance, amphibian populations occurring at the latitudinal or altitudinal margins of their distribution ranges are those most likely to respond to any environmental change and demonstrate exaggerated fluctuations.

Nevertheless, it may be significant that in Canada (Seburn, 1992), Europe (Talvi, 1991) and the CIS (Kuzmin et al., 1993), declines have been noted at the northern boundaries of species' ranges. In the southern hemisphere this may correspond to the observed progression of declines from the south to north of eastern Australia (Richards et al., 1992, 1993). No comparable information from South America or Africa is yet available.

Higher elevation species seem especially susceptible. Amphibian declines in these habitats have been reported in Queensland (Richards et al., 1992, 1993), the Ukraine (Misyura, 1993), the Caucasus (Kuzmin, 1993), Puerto Rico (Joglar and Burrowes, 1992), Costa Rica (Savage et al., 1991), Ecuador (Puertas et al., 1992), the Rocky Mountains, the Cascades and Sierra Nevada Range in the U.S.A. (Bury and Corn, 1992; Corn, 1993). These occurrences are primarily in undisturbed areas that experience negligible direct anthropogenic effects and may therefore be cases of possible indirect global factors. The circumstances are otherwise with anuran declines in the Venezuelan Andes and Western Ghats of India, where habitat alteration is taking place (La Marca and Reinthaler, 1991; Daniels, 1991). Zuiderwijk (1992, in litt.) attributes observed declines in the mountainous regions of Spain, Portugal and Italy to drought caused by land use and over-exploitation of water.

Trends in species and life history characters

The family Bufonidae was suggested by B. Johnson (1992) as being the most imperiled. In comparing two allopatric species, *Bufo boreas* and *B. hemiophrys baxteri,* Corn (1993) and Corn and Bury (1993) concluded that the only commonalities between them were that both declined during the same period (since about 1975), both have been observed with red-leg disease, and surviving populations displayed relatively low egg mass numbers. In the southwestern U.S. ranid frogs as a group have also declined (Scott, 1993).

Stream or vernal pool breeding species have been noted as more in decline than terrestrial amphibians in several locations throughout the world. In Eurasia and the United Kingdom, the highly aquatic *Triturus cristatus* is reported in decline.

Current information from the United States does not enable an update as to the status of *Rana pipiens* throughout much of its range east of the Rocky Mountains, necessary for comparison with the Canadian declines.

Probable and suspected causal factors

The overwhelmingly reported cause of declines is habitat destruction, disturbance and fragmentation. B. Johnson (1992) and Bogart (1992) both stated that habitat destruction is the single-most influential cause of declines in Canada, as did Corn (1993) for the western United States, Dodd (1992) for the southeastern United States, and Kuzmin (1993) for the CIS. There is no question that the global extent of human disturbance is seriously impacting major ecosystems.

The negative effects of environmental contaminants have been documented here and verified in other recent studies in Canada (Bishop, 1992; Clark, 1992; McAlpine, 1992), Europe (Leuven et al., 1986; Parent, 1992), the United States (Cory, 1971; Pierce, 1985; see also papers in Dunson and Wyman, 1992), Zambia (Simbotwe, 1992), the CIS (Kuzmin, 1993) and elsewhere.

The introduction of non-native predatory fish (Bradford, 1989, 1993, Kuzmin et al., 1993), frogs (Hayes and Jennings, 1986, cited in Bury and Corn, 1992) and rarely mammals (Cree, 1992; Hedges, 1992), has also been shown to be very detrimental to some amphibians. That negative consequences of coactions between fish and/or non-native frogs upon amphibian populations may be caused by other than direct predation has been established by Liss (1993) and Kupferberg (1993).

Weather is one of the most significant natural killers of amphibians (Corn, 1993). Drought is a potentially important factor that can result in localized extinctions, but not likely on the scale observed in southeastern Australia (Tyler, 1991). According to Zuiderwijk (1992), drought is the primary causative agent in Europe. Conversely, flooding can cause catastrophic mortality, as reported for *Ascaphus truei* in the U.S. Pacific northwest by Metter (1968).

The causes of two local mass mortality events have differing suggested causes. On the island of Kauai, Hawaii, local disappearances of *Bufo marinus* have been recorded (J. Wright, in litt.). David Martin (in litt.) observed some *B. marinus* populations on that island in a state of emaciation. A sample Martin collected was forwarded to Dr. D. Earl Green for necropsy, whose findings indicate the decline was solely due to starvation during a period (winter) of probable low prey numbers (D.E. Green, in litt.). Further histopathologic examinations are in progress (D.E. Green, in litt.). Local mortality episodes of *Rana temporaria* in Switzerland have been caused by oxygen depletion when eutrophic ponds freeze over (Gerlach and Bally, 1992). A similar fate was observed among *Rana muscosa* occupying shallow ponds in the Sierra Nevada Mountains of the western U.S. (Bradford, 1983).

It appears likely a combination of effects is occurring in many instances of amphibian declines. Horne and Dunson (1993) are exploring interactions between pH, heavy metals, and water hardness in determining toxicity to larval and embryonic salamanders.

In another important study, Carey (1993) looked at the combined effects of various environmental stressors, including low temperature, on immune system response. This may explain the apparent deaths of adult frogs and toads due to red-leg disease, as well as the extirpations that have occurred in cold, high elevation sites.

Scott (1993) proposed a "Postmetamorphic Death Syndrome" (PDS) to describe a set of similar events and symptoms demonstrated in ranid frog populations in the southwestern U.S. "PDS" is characterized by: the mortality of all postmetamorphic individuals in a short period; a pattern of synchrony at a micro-geographic scale, but not among large regions; a "ripple effect" in which disappearances spread along an expanding perimeter. Most such die-offs are noticed during or following unusually cold periods, or brumation. In a given region PDS does not appear to affect all species equally. Scott (1993) suggested a disease organism as the causative agent. Poxvirus-like particles have been associated with unusual episodes of mortality among *Rana temporaria* in the United Kingdom (Cunningham et al., 1993).

Fellers and Drost (1993b) observed that a combination of factors may be causing declines in western U.S. National Parks: (1) non-native, predatory fish; (2) loss of habitat due to a five year drought; and (3) gradual loss of meadows and associated aquatic habitat resulting from long periods of fire suppression.

CONCLUSIONS

We must first emphasize the fact that the kind and quantity of evidence presented here is not yet adequate to derive clear-cut determinations as to the nature and extent of amphibian declines.

At this time care must be exercised to avoid summing a number of possibly coincidental events as a conclusion that we are dealing with a phenomenon generally catastrophic in magnitude or global in extent. Otherwise, we face the inherent danger of hyperbole producing the same anesthetic effect as Chicken Little crowing "the sky is falling." The inhabitants of south Florida, Hawaii, and Australia may have to be pressed hard to convince them amphibians are experiencing major declines, while they find themselves suffering a plague of *Bufo marinus*.

In the process of determining if amphibian declines are actually happening and, if so, what their causes might be, the application of uniform field and analytical techniques must be applied. The formulation of viable conservation and management practices will require a foundation of good scientific data. The Smithsonian Institution document, "Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians," is scheduled for distribution in December 1993. Efforts are being made to provide all DAPTF Working Groups with these protocols in order to maximize their utilization.

One difficulty we continued to encounter in our attempts to determine the risk level of amphibian populations was the lack of consistent classifications regarding status. Greater efforts are needed to encourage Working Groups to adopt uniform criteria and Red List categories such as those recommended by the World Conservation Union (IUCN). A request for evaluation of criteria and categories adopted by the IUCN/Species Survivial Commission (SSC) has been issued by Simon N. Stuart (in litt.).

More than 720 population status reports are listed in the Appendix, some of which have multiple designations including the risk status of populations at different localities, or the use of combined categories (e.g., T/E for Threatened/Endangered). Only 43 populations (approximately 6%) are designated as Safe/Low Risk (S/LR) or Insufficiently Known (IK). In view of the fact that the focus of monitoring activities has thus far been to identify species in decline, any validity assigned to this figure would be highly conjectural.

Such opposing conclusions as those presented in studies of acidification tolerances among montane amphibian species in the USA (e.g., Harte and Hoffman, 1989; Wissinger and Whiteman, 1992; Vertucci and Corn, 1993) should be further tested. In Ontario, Canada, a study by Grant and Licht (1993) showed that responses of embryos and larvae of three anuran species to acidic conditions were significantly different; however, in one species (*Hyla versicolor*) a population from an "acid-sensitive" location exhibited greater tolerance than those from elsewhere in its distribution range.

The role of potential predators needs to be more thoroughly examined. In many cases the impact appears a direct predator-prey relationship; however, Liss et al. (1993) in their studies of aquatic salamander populations in the U.S. Pacific northwest found distribution and abundance of salamander larvae resulted from complex interactions due not only to the presence of potentially predatory fish, but also conditions of the physical environment and food availability. Interactions (competition) between introduced and native frog species have been shown to perturb aquatic communities and exert differential effects on natives (Kupferberg, 1993).

The importance of studying amphibian populations inhabiting urban areas has been emphasized by B. Johnson (1992). A species that survives well under the influence of strong anthropogenic stress, yet is declining in undisturbed areas, should provide a measure of species resilience and provide an opportunity to determine what additional factors might be at play.

There is emerging evidence that metapopulation dynamics are of significance in regard to the nature of colonization and extinction, and are thus important to consider in formulating conservation management practices (Cortwright, 1993; Olson and Bradshaw, 1993). Corn (1993) emphasized the importance of considering temporal and spatial population characteristics in the design of such strategies. Recent research on the population genetics, ecology and life history of *Ambystoma californiense* (Gustafson, 1992; Shaffer, 1993) indicated that local extinctions commonly occur and the ability to recolonize through migration is a critical factor for species persistence. In Sweden a similar conclusion was reached by Sjögren (1993 a & b) in a five year study of metapopulation demographics and local extinction in *Rana lessonae*.

The use of corridors has been recommended in a proposed conservation strategy in Western Australia (Wardell-Johnson and Roberts, 1991). The importance of providing for migration between metapopulations, whether through corridors (B. Johnson, 1992) or by assigning large tracts as protected habitat that meet threshold requirements of species (Swan and Oldham, 1993), will be critical to maintaining, and for many cases now, reviving amphibian populations.

Wherever present, amphibians should be included as integral elements in all environmental impact studies and conservation management plans. This recommendation is supported in a study by Fellers and Drost (1993b), who concluded that current forest management practices may negatively impact amphibian communities and, thus, should be carefully reviewed. Two recent government documents, the "Gang-of-Four" report (Johnson et al., 1991) and The Report of the Scientific Analysis Team (Thomas et al., 1993), apply an ecosystem approach to the much debated old-growth, late-successional forests in the Pacific northwest of the United States; both studies include amphibians, along with birds, mammals and plants, in their evaluations. Nevertheless, we must not be overly inclined to synonymize "amphibians" with the phrase "biological indicators." While it does appear that certain taxa may indeed be important harbingers of environmental change, sound conclusions demand sound evidence. The term "bioindicator" has already been over-extrapolated by application to fishes, reptiles, birds, invertebrates and plants. (For further discussion see Parent, 1992.)

The consequences of large-scale, even global environmental factors such as shifts in acidification, climate conditions, UV radiation/ozone levels, etc., to a great degree remain undetermined. Priority status should be given to long-term ecological studies that combine the field and laboratory research required to elucidate their significance. An initiative should also focus on the vast body of evidence as to lethal and sub-lethal effects of herbicides and insecticides. Intensive toxicological studies are needed to evaluate current standards of use.

Immediate measures need to be taken to conserve biodiversity in ecosystems (see Lubchenco et al., 1991). If world-wide pollution and habitat destruction continue at present rates it will not be long before amphibian declines are among the least of our concerns. We must strive quickly to manage a sustainable biosphere or face an onslaught of human initiated threats the complexity of which we can barely grasp. Otherwise, there is one certitude. *Homo sapiens* will become the only species on planet Earth whose existence is endangered by its superabundance.

RECOMMENDATIONS FOR FUTURE DAPTF OPERATIONS

The following recommendations for future operations were formulated in collaboration with Bob Johnson, Chair of the DAPTF.

1. Continue to organize and activate additional regional Working Groups, especially in areas of rich species diversity, where the Task Force remains underrepresented, e.g., the Old World Tropics, Asia, and eastern Europe.

2. Develop collaborative and coordinated long-term projects among Working Groups that will focus on biodiversity "hot spots." Pristine regions, those of high endemism and/or of great fragility need to be identified in order to solicit support from international conservation agencies, which can best be achieved by defining these investigations within the framework of a global initiative.

3. Improve and enlarge upon fund raising activities. Support for pilot-projects and facilitating the activities of Working Groups are essential to the success of Task Force activities. There is a urgent need for an increase in funds for "seed-grant," as well as for action that will stimulate regional monitoring of amphibian populations and assessing the status of any declines.

4. Determination of direct and indirect environmental factors impacting upon amphibian populations is an integral phase of the monitoring and assessment activities. Such information will be necessary to provide a basis for developing management and conservation policies.

5. Increase the utility of, and access to, the DAPTF databank by the scientific community. Communication among Working Groups and the Coordinator remains a top priority activity. It is essential also, to network with such organizations having extensive databanks such as the Smithsonian Institution, British Museum (Natural History), and the World Conservation Monitoring Centre, in Cambridge, UK.

6. Implement the adoption of standardized protocols for monitoring and evaluating the status of amphibian populations. Recent publication by the Smithsonian Institution of "Measuring and Monitoring Biodiversity: Standard Methods for Amphibians," will enable the application (and evaluation) of uniform sampling techniques among Working Groups, thus assuring maximum utilization of comparable data. To this end the DAPTF should assure comprehensive distribution of this document to Working Groups, especially to those in economically depressed circumstances.

7. Implement world-wide adoption of uniform criteria and categories in classifying risk status for amphibians, The IUCN/SSC recently formulated new criteria for Red List categories and Appendices of the Commission on International Trade of Endangered Species (CITES) that are currently being evaluated.

8. Expand activities in public education. Many issues of concern to the Task Force have implications for preservation of biodiversity and its significance as to the quality of life around the globe. To effect positive changes in attitudes, and influence decisions on issues relating to a sustainable biosphere, the Task Forces' focus on amphibian declines should be made relevant to the general public at the individual and community level. *FROGLOG* can continue to serve well in this endeavor. Current problems should be brought to the attention of the international print and broadcast media.

9. Solicit the endorsement, involvement and support of herpetologists world-wide. International, national and regional societies should be more actively engaged with the DAPTF, not the least of which is the World Congress of Herpetology.

10. Proceed with arrangements to archive accumulated hard copy files with the Smithsonian Institution (SI), as has been offered. The present limitations of space are rapidly becoming overcrowded as a result of our accumulation of correspondence, reports, etc. The SI offered to store and manage our inactive files, which should be retained for a period of approximately five years, but no action has yet been taken by the IUCN/SSC.

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Appendix I: Table of Target Species, Localities and Critical Habitats

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
NEARCTIC REGION					
Canada					
Alberta	W. Roberts	22-12-92	*Bufo cognatus*	D	NG
			B. hemiophrys	D	NG
			Rana pipiens	D	N of 51°N latitude
			R. pretiosa	D	NG
British Columbia	S. Orchard	22-12-92	*Ambystoma tigrinum*	D	Okanangan & Thompson valleys
			Ascaphus truei	D	Coast Rng,, W slope Cascades, W slope Rockies in SE of Prov.
			Dicamptodon tenebrosus	D	Coast Rng,, W slope of Cascades
			Plethodon idahoensis	D	W slope of Purcell Mts.
			Rana pretiosa	D	over range in BC
			R. pipiens	D	over range in BC
			Scaphiopus intermontanus	D	Okanangan & Thompson valleys
Manitoba	W. Koonz	22-12-92	*Rana pipiens*	D	over range, some contraction of range

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Ontario	M. Oldham M. Berrill et al.	22-12-92 22-12-92	*Acris crepitans blanchardi*	E	at northern edge of range, Pelee Island
			Rana catesbeiana	D	S & central Ontario
Quebec	J. Bonin	22-12-92 05-10-93	*Rana palustris*	LA	Appalachian Mts. in SW Quebec, few scattered localities known
			Pseudacris triseriata	R,D	St. Lawrence valley, Ile Perrot
			Desmognathus ochrophaeus	R	at northern edge of range, foothills of Adirondacks
			Gyrinophilus porphyriticus	R	" " " , SW Quebec
			Hemidactylium scutatum	R	few scattered localities known
Saskatchewan	C. Seburn	22-12-92	*Bufo cognatus*	R	occurs only in SW corner of Saskatchewan
			Rana pipiens	D	NG
			Scaphiopus bombifrons	R	at northern limits of range
USA					
Pacific NW	D. Olson	09-12-92 28-09-93	*Ambystoma tigrinum*	SM	Washington
			Aneides flavipunctatus	sp	Oregon
			A. ferreus	sc	Oregon

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Pacific NW, cont.			*Ascaphus truei*	sv, SM	(sv) Oregon & (SM) Washington
			Batrachoseps attenuatus	sp	Oregon
			Bufo wrighti	sc	Oregon
			B. boreas	D	Oregon & Washington
			B. woodhousii	SM	Washington
			Dicamptodon copei	sc, SM	(sc) Oregon & (SM) Washington
			Plethodon dunni	SC	Washington
			P. elongatus	C2,sv	Oregon
			P. larselli	C2,sv SC	" Washington
			P. stormi	C2,sv	Oregon
			P. vandykei	SC	Washington
			Rana aurora	C2,su	Oregon
			R. boylii	su	Oregon
			R. cascadae	C2,sc	Cascade Rng., Oregon
			R. pipiens	sv	Oregon
			R. pretiosa	C2,sc	Oregon & Washington
			Rhyacotriton olympicus	sv,SM	(sv) Oregon & (SM) Washington

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Rocky Mts.	R.B. Bury & P.S. Corn	05-03-92	*Ambystoma tigrinum*	D	Colorado, Arizona
			Bufo boreas	D	Colorado, Wyoming, New Mexico
			B. hemiophrys baxteri	D	Laramie Basin, Wyoming
			Rana blairi	D	Colorado
			R. onca	X(?)	Utah (Rediscovered by R. Jennings, 1993)
			R. pipiens	D	Colorado, Wyoming
			R. pretiosa	D	Utah
Central Region	M. Lannoo	20-05-93 13-10-93	*Acris crepitans blanchardi*	D	N Indiana
			Ambystoma laterale	RC E,SC	 (E) Iowa, Ohio, (SC) Indiana
			A. platineum	E	Illinois
			A. talpoideum	R	Missouri
			Aneides aeneus	RC E,NE	 (E) Ohio, (NE) Indiana (recently discovered)
			Cryptobranchus alleganiensis	RC E	 Illinois (1 Jan 94), Indiana, Ohio
			Desmognathus fuscus conanti	E	Illinois (1 Jan 94)
			Eurycea lucifuga	E	Ohio

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Central Region, cont.			*Hemidactylium scutatum*	RC	
				T	Illinois (1 Jan 94), Indiana
				R, SC	(R) Missouri, (SC) Ohio
			Necturus maculosus	E,SC	(E) Iowa, (SC) Indiana
			Notophthalmus viridescens	E	Iowa
			Pseudacris streckeri	T	Illinois
			P. s. illinoensis	RC	
				R	Missouri
			Pseudotriton ruber	E	Indiana
			Rana areolata	RC	
				E,T	(E) Iowa, (T) Indiana
			R. areolata circulosa	LA?	Iowa. Not seen since 1940.
			R. blairi	SC	Indiana
			R. pipiens	R, SC	(R) Missouri, (SC) Indiana
			Rana sylvatica	R	Missouri
			Scaphiopus bombifrons	T	Iowa
			S. holbrookii	RC	
				E,SC	(E) Ohio, (SC) Indiana
			S. h. holbrookii	R	Missouri

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Great Lakes	G. Casper J. Huff	11-12-92 91	*Acris crepitans blanchardi*	D	wetlands in Michigan, Minnesota, & Wisconsin
			Hyla crucifer	D	Wisconsin
			Rana clamitans	D	"
			R. sylvatica	D	"
			Pseudacris triseriata	D	"
Northeast	R. Wyman	22-12-92 08-09-93	*Acris crepitans*	T	New York
			Ambystoma jeffersonianum	S,D	(S) Massachusetts & New York & (D) Pennsylvania
			A. laterale	E,S	(E) New Jersey & (S) Massachusetts & New York
			A. maculatum	S,D	(S) New York & (D) Pennsylvania
			A. platineum	S	Massachusetts
			A. tigrinum	E	New York, New Jersey, Pennsylvania, Delaware, Maryland
			A. tremblayi	E,S	(E) New Jersey & (S) Massachusetts
			Aneides aeneus	E,T	(E) Maryland & (T) Pennsylvania
			Cryptobranchus alleganienis	E,S	(E) Maryland & (S) New York & Pennsylvania
			Eurycea longicauda	T,D	(T) New Jersey & (D) New York
			Gastrophryne carolinensis	E	Maryland

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Northeast, cont.			*Gyrinophilus porphyriticus*	S	Massachusetts
			Hemidactylium scutatum	S	Massachusetts
			Hyla andersonii	E	New Jersey
			H. chrysoscelis	E	New Jersey & Delaware
			H. gratiosa	E	Delaware & Maryland
			Plethodon nettingi	T/E	federally listed - Cheat Mtn. salamander
			P. wehrlei	S	Maryland
			Pseudotriton montanus	T,S	(T) New Jersey & (S) Pennsylvania
			Pseudacris brachyphona	S	Maryland
			P. feriarum	E,D	(E) Pennsylvania & (D) New York
			P. triseriata	E	Vermont
			Rana utricularia	E,S	(E) Pennsylvania & (S) New York
			R. virgatipes	S	Maryland
			Scaphiopus holbrooki	T,D	(T) Massachusetts & Rhode Island & (D) New York
Appalachia	J. Mitchell *in* R. Bruce	08-01-93	*Ambystoma tigrinum*	E	Maple Flats, G. Washington NF; Isle of Wight Co., Virginia
			A. mabeei	T	Grafton Ponds, York Co.; Isle of Wight Co., Virginia

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Appalachia, cont.			*Hyla gratiosa*	T	Grafton Ponds, York Co.; Isle of Wight Co., Virginia
			Plethodon hubrichti	SU	The Peaks of Otter, Jefferson NF, Virginia (fed. candidate T/E)
			P. punctatus	D?	Shenandoah Mt., G. Washington NF, VA (local concern)
			P. shenandoah	T/E	Shenandoah Nat'l. Park, Virginia
			Rana virgatipes	S	Seashore State Park, Virginia Beach, VA (special concern sp.)
	A. Braswell	29-01-93	*Rana c. capito*	SC	N Carolina, fed. candidate for T/E
Southeast	C.K. Dodd, Jr. P. Moler	27-07-92 24-08-93	*Ambystoma cingulatum*	C2,D	S Carolina, Georgia, Florida, Alabama
			Desmognathus auriculatus	D	S Carolina & Florida coastal plains
			Desmognathus fuscus	D	S. Carolina
			Necturus sp.	C2,D	Sipsey Fork, Alabama
			Notophthalmus perstriatus	C2,D	Georgia, Florida
			Phaeognathus hubrichti	T	ravines of the Red Hills in Alabama
			Rana capito	C2,D	Mississippi, Alabama (Florida?)
					General hot spots: coastal plain temporary wetlands, esp. isolated wetlands in pine uplands; mtn. tops in S Appalachia.

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Mississippi Delta	S.E. Trauth	30-08-93	*Bufo valliceps*	IK	Arkansas
			Cryptobranchus bishopi	CR	"
			Desmognathus fuscus	EW	on Crowley's Ridge, Arkansas
			Hemidactylium scutatum	SU	Arkansas
			Hyla avivoca	VU	"
			H. squirella	IK	"
			Plethodon caddoensis	VU	"
			P. fourchensis	VU	"
			P. kiamichi	VU	"
			P. ouachitae	VU	"
			Pseudacris streckeri illinoensis	EN	"
			P. s. streckeri	EN	"
			Rana areolata areolata	IK	"
			Scaphiopus bombifrons	EN	"
			Typhlotrition spelaeus	SU	"
Southern Plains	Bury & Corn	05-03-92	*Bufo houstonensis*	T/E	Texas

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Southwest	Bury & Corn	05-03-92	*Ambystoma tigrinum stebbinsi*	D	Arizona
			Bufo boreas	D	New Mexico
			B. microscaphus	D	Arizona
			Rana chiricahuensis	D	Arizona, New Mexico
			R. pipiens	D	Arizona
			R. subaquavocalis	D	Arizona
			R. tarahumarae	D	Arizona
			R. yavapaiensis	D	Arizona, New Mexico
			Rana sp.	D	New Mexico (N. Scott)
	J. Howland & M. Sredl	14-01-92	*R. blairi*	D	Sulphur Springs Valley, Arizona (small, isolated pop.)
	M. Sredl	04-11-93			
Calif./Nevada	G. Fellers	13-11-93	*Ambystoma californiense*	F2	NG
			A. gracile	D	"
			A. macrodactylum croceum	E	Santa Cruz Co., CA
			A. m. sigillatum	D	NG
			Ascaphus truei	SC	"

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Calif./Nev., cont.			*Batrachoseps aridus*	E	NG
			B. campi	F1	"
			B. pacificus pacificus	F2	Channel Islands, CA
			B. simatus	F2,T	Kern Canyon, CA?
			B. stebbinsi	F2,T	Tehachapi, CA?
			Batrachoseps sp. 1	cs	NG (Breckenridge Mt. Slender Salamander)
			B. sp. 2	cs	" (no common name)
			B. sp. 3	cs	" (Scodie Mt. Slender Salamander)
			B. sp. 4	cs	" (Kern Plateau Slender Salamander)
			B. sp. 5	cs	" (Guadalupe Cr. Slender Salamander)
			Bufo alvarius	SC	Colorado River, CA
			B. boreas	D	Yosemite Nat. Park
			B. canorus	SC	Yosemite Nat. Park
			B. exsul	T	NG
			B. microscaphus californicus	F2,SC	"
			B. m. microscaphus	F2	"
			B. nelsoni	F2	"

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Calif./Nev., cont.			*Dicamptodon ensatus*	D	NG
			Ensatina eschscholtzii croceator	F2,SC	"
			E. e. klauberi	F2,SC	"
			Hydromantes brunus	F2,T	"
			H. platycephalus	F2,SC	"
			H. shastae	F2,T	"
			Plethodon elongatus	F2,SC	"
			P. stormi	F2,T	"
			Pseudacris (Hyla) regilla	D	Yosemite Nat. Park
			Rana a. aurora	SC	NG
			R. a. draytoni	F2,SC	"
			R. boylii	SC	"
			R. cascadae	SC	"
			R. fisheri	F3B	"
			R. muscosa	SC	Sierra Nevada Mt. range
			R. onca	F3A	Nevada (see Jennings, R.D., 1993)
			R. pipiens	SC	NG

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Calif./Nev., cont.			*Rana pretiosa*	SC	NG
			R. yavapaiensis	F2	"
			Rana sp. (Duckwater frog)	F3B	"
			Rhyacotriton variegatus	D	"
			Scaphiopus couchii	SC	"
			S. hammondii	SC	"
			Taricha t. torosa	D	"
	R.B.Bury & P.S. Corn	05-03-92	*Rhyacotriton olympicus*	D	California
Mexico	O. Flores-Villela & P. Gerez	88	*Ambystoma dumerilii*	CAp2	lakes of the high central plateau
			A. lermanse	CAp2	" " " "
			A. mexicanum	CAp2	" " " "
			Bufo retiformes	CAp2	NG
PALEARCTIC REGION					
CIS	S. Kuzmin et al. S. Kuzmin	14-05-93 07-09-93	*Bombina bombina*	R	Moscow distr., Belorussia, Tatarstan
	D. Tarkhnishvili	14-09-93	*B. variegata*	D	range restriction in Ukraine

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
CIS, cont.			*Bufo bufo*	D	Moscow & Ivanovo distrs., Pridneprovie,
				R	Tyumen distr., Kondo-Sosvinsky res.
				V	Tomsk distr.
				E	Tuwa, area submerged by hydro-elec. power station
			B. calamita	R	Belorussia, Ukraine
			B. raddei	D	Khabarovsk distr., Komsomolsky res.
			B. verrucosissimus	D	N Caucasus, Abrau res.
				V	Georgia
			B. viridis	D	Moscow city, Ivanovo distr., N Ural
				R	Pridneprovie
			Hyla japonica	D	Sakhalin
			Mertensiella caucasica	S	Georgia
			Pelobates fuscus	D?	Moscow
			P. syriacus	E	Tbilisi, Georgia; on Red List in Russia
			Pelodytes caucasicus	V?	Georgia; on Red List in Russia
			Rana amurensis	D?	Tomsk distr., Khabarovsk distr, Komsomolsky Res.
			R. arvalis	D	Moscow & Tomsk distrs., Central Kazakhstan, Nura River
			R. chensinensis	D	Khingansky res.-hydo-elec. power station
			R. dalmatina	D	Ukraine
			R. lessonae/esculenta	D	Moscow city

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
CIS, cont.			*Rana ridibunda*	D	Moscow & Nizhny Novgorod cities, Ivanovo distr. Central Kasakhstan, Nura River
			R. temporaria	D E	N Karelia near lake Ket Pridneprovie
			Salamandrella keyserlingii	D,V R	(D) Tyumen distr., Kondo-Sosvinsky res., (V) Tomsk distr. Khabarovsk distr., Komsomolsky Res.
			Triturus cristatus	D	Moscow, Ivanovo distrs., Nizhny Novgorod, Belorussia, Tatarstan, Volzhsko-Kamsky reserve.
			T. karelini	D	Georgia
			T. vittatus ophryticus	?	on Red List in Russia
			T. v. vulgaris	D	Nizhny Novgorod, Moscow cities, Ivanovo distr., Ukraine, Pridneprovie
			T. vulgaris lantzi	V	neotenic pop. in Abkhasia, Georgia
Ukraine	A. Misyura	04-01-93	*Bufo bufo*	D	Dnieper region
			B. calamita	D	NW Ukraine, in Red Book
			B. viridis	D	Dnieper region
			Rana dalmatina	D	Zakarpathye, in Red Book
			R. temporaria	D	Dnieper region

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Ukraine, cont.			*Triturus alpestris*	D	Karpathians, Zakarpatye, Lvov, Ivano-Frankovsk & Chernovtsy habitat 150-2000 m, near streams & lakes, in Red Book
			T. montandoni	D	same as *T. alpestris* above, in Red Book
			T. vulgaris	D	Dnieper region
Ural 1-urban	V. Vershinin	02-11-92	*Rana temporaria*	E	Ural cities
			Salamandrella keyserlingii	T	Ekaterinburg, Chelyabinsk
			Triturus vulgaris	E	Ural cities
W Siberia	V.N. Kuranova	08-02-93	*Bufo bufo*	D	Tomsk region
			Rana amurensis	D	Ob river valley & tributaries
			R. arvalis	D	" " " "
			Salamandrella keyserlingii	D	Tomsk region
			Triturus vulgaris	D	"
People's Republic of China (PRC)	F. Zili	24-08-92	*Oreolax rhostigmatus*	T/E	NG (Omei Mtns. have historical data)
			Rana chevronta	T/E	"
			R. tigrina	T/E	"

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
PRC, cont.			*Vibrissaphora boringii*	T/E	NG
	W. Cheng	03-01-93	*Andrias davidianus*	E	Qimen, Anhui, China
Estonia	T. Talvi	91	*Bufo calamita*	R/V	NG
			B. viridus	R/V	"
			Pelobates fuscus	R/V	"
			Triturus cristatus	R/V	"
Romania	D. Cogalniceanu	27-09-93	*Bombina bombina*	VU	NG
			B. variegata	S/LR	"
			Bufo bufo	VU	"
			B. viridis	S/LR	"
			Hyla arborea	VU	"
			Pelobates f. fuscus	VU	"
			P. syriacus balcanicus	EN	"
			Rana arvalis	EN	"
			R. dalmatina	VU	"

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Romania, cont.			*Rana esculenta*	S/LR	NG
			R. lessonae	NE	"
			R. ridibunda	S/LR	"
			R. temporaria	VU	"
			Salamandra salamandra	VU	"
			Triturus alpestris	VU	"
			T. cristatus	VU	"
			T. dobroqicus	EN	"
			T. montandoni	SU	"
			T. vulgaris ampelensis	VU	"
			T. v. vulgaris	S/LR	"
W Europe	A. Zuiderwijk	10-11-92	*Alytes obstetricans*	T	Belgium & S of Limburg, Netherlands
			Bufo calamita	T,D	Belgium
			B. viridis	T,V	(T) France, (V) Mts. of N & central Spain
			Bombina variegata	E D	Belgium & S of Limburg, Netherlands France, Belgium & S of Limburg, Netherlands
			Chioglossa lusitanica	T	Mts. of N & central Spain

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
W Europe, cont.			*Discoglossus galganoi*	V	Mts. of N & central Spain
			D. pictus	V	Mts. of N & central Spain
			Euproctus asper	V	Mts. of N & central Spain; France
			Hyla arborea	E,D	Vlaanerderen & middle of Limburg, Netherlands
				T,D	Belgium
				D	Mts. of N & central Spain
			Pelobates cultripes	D	France - dune areas in S
			P. fuscus	E,T,V	(E) France, (T) Belgium, (V) Netherlands
			Rana arvalis	E,D	France
				T,D	(T) Belgium & Netherlands, (D) Netherlands
			R. dalmatina	E,V	(E) Belgium, (V) Mts. of N & central Spain
			R. iberica	V	Mts. of N & central Spain
			Salamandra atra	V	France
			S. salamandra	T	Belgium
				T,D	S of Limburg, Netherlands
			Speleomantes italicus	V	France
			Triturus alpestris	V	Mts. of N & central Spain
				D	Vlaanderen, Netherlands
			T. boscai	V	Mts. of N & central Spain

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
W Europe, cont.			*Triturus cristatus*	T D	Belgium & Vlaanderen, Netherlands central France & dune areas in NW; Belgium & Netherlands
			T. helveticus	T, D V	(T) Belgium, (D) Vlaanderen, Netherlands Mts. of N & central Spain
Portugal	O. Paulo	07-10-93	*Chioglossa lusitanica*	IK	NG
			Hyla arborea	S/LR	"
			Triturus helveticus	S/LR	" Important areas for amphibian conservation in Portugal: Nat. Parks of Peneda-Gerês, Serra da Estrela, Serra de S. Mamede
UK	T. Halliday	13-10-92	*Bufo calamita*	S	lowland heath and coastal dunes
			Triturus cristatus	S	" " " " "
ETHIOPIAN REGION					
Zambia	M.P. Simbotwe	02-03-93	*Afrixalus wittei*	V	Wet grasslands
			Arthroleptis stenodactylus	V	montane & evergreen forests, Zambia
			A. xenodactyloides	V	" " " " "
			A. xenochirus	V	" " " " "
			Chiromantis xerampelina	V	Wet grasslands

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Zambia, cont.			*Hyperolius* sp.	V	Wet grasslands
			Ptychadena sp.	V	"
			Phrynobatrachus sp.	V	"
			Strongylopus fuelleborni	V	montane & evergreen forests, Zambia
ORIENTAL REGION					
Indian S.C.	S.K. Dutta	22-11-92	*Bufo hololius*	D?	NG
			Indirana brachytarsus	D?	"
			I. diplostictus	D?	"
			Limnonectes tigerinus	V	"
			Melanobatrachus indicus	D?	NG, on IUCN Red List, 1990
			Micrixalus saxicola	D?	NG
			Nannobatrachus beddomii	D?	"
			Nyctibatrachus deccanensis	D?	"
			Occidozyga hexadactyla	V	S-SW India
			Pedostibes kempi	D?	NG, on IUCN Red List, 1990
			P. tuberculosus	D?	NG, on IUCN Red List, 1990

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Indian S.C., cont.			*Philautus pulcherrimus*	D?	NG
			P. temporalis	D?	"
			Rhacophorus lateralis	D?	"
			Tylototriton verrucosus	V	endemic to NE India
	P. Mallick	07-09-92	*Kaloula pulchra*	D	Howrah district, West Bengal
			Polypedates maculatus	D	" " "
			Rana tigerina	D	" " "
			R. hexadactyla	D	" " "
			Uperodon globulosum	D	" " "
			U. systoma	D	" " "
Taiwan, R.O.C.	K.Y. Lue	18-08-92	*Hynobius formosanus*	E	NG
			H. sonai	E	"
			Microhyla butleri	E	"
			Rana plancyi	T	"
			R. taipehensis	T	"
			Rhacophorus smaragdinus	T	"

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
NEOTROPICAL REGION					
Puerto Rico	R. Joglar & P. Burrowes	16-11-92 28-09-93	*Eleutherodactylus antillensis*	NE	NG
			E. brittoni	NE	"
			E. cochranae	NE	"
			E. cooki	VU	areas in Barrio Espino (vicinity of Rte. 181 from km 14 to km 18) in San Lorenzo, Barrio Quebradillas (vicinity of Rte. 900) in Yabucoa.
			E. eneidae	EW	El Yunque in Sierra de Luquillo, Carite, Toro Negro, Guilarte & Maricao Forest Reserves.
			E. gryllus	D?	Dept. Nat. Res. reports declines in some areas, surveys needed
			E. hedricki	D?	" " " " " " " "
			E. jasperi	EW	Sierra de Cayey: mostly betw. Rte. 15 & 7741, Rte. 741, Cerro Avispa (Rte. 715). Cerro El Gato (Rte. 7737) & Carite Forest Res.
			E. karlschmidti	EW	probably extinct (not seen in 20 years)
			E. locustus	VU	El Yunque in Sierra de Luquillo & Carite Forest Reserve
			E. monensis	NE	NG
			E. portoricensis	D	El Yunque in Sierra de Luquillo
			E. richmondi	EN	El Yunque in Sierra de Luquillo, Carite, Toro Negro, Guilarte & Maricao Forest Reserves.

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Puerto Rico, cont.			*Eleutherodactylus schwartzi*	D?	(from Virgin Islands but part of Great Puerto Tican Bank) - reported as declining in some areas.
			E. wightmanae	D	El Yunque in Sierra de Luquillo
			Leptodactylus albilabris	NE	NG
					Critical habs.: El Yunque, Sierra de Luquillo; Carite, Toro Negro, Guilarte & Maricao Forest Reserves; private lands in Las Vegas, Maricao, Sierra de Cayey and San Lorenzo-Patillas.
	R. Johnson	90	*Peltophryne lemur*	VU	Quebradillas area & vicinity of Guanica
Greater Antilles	S.B. Hedges	14-12-92 16-08-93	*Eleutherodactylus cavernicola*	VU	Jamaica
			E. fuscus	VU	"
			E. junori	VU	"
			E. orcutti	D	Jamaica, Hardwar Gap, stream breeder
			E. semipalmatus	D	Hispaniola, Massif de La Selle, Furcy (Haiti), stream breeder
			E. sisyphodemus	VU	Jamaica
			Hyla vasta	D	Hispaniola, stream breeder Haiti - high endemism, critically low forest cover (1%)
Lesser Antilles	R. Henderson	04-01-93	*Colostethus* sp. (new)	D	SE slopes of Montagne Pelee
			Eleutherodactylus euphronides	LA	Mt. St. Catherine & Grand Etang area, Grenada

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Lesser Antilles, cont.			*Eleutherodactylus shrevei*	LA	Soufriere Volcano area, Vermont Nature Res., St. Vincent
			Leptodactylus fallax	D,T	W Dominica & Montserrat (respectively)
Honduras	J.R. McCranie	08-11-92	*Bolitoglossa dofleini*	V	NG
	L.D. Wilson & J.R. McCranie	15-08-92	*B. carri*	V	"
	J.R. McCranie	08-09-93	*B. celaque*	V	"
			B. dunni	V	"
			B. schmidti	V	"
			Eleutherodactylus anciano	V	"
			E. aurilegulus	V	"
			E. chrysozetetes	V	"
			E. cruzi	V	"
			E. merendonensis	V	"
			E. milesi	LA	Parque Nacional Cusuco, Honduras, in 1992 (cloud forest)
			Gymnophis syntrema	V	NG
			Hyla bromeliacia	V	"
			H. salvaje	V	"
			H. soralia	LA	Parque Nacional Cusuco, Honduras, in 1992 (cloud forest)

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Honduras, cont.			*Nototriton barbouri*	V	NG
			N. nasalis	V	"
			Oedipina gephyra	V	"
			O. ignea	V	"
			O. stuarti	V	"
			Plectrohyla dasypus	LA	Parque Nacional Cusuco, Honduras, in 1992 (cloud forest)
			P. teuchestes	LA	Parque Nacional Cusuco, Honduras, in 1992 (cloud forest)
Costa Rica/ Panama	J. Savage et al.	18-02-91	*Atelopus senex*	D	Bajo La Hondura, Paso La Palma, Cerro Chompipe - Costa Rica
			A. varius	LA	Monteverde Cloud Forest, Costa Rica
			Bufo holdridgei	D	Bajo La Hondura, Paso La Palma, Cerro Chompipe - Costa Rica
			B. periglenes	LA	Monteverde Cloud Forest, Costa Rica
			B. typhonius	LA	Barro Colorado Island & Limbo, Panama
			Colostethus flotator	D	Barro Colorado Island & Limbo, Panama
			Dendrobates auratus	D	Panama
			Eleutherodactylus biporcatus	D	"
			E. bransfordi	D	"

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Costa Rica/ Panama, cont.			*Eleutherodactylus cruentus*	D	Limbo, Panama
			Rana warszewitschii	D	Panama
			Smilisca phaeota	D	"
Venezuela	J. Péfaur	12-08-92	*Allophryne ruthveni*	T/E	Península de Paria, Sucre
			Atelopus carbonerensis	T/E	Andes de Mérida
			A. mucubajiensis	T/E	" "
			A. oxyrhynchus	T/E	" "
			Atelopus (3 additional sp.)	T/E	Andes de Mérida
			Bolitoglossa borburata	T/E	NG
			B. orestes	T/E	"
			Centrolene (4 sp.)	T/E	Sierra de Perijá, Zulia
			Ceratophrys calcaracta	T/E	NG
			C. cornuta	T/E	"
			Colostethus alboquttatus	T/E	"
			C. collaris	T/E	"
			C. duranti	T/E	"

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Venezuela, cont.			*Colostethus haydeeae*	T/E	NG
			C. humilis	T/E	"
			C. leopardalis	T/E	"
			C. mandelorum	T/E	"
			C. mayorgai	T/E	"
			C. meridensis	T/E	"
			C. orostoma	T/E	"
			C. saltuensis	T/E	"
			C. serranus	T/E	"
			Eleutherodactylus ginesi	T/E	Tepuis, Bolivar/Amazonas
			E. lancini	T/E	" " "
			E. paramerus	T/E	" " "
			Gastrotheca (4 sp.)	T/E	Coastal Range, Aragua/D.F.
			Hyalinobatrachium (10 sp.)	T/E	Sierra de Yaracuy, Yaracuy
			Hyla jahni	T/E	Sierra del Turimiquire, Sucre/Monagas
			H. labialis	T/E	" " " " "
			H. lascinia	T/E	" " " " "

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Venezuela, cont.			*Hyla platydactyla*	T/E	Sierra del Turimiquire, Sucre/Monagas
			Oreophrynella huberi	T/E	Reserva Forestal de Caparo, Barinas
			O. macconelli	T/E	" " " " "
			O. quelchii	T/E	" " " " "
			Stefania (5 sp.)	T/E	Península de Paria, Sucre
	E. La Marca & H. Reinthaler (only additional sp. from above)	91	*Atelopus pinangoi*	D	páramos & cloud forests in Venezuela Cordillera de Mérida
			A. sorianoi	D	" " " " " " "
Ecuador	C. Puertas, et al.	14-05-92	*Atelopus ignescens*	LA	cloud forests & páramos- high Andes, Ecuador
			A. pachydermus	LA	" " " " " "
			Centrolenella buckleyi	LA	" " " " " "
			Colostethus jacobuspetresi	LA	" " " " " "
			C. vertebralis	D	" " " " " "
			Nelsonophryne aequatorialis	D	" " " " " "
			Telmatobius niger	D	" " " " " "
			T. vellardi	D	" " " " " "

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Peru	A. Salas & P. Jimenez	29-09-93	*Atelopus peruensis*	D	Premontane forest, Ancash
			Atelopus sp.	D	" " , Cajamarca
			Batrachophrynus macrostomus	D	Puna, Junín Lake
			Colostethus littoralis	D	Coastal area, Lima
			Dendrobates mysteriosus	D	Highland Forest, Cord. El Condor
			Telmatobius arequipensis	D	Highland Steepe, Arequipa
Brazil	R. Heyer et al.	90	*Adenomera marmorata*	R/LA	Boracéia, Serra do Mar Rng., Estdo. São Paulo, 900m
			Centrolenella eurygnatha	R/LA	" " " " " " "
			Crossodactylus dispar	LA	" " " " " " "
			Cycloramphus boraceiensis	LA	" " " " " " "
			C. semipalmatus	LA	" " " " " " "
			Eleutherodactylus guentheri	R/LA	" " " " " " "
			E. parvus	R/LA	" " " " " " "
			Fritziana ohausi	R/LA	" " " " " " "
			Hylodes asperus	LA	" " " " " " "
			H. phyllodes	R/LA	" " " " " " "

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Brazil, cont.			*Ololygon perpusilla*	R/LA	Boracéia, Serra do Mar Rng., Estdo. São Paulo, 900m
			Thoropa miliaris	LA	" " " " " " "
Bolivia	P. Ergueta & J. Sarmiento	29-09-93	*Telmatobius culeus*	D	Lago Titicaca , Vertientes Orientales Andes, Serranías and isolated wet mountains, Bolivian Amazon
Uruguay	M. Klappenbach & J. Langone	29-09-93	*Argentenohyla siemersi*	D	Villa Serrana, Lavalleja
			Ceratophrys ornata	D	Sierra del Infiernillo, Rivera
			Melanophryniscus devincenzii	D	Bañados de Carrasco, Canelones
			M. montevidensis	D	Sierra de Animas, Maldonado
			M. orejasmirandai	D	Delta del Tigre, San José
			M. sanmartini	D	Pajas Blancas, Montevideo
Chile	J.C. Ortiz A. Veloso	05-10-92 30-09-93	*Alsodes barrioi*	EN	NG
			A. montanus	CR	"
			A. nodosus	EN	"
			A. tumultuosus	CR	"
			A. vanzolinii	VU	"

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Chile			*Alsodes vittatus*	R	Fed. & Admin. Region 9
			Batrachyla antartandica	V	Fed. & Admin. Region 10
			B. taeniata	VU	NG
			Bufo atacamensis	VU	"
			B. arunco	V	Fed. & Admin. Region 5 & 6
			B. chilensis	VU	NG
			B. papillosus	V,NE	Admin. Regions 8, 9. 10, 11; NE to IUCN cats.
			B. rubropunctatus	VU	NG
			B. spinolosus	VU	"
			B. variegatus	IK	"
			Caudiverbera caudiverbera	EN	"
			Eupsophus contulmoensis	E,NE	Fed. & Admin. Region 9; NE to IUCN cats.
			Eupsophus coppingeri	R, NE	Fed. & Admin. Region 10 & 1; NE to IUCN cats.
			E. insularis	R,NE	Fed. & Admin. Region 8; NE to IUCN cats.
			E. migueli	VU	NG
			E. nahuelbutensis	IK	"
			Hylorina sylvatica	IK	"

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Chile, cont.			*Insuetophrynus acarpicus*	CR	NG
			Pleurodema bufonina	CR	"
			P. thaul	VU	"
			Rhinoderma darwini	VU	"
			R. rufum	SU	"
			Telmatobius halli	R,NE	Fed. & Admin. Region 2; NE to IUCN cats.
			T. laevis	IK	NG
			T. pefauri	CR	"
			T. peruvianus	V,E, R NE	(V) Fed., (E) Admin. Region 1, (R) Reg. 2 (refers to IUCN categories)
			T. zapahuirensis	CR	NG
			Telmatobufo australis	VU	"
			T. bullocki	CR	"
			Telmatobufo venustus	CR	"
Argentina	E. Lavilla	29-09-93	*Atelognathus patagonicus*	D	Laguna Blanca, Neuquén
			A. salai	D	Monte Iwan, Los Antiguos, Santa Cruz
			Telmatobius atacamensis	D	San Antonio de los Cotres, Salta

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Argentina, cont.	M. Christie	84	*Alsodes gargola*	R	Lanin and Nahuel Huapi NP
			A. monticola	S/LR	" " " "
			Atelognathus nitoi	VU	" " " "
			Batrachyla antartandica	VU	" " " "
			B. leptopus	VU	" " " "
			B. taeniata	VU	" " " "
			Bufo spinulosus	S/LR	" " " "
			B. variegatus	S/LR	Lanin and Nahuel Huapi NP
			Eupsophus roseus	R	" " " "
			Hylorina sylvatica	VU	" " " "
			Pleurodema bufonina	S/LR	" " " "
			P. thaul	S/LR	" " " "
			Rhinoderma darwini	VU	" " " "
AUSTRALIAN REGION					
Australia	M. Tyler	04-12-92	*Adelotus brevis*	D?	gen. dec. or local decl. in NE & Cen. NSW, SE QLD
			Geocrinia alba	E	extreme SW Western Australia

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Australia, cont.			*Geocrinia vitellina*	V	E of Leeuwin-Naturaliste Ridge, SE W Australia
			Heleioporus albopunctatus	D	W Australia wheatbelt
			Lechriodus fletcheri	D?	coastal NE NSW extending to SE QLD
			Litoria aurea	LA	ACT, S tablelands of NSW
			L. brevipalmata	V	NE & central coastal NSW, SE QLD
			L. dentata	V	SE QLD & E coast NSW
			L. flavipunctata	D	ACT
			L. lesueuri	V?	rainforests of Conondale Rng. QLD
			L. nannotis	V	high el. within distribution, QLD rainforests
			L. nyakalensis	D?	N QLD: Douglas Cr. to Alexandra Cr., 380-1020m
			L. pearsoniana	V?	Conondale Ranges, SE QLD
			L. raniformis	LA	ACT; S tablelands of NSW; S & Central Victoria
			L. rheocola	D	local decl. w/in range: Broadwater Falls to Amos Bay
			L. spenceri	E?	marked contraction of range (E Victoria, S NSW)
			L. verreauxii	D	ACT
			Mixophyes fasciolatus	D	rainforest portion of hab., NE coastal NSW, SW-mid QLD
			M. fleayi	E	rainforest on border of NSW and QLD

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Australia, cont.			*Mixophyes iteratus*	V?	Conondale Rng. SE QLD, no record since '85
			Nyctimystes dayi	D	wet tropics of QLD
			Pseudophryne australis	LA	central coastal NSW
			P. bibroni	V	absent from ACT
			P. corroboree	LA	local extinctions, declines in N Brindabella Rng.
			Rheobatrachus silus	X?	over total distribution
			R. vitellinus	X?	over total distribution
			Taudactylus acutirostris	D	Mt. Graham to Big Tableland, 300-1300m
			T. diurnus	E	Conondale and Blackwell Rngs., SE QLD
			T. eungellensis	E	Clarke Range
			T. liemi	E	Crediton State Forest, QLD
			T. pleione	D?	Kroombit Tops State Forest
			T. rheophilus	D?	Thornton Pk. to Mt. Bellender Ker, QLD
			Uperoleia marmorata	D?	only known from type locality: Kimberly coast, WA
			U. orientalis	D?	Alexandria Station, NT
	M. J. Tyler (only additional sp. from above)	91	*Crinia georgiana*	D	Lake Dumbleyung, WA
			Geocrinia laevis	D	S. & Central Victoria

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Australia, cont.			*Geocrinia victoriana*	D	S. & Central Victoria
			Heleioporus eyrei	D	Perth metropolitan area
			Limnodynastes dumerilii	D	SE S Australia, S & Central Victoria
			L. tasmaniensis	D	" " " " "
			Litoria adelaidensis	D	Lake Dumbleyung, WA
			L. ewingi	D	S & Central Victoria
			Pseudophryne dendyi	D	" " "
			P. semimarmorata	D	SE S Australia, S & Central Victoria
Aust. Capital Territory	T. Osborne	91?	*Litoria aurea*	LA	betw. Canberra & Cooma; Bathurst dist.; S & Cen. Vic.
			L. flavipunctata (?)	LA	" " " " " " "
			L. raniformis	LA	" " " " " " "
			L. verreauxii	R	Canberra, tablelands
			Pseudophryne corroboree	LA	Snowy Mts., Bamberi Rng.; N Brindabella Rng.
			P. bibroni	LA	ACT; W Lake George; S & Central Victoria

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
New S. Wales	M. Mahony	30-03-93	*Assa darlingtoni*	V	NG - habitat: montane rainforest
			Crinia tinnula	V	coastal swamps of NE NSW & SE QLD
			Helioporus astraliacus	V	NG - over total distribution
			Kyarranus kundagungan	V	NG - habitat: montane rainforest
			K. spagnicolus	V	" " " "
			Litoria aurea	T	N 3/4 of range (E seaboard NSW)
			L. brevipalmata	V	NG
			L. flavipunctata	T	"
			L. olongburensis	V	coastal swamps of NE NSW & SE QLD
			L. piperata	V	NG - distribution >800 m
			L. subglandulosa	V	NG - distribution >800 m - stream breeder
			L. spenceri	T	S NSW (most of range in Victoria)
			Mixophyes balbus	T	absent from S 2/3 of range
			M. fleayi	T	NG
			M. iteratus	T	"
			Pseudophryne australis	V	Sydney
			P. corroboree	V	alpine bogs

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
New S. Wales, cont.	H. Ehmann (only additional sp. from above)	16-10-92	*Litoria booroolongensis*	D	NG
			Philoria loveridgei	D	"
Queensland	S. Richards, K. McDonald & R. Alford	05-04-93	*Adelotus brevis*	IK	(S/LR?) - Upland pops. in Clarke Range declining but pops. below 200m still present. SE QLD pop. status unknown with unsubstantiated declines, Brisbane metro. area secure.
	K. McDonald	17-10-93	*Assa darlingtoni*	SU	no evidence of declines in '92-'93
			Crinia tinnula	SU	no evidence of declines in QLD Nat. Parks, some habitat destruction elsewhere.
			Kyarranus kundagungan	SU	no evidence of decline
			K. loveridgei	SU	" " "
			Lechriodus fletcheri	S/LR	unsubstantiated reports of declines
			Litoria brevipalmata	SU	unsubstantiated reports of declines
			L. dentata	S/LR	NG
			L. lesueurii	IK	(S/LR?) declines in rainforest pops. in Conondale Range early '80s, current status unknown. Wet Tropics pops. secure.
			L. lorica	CR	Tornton Pk. & McDowell Range
			L. nannotis	EN	most upland sites >300 m el. S of Daintree River
			L. nyakalensis	CR	upland stream breeder, Carbine Tableland
			L. olongburensis	SU	NG

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Queensland cont.			*Litoria pearsoniana*	IK	declines in Conondale Range in 1983, current status unknown
			L. rheocola	EN	most upland sites S of Daintree River
			L. subglandulosa	IK	NG
			Litoria verreauxi	S/LR	NG
			Mixophyes fasciolatus	S/LR	"
			M. fleayi	EN	declines in the Border Ranges
			M. iteratus	VU	not seen in Conondale Range since '85, current status unknown
			Nyctimystes dayi	EN	upland pops. have declined
			Pseudophryne bibroni	IK	unsubstantiated reports of declines
			Rheobatrachus silus	EW/CR	Conondale and Blackall Ranges declines started in '79, not seen since '81
			R. vitellinus	EW/CR	Clarke Range, Eungella NP & Pellon SF - not seen since '85
			Taudactylus acutirostris	CR	Big Tableland to Douglas Ck. Kirrama Range - declined in '90s
			T. diurnus	EW/CR	Blackall, Conondale & D'Aguilar Ranges - declined in '79 & not seen in last 11 years
			T. eungellensis	CR	Clarke Range, Eungella NP, Pelion Cathu & Crediton St. Forests. declined in '86.
			T. liemi	SU	NG
			T. pleione	IK	"

Region	Reporter	Date (D-M-Y)	Target Species	Status	Localities/Critical Habitats
Queensland cont.			*Taudactylus rheophilus*	CR	upland stream breeder, Carbine Tableland of the Wet Tropics
New Zealand	A. Cree	28-10-92 15-09-93	*Leiopelma archeyi*	S	Coromandel Peninsula, Whareorino, Waikato
			L. hamiltoni	E,S	(E) Stephens Island & (S) Maud Island
			L. hochstetteri	S	Coromandel Peninsula, Whareorino, Waikato

KEY:

Status Categories:

National or regional:

D	Decline observed
E	Endangered
LA	Locally Absent
R	Rare
RC	Regional Concern
S	Sensitive
T	Threatened
V	Vulnerable
X	Extinct
?	suspected

U.S. National and State:

F1	USA Federal candidate 1
F2	USA Federal candidate 2
F3A	USA Federal candidate 3A
F3B	USA Federal candidate 3B
SC	State Species of Special Concern
SM	State Monitor
sc	State Critical - Oregon Dept. of Fish & Wildlife
sv	State Vulnerable - Oregon Dept. of Fish & Wildlife
sp	State Peripheral or Rare - Oregon Dept. of Fish & Wildlife
su	State Undetermined - Oregon Dept. of Fish & Wildlife
cs	Candidate for State Status
C2	Candidate 2- US Fish &Wildlife

IUCN/Red List Categories:

EX	Extinct
EW	Extinct in the Wild
CR	Critical
EN	Endangered
VU	Vulnerable
SU	Susceptible
S/LR	Safe, Low Risk
IK	Insufficiently Known
NE	Not Evaluated

CITES

CAp2	Appendix 2

Localities/Critical Habitats:

NG	Not Given