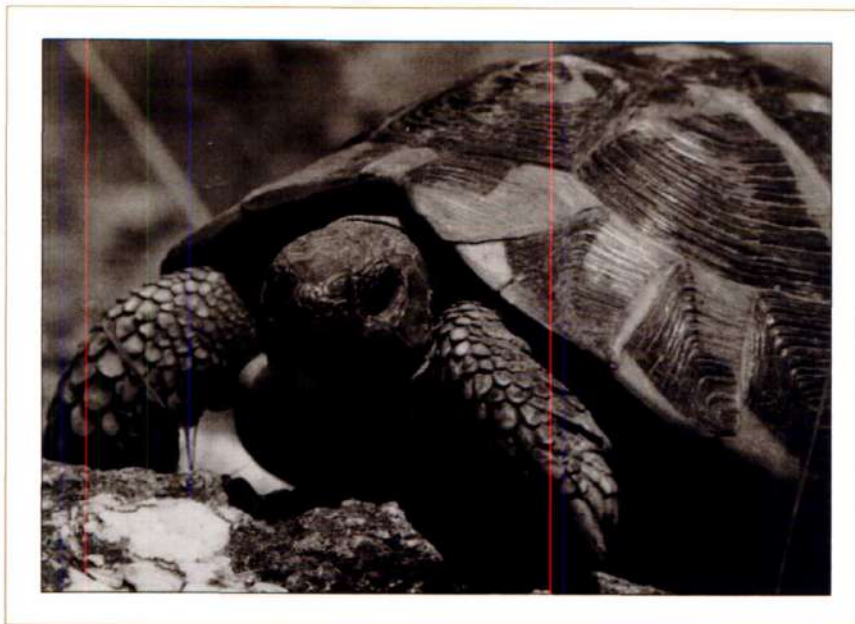


# Tortoises and Freshwater Turtles

An Action Plan for their Conservation



IUCN/SSC Tortoise and  
Freshwater Turtle Specialist Group



DICE  
at UKC

This publication has been produced by IUCN—The World Conservation Union, in collaboration with WWF—World Wide Fund for Nature, the American Association of Zoological Parks and Aquariums, the People's Trust for Endangered Species, and the Durrell Institute of Conservation and Ecology at the University of Kent, Canterbury, U.K.

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Cover photo: Hermann's Tortoise (*Testudo hermanni*) in southern France. (Photo by D. Stubbs)

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This One



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## Foreword

This action plan is not meant to be yet another action plan to gather dust on some shelf, effectively inaccessible to both the interested and committed, and considered impracticable and inoperative by the bureaucrat. It is a tool to help those who will get things done on the ground. It is not a definitive agenda, nor a funding or resource directory. We would like to have encompassed all the species in detail (though not all are in need of urgent attention), but we have insufficient knowledge and not enough space in this action plan. Instead, we have concentrated on those species that we know to be under some pressure in the wild, and we have identified the key factors leading to their problems either by investigation and correspondence, or by carrying out pilot projects which have tutored us in their ecology. We are conscious of the need both to make our efforts efficient and pertinent to rural economies and to involve those very people whose lives and practices are intertwined with tortoises and freshwater turtles, and upon whom the conservation of these animals rests. Many of us who are zoologists and ecologists inevitably become aware of the political, social and economic parameters involved in conservation as we work for extended periods in the wilds.

This plan is a beginning. We expect it to stimulate and help those in the field, and contribute to the publication of a further

report in 1989 at the First World Congress of Herpetology at the University of Kent on the details concerning the status and distribution of terrestrial chelonians, thereby providing a broad-based and practical agenda.

Since the early 1980s, when both the Tortoise and Freshwater Turtle Specialist Groups of the IUCN Species Survival Commission were formed, there have been a number of positive initiatives by Group members, and some species are now receiving conservation attention. For only a few species, such as the Galapagos tortoises, work already had been in progress for a number of years. However, it is still painfully apparent that to most of the questions that are vital to conservation planning, especially concerning the real survival status of the forty tortoise species and over two hundred freshwater turtle species, the answer often remains a resounding "We don't know."

Recently the Groups have been combined into one single Group under the joint chairmanship of the undersigned, with Ed Moll, Walter Sachsse, Kristin Berry, and John Behler as deputy chairmen, overseeing more than 300 members and correspondents in 37 countries. We have helped, supported, or been directly involved in many projects concerned with obtaining information regarding the species in the wild (such as Operation Tortoise), in captivity and in trade; we have taken direct action



to conserve species in many countries and effect on-ground operations to consolidate species' futures; and we have advised both agencies and countries who are actively concerned with global conservation or with their own nation's resources. For example: the ban of the European trade in tortoises; the successful and continuing projects to protect species in France, where the world's first ever "tortoise village" has just opened; the projects in California and Mexico (to name a few); and the recent news that one of our projects in Madagascar has been successful in breeding the rarest full species of tortoise attests to our activities and gives hope for the future. Group members can be effective by using this plan and the Group newsletter, and by writing to the chairmen and vice-chairmen with information about the distribution, status and specific problems that affect chelonian populations. It is only by such activity that we can

sharpen our future plans and be relevant in our advice and actions.

Many people have contributed to this action plan and we are grateful for their help and efforts. On behalf of the Group we would like to thank Simon Stuart, and particularly David Stubbs, who compiled this document. Karin Nelson and George Rabb of the Chicago Zoological Society saw the text through to publication.

Ian R. Swingland  
Peter C.H. Pritchard  
Co-chairmen, IUCN/SSC  
Tortoise and Freshwater Turtle  
Specialist Group

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David Stubbs  
Action Plan Compiler, IUCN/SSC  
Tortoise and Freshwater Turtle  
Specialist Group

## Introduction

In recent years there has been growing awareness of the need for positive conservation action for chelonians. Unfortunately there are still major gaps in our knowledge of the ecology, distribution, and status of many of the rarer and endangered species. This makes conservation planning all the more difficult but no less urgent. The Tortoise and Freshwater Turtle Specialist Group of the Species Survival Commission of the IUCN has devised this action plan to stimulate further practical conservation for chelonians and to direct conservation efforts towards clearly defined priorities. This action plan is not an academic reference document. It is a working tool expressly aimed at ensuring that appropriate conservation action for chelonians actually does happen.

This action plan is concerned with all non-marine chelonians, about 240 species altogether, of which about 200 are loosely known as freshwater turtles, and the remaining 40 species comprise the land tortoises. Tortoises and freshwater

turtles range throughout the tropical and warm temperate regions of the world, occupying a wide variety of habitats, from rain forest to true desert, from small puddles to great rivers and lakes, and playing diverse ecological roles. Chelonians are proving to be popular and useful subjects for scientific research. Many of the complexities of their ecology which are not yet fully unravelled, such as environmental sex determination, are of fundamental importance, and should lead to a better understanding of natural systems and communities, and of the evolutionary process as a whole.

On a more basic level man has had a long association with chelonians. Most species are edible and, especially in developing countries, have significant value as a source of fresh meat (and in some cases eggs as well). Unfortunately, hunting intensity is frequently excessive and uncontrolled. This, together with the use of chelonians for other products (e.g. souvenirs, aphrodisiacs, medicines) and for the international



pet trade, is believed to be causing a severe strain on wild populations. Chelonians are slow-growing animals, not adapted to high levels of adult predation, and they cannot replace such losses quickly. They are also variably susceptible to habitat changes and pollution—some species are reasonably tolerant, while others depend on the maintenance of fragile, undisturbed ecosystems. Typically, over-harvesting for food and trade has been the primary cause of species decline, and then habitat destruction has provided the coup de grâce—but sometimes vice-versa.

There are two overriding and immediate concerns for the Specialist Group:

1. To ensure the protection and survival of all the threatened and vulnerable species of tortoises and freshwater turtles throughout the world.
2. To achieve effective protection and management of selected areas supporting a high diversity of chelonian species and/or an abundance of individuals.

In order to achieve sustainable conservation measures, the Specialist Group fully recognizes the absolute importance of habitat protection and management, coupled with a firm basis of support from local people. This is a crucial point and it must be understood that social and economic factors will ultimately decide the fate of most species. In this regard it is essential to have regional conservation strategies embracing the key points from the various specialist group action plans, which can be integrated with the wider social issues upon which real species conservation depends.

In devising this action plan, the Tortoise and Freshwater Turtle Specialist Group appreciates its own, and IUCN's, limitations in relation to providing long-term management and funding. The Group, under the co-chairmanship of Dr. Ian Swingland and Dr. Peter Pritchard, serves as one of many groups of experts from around the world, providing technical advice to the Species Survival Commission of IUCN. In the context of this action plan the Specialist Group envisages itself in a catalytic role leading to the fulfillment of the above goals. The Group does not have resources for permanent active management, or land purchases, and these are generally seen as the responsibility of governmental and non-governmental organizations in the countries in question. However, the Group can contribute on behalf of IUCN along the following lines:

- Identifying and publicizing the conservation requirements of tortoises and freshwater turtles.
- Carrying out status surveys and developing pilot projects.
- Liaising and co-operating with other conservation groups and development agencies, so that, where appropriate, chelonian projects can be included within existing or intended-conservation programmes.
- Monitoring and advising on long-term projects, rather than running the entire programme.
- Applying pressure to governments and other decision makers to establish domestic or national conservation programmes.
- Encouraging and lobbying for international agreements.
- Creating and increasing public awareness of the importance of tortoise and freshwater turtle conservation, both in respect to their vital ecological functions and their place in the natural heritage of the world, and particularly of the countries and areas in which they occur.

Within the limitations imposed by lack of information on many species, this action plan addresses the current priorities of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Given its worldwide scope, the plan concentrates on securing conservation action for the most endangered species and for areas with the greatest concentrations of priority species. The latter may include several commoner species which are not currently threatened, but which are considered as an important resource by local communities, and for which a carefully designed management plan (including controlled harvesting) is likely to be the most effective means of sustainable conservation. Subspecies, or species threatened in one country but which are sufficiently widespread in others so as not to be in imminent danger of extinction, are generally not included. Such cases are certainly worthy of inclusion in national or regional conservation strategies, and would definitely receive the support of the Specialist Group. The Group welcomes new conservation initiatives directed towards any chelonian species, and also maintains a close interest in existing projects.

A final note of caution; this action plan alone cannot save all tortoises and freshwater turtles for all time, but if we are to avert major losses in the world's chelonian fauna and to maintain its current diversity, we need to establish immediately a solid foundation of conservation action. The priority programme contained in this action plan is the Tortoise and Freshwater Turtle Specialist Group's contribution to this aim.



# 1. Checklist of Tortoises and Freshwater Turtles

Chelonian taxonomy is currently in a state of flux. Many indisputably new species and subspecies await formal description, a number of existing taxa have recently been renamed or are currently under review, and a few commonly accepted forms are now considered to be invalid. For conservationists, whose mandate is to preserve genetic diversity to the fullest possible extent, this situation is unfortunate and confusing. In order to establish a comprehensive conservation programme for terrestrial and freshwater chelonians, it is important to be clear about the full range of genetic diversity within our remit. It is also important that our work is readily understood by the widest possible audience, and at the same time respected as an up-to-date and authoritatively-based conservation action programme.

For these reasons it is important to adopt an approach that includes undescribed but recognizable taxa, as well as named ones. The basis for the species list presented in this action plan is therefore taken from Iverson's recent world checklist with distribution maps (Iverson 1986). This is the most recent published list available, and has the attractive feature of retaining many of the names which are familiar to, and generally accepted by active field conservationists. However, we cannot ignore recent taxonomic revisions, and while we follow Iverson's version as fully as possible in the body of this action plan, certain amendments have been incorporated. A full cross-reference between old and new names is given in Appendix 4.

Six new full species names have been published since Iverson's list and these are included in our checklist: *Cuora pani* Song, 1984; *Cuora chriskarannarum* Ernst and McCord, 1987; *Cuora mccordi* Ernst, 1988; *Cuora aurocapitata* Luo and Zong, 1988; *Pelochelys taihuensis* Huang, 1984; and *Pelusios broadleyi* Bour, 1986. *Cuora chriskarannarum* is probably a synonym of *C. pani* (H.D. Philippen, pers. comm.).

To these must be added unnamed but recognizably different populations, in many cases representing potentially nameable species and subspecies. These include distinct forms ranging from those known only to a few workers with close familiarity with a species-group, to populations whose existence and distinguishing features have been described in the scientific literature, often a decade or more ago, but for which new binomials or trinomials have yet to be proposed. As conservationists, we cannot ignore taxa merely because they do not have an official name.

In these cases we have not attempted to circumvent the proper credit due to the discoverers of new taxa by using new scientific names in this document (although see Smith and Smith (1980) for a justification for allocating deliberate *nomina nuda* in advance of formal descriptions), but instead we have

characterized such forms by allusion to the regions where they occur. We hope that the inclusion of these taxa will speed up the process of their formal description. These additions also serve to underline our incomplete knowledge of the taxonomy of living species of tortoises and freshwater chelonians.

In addition, we consider it important to preserve isolated or relict populations of widespread species even when careful morphological analysis has failed to reveal statistically demonstrable differences. In some cases such populations were formerly considered to represent valid sub-species, as in the case of the Plymouth red-belly turtle "*Pseudemys rubiventris bangsi*," the Illinois mud turtle "*Kinosternon flavescens spooneri*," and the Key mud turtle "*Kinosternon bauri bauri*."

Distributional information is given as the biogeographic realms in which each species is found. The nomenclature for these realms follows the IUCN adopted standard, set down by Udvardy (1975). The geographical limits of each realm are also taken from Udvardy, except for the junction between the Nearctic and Neotropical realms, where for practical convenience the division is taken as a line across central Mexico, from San Blas in the west to Tampico in the east. Thus species in southern Mexico occurring partly or entirely in the central Madrean-Cordilleran biogeographic province are treated as Neotropical species, and those found in the U.S.A. and northern Mexico are Nearctic species. The Palaearctic realm has been subdivided into East (mostly the northern half of China and Japan) and West (Europe, North Africa, Soviet Asia, and the Middle East, as far as western Pakistan) to provide more sensible groupings of species.

## Abbreviations

### Realm

**AT:** Afrotropical (Continental Africa south of the Sahara, Madagascar, and Indian Ocean Islands); **AUS:** Australasian; **IM:** Indomalayan (Indian sub-continent, Southeast Asia, and Indochina); **NA:** Nearctic (USA, Canada, and northern Mexico); **NT:** Neotropical (Central and South America); **O:** Oceanian (New Guinea and Pacific Ocean Islands); **EP:** Eastern Palaearctic; **WP:** Western Palaearctic.

### RDB

Red Data Book. IUCN RDB Categories of Threat are as follows: **E:** Endangered; **V:** Vulnerable; **R:** Rare; **I:** Indeterminate; **K:** Insufficiently Known. (N.B. lower case letters refer to the status categories of subspecies, and upper case letters



refer to full species). A revision of these categories was carried out in consultation with the Tortoise and Freshwater Turtle Group in late 1987, and the results were included in the 1988 IUCN Red List of Threatened Animals. The categories given here are those of the new list. The exact definitions of the categories are given in the 1988 Red List. Species that the Tortoise and Freshwater Turtle Specialist Group considers should be added to the Red List, or changed to another category, are indicated in Appendix 1.

## CITES

Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington 1973). **I**: listed in Appendix I of CITES; **II**: listed in Appendix II of CITES; **III**: listed in Appendix III of CITES (in this instance, all these have been proposed by Ghana). See Appendix 3 of this Action Plan for some recommended changes for Asian species. (N.B. the CITES classification for *Lissemys punctata* refers to *L. p. andersoni*, and for *Trionyx spiniferus* it refers to *T. s. ater*, herein called *Apalone s. ater*.)

## APR

Action Plan Rating. **1**: known threatened species in need of specific conservation measures; **2**: species of restricted distribution in need of status investigation; **3**: other species for which specific conservation projects and status surveys are required; **X**: species which have received, or are receiving some conservation action. (For a full explanation of these categories refer to Chapter 2, "Priority Ratings").

## Asterisk (\*)

Species marked with an asterisk have recently been renamed; please refer to Appendix 4. Notes corresponding to the numerical superscripts after certain taxa can also be found in Appendix 4.

## Checklist

	Realm	RDB	CITES	APR
<b>Cryptodires (Hidden-necked turtles)</b>				
<b>Family Carettochelyidea</b>				
Pig-nosed turtle	O+AUS	K		1
<i>Carettochelys insculpta</i>				
<b>Family Chelydridae</b>				
Common snapping turtle	NA+NT			
<i>Chelydra serpentina</i>				
<i>C. s. serpentina</i>				
<i>C. s. acutirostris</i>				
<i>C. s. osceola</i>				
<i>C. s. rossignoni</i>				
Alligator snapping turtle	NA	V		3
<i>Macrochelys temminckii</i>				

	Realm	RDB	CITES	APR
<b>Family Dermatemyidae</b>				
Central American river turtle	NT	V	II	1
<i>Dermatemys mawii</i>				
<b>Family Emydidae</b>				
<b>Subfamily Batagurinae</b>				
Annam leaf turtle	IM	K		2
<i>Annamemys annamensis</i> <sup>1</sup>				
River terrapin	IM	E	I	1X
<i>Batagur baska</i>				
<i>B. b. baska</i>				
<i>B. b. ranongensis</i>				
Painted terrapin	IM	E		1X
<i>Callagur borneoensis</i>				
Chinese red-necked pond turtle	IM			
<i>Chinemys nigricans</i> <sup>*2</sup>				
Chinese three-keeled pond turtle	IM+EP			
<i>Chinemys reevesii</i> <sup>3</sup>				
Yellow-margined box turtle	IM+EP			
<i>Cistoclemmys flavomarginata</i>				
Indochinese box turtle	IM	K		2
<i>Cistoclemmys galbinifrons</i>				
<i>C. g. ssp. (mainland Indochina)</i>				
<i>C. g. ssp. (Hainan Island)</i>				
Hainan box turtle	IM	K		2
<i>Cistoclemmys hainanensis</i>				
Malayan box turtle	IM			
<i>Cuora amboinensis</i>				
<i>C. a. ssp. (Asian mainland)</i>				
<i>C. a. ssp. (Philippines)</i>				
<i>C. a. ssp. (Indonesia)</i>				
Anhui box turtle	EP			2
<i>Cuora aurocapitata</i>				
<i>Cuora chriskarannarum</i>				
(China)	IM			2
<i>Cuora mccordi</i> (China)	IM			2
Chinese box turtle	EP			2
<i>Cuora pani</i>				
Chinese three-striped box turtle	IM			
<i>Cuora trifasciata</i> <sup>3</sup>				
Yunnan box turtle	IM	K		2
<i>Cuora yunnanensis</i>				
<i>Cuora sp. (highland Yunnan)</i>	IM			2
Asian leaf turtle	IM			3
<i>Cyclemys dentata</i>				
Stripe-necked leaf turtle	IM			
<i>Cyclemys tcheponensis</i> <sup>4</sup>				
Spotted pond turtle	IM	I	I	3
<i>Geoclemys hamiltonii</i>				
Cochin forest cane turtle	IM	V		2
<i>Geoemyda silvatica</i> <sup>*</sup>				
Black-breasted leaf turtle	IM+EP			3
<i>Geoemyda spengleri</i>				
<i>G. s. spengleri</i>				
<i>G. s. japonica</i>				
Crowned river turtle	IM			3
<i>Hardella thurjii</i>				

	Realm	RDB	CITES	APR		Realm	RDB	CITES	APR
Arakan forest turtle <i>Heosemys depressa</i>	IM	K		2	Malaysian giant turtle <i>Orlitia borneensis</i>	IM	K		3
Giant Asian pond turtle <i>Heosemys grandis</i>	IM				Keeled box turtle <i>Pyxidea mouhotii</i>	IM			3
Palawan pond turtle <i>Heosemys leytenensis</i>	IM	I		2	Brown wood turtle <i>Rhinoclemmys annulata</i>	NT			
Spiny turtle <i>Heosemys spinosa</i>	IM			1	Furrowed wood turtle <i>Rhinoclemmys areolata</i>	NT			
Yellow-headed temple turtle <i>Hieremys annandalii</i>	IM				Maracaibo wood turtle <i>Rhinoclemmys diademata</i>	NT			
Three-striped roof turtle <i>Kachuga dhongoka</i>	IM			3	Black wood turtle <i>Rhinoclemmys funerea</i>	NT			
Red-crowned roof turtle <i>Kachuga kachuga</i>	IM	I		1	Colombian wood turtle <i>Rhinoclemmys melanosterna</i>	NT			
Brown roofed turtle <i>Kachuga smithii</i>	IM				Large-nosed wood turtle <i>Rhinoclemmys nasuta</i>	NT			
<i>K. s. smithii</i> (Indus and lower Ganges)					Painted wood turtle	NA+NT			
<i>K. s. pallidipes</i> (Upper Ganges (India + Nepal))					<i>Rhinoclemmys pulcherrima</i>				
Assam roofed turtle <i>Kachuga sylhetensis</i>	IM	K		2	<i>R. p. pulcherrima</i>				
Indian roofed turtle <i>Kachuga tecta</i>	IM	I			<i>R. p. incisa</i>				
Indian tent turtle <i>Kachuga tentoria</i>	IM				<i>R. p. manni</i>				
<i>K. t. tentoria</i>					<i>R. p. rogerbarbouri</i>				
<i>K. t. circumdata</i>					Spotted-legged turtle	NT			
<i>K. t. flaviventer</i>					<i>Rhinoclemmys punctularia</i>				
Burmese roofed turtle <i>Kachuga trivittata</i>	IM	K		1	<i>R. p. punctularia</i>				
Malayan snail-eating turtle <i>Malayemys subtrijuga</i>	IM			3	<i>R. p. flammigera</i>				
Caspian turtle <i>Mauremys caspica</i>	WP				Mexican spotted wood turtle <i>Rhinoclemmys rubida</i>	NT	K		3
<i>M. c. caspica</i>					<i>R. r. rubida</i>				
<i>M. c. rivulata</i>					<i>R. r. perixantha</i>				
Japanese turtle <i>Mauremys japonica</i>	EP				<i>Rhinoclemmys</i> sp. (Magdalena River and East Panama)	NT			2
Mediterranean turtle <i>Mauremys leprosa</i>	WP				Four-eyed turtle <i>Sacalia bealei</i> <sup>5</sup>	IM			
Asian yellow pond turtle <i>Mauremys mutica</i> *	IM+EP				<i>Sacalia</i> sp. (Hainan Island)	IM			2
<i>Mauremys</i> sp. (Fukien, China)	IM			2	Black marsh turtle <i>Siebenrockiella crassicolis</i>	IM			
<i>Mauremys</i> sp. (Northern Burma)	IM			2					
Tricarinate hill turtle <i>Melanochelys tricarinata</i>	IM	I	I	3	<b>Subfamily Emydidae</b>				
Indian black turtle <i>Melanochelys trijuga</i>	IM				Painted turtle	NA			
<i>M. t. trijuga</i>					<i>Chrysemys picta</i>				
<i>M. t. coronata</i>					<i>C. p. picta</i>				
<i>M. t. edeniana</i>					<i>C. p. bellii</i>				
<i>M. t. indopeninsularis</i>					<i>C. p. dorsalis</i>				
<i>M. t. parkeri</i>					<i>C. p. marginata</i>				
<i>M. t. thermalis</i>					Spotted turtle <i>Clemmys guttata</i>	NA			
<i>M. t. wiroti</i>					Wood turtle <i>Clemmys insculpta</i>	NA			
Burmese eyed turtle <i>Morenia ocellata</i>	IM	K	I	3	Pacific pond turtle <i>Clemmys marmorata</i>	NA			
Indian eyed turtle <i>Morenia petersi</i>	IM				<i>C. m. marmorata</i>				
Malayan flat-shelled turtle <i>Notochelys platynota</i>	IM	K		3	<i>C. m. pallida</i>				
Chinese stripe-necked turtle <i>Ocadia sinensis</i>	IM+EP				Bog turtle <i>Clemmys muhlenbergii</i>	NA	R	II	3
<i>Ocadia</i> sp. (Hainan Island)	IM			2	Chicken turtle <i>Deirochelys reticularia</i>	NA			
					<i>D. r. reticularia</i>				
					<i>D. r. chrysea</i>				
					<i>D. r. miaria</i>				
					Blanding's turtle <i>Emydoidea blandingii</i>	NA			3
					European pond turtle <i>Emys orbicularis</i> <sup>3</sup>	WP			



	Realm	RDB	CITES	APR		Realm	RDB	CITES	APR
Barbour's map turtle <i>Graptemys barbouri</i>	NA	K		3	Texas cooter <i>Pseudemys texana</i>	NA			
Cagle's map turtle <i>Graptemys caglei</i>	NA	K		3	Common box turtle <i>Terrapene carolina</i>	NA+NT			
Yellow-blotched map turtle <i>Graptemys flavimaculata</i>	NA	I		3	<i>T. c. carolina</i>				
Common map turtle <i>Graptemys geographica</i>	NA				<i>T. c. baurii</i>				
Black-knobbed map turtle <i>Graptemys nigrinoda</i>	NA				<i>T. c. major</i>				
<i>G. n. nigrinoda</i>					<i>T. c. mexicana</i>				
<i>G. n. delticola</i>					<i>T. c. triunguis</i>				
Ringed map turtle <i>Graptemys oculifera</i>	NA	K		2	<i>T. c. yucatanana</i>				
Ouachita map turtle <i>Graptemys ouachitensis</i>	NA				Coahuilan box turtle <i>Terrapene coahuila</i>	NA	V	I	2
<i>G. o. ouachitensis</i>					Spotted box turtle <i>Terrapene nelsoni</i>	NA	K		2
<i>G. o. sabinensis</i>					<i>T. n. nelsoni</i>				
False map turtle <i>Graptemys pseudogeographica</i>	NA				<i>T. n. klauberi</i> <sup>6</sup>				
<i>G. p. pseudogeographica</i>					Ornate box turtle <i>Terrapene ornata</i>	NA			
<i>G. p. kohnii</i>					<i>T. o. ornata</i>				
Alabama map turtle <i>Graptemys pulchra</i>	NA				<i>T. o. luteola</i>				
<i>G. p. ssp. (Mobile Bay drainages)</i>					Hispaniolan slider <i>Trachemys decorata</i>	NT	K		2
<i>G. p. ssp. (Escambia and Yellow Rivers)</i>					Cuban slider <i>Trachemys decussata</i>	NT			
<i>G. p. ssp. (Pascagoula River)</i>					<i>T. d. decussata</i> <sup>11</sup>				
<i>G. p. ssp. (Pearl River)</i>					<i>T. d. angusta</i> <sup>11</sup>				
Texas map turtle <i>Graptemys versa</i>	NA				Common slider <i>Trachemys scripta</i>	NA+NT			
Diamondback terrapin <i>Malaclemys terrapin</i>	NA				<i>T. s. scripta</i>				
<i>M. t. terrapin</i>					<i>T. s. brasiliensis</i>				
<i>M. t. centrata</i>					<i>T. s. callirostris</i>		v		
<i>M. t. littoralis</i>					<i>T. s. cataspila</i>				
<i>M. t. macrospilota</i>					<i>T. s. chichiriviche</i>				
<i>M. t. pileata</i>					<i>T. s. dorbigni</i>				
<i>M. t. rhizophorarum</i>					<i>T. s. elegans</i>				
<i>M. t. tequesta</i>					<i>T. s. cf. elegans (southern Texas)</i>				
<i>M. t. ssp. (Florida Bay)</i>					<i>T. s. gaigeae</i> <sup>7</sup>				
Alabama red-bellied turtle <i>Pseudemys alabamensis</i>	NA	R		2	<i>T. s. grayi</i>				
River cooter <i>Pseudemys concinna</i>	NA				<i>T. s. hartwegi</i> <sup>8</sup>				
<i>P. c. concinna</i>					<i>T. s. hiltoni</i>				
<i>P. c. gorzugi</i>					<i>T. s. nebulosa</i>				
<i>P. c. hieroglyphica</i>					<i>T. s. ornata</i> <sup>9</sup>				
<i>P. c. metterii</i>					<i>T. s. taylori</i>				
<i>P. c. suwanniensis</i>					<i>T. s. venusta</i>				
Common cooter <i>Pseudemys floridana</i>	NA				<i>T. s. yaquia</i>				
<i>P. f. floridana</i>					<i>T. s. ssp. (Northern Yucatan)</i>				
<i>P. f. peninsularis</i>					<i>T. s. ssp. (Caribbean drainages, Río Coco to Río Atrato)</i> <sup>10</sup>				
Florida red-bellied cooter <i>Pseudemys nelsoni</i>	NA				<i>T. s. ssp. (Lago Nicaragua)</i>				
American red-bellied turtle <i>Pseudemys rubriventris</i>	NA				<i>T. s. ssp. (Pacific drainages of Costa Rica and Panama)</i>				
					Central Antillean slider <i>Trachemys stejnegeri</i>	NT			2
					<i>T. s. stejnegeri</i>				
					<i>T. s. malonei</i>		r		
					<i>T. s. vicina</i>				
					Jamaican slider <i>Trachemys terrapen</i> <sup>11</sup>	NT			



	Realm	RDB	CITES	APR		Realm	RDB	CITES	APR
<b>Family Kinosternidae</b>					Razor-backed musk turtle	NA			
Tabasco mud turtle	NT				<i>Sternotherus carinatus</i>				
<i>Kinosternon acutum</i>					Flattened musk turtle	NA	V		3
Alamos mud turtle	NA				<i>Sternotherus depressus</i>				
<i>Kinosternon alamosae</i>					Loggerhead musk turtle	NA			
Narrow-bridged mud turtle	NT	R		2	<i>Sternotherus minor</i>				
<i>Kinosternon angustipons</i>					<i>S. m. minor</i>				
Striped mud turtle	NA				<i>S. m. peltifer</i>				
<i>Kinosternon baurii</i>					Common musk turtle	NA			
Creaser's mud turtle	NT	R		3	<i>Sternotherus odoratus</i>				
<i>Kinosternon creaseri</i>					Narrow-bridged musk turtle	NT			
Dunn's mud turtle	NT	R		2	<i>Claudius angustatus</i>				
<i>Kinosternon dunni</i>					Chiapas giant musk turtle	NT			
Yellow mud turtle	NA+NT				<i>Staurotypus salvinii</i>				
<i>Kinosternon flavescens</i>					Mexican giant musk turtle	NT			
<i>K. f. flavescens</i>					<i>Staurotypus triporcatus</i>				
<i>K. f. arizonense</i>					<b>Family Platysternidae</b>				
<i>K. f. durangoense</i>					Big-headed turtle	IM			3
Herrera's mud turtle	NA+NT				<i>Platysternon megacephalum</i>				
<i>Kinosternon herrerae</i>					<i>P. m. megacephalum</i>				
Mexican rough-footed mud turtle	NA+NT				<i>P. m. peguense</i>				
<i>Kinosternon hirtipes</i> <sup>12</sup>					<i>P. m. tristernalis</i>				
<i>K. h. hirtipes</i>					<i>P. m. shiui</i>				
<i>K. h. chapalaense</i>					<i>P. m. vogeli</i>				
<i>K. h. magdalense</i>					<b>Family Testudinidae</b>				
<i>K. h. murrayi</i>					Aldabran giant tortoise	AT	R	II	X
<i>K. h. tarascense</i>					<i>Aldabrachelys elephantina</i> <sup>*13</sup>				
Mexican mud turtle	NA+NT				S. African bowsprit tortoise	AT		II	
<i>Kinosternon integrum</i>					<i>Chersine angulata</i>				
White lipped mud turtle	NT				S. American red-footed tortoise	NT		II	3
<i>Kinosternon leucostomum</i>					<i>Geochelone carbonaria</i>				
<i>K. l. leucostomum</i>					<i>G. c. carbonaria</i> (Venezuelan llanos)				
<i>K. l. postinguinale</i>					<i>G. c. ssp.</i> (Panama and Choco, Colombia)				
Oaxaca mud turtle	NT	I		3	<i>G. c. ssp.</i> (Guiana)				
<i>Kinosternon oaxacae</i>					<i>G. c. ssp.</i> (Eastern Brazil)				
Scorpion mud turtle	NA+NT				<i>G. c. ssp.</i> (Bolivia)				
<i>Kinosternon scorpioides</i>					<i>G. c. ssp.</i> (Paraguay and Argentina)				
<i>K. s. scorpioides</i>					Chaco tortoise	NT	V	II	1
<i>K. s. abaxillare</i>					<i>Geochelone chilensis</i>				
<i>K. s. albogulare</i>					Giant Argentine Tortoise	NT			2
<i>K. s. carajasensis</i>					<i>Geochelone donosobarrosi</i>				
<i>K. s. cruentatum</i>					S. American yellow-footed tortoise	NT		II	3
<i>K. s. seriei</i>					<i>Geochelone denticulata</i>				
<i>K. s. ssp.</i> (Isla Coiba, Panama)					Indian star tortoise	IM		II	
Sonora mud turtle	NA				<i>Geochelone elegans</i>				
<i>Kinosternon sonoriense</i>					Galapagos giant tortoise	NT	V	I	1X
<i>K. s. sonoriense</i>					<i>Geochelone nigra</i> <sup>*14</sup>				
<i>K. s. longifemorale</i>					<i>G. n. abingdoni</i>				
Common mud turtle	NA				<i>G. n. becki</i>				
<i>Kinosternon subrubrum</i>					<i>G. n. duncanensis</i>				
<i>K. s. subrubrum</i>					<i>G. n. hoodensis</i>				
<i>K. s. hippocrepis</i>					<i>G. n. phantastica</i>				
<i>K. s. steindachneri</i>					<i>G. n. porteri</i>				
<i>Kinosternon</i> sp. (Jalisco, Mexico)	NT			2					

	Realm	RDB	CITES	APR		Realm	RDB	CITES	APR
<i>G. n. vicina</i>					Impressed tortoise	IM	K	II	1
<i>G. n. ssp. (NE Chatham Island)</i>					<i>Manouria impressa</i>				
<i>G. n. ssp. (NW Indefatigable Island)</i>					Geometric tortoise	AT	V	I	X
Leopard tortoise	AT		II		<i>Psammobates geometricus</i>				
<i>Geochelone pardalis</i> <sup>3</sup>					African serrated star tortoise	AT		II	
Burmese star tortoise	IM	K	II	2	<i>Psammobates oculifera</i>				
<i>Geochelone platynota</i>					African tent tortoise	AT		II	
Radiated tortoise	AT	V	I	X	<i>Psammobates tentorius</i> <sup>3</sup>				
<i>Geochelone radiata</i>					<i>P. t. tentorius</i>				
African spurred tortoise	AT		II	3	<i>P. t. trimeri</i>				
<i>Geochelone sulcata</i>					<i>P. t. verroxii</i>				
Angonoka	AT	E	I	X	Common spider tortoise	AT	I	II	3
<i>Geochelone yniphora</i>					<i>Pyxis arachnoides</i>				
Desert tortoise	NA	V	II	X	<i>P. a. arachnoides</i>				
<i>Gopherus agassizii</i> <sup>3</sup>					<i>P. a. brygooi</i>				
Berlandier's tortoise	NA	I	II	X	<i>P. a. oblonga</i>				
<i>Gopherus berlandieri</i>					Flat-shelled spider tortoise	AT	I	II	2
Bolson tortoise	NA	E	I	X	<i>Pyxis planicauda</i>				
<i>Gopherus flavomarginatus</i>					Spur-thighed tortoise	WP		II	
<i>G. f. ssp. (Northern population)</i>					<i>Testudo graeca</i>				
<i>G. f. ssp. (Southern population)</i>					<i>T. g. graeca</i>		V		
Gopher tortoise	NA	V	II	X	<i>T. g. floweri</i>				
<i>Gopherus polyphemus</i>					<i>T. g. ibera</i>				
Beaked Cape tortoise	AT		II		<i>T. g. nikolskii</i>				
<i>Homopus areolatus</i>					<i>T. g. terrestris</i>				
Berger's tortoise	AT	K	II	2	<i>T. g. zarudnyi</i>				
<i>Homopus bergeri</i>					Hermann's tortoise	WP	V	II	X
Boulenger's Cape tortoise	AT		II		<i>Testudo hermanni</i>				
<i>Homopus boulengeri</i>					<i>T. h. hermanni</i> *				
Karoo Cape tortoise	AT		II		<i>T. h. boettgeri</i> *				
<i>Homopus femoralis</i>					Horsfield's tortoise	WP		II	3
Speckled Cape tortoise	AT		II		<i>Testudo horsfieldii</i>				
<i>Homopus signatus</i>					Egyptian tortoise	WP	V	II	3
<i>H. s. signatus</i>					<i>Testudo kleinmanni</i>				
<i>H. s. cafer</i> *					Marginated tortoise	WP		II	
Elongated tortoise	IM	K	II	1	<i>Testudo marginata</i>				
<i>Indotestudo elongata</i>					<b>Family Trionychidae</b>				
Travancore tortoise	IM	R	II	2	Nubian flapshell turtle	AT			
<i>Indotestudo forstenii</i> <sup>15</sup>					<i>Cyclanorbis elegans</i>				
Bell's hinge-back tortoise	AT		II		Senegal flapshell turtle	AT			
<i>Kinixys belliana</i> <sup>3</sup>					<i>Cyclanorbis senegalensis</i>				
<i>K. b. belliana</i>					Aubry's flapshell turtle	AT			
<i>K. b. mertensi</i>					<i>Cycloderma aubryi</i>				
<i>K. b. nogueyi</i>					Zambesi flapshell turtle	AT			
<i>K. b. spekii</i>					<i>Cycloderma frenatum</i>				
Serrated hinge-back tortoise	AT		II		Indian flapshell turtle	IM		I	
<i>Kinixys erosa</i>					<i>Lissemys punctata</i>				
Home's hinge-back tortoise	AT		II		<i>L. p. punctata</i>				
<i>Kinixys homeana</i>					<i>L. p. andersoni</i>				
Natal hinge-back tortoise	AT		II	2	Burmese flapshell turtle	IM			
<i>Kinixys natalensis</i>					<i>Lissemys scutata</i>				
African pancake tortoise	AT	K	II	1	Asiatic softshell turtle	IM			3
<i>Malacochersus tornieri</i>					<i>Amyda cartilaginea</i> *				
Asian brown tortoise	IM	K	II	3	Thai softshell turtle	IM			
<i>Manouria emys</i>					<i>Amyda nakornsrihammarajensis</i>				
<i>M. e. emys</i>					Florida softshell turtle	NA			
<i>M. e. phayrei</i>					<i>Apalone ferox</i> *				



	Realm	RDB	CITES	APR		Realm	RDB	CITES	APR
Smooth softshell turtle <i>Apalone mutica</i> *	NA				Black spine-necked swamp turtle	NT	K		3
<i>A. m. mutica</i>					<i>Acanthochelys spixii</i>				
<i>A. m. calvaia</i>					Giant snake-necked turtle	AUS			
Spiny softshell turtle <i>Apalone spinifera</i> *	NA		I		<i>Chelodina expansa</i>				
<i>A. s. spinifera</i>					<i>C. e. ssp.</i> (New South Wales)				
<i>A. s. asper</i>					<i>C. e. ssp.</i> (Fraser Is. and E Queensland)				
<i>A. s. ater</i>					Common snake-necked turtle	AUS			
<i>A. s. emoryi</i>					<i>Chelodina longicollis</i>				
<i>A. s. guadalupensis</i>					New Guinea snake-necked turtle	AUS+O			
<i>A. s. hartwegi</i>					<i>Chelodina novaeguineae</i>				
<i>A. s. pallidus</i>					<i>C. n. ssp.</i> (New Guinea)				
Indian softshell turtle <i>Aspideretes gangeticus</i> *	IM		I		<i>C. n. ssp.</i> (Queensland)				
Indian peacock softshell turtle	IM		I		<i>C. n. ssp.</i> (Roti)				
<i>Aspideretes hurum</i> *					Narrow-breasted snake- necked turtle	AUS			
Leith's softshell turtle <i>Aspideretes leithii</i> *	IM				<i>Chelodina oblonga</i>				
Black softshell turtle <i>Aspideretes nigricans</i> *	IM	R	I	2	Parker's snake-necked turtle	AUS			
Narrow-headed softshell turtle	IM			3	<i>Chelodina parkeri</i>				
<i>Chitra indica</i>					Northern Australian snake-necked turtle	AUS			
Malayan softshell turtle <i>Dogania subplana</i> *	IM			3	<i>Chelodina rugosa</i>				
Burmese peacock softshell turtle	IM			3	Siebenrock's snake-necked turtle	AUS			
<i>Nilssonina formosa</i> *					<i>Chelodina siebenrocki</i>				
Wattle-necked softshell turtle <i>Palea steindachneri</i> *	IM				Steindachner's snake-necked turtle	AUS			
Asian giant softshell turtle <i>Pelochelys bibroni</i>	IM+O			3	<i>Chelodina steindachneri</i>				
Chinese giant softshell turtle <i>Pelochelys taihuensis</i>	IM			2	<i>Chelodina sp.</i> (Northern Western Australia)	AUS			2
Chinese softshell turtle <i>Pelodiscus sinensis</i> * <sup>3</sup>	EP+IM				<i>Chelodina sp.</i> (Eastern Papua New Guinea)	O			2
Euphrates softshell turtle <i>Rafetus euphraticus</i> *	WP				Matamata	NT			
Swinhoe's softshell turtle <i>Rafetus swinhoei</i>	EP			2	<i>Chelus fimbriatus</i>				
African softshell turtle <i>Trionyx triunguis</i>	AT+WP		III		N. Australian snapping turtle	AUS			
<b>Pleurodires (Side-necked turtles)</b>					<i>Elseya dentata</i>				
<b>Family Chelidae</b>					<i>E. d. ssp.</i> (Northern Territory)				
Big-headed Pantanal swamp turtle	NT	K		2	<i>E. d. ssp.</i> (Coastal central Queensland)				
<i>Acanthochelys macrocephala</i>					<i>E. d. ssp.</i> (Northern Queensland)				
Chaco side-necked turtle <i>Acanthochelys pallidipectoris</i>	NT	R		2	Serrated snapping turtle	AUS			
Brazilian radiolated swamp turtle	NT				<i>Elseya latisternum</i>				
<i>Acanthochelys radiolata</i>					<i>E. l. ssp.</i> (Queensland)				
					<i>E. l. ssp.</i> (Richmond and Tweed Rivers)				
					<i>E. l. ssp.</i> (Fitzroy River)				
					<i>E. l. ssp.</i> (New South Wale )				
					New Guinea snapping turtle	O			
					<i>Elseya novaeguineae</i>				
					<i>Elseya sp.</i> (Southern New Guinea)	O			2
					<i>Elseya sp. ssp.</i> (Manning River, NSW)	AUS			2
					<i>E. sp. ssp.</i> (Bellingen River)				
					Australian big-headed side-necked turtle	AUS			
					<i>Emydura australis</i>				



	Realm	RDB	CITES	APR		Realm	RDB	CITES	APR
<i>E. a. ssp.</i> (Northern Territory)					Northern highland side-necked turtle	NT			
<i>E. a. ssp.</i> (Queensland)					<i>Phrynops tuberosus</i>				
Kreffft's river turtle	AUS				Vanderhaege's toad-headed turtle	NT			
<i>Emydura krefftii</i>					<i>Phrynops vanderhaegei</i>				
Murray River turtle	AUS				Williams' S. American side-necked turtle	NT			
<i>Emydura macquarrii</i> <sup>3</sup>					<i>Phrynops williamsi</i>				
Brisbane short-necked turtle	AUS				Zulia toad-headed turtle	NT	K		2
Red-bellied short-necked turtle	AUS+O				<i>Phrynops zuliae</i>				
<i>Emydura subglobosa</i>					Twist-necked turtle	NT			
Victoria short-necked turtle	AUS				<i>Platemys platycephala</i>				
<i>Emydura victoriae</i>					<i>P. p. platycephala</i>				
<i>Emydura</i> sp. (Cooper Creek, Queensland)	AUS			2	<i>P. p. melanonota</i>				
<i>Emydura</i> sp. (Batten Creek, N. Territory)	AUS			2	Fitzroy turtle	AUS			2
<i>Emydura</i> sp. (Fraser Island, Queensland)	AUS			2	<i>Rheodytes leukops</i>				
Maximilian's snake-necked turtle	NT				Western swamp turtle	AUS	E	I	1X
<i>Hydromedusa maximiliani</i>					<i>Pseudemydura umbrina</i>				
S. American snake-necked turtle	NT				<b>Family Pelomedusidae</b>				
<i>Hydromedusa tectifera</i>					Madagascan big-headed side-necked turtle	AT	I	II	1
Dahl's toad-headed turtle	NT	I		2	<i>Erymnochelys madagascariensis</i>				
<i>Phrynops dahli</i>					Helmeted turtle	AT		III	
Geoffroy's side-necked turtle	NT				<i>Pelomedusa subrufa</i> <sup>3</sup>				
<i>Phrynops geoffroanus</i> <sup>16</sup>					<i>P. s. subrufa</i>				
Gibba turtle	NT				<i>P. s. olivacea</i>				
<i>Phrynops gibbus</i>					Big-headed Amazon River turtle	NT		II	
Hilaire's side-necked turtle	NT				<i>Peltocephalus dumerilianus</i>				
<i>Phrynops hilarii</i>					Adanson's mud turtle	AT		III	
Hoge's side-necked turtle	NT	I		2	<i>Pelusios adansonii</i>				
<i>Phrynops hogei</i>					Okavango mud turtle	AT			
Guiana toad-headed turtle	NT				<i>Pelusios bechuanicus</i>				
<i>Phrynops nasutus</i>					Turkana mud turtle	AT			2
Amazonian toad-headed turtle	NT				<i>Pelusios broadleyi</i>				
<i>Phrynops raniceps</i>					African keeled mud turtle	AT			
<i>P. r. ssp.</i> (Brazil)					<i>Pelusios carinatus</i>				
<i>P. r. ssp.</i> (Bolivia)					W. African mud turtle	AT		III	
Red-footed Amazon side-necked turtle	NT	K		3	<i>Pelusios castaneus</i>				
<i>Phrynops rufipes</i>					E. African yellow-bellied mud turtle	AT			
Tuberculated toad-headed turtle	NT				<i>Pelusios castanoides</i>				
<i>Phrynops tuberculatus</i>					<i>P. c. castanoides</i>				
					<i>P. c. intergularis</i>				
					C. African giant mud turtle	AT			
					<i>Pelusios chapini</i>				

	Realm	RDB	CITES	APR		Realm	RDB	CITES	APR
African forest turtle	AT		III		<i>P. w. williamsi</i>				
<i>Pelusios gabonensis</i>					<i>P. w. laurenti</i>				
African dwarf mud turtle	AT				<i>P. w. lutescens</i>				
<i>Pelusios nanus</i>					Red-headed Amazon				
W. African black forest turtle	AT		III		river turtle	NT	K	II	3
<i>Pelusios niger</i>					<i>Podocnemis erythrocephala</i>				
Variable mud turtle	AT				Giant S. American river	NT	E	II	1X
<i>Pelusios rhodesianus</i>					turtle				
Seychelles mud turtle	AT	K		2	<i>Podocnemis expansa</i>				
<i>Pelusios seychellensis</i>					Río Magdalena river turtle	NT	I	II	3
E. African serrated mud turtle	AT				<i>Podocnemis lewyana</i>				
<i>Pelusios sinuatus</i>					Six-tubercled Amazon river	NT	K	II	3
E. African black mud turtle	AT				turtle				
<i>Pelusios subniger</i>					<i>Podocnemis sextuberculata</i>				
<i>P. s. subniger</i>					Yellow-spotted Amazon river	NT	V	II	1
<i>P. s. parietalis</i>					turtle				
Upemba mud turtle	AT			2	<i>Podocnemis unifilis</i>				
<i>Pelusios upembae</i>					Savanna side-necked turtle	NT		II	
William's African mud turtle	AT				<i>Podocnemis vogli</i>				
<i>Pelusios williamsi</i>									

## 2. Conservation Priority Ratings

It is inappropriate to attempt rating conservation priorities according to some numerical system because of the general lack of reliable field data for many species. This would give a false impression of objectivity, when in fact the only basis for selecting projects is inevitably a subjective assessment of the incomplete information available. Conservation action frequently depends on opportunity, the coming together of human and financial resources, so it can be limiting if an attractive and fundable project is scored low on some hierarchical scale of priorities, inflexible to changes in circumstances.

All projects presented in this action plan are considered important. The different categories accorded to each species are a reflection of the nature of the conservation action required, not the relative urgency of the projects. All species on the updated IUCN Red List are given an Action Plan Rating (APR):

- APR 1:** Specific projects required for species known to be badly threatened or heavily exploited.
- APR 2:** This category covers all of the little-known species of very restricted distribution. Most are believed to be in need of active protection, and possibly other conservation measures, but status surveys are required first to establish which kind of conservation action would be most appropriate. Following a status survey, species would be moved into category 1 if specific action is required, or they would be removed to a pending list—no imminent action necessary—if found to be doing sufficiently well.
- APR 3:** More widespread than category 2 species, but nonetheless believed to be in need of some conservation action, possibly limited to a part of their total range. Lack of information prevents detailed conservation proposals. Status surveys generally needed to confirm need for specific action. Detailed project proposals would be needed before transferring any of these species to category 1.

**APR X:** Species already in receipt of some conservation action. So few species have received any positive attention that it is worth highlighting the specific cases. Further funding and continued action is necessary in most cases. Even for those species which are now reasonably secure the Specialist Group needs to maintain a close interest, since the various techniques developed may have important applications for current priority projects, and the status of the species could deteriorate if there is any lapse in conservation effort.

Species excluded from any of these categories are not known to be in urgent need of attention at present. However, no chelonian can truly be regarded as completely safe these days, and any conservation action for unrated species is to be welcomed. This may often be at a national or regional level where a species is locally endangered. A number of distinct subspecies would be included here. It is hoped that most species, including commoner ones, will receive conservation benefits from 'area based' projects focusing on protection of species assemblages, or particular habitats and their associated fauna. This theme is to be developed further through IUCN's regional action plans.

### 2.1 Key Species

Species accorded a priority conservation rating for this action plan are listed below according to the main types of threat facing them. Some species are endangered for clearly defined reasons, while others are feared to be in trouble because of their restricted ranges or habitat specializations.

#### a. Large river turtles (APR = 1)

All species in trouble through over-exploitation for eggs and meat, and some are particularly vulnerable at colonial nesting sites.



*Carettochelys insculpta*  
*Dermatemys mawii*  
*Batagur baska*  
*Callagur borneoensis*  
*Kachuga kachuga*  
*Kachuga trivittata*  
*Podocnemis expansa*  
*Podocnemis unifilis*  
*Erymnochelys madagascariensis*

**b. Other heavily exploited or generally threatened species (APR = 1)**

*Heosemys spinosa*  
*Geochelone chilensis*  
*Indotestudo elongata*  
*Malacochersus tornieri*  
*Manouria impressa*  
*Pseudemys umbrina*

Some attention may be necessary for commoner species increasingly occurring in trade, e.g. *Terrapene* spp., *Graptemys* spp., and *Kinixys* spp. With recent bans on trade in European tortoises, West African *Kinixys* species are featuring increasingly in European and North American import trade, even though these specialized rain-forest species do not live long in captivity.

**c. Species limited to specific habitats (APR = 2)**

Naturally relict or localized forms (habitat/area protection vital).

*Kinosternon angustipons*  
*Kinosternon dunni*  
*Terrapene coahuila*  
*Terrapene nelsoni*  
*Pseudemys alabamensis*  
*Trachemys stejnegeri*  
*Trachemys decorata*  
*Geoemyda silvatica*  
*Geochelone donosobarrosi*  
*Graptemys oculifera*  
*Kinixys natalensis*  
*Pyxis planicauda*  
*Phrynops dahli*  
*Phrynops hogei*  
*Phrynops zuliae*  
*Acanthochelys macrocephala*

*Rheodytes leukops*  
*Pelusios broadleyi*

**d. Species extremely limited in range (APR = 2)**

'Mythical' species (few contemporary records, often known only from type series, from single, or very few localities). Surveys and studies are needed to confirm taxonomic identity and continued existence of viable populations.

*Kachuga sylhetensis*  
*Indotestudo forstenii* (Sulawesi population)  
*Heosemys leytensis*  
*Heosemys depressa*  
*Annamemys annamensis*  
*Geochelone platynota*  
*Homopus bergeri*  
*Aspideretes nigricans*  
*Rafetus swinhoei*  
*Pelusios seychellensis*

Other species recorded in 3 or less localities (from Iverson 1986) but not necessarily rare:

*Cistoclemmys galbinifrons*  
*Cistoclemmys hainanensis*  
*Ocadia* sp. (Hainan Is.)  
*Pelochelys taihuensis*  
*Sacalia* sp. (Hainan Is.)  
*Cuora* sp. (Highland Yunnan)  
*Cuora aurocapitata*  
*Cuora chriskarannarum*  
*Cuora mccordi*  
*Cuora pani*  
*Cuora yunnanensis*  
*Mauremys* sp. (Fukien, China)  
*Mauremys* sp. (N. Burma)  
*Rhinoclemmys* sp. (Magdalena River + E. Panama)  
*Kinosternon* sp. (Jalisco, Mexico)  
*Chelodina* sp. (NW Australia)  
*Chelodina* sp. (E. Papua New Guinea)  
*Elseya* sp. (S. New Guinea)  
*Elseya* sp. (Manning River, New South Wales)  
*Emydura* sp. (Cooper Creek, Queensland)  
*Emydura* sp. (Batten Creek, Queensland)  
*Emydura* sp. (Fraser Island, Queensland)  
*Acanthochelys pallidipectoris*  
*Pelusios upembae* (common and protected within Upemba National Park, Zaire, which covers most of its range; Broadley pers. comm.)

**e. Species believed to be in need of some conservation action (APR = 3)**

May be threatened over substantial part of range, or widespread but with insufficiently known status.

*Macrolemys temminckii*  
*Cyclemys dentata*  
*Geoclemys hamiltonii*  
*Geoemyda spengleri*  
*Hardella thurjii*  
*Kachuga dhongoka*  
*Malayemys subtrijuga*  
*Melanochelys tricarinata*  
*Morenia ocellata*  
*Notochelys platynota*  
*Orlitia borneensis*  
*Pyxidea mouhotii*  
*Rhinoclemmys rubida*  
*Clemmys muhlenbergii*  
*Emydoidea blandingii*  
*Graptemys barbouri*  
*Graptemys caglei*  
*Graptemys flavimaculata*  
*Kinosternon creaseri*  
*Kinosternon oaxacae*  
*Sternotherus depressus*  
*Platysternon megacephalum*  
*Geochelone carbonaria*  
*Geochelone denticulata*  
*Geochelone sulcata*  
*Manouria emys*  
*Pyxis arachnoides*  
*Testudo horsfieldii*  
*Testudo kleinmanni*  
*Chitra indica*

*Pelochelys bibroni*  
*Dogania subplana*  
*Amyda cartilaginea*  
*Nilssonia formosa*  
*Acanthochelys spixii*  
*Phrynops rufipes*  
*Podocnemis erythrocephala*  
*Podocnemis lewyana*  
*Podocnemis sextuberculata*

**f. Species already receiving conservation attention (APR = X)**

Does not include species for which there have merely been status surveys carried out. Each of the species listed here has received, or is receiving, detailed, positive study and practical conservation. In some cases the species is still gravely threatened and further projects or extensions to existing programmes have to be considered.

*Aldabrachelys elephantina*  
*Batagur baska*  
*Callagur borneoensis*  
*Geochelone nigra*  
*Geochelone radiata*  
*Geochelone yniphora*  
*Gopherus agassizii*  
*Gopherus berlandieri*  
*Gopherus flavomarginatus*  
*Gopherus polyphemus*  
*Psammobates geometricus*  
*Podocnemis expansa*  
*Pseudemydura umbrina*  
*Testudo hermanni* (Western race only—*T. h. hermanni* (formerly *T. h. robertmertensi*))



### 3. Regional Distribution of Species of Conservation Concern

For ease of comparison with other IUCN regional action plans, the Afrotropical realm is sub-divided into Continental Africa (AF) and Madagascar and the Seychelles (M) in the table below. Australian and Oceanian species are grouped together because of the small number of the latter and the degree of overlap of species between the two realms. The species totals do not always add up, as some species are found in more than one realm. All other headings and codes in the table below are the same as in Chapter 1. Some species listed under APR group X are also included in APR group 1 to highlight the continued urgency for further conservation action.

	Realm								Total
	AUS+O	AF	M	NA	NT	IM	EP	WP	
<b>Total species</b>	28	37	9	52	62	70	10	10	263
APR group 1	2	1	1	0	5	7	0	0	16
APR group 2	8	4	2	4	12	19	3	0	52
APR group 3	1	2	1	7	10	18	0	2	39
APR group X	1	1	3	4	2	2	0	1	14
<b>Carettochelyidae</b>	1								1
APR group 1	1								1
<b>Chelydridae</b>				2	1				2
APR group 3				1					1
<b>Dermatemyidae</b>					1				1
APR group 1					1				1
<b>Emydidae;</b>									
<b>Batagurinae</b>				1	10	48	8	2	63
APR group 1						5			5
APR group 2					1	15			15
APR group 3					1	11			11
APR group X						2			2
<b>Emydidae;</b>									
<b>Emydinae</b>				29	6			1	34
APR group 2				4	2				5
APR group 3				6					5
<b>Kinosternidae</b>					13	15			23
APR group 2						3			3
APR group 3					1	2			3
<b>Platysternidae</b>							1		1
APR group 3							1		1
<b>Testudinidae</b>		16	5	4	5	6		5	41
APR group 1		1			2	2			5
APR group 2		2	1		1	2			6
APR group 3		1	1		2	1		2	7
APR group X		1	3	4	1			1	10
<b>Trionychidae</b>	1	5			3		15	2	25
APR group 2							2	1	3
APR group 3	1						5		5
<b>Chelidae</b>	26					21			47
APR group 1	1								1
APR group 2	8					5			13
APR group 3						2			2
APR group X	1								1
<b>Pelomedusidae</b>		16	4			7			25
APR group 1			1			2			3
APR group 2		1							1
APR group 3						3			3
APR group X						1			1

The preceding table breaks down the total species list to show which realms and families hold the species most in need of conservation. This is the first step towards identifying areas where groups of species can be protected under a general conservation initiative. There are altogether 107 (41%) of the

263 species requiring priority conservation action, 44 (41%) of which occur in Asia (the Indomalayan realm). This realm has both the highest number of species (70) and the highest proportion (63%) which need positive conservation. The Neotropics is the second most deserving realm in this respect, with 27 (41%) of its 66 species in need of conservation. In Australasia the situation is more confused, with a large proportion of unnamed species in need of status verification, while in all the other realms the proportion of priority species is less than 30%.

It is clear, therefore, that the main thrust of this action plan should be directed towards Asia and South and Central America. Moreover, among the land tortoises, Testudinidae, which have already received some conservation attention in various parts of the world, there has yet to be any action (apart from simple inclusion in lists of protected species) on behalf of the Asian tortoises, of which 5 out of 6 are in need of positive conservation measures.

Some countries have a well-developed nature conservation programme and there is less need for outside involvement from IUCN. This is generally the case in Europe, Australia, South Africa, and the U.S.A., so, with relatively few exceptions, the main emphasis of practical projects in this action plan is aimed towards developing countries. However, this must not induce a sense of complacency in developed countries. The Tortoise and Freshwater Turtle Specialist Group welcomes conservation initiatives on any species of chelonian, no matter where. Furthermore, a number of projects in the U.S.A. and Europe, for example, are developing techniques and experience which will provide invaluable background for new projects in other countries. It is therefore important for the Specialist Group to maintain a close interest in the long-term viability of established projects, and to ensure that the relevant accumulated experience is effectively disseminated to project workers in other parts of the world.



## 4. Current Conservation Action for Tortoises

Since the foundation of the (separate) Tortoise and the Freshwater Turtle Specialist Groups in 1981, a number of important, practical initiatives have taken place. This action plan is primarily aimed at highlighting new work needed to conserve tortoises and freshwater turtles, but it is appropriate to mention some of the projects already undertaken by group members. These can serve both as an example of the range of projects carried out, and as encouragement for future action. In some cases these existing projects require further funding or resources to sustain the conservation effort, and at the very least, their inclusion here is a reaffirmation of the Group's support and interest.

Although this chapter focuses on tortoise projects, chiefly because of information at hand and involvement of Specialist Group members, it is also important to note that some important work has been directed to freshwater chelonian species. These include hatchery programmes for *Batagur baska* and *Callagur borneoensis* in western Malaysia, ongoing captive breeding efforts for *Pseudemydura umbrina* in western Australia, and beach protection efforts for *Podocnemis expansa* in Venezuela, Brazil, and Peru. The efforts to obtain legal protection of several species in numerous different countries must also be acknowledged.

### 4.1 Operation Tortoise (OT)

Operation Tortoise is a four-year global survey of terrestrial chelonians that commenced in 1985 under the direction of Dr. Ian Swingland, Co-chairman of the Specialist Group and Director of the Durrell Institute of Conservation and Ecology, University of Kent, U.K., the institutional base for the project. The aim is to produce a comprehensive report on the status, distribution, and ecology of all the world's tortoises to provide a firm basis for their conservation worldwide. OT is receiving the help of many institutions, governments, and sponsors, and has also utilized the Specialist Group's extensive network of members and correspondents.

The main body of the work will involve collecting existing information from publications and ongoing field projects, and presenting them in a particular format (see following chapter). Where original field work has been required, it has been carried out according to a controlled sampling programme in well defined areas so that data are directly comparable between sites and with existing population data for European and other species.

The impetus generated by OT to conserve tortoises will not be dissipated at the end of the project. In September 1989 at the First World Congress of Herpetology, IUCN will publish the multi-authored report, which is intended to provide both a major reference volume on tortoises, and to serve as a support for funding requests to various world agencies to sponsor and implement key conservation programmes.

**Contact person:** Ian Swingland

### 4.2 Species Recovery Programme for Hermann's Tortoise in Southern France

Following a detailed, three-year ecological study of this species by the University of Kent team, a locally based conservation initiative has been established in the Massif des Maures, Var, southern France. *Testudo hermanni* has declined alarmingly in France in recent decades due to a combination of illegal collecting and habitat loss through forest fires, urbanization, and abandonment of traditional forestry and agricultural management.

The project runs under the aegis of La Station d'Observation et de Protection des Tortues des Maures (SOPTOM), a non-profit trust established in 1985 specifically to carry out the conservation programme (Devaux, Pouvreau, and Stubbs 1986) and to develop public awareness about the serious threats to wild tortoises in France.

SOPTOM has attracted widespread support at all levels, from local village councils to national and international conservation bodies and government departments, for its active field programme (population censuses, habitat restoration, protected rearing of juveniles and subsequent reintroduction to the wild), coupled with a strong educational and public awareness theme. In May 1988, SOPTOM opened the first ever "Village des Tortues," a dual conservation and visitor centre providing the necessary facilities for SOPTOM to carry out an effective field programme, and a place where the public can see the project at work.

The ultimate aims are for the Massif des Maures to be declared a "Parc Naturel Regional," thereby safeguarding the last area of tortoise habitat in mainland France, and for the work of SOPTOM to act as a pilot project, stimulating other tortoise conservation initiatives in Mediterranean Europe and elsewhere.



**Contact persons:** Bernard Devaux and David Stubbs

**Further funding required:** U.S. \$20,000 for extra installations for the "Village des Tortues"; U.S. \$20,000 per year for a full-time field officer.

### 4.3 Desert Tortoise Conservation in the U.S.A.

The desert tortoise *Gopherus agassizii* is severely threatened throughout its range in the western U.S. and northern Mexico. Habitat destruction and disturbance are key factors, stemming from the increasing pressure for recreational use and development of critical tortoise habitat by the affluent human population of California and Nevada. To this must be added the long-term deleterious effects of pet trade exploitation, over-grazing by sheep and cattle, and extensive disturbance from military training manoeuvres and installations.

Desert conservation is, however, becoming an increasingly important public issue in the U.S., and this is providing a favourable climate for practical tortoise conservation initiatives. There are currently moves to get the species upgraded on federal and state protected species listings, and there are a number of attempts to obtain mitigation and compensation from developers.

Conservation effort focuses on the Desert Tortoise Natural Area, established by the Bureau of Land Management and now promoted by the Desert Tortoise Preserve Committee, which has helped raise funds for land purchase within the reserve area. A small visitor kiosk was built in 1980 and interpretive materials prepared for guided tours, visitors, and schools in nearby towns and cities. The project has also been aided by other voluntary groups, both locally and nationally.

Future conservation work centres around further land purchase, employing a full-time warden, investigating the taxonomic status of the main different populations (recent research indicated that there may be three or more distinct subspecies or species, which would significantly alter the conservation perspectives for each population and further justify the establishment of more reserves), and expanding the educational and public awareness campaigns.

**Contact person:** Kristin Berry

**Further funding required:** U.S. \$12,500 for morphometric and ecological study of desert tortoise populations in U.S.A. and Mexico in cooperation with the Mexican authorities; U.S. \$20,000 per year for full time field officer.

### 4.4 Conservation of the Angonoka Tortoise in Madagascar

Confined to the area around Baly Bay in northwestern Madagascar, the Angonoka *Geochelone yniphora* is regarded as



Two rare land tortoises in receipt of positive conservation action.

**Top:** The Angonoka (*Geochelone yniphora*), the world's rarest tortoise species, is now the focus of a permanent field project in northwest Madagascar. In 1987, the first captive laid eggs were hatched at the Amphijora field station. (Photograph by P.C.H. Pritchard.)

**Bottom:** A Galapagos giant tortoise (*Geochelone nigra hoodensis*), one of the subspecies to have been successfully raised in captivity and repatriated to its original island home. (Photograph by P.C.H. Pritchard.)

the world's most endangered tortoise species. Habitat degradation, an excessive rate of egg predation by wild pigs, and collecting of wild specimens by local people are contributing to the species' demise.

The conservation of this species was given top priority at the inaugural meeting of the Tortoise Specialist Group in 1981. In 1985, a full-scale field project was initiated under the auspices of the Durrell Institute of Conservation and Ecology, working in close liaison with the Malagasy Government and the Specialist Group. The project, now funded by WWF—International and the Jersey Wildlife Preservation Trust, combines critical habitat protection through the establishment of a natural reserve, with locally based captive breeding and an educational programme.

There has been some subsidiary work on *Geochelone radiata*, another rare Madagascan tortoise, including captive breeding at the Jersey Zoo and also in the U.S.A. (St. Catherine's Island, Georgia; Brownsville Zoo, Texas), but an extension of



the field programme is also envisaged. This project may also be able to investigate and conserve another threatened species, *Pyxis planicauda*.

A full-time field officer has been in place for two years with the task of supervising the conservation programme and training local project officers in the necessary skills for the long-term maintenance of the programme.

A major landmark in breeding success was recently achieved with the successful hatching of a captive-bred Angonoka at the Amphijora field station in December, 1987.

**Contact persons:** Ian Swingland and Lee Durrell

**Further funding required:** U.S. \$30,000 per year for *G. yniphora*; funding requirements for other species not yet established.

## 4.5 Conservation of the Galapagos Giant Tortoises

This is the longest-established conservation programme for any tortoise species. The work has been based at the Charles Darwin Research Station on Santa Cruz Island, where there are laboratory facilities and captive breeding pens. The tortoise work is run in conjunction with many other biological projects on these well-known islands.

Successful work has been carried out on the Española or Hood Island population—*Geochelone nigra hoodensis*. In the early 1960s only 14 specimens (all adult) could be located. Apparently they had not bred successfully for many years. All 14 specimens were brought to Santa Cruz for a captive breeding programme. Since the first hatchlings were born in 1971, some 384 tortoises have been raised and 184 already reintroduced to their natural 'home'.

Similarly, the depleted population of Pinzón (or Duncan) Island has been restocked by young animals raised in captivity from rescued nests (rats were causing 100% hatchling mortality). Since 1966, the total number of tortoises released onto the island is 236. A recent drought has caused some mortality of the remaining adults, and some of the released young too, but it is hoped that the head-starting programme has come in sufficient time to guarantee the continued survival of this race.

A five point programme for future conservation work has been proposed:

1. Census of tortoise populations on Isabela Island to determine population structure and recruitment rates, and to identify nesting zones where control of introduced animal pests is necessary.

**Funding required:** U.S. \$10,000 per year for 3 years.

2. Control of rats in nesting areas and habitats of juveniles on Pinzón Island to enhance recruitment and reduce depend-

ence on captive rearing programme on Santa Cruz. Efficient rat control techniques still need to be perfected.

**Funding required:** U.S. \$10,000 per year for 2 years.

3. Investigation of temperature-dependent sex determination in the field and in captivity to enable improved population management and more effective captive breeding. This project will link with similar studies on other chelonian species around the world, coordinated by the Specialist Group.

**Funding required:** U.S. \$20,000 per year for 3 years.

4. Investigation of growth, survival, and reproduction of repatriated tortoises on the islands of Española and Pinzón in order to monitor degree of recovery of populations and thereby to plan future conservation efforts as needed.

**Funding required:** U.S. \$10,000 per year for 2 years.

5. Development of improved management techniques for reproductive adults, egg incubation, and juvenile rearing. A higher rate of hatching success is required to enable more effective recovery of the most endangered populations. This project will collaborate closely with the Specialist Group Captive Breeding Subcommittee.

**Funding required:** U.S. \$10,000 per year for 2 years.

**Contact persons:** Director, Charles Darwin Research Station; Tom Fritts; Howard Snell

## 4.6 Operation Curieuse

Between 1978 and 1982, a batch of 299 Aldabran giant tortoises was introduced onto Curieuse Island in the Seychelles as part of a plan to establish a second (reserve) population of this species and to relieve human pressures on its only remaining indigenous population on Aldabra atoll. After initially encouraging reports, a team from the Zoological Society of London discovered that although the tortoises were breeding, the offspring were being heavily poached, and recruitment was negligible.

The Seychelles Government has declared Curieuse Island a National Park and has given London Zoo permission to establish a permanently staffed tortoise nursery and education centre on the island, with the aim of enhancing recruitment and developing conservation awareness among the Seychellois in general. This work will operate concurrently with an anti-poaching programme around the island. The Curieuse experiment is intended as a pilot project for potentially reintroducing giant tortoises on to other islands in the Seychelles group.

**Contact person:** David Spratt

**Further funding required:** U.S. \$50,000



## 5. Conservation Action

### 5.1 General Recommendations

Several distinct types of conservation action can be envisaged. These are best described under two main categories; short-term projects with a fixed end point, and long-term projects requiring a permanent commitment. In addition to these direct functions, the Specialist Group will always be active in promoting the conservation case for chelonians by producing educational material for a wide variety of readerships, and by lobbying governments at all levels (local to international) to undertake their own conservation programmes, and to effect the passage and enforcement of conservation laws.

#### Short-term or Fixed Duration Projects

##### Status surveys

The current state of knowledge of most species, particularly the freshwater ones, dictates that status surveys form a major component of this action plan. However, merely reporting on the status of a species and improving the accuracy of information on distribution and abundance does not in itself achieve direct conservation benefits, although in many cases this information is an essential foundation for establishing effective, longer-term conservation action. Species selected in this action plan for status surveys include all those which appear to be most vulnerable by virtue of their restricted range and/or specialized habitat requirements (i.e. APR group 2). Most projects nominated for APR group 3 species will also require a status survey component as a preliminary stage. Where possible, the cost effectiveness of status surveys has been increased by focusing on groups of species believed to inhabit the same general area—i.e. the species assemblage approach. It is also important to study the available literature as fully as possible before rushing out into the field and possibly duplicating existing work, or wasting time and resources unnecessarily.

In order to maximize the conservation effectiveness of status surveys, a set of guidelines has been produced (see section 5.2). This covers both the field work phase, involving the establishment of positive links with local people, understanding their social and economic relationships with the target species and how they might benefit from conservation measures, and a follow-up period to establish the necessary political, cultural and educational framework for future conservation action. Such a system should be seen as a series of pilot projects aimed

at developing and implementing realistic field programmes, which, where possible, can be integrated into the appropriate initiatives of conservation and development agencies.

##### Sanctuaries

There are potentially many opportunities to achieve small-scale protection of some chelonian populations in developing countries by designating sanctuary areas. For example, some eastern religious sanctuaries can offer refuge to otherwise heavily exploited species. In other parts of the world there may be private land owners sympathetic to conservation, who are willing to support a sanctuary on their land (as in Cape Province, South Africa).

The sanctuary, or source area concept, offers complete protection for a breeding nucleus of a population. When the source population increases in size, animals spread out to colonize outlying areas where some exploitation is allowed. The protected nucleus ensures the survival of the population.

#### Long-term or Permanent Projects

##### Reserves

In many developing countries where large-scale habitat destruction and exploitation are threatening many species, the establishment of special reserves is potentially the most effective long-term conservation measure, but can be very difficult to achieve.

Reserves need to be large enough to provide sufficient feeding and nesting areas for a viable population(s) of the target species. They may serve as source areas providing stock for expansion into and repopulation of exploited areas. Associated problems here will include ensuring that neighbouring areas of habitat are not destroyed or over-exploited. Reserves also need to be adequately funded to provide for staff, equipment, and educational material, sufficient to ensure full and enforced protection of the reserve area, and general appreciation and understanding of the project among the surrounding local population. Control of poaching will never be easy, especially since rare tortoises and turtles are valued for the international pet trade as well as a local food source. The most effective reserves are, therefore, likely to be those established for their wider faunal and floral value, and that can draw from a wider pool of resources and funding opportunities.



### Hatcheries and nest area protection

For many species, the main threat occurs at nesting areas, where both adult females and eggs are easily taken. In the case of migratory or wide-ranging species, it would usually be impractical to establish an all-embracing reserve area, although the 600 km<sup>2</sup> National Chambal Sanctuary in India is an example of what is possible. The most realistic solution would be to concentrate on protecting nesting areas. This approach is envisaged particularly for the colonially nesting, large river turtles. These species typically use traditional nesting sites and are frequently heavily exploited as a result.

The preferred method is to achieve protection of the nesting sites, so that the natural course of incubation and hatching can be followed. Where such controls are not practical, or where there is also a valid reason for head-starting, a hatchery and protected rearing programme needs to be established. This is a more expensive and technically difficult operation but is frequently the most viable option. Detailed hatchery techniques for sea turtles are described by Pritchard et. al. (1983). The principles are largely the same for most freshwater species, but with some important exceptions, such as species laying hard-shelled eggs and those laying eggs on the surface, notably *Rhinoclemmys* and *Kinosternon* spp. In all cases, great care must be taken to ensure that the effects of environmental sex determination do not lead to the production of unnatural, imbalanced sex ratios. This is an area where the Specialist Group can play an important role in coordinating research and liaison between interested parties.

### Captive breeding

The Specialist Group's policy guidelines are given in Appendix 2. Captive breeding projects in this action plan are concerned solely with the ultimate release into the wild of captive-bred specimens for repopulation and restocking programmes. The Tortoise and Freshwater Turtle Specialist Group does not express any opinion or judgement here on commercial "farms" and "ranches" for crocodilians or marine turtles, but feels that operations of this type offer little identifiable potential benefit for conservation of freshwater turtles and tortoises at this time.

Wherever possible, captive breeding for conservation projects will operate within the natural range of the species concerned. Before such rearing and release schemes can be initiated, it is essential that the causes of a species' rarity are understood, and that these factors are no longer operating, or can at least be taken into account and controlled.

## General Action Points

### Closed seasons

In several cases it may be politically more feasible to limit the exploitation of a species, rather than to ban all hunting and collecting. Coupled with an appropriately-pitched educational campaign, it should be possible to persuade collectors and

hunters of the need to keep within a sustainable cropping level. The operation of closed seasons can effectively protect species at their most vulnerable period, usually the nesting season. This can also serve to prevent a disproportionate toll on females.

In India, for example, a dual closed season policy is recommended—December to April for "hardshells" and August to November for "softshells." This reflects their respective vulnerabilities at nesting time, yet also allows year-round harvesting of one species or another, thus avoiding hardship to those people who rely upon turtles for income or as an important dietary component. Enforcement is also easy, because there is no need for wildlife officers to be able to identify individual species.

### Market monitoring

One of the simplest and most effective means of assessing legal exploitation levels is to monitor major market centres. Simple abundance on market stalls is not necessarily an indication of threat—indeed it may suggest the continued existence of large populations of such species in the market catchment area. But market monitoring will detect changes in relative numbers of different species sold; changes in the size classes captured may indicate a deleterious effect of exploitation on the wild populations; prices may reflect difficulty of capture; and the appearance of different species, including known rare ones, can be used as an early warning of the likely need for conservation action.

### Protection and law enforcement

The Specialist Group is always concerned about increasing the effectiveness of national and international laws relating to chelonian protection. Pressure from group members, or advice to other conservationists actively lobbying for tighter controls, is cheap and simple, yet potentially of great value for species and area conservation.

In some cases common species are protected and this can lower the credibility of otherwise useful legislation. International conventions like CITES, and national laws should accurately reflect the rarity and degree of threat to given species. IUCN specialist groups are well qualified to advise legislators on specific cases for inclusion or deletion from protected lists.

Official government wildlife officers in countries where trading is rife must be better trained to identify endangered turtle species.

### Research and liaison

Another important role for the Specialist Group is the coordination of research and captive breeding efforts across the world. There are numerous species in different regions requiring largely similar conservation action. There is therefore much potential value in collaborative research and applying the results of one study to other situations, without endless redevelopment of basic techniques.



Aspects of greatest mutual interest are:

- captive breeding husbandry, including provision of conditions likely to produce natural sex ratios and natural, healthy growth in hatchlings;
- harvesting models to determine sustainable exploitation levels for important food species in developing countries;
- relocation studies that monitor the subsequent fate of animals released into the wild.

The Specialist Group has established a Captive Breeding Sub-committee under the chairmanship of Professor Walter Sachtse to provide an advisory service to chelonian conservation projects of this type throughout the world. Among its aims will be the updating of priority lists of species needing captive breeding and identifying suitable personnel and institutions to carry out these programmes.

### Education

This embraces many of the above project categories and is a vital ingredient in any conservation initiative. There are two particular levels of focus. First, the specific, project-related education programmes that deal particularly with local people and officials to complement the on-ground conservation work. This is vital to earn the respect of local land owners, fishermen, forestry workers etc., without whose support there is little realistic prospect of mounting effective long-term conservation projects. Second, the general, world-wide promotion of chelonian conservation, aimed at governments, large corporations and agencies, the general public in urban areas and throughout the developed world, and potential funding sources. This diffuse and long-term side of education can be continually maintained by publications, press articles, films, videos, lectures, seminars, exhibitions, slide packs, and the like. Some of these can be produced for profit, with the proceeds recycled into direct turtle and tortoise conservation projects.

## 5.2 Status Survey Guidelines

A status survey alone does not constitute conservation action. It needs to be followed by education, habitat protection, restriction or elimination of direct capture, and/or a captive breeding programme. In addition, the following points should be addressed as fully as possible:

### Ecological field work

- Habitat requirements, including nesting sites, feeding areas and, where relevant, hibernation or aestivation areas, including assessment of habitat stability and threats from alternative land uses.

- Population density; assessments more probably relative than absolute, based on observation frequencies in different sites and habitats.
- Population size structure and sex ratio.
- Evaluation of population trends.

### Locally related research

- Assessment of local people's attitudes toward chelonians.
- Exploitation; note whether tortoises or turtles are killed or collected for local use or traded further afield. Document actual uses of captured animals. Also note size structure and sex ratio of harvested animals.
- Accessibility of main chelonian populations; vulnerability to exploitation.
- Ownership of relevant land; could a reserve be established?

### Groundwork for future conservation programme

- Assessment of likely local attitudes to a conservation project. What benefits would be of interest to local people?
- Economics of exploitation. How valuable are chelonians to the local economy and what would be the effect of reducing the exploitation to a sustainable level, or halting it altogether? What alternatives could be envisaged?
- Liaison with local officials and community leaders.
- Assessment of current legal protection, especially degree of enforcement and need for further legislation.
- Determine availability and willingness of institutions based in host country to support and/or carry out an eventual conservation programme.
- Identify key personnel, both potential field workers and research supervisors, who could undertake programme.
- Establish need for training of potential local field officers.
- Evaluate likely costs of a locally based project.
- Assess potential for integrating a particular chelonian conservation project with a wider habitat or species assemblage protection initiative.

### Reporting

- Copies of chelonian status survey reports should be lodged with IUCN headquarters in Gland, Switzerland, and also with funding organizations, the chairs of the Specialist Group, the appropriate regional coordinator of the Group and, where relevant, the chair of the Captive Breeding Sub-committee. Appropriate governmental and non-governmental organizations should also receive copies.
- In the case of land tortoises, any such reporting should be in the format designed for Operation Tortoise (OT), the current global conservation survey of the 40 species of the Testudinidae (see page 21).



## Operation Tortoise Species Report Format

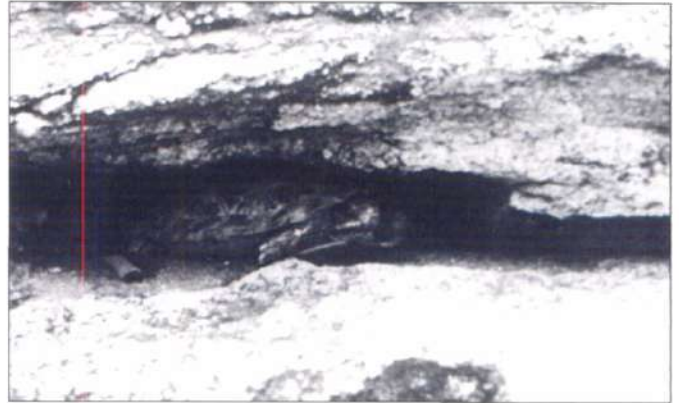
- a. Contributors and contacts
- b. Introduction
  - General introduction to biogeographic region
  - Brief history of tortoises in the region
  - Current importance in terms of diversity, numbers and conservation of tortoises
- c. Species
  - 2-4 page report on each species in region as follows:
    - Latin and common names
    - Description and taxonomy (brief outline of geographic variation)
    - Status and distribution: habitat; ecology; threats to survival; conservation recommendations (follow expanded guidelines for Status Surveys outlined above)
    - Current research
    - Remarks
    - Bibliography
- d. Conclusions

The deadline for receiving final drafts of the species reports for "Operation Tortoise: The Status and Distribution of the World's Tortoises" was 1 September 1988, in time for publication by IUCN for the First World Congress of Herpetology at Canterbury, UK in September 1989. However, subsequent updating reports are still requested by the Group. The above reporting formats are equally valid for freshwater chelonians and should be treated as a standard for compilers. This will facilitate a consistent approach and will readily target the conservation requirements of any given species.

## 5.3 Regional Conservation Workshops

The success of many of our conservation projects will ultimately depend on the work of locally based field officers, regional/governmental wildlife officers, park managers and scientists. Few such people have been trained in the field techniques for studying and managing tortoise and freshwater turtle populations.

It is therefore proposed to establish a series of regional conservation workshops, aimed specifically at future project workers and wildlife managers who will be based in these regions. The training will take place in the field, and in many cases could simultaneously contribute towards some of our specific project



Conservation problems.

Top: Skulls of alligator snapping turtles (*Macrochelys temminckii*) at Dawson, Georgia. This species is now severely depleted in much of its former range due to excessive exploitation. (Photograph by P.C.H. Pritchard.)

Bottom: The pancake tortoise (*Malacochersus tornieri*) is appearing in increasing numbers in international trade, and there are fears that wild populations are being over-collected. (Photograph by P.C.H. Pritchard.)

proposals. Several of the status surveys required could be undertaken by student researchers under the supervision of an experienced principal investigator.

Aspects to be covered during each two week (minimum) course would include: habitat assessment, trapping, marking, telemetry, population census and monitoring techniques, captive breeding and rearing, and reintroduction/restocking considerations.



## 6. Specific Conservation Projects

### 6.1 Australasian and Oceanian Realm

#### Conservation of the pig-nosed turtle (*Carettochelys insculpta*) in Papua New Guinea

The pig-nosed turtle is a large, freshwater chelonian, threatened principally by over-exploitation at colonial nesting grounds, and also by physical disturbance and erosion of nest sites from increased river traffic and changes in water level and flow patterns caused by damming and other industrial projects. The species is poorly known, but is recorded from several rivers in southern New Guinea and also from Northern Territory, Australia. Initial research on this species indicates the need for the following measures in Papua New Guinea, focusing especially on the Fly River catchment:

- Comparative studies on the impact of different levels of exploitation of this species are needed to serve as a foundation for future monitoring of the turtle populations, and to enable future advice to be given to local communities to help them protect *Carettochelys* and its eggs.
- An assessment of the current intensity of exploitation is required to provide a basis for monitoring, and if necessary, controlling future trends in exploitation with changes in human populations and practices.
- An evaluation of the principal habitat requirements of *Carettochelys* is required in order to evaluate and respond to the potential impact of proposed, or potential, projects in river catchments, such as hydroelectricity schemes, mangrove clearing/woodchipping, etc.
- Population data are required to determine whether a management programme for ensuring a sustainable harvest of *Carettochelys* is necessary and attainable.
- The population studies must be associated with research into the possibility of integrating a sustainable harvest system into local economies. This will almost certainly need to be backed up with a public awareness and education campaign. The programme will also include provision for training local wildlife staff and maintaining their operations.

In view of the importance of *Carettochelys* as a food source for local people and the decentralized nature of the wildlife management authority in Papua New Guinea, conservation measures will need to be introduced with sensitivity. Specific action to be recommended may include a nest site protection scheme allied to a closed season for hunting and egg collecting.

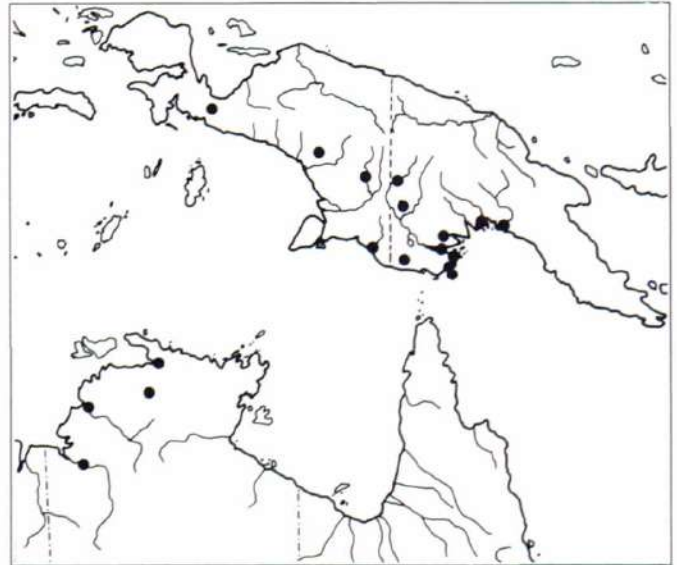


Figure 1. Distribution of the pig-nosed turtle (*Carettochelys insculpta*). (From Iverson 1986.)

Other species occurring in the Fly River system that could potentially benefit from conservation input for *Carettochelys*:

*Pelochelys bibroni*  
*Chelodina novaeguineae*  
*Elseya novaguineae*  
*Emydura subglobosa*

Populations in northern Australia need investigation to determine status and exact distribution. This will also provide a basis for comparison with work in Papua New Guinea. Some funds have already been secured for initial surveys in Kakadu National Park and the Daly River region of Northern Territory. Further work is necessary to identify areas of critical habitat for future management and protection.

**Contact persons:** Arthur Georges, Linda Heaphy, Mark Rose

**Budget:** U.S. \$50,000

#### Status survey of the Fitzroy turtle (*Rheodytes leukops*)

This is a very poorly studied species known only from the Fitzroy River system, eastern Queensland, Australia. The



majority of recent visitors have failed to find this turtle, the habitat of which is only accessible during clear-water episodes (dry season).

**Contact person:** Robert Parmenter

**Budget:** U.S. \$3,000

### **Population monitoring and breeding research for the Western swamp turtle, *Pseudemydura umbrina***

The Western swamp turtle is an unusual species confined to two nature reserves on the outskirts of Perth, Western Australia, where it inhabits ephemeral winter-wet swamps, and spends 6-8 months a year in aestivation. The total population is less than 100 animals and declining; one of the two populations might no longer exist, and there may be as few as one or two females remaining in the wild. The only valid hope lies in captive breeding, but this has proved extremely difficult to date; it is believed that the turtles need stressed conditions (e.g. long drought) in order to trigger breeding.

Continued monitoring is required to understand more fully the species' specialized and critical breeding cycle, and international expertise is needed to help increase the success rate of the current captive breeding programme at the Conservation and Land Management Centre in Perth.

Three main aims have to be achieved:

- Inducing the females to produce eggs
- Increasing the fertility rate of the eggs (which was less than 50% in 1980, the last season with reproduction in captivity)
- Improving the hatching rate, survival, and growth of juveniles.

Since the captive breeding and rearing programme will need to run for several years before animals can be released into the wild, it is essential that the remaining natural sites are fully protected and managed to maintain suitable habitat.

**Contact person:** Andrew Burbidge

**Captive Breeding advisors:** Gerald Kuchling and Walter Sachsse (through T&FWT Specialist Group Captive Breeding Sub-committee).

**Budget:** U.S. \$10,000

## **6.2 Afrotropical Realm**

### **Pilot programme for the conservation of the spurred tortoise (*Geochelone sulcata*) in sub-Saharan Africa**

*Geochelone sulcata* is a widespread but thinly-scattered and little-known species occurring across the Sahel and sub-Saharan region from Senegal to Ethiopia. It is the largest mainland tortoise in Africa, and an important component of the fauna of this semi-desert region, but its current status is uncertain and it may no longer inhabit several of its former localities.

A small-scale captive breeding programme has been established at the Nazinga Ranch, Burkina Faso, as part of a wider programme to evaluate the potential meat production per unit area that can be obtained on a sustainable basis. The ultimate aim of the project, through the cooperation of local people, government authorities, and specialists is to develop a unified approach to conservation and rural development in West Africa.

Work on *Geochelone sulcata* should be integrated into this programme and extended to other parts of the species range as the project develops. Initial status surveys should concentrate in West Africa in Senegal, Mali and Burkina Faso, and further east in Sudan. The potential for a pilot project for the reintroduction of tortoises in Sudan, utilizing stock from the very successful captive breeding colony at the Al-Ain Zoo, Abu Dhabi, should be investigated.

**Contact persons:** Clark Lungren (Burkina Faso), Jean-Pierre Pouvreau (Senegal), Mohd. Reza Khan (Abu Dhabi), and David Stubbs (U.K.)

**Budget:** U.S. \$40,000 for initial establishment phases.

### **Status survey and pilot project for the conservation of the pancake tortoise (*Malacochersus tornieri*) in Kenya and Tanzania**

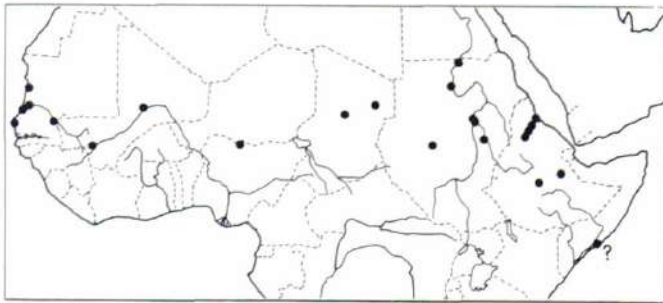
This unusual tortoise of rocky hills and outcrops in arid thorn bush and savanna is scattered in isolated localities in southern Kenya (Kitui District) and northern Tanzania (Dodoma District). Few population data exist, but there was formerly heavy pet trade exploitation in Kenya, and there has recently been renewed heavy export from Tanzania. Many sites are vulnerable because of their proximity to dense human populations and trade centres.

Recent reports from Roger Wood in Kenya indicate that stable, undisturbed populations still remain. Detailed status surveys need to be conducted between May and August in main areas where populations are known and within existing wildlife reserves. This study is part of the priority programme of Operation Tortoise, the global review of tortoise status. Field staff will be supplemented by visiting specialists. Immediate goals are to locate as many existing populations as possible and determine their viability. Further, long-term conservation effort will be directed towards the purchase and management of small reserve areas; potential sites also have high botanical importance. Results of numerous captive breeding exercises need to be harnessed, and the Tanzanian authorities should be encouraged to implement CITES obligations for this species (i.e., to control and monitor trade levels through export licenses).

**Contact persons:** Don Moll, Tom Langton, and J. Hebrard

**Budget:** U.S. \$30,000



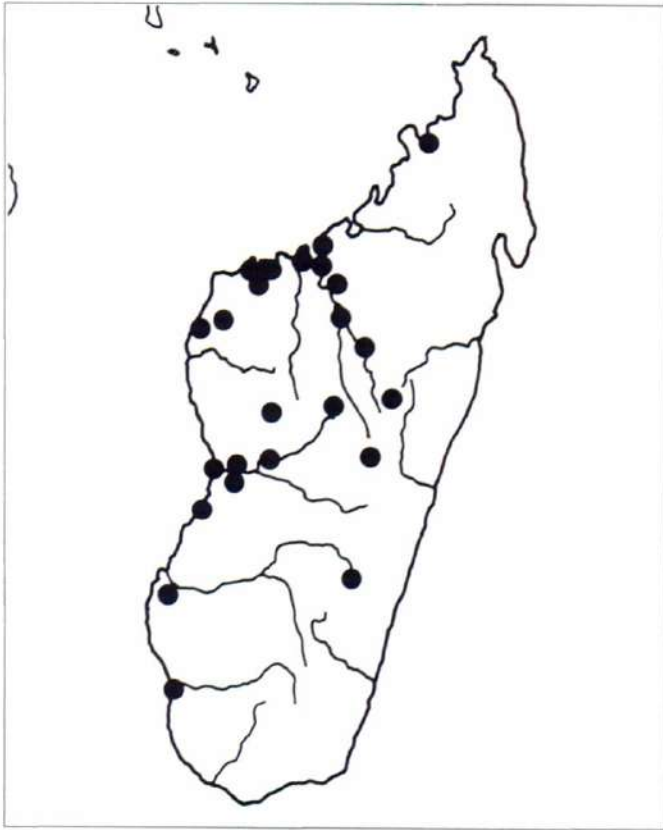


### Status survey of Berger's tortoise (*Homopus bergeri*) in Namibia

Recently rediscovered, nothing is known about the status and distribution of this species other than that it occurs near Aus in southern Namibia.

Contact person: William Branch

Budget: U.S. \$5,000



### Status survey of Seychelles mud turtle (*Pelusios seychellensis*)

This is a species endemic to the Seychelles Islands, in need of confirmation of its continued existence. If found, the population will require a full status survey, including investigation of competition with the more common East African yellow-bellied mud turtle (*Pelusios castanoides*), and verification of taxonomic uniqueness. Field work to concentrate on Mahé.

Contact person: Roger Bour

Budget: U.S. \$15,000

### Conservation of the Madagascan big-headed side-necked turtle (*Erymnochelys madagascariensis*)

This large endemic river turtle is reportedly declining over much of its range in western Madagascar, mainly because of over-exploitation and habitat degradation. This is a species of great zoogeographic interest because of its close affinity to the *Podocnemis* spp. of South America.

Figure 2. Top: Distribution of the African spurred tortoise (*Geochelone sulcata*) (From Iverson 1986.)

Bottom: Distribution of the Madagascan big-headed side-necked turtle (*Erymnochelys madagascariensis*) (From Iverson 1986.)

### Status survey of *Kinixys natalensis* in Natal

This is a little-known species of limited distribution in Natal, Swaziland and southern Mozambique. It is in need of a field survey to assess its conservation requirements.

Contact persons: Dr. O. Bourquin and Don Broadley

Budget: U.S. \$3,000



Adult male and female Boulenger's Cape tortoise (*Homopus boulengeri*), one of the world's smallest tortoises, whose range is confined to certain rocky habitats in the Great Karoo of South Africa. It does not survive long in captivity. (Photo by P.C.H. Pritchard.)



A detailed status survey, including of its population biology, is required with a plan to introduce sustainable yield management. Initial fieldwork should concentrate on populations in permanent lakes along the Tsiribihina River, where the species is reportedly abundant, and at Lake Kinkony, where it is heavily exploited. Sites should be identified for potential reserves and for closed season nesting-ground protection. CITES Appendix II status should be observed and enforced, but export is probably not the main problem.

**Contact person:** Charles Blanc

**Budget:** U.S. \$25,000

### Status survey and habitat protection for the flat-shelled spider tortoise (*Pyxis planicauda*) in the Andranomena Forest

This small tortoise is endemic to Madagascar. Its total range is supposedly limited to the Andranomena and Amborompotsy Forests near Morondava on the central-west coast, but suitable habitat is possibly available in other forested areas nearby. Recent field studies indicate that much of the habitat in the species' range is in good condition and some is nominally protected, but there may be threats from habitat destruction and modification (timber logging), leading to an increased number of egg predators. There has been no known success with captive breeding, although captive groups have been held in the San Diego and Knoxville Zoos (U.S.A.).

A full status survey and population study is urgently required to provide an impetus for protection of the remaining natural habitat and construction of an on-site captive rearing and protected breeding facility. One possibility could be to expand the Ampijora captive breeding facility for *Geochelone yniphora* to accommodate other Madagascan tortoise species, provided that extra funds become available.

**Contact person:** Gerald Kuchling

**Budget:** U.S. \$25,000

## 6.3 Nearctic Realm

### Conservation of the alligator snapping turtle (*Macrochelys temminckii*)

This species is severely depleted along many river basins, particularly in Louisiana and parts of Georgia, Alabama, and Mississippi. It is heavily exploited for food and for its alleged damage to fisheries in certain areas.

It should be included on the federal protected list as "Threatened" and pressure should be exerted on Louisiana authorities to enforce protection. A moratorium on all hunting of this species in that state is required while detailed population

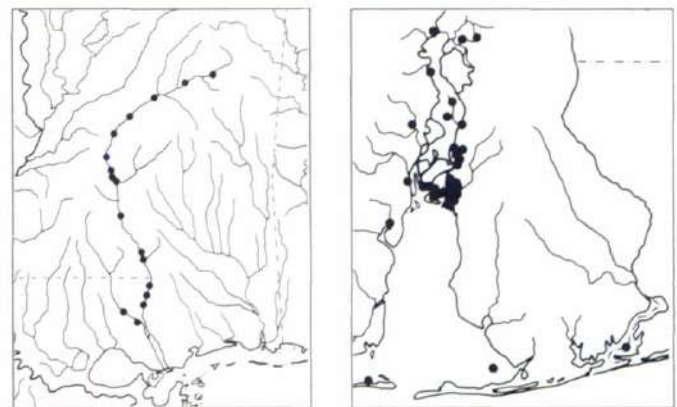
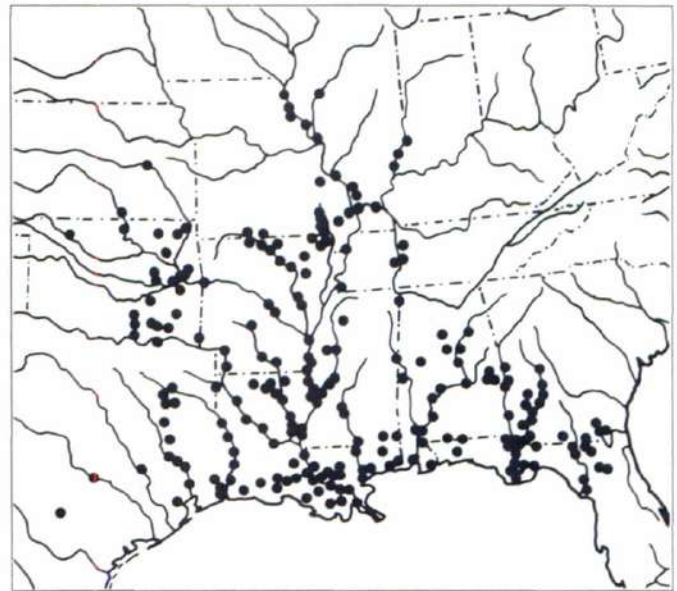


Figure 3. Top: Distribution of the alligator snapping turtle (*Macrochelys temminckii*).

Bottom left: The ringed map turtle (*Graptemys oculifera*), along the Pearl River drainage.

Bottom right: The Alabama red-bellied turtle (*Pseudemys alabamensis*), in Mobile Bay. (All from Iverson 1986.)

assessments are carried out. This will also need careful approaches to market traders to develop support for conservation measures. The ultimate aim is to provide integrated protection and cropping management on a river basin basis. It is important to survey populations of small-sized animals to see if they are still viable with large adults almost totally removed, for instance in Rapides Parish, south of Alexandria, Louisiana.

**Contact person:** Peter Pritchard

**Budget:** U.S. \$25,000



### Conservation of the Alabama red-bellied turtle, *Pseudemys alabamensis*

This large, robust emydine turtle is limited to quiet backwaters in Mobile Bay and tributary streams in Baldwin and Mobile counties, Alabama. It is threatened because of restricted range, specialized habitat, low population numbers, and susceptibility to inadvertent harvest by fishermen. It was recently listed as "Threatened" by the USDI, who have promulgated a recovery plan.

There is a need to protect principal habitats (weed beds) and nesting and hibernation sites. Priority protection is needed for critical habitats from south of Gravine Island to the beds of submerged aquatic vegetation south of the I-10 Causeway across Mobile bay. This area needs regular wardening, enforceable seasonal access restrictions to limit inadvertent harvest by fishermen, and potentially some small land purchases.

**Contact persons:** C. J. McCoy and James Dobie

**Budget:** U.S. \$20,000 initially, plus an annual maintenance budget to be determined.

### Conservation of the yellow-blotched map turtle (*Graptemys flavimaculata*) in Mississippi

This is possibly the most restricted of the sawback turtles, limited to the Pascagoula catchment in southeast Mississippi. Few thriving populations remain, and these tend to be isolated and scattered. There is critical habitat in Pascagoula River from Wade north into Leaf River at Merrill.

An education programme is needed to curtail shooting of basking turtles. River pollutants need to be identified, sourced, and curtailed. Studies of relative breeding success of turtle



Adult female Barbour's map turtle (*Graptemys barbouri*), a species confined to the Apalachicola/Chipola river system in northwestern Florida and adjacent Georgia. (Photo by P.C.H. Pritchard.)



Yucutan box turtle (*Terrapene carolina yucutana*), the least-known of the various subspecies of American box turtle. It is confined to the Yucutan Peninsula of Mexico, where it is rarely seen. (Photo by P.C.H. Pritchard.)

populations in each tributary will help determine the effect of the pollutants and the prospects for species recovery.

**Contact person:** C. J. McCoy

**Budget:** U.S. \$25,000

### Recovery programme for the ringed sawback turtle (*Graptemys oculifera*)

This turtle is known only from the Pearl and Bogue Chitto Rivers in Mississippi and Louisiana. These are large river systems supporting an abundance of molluscs, the primary food source of the ringed sawback. The species is listed as threatened under the provision of the Endangered Species Act (1973). The principal threats appear to be habitat alteration by river engineering schemes and pollution (in the Pearl River south of Jackson).

A draft recovery plan has been prepared (Stewart 1987a). Because of the very limited knowledge on the ecology and critical habitat requirements of this species, the initial programme focuses on basic life history research and habitat evaluation. This project will concentrate on the two key populations identified by McCoy and Vogt (1980), as well as further survey work to locate other areas of critical habitat, so that their protection and appropriate management can be incorporated into the programme of regional river catchment planners and the Federal Endangered Species Program.

**Contact person:** Ken Dodd

**Budget:** U.S. \$25,000



## Conservation programme for the Coahuilan box turtle (*Terrapene coahuila*)

This aquatic box turtle is restricted to the specialized marshy habitats of the intermontane desert basin of Cuatro Ciénegas, Coahuila State, northern Mexico. The species is threatened by habitat modification, particularly irrigation schemes, and by virtue of its extremely limited range and habitat requirements. Captive breeding at the Gladys Parler Zoo (Brownsville, Texas) has been very successful.

Conservation priorities are to secure protected status for the turtle's remaining natural habitat and to devise a long-term management strategy to prevent inappropriate drainage schemes. This should be preceded by an up-to-date status review. Legislation already prohibits collecting.

Benefits for other species: there are three other freshwater turtle taxa occurring in the Cuatro Ciénegas basin: *Trachemys scripta taylori*, *Apalone spinifer ather*, and *A. s. emoryi*. The basin also supports several endemic invertebrates and fish.

**Contact person:** To be determined. Meanwhile, inquiries should be directed via Specialist Group Co-chairman, Peter Pritchard.

**Budget:** Undetermined

## Status survey of the spotted box turtle (*Terrapene nelsoni*) in western Mexico

There are very few extant records of this localized, terrestrial emydid turtle in northwestern Mexico, except for the single village area of Pedro Pablo, Nayarit. This is partly due to difficulty in locating animals, since they only appear after heavy rain. The overall distribution and the validity of the two described subspecies remain unclear. A full status survey is required.

**Contact persons:** Pat Minx and John Iverson

**Budget:** U.S. \$25,000

## Conservation of the Bolson tortoise (*Gopherus flavomarginatus*) in Mexico

This large terrestrial species, endemic to Mexico, is limited to the Bolson de Mapimi in the Chihuahuan Desert of the north-central plateau. Localized and discontinuous populations are primarily found in Tobosa (*Hilaria mutica*) grasslands on shallow slopes fringing basin flood plains. It is severely threatened by human exploitation for food, habitat degradation by livestock and agriculture, and illegal trade. Collapsing distribution, depressed fecundity, nest destruction, and low juvenile survivorship contribute to minimize the recruitment rate.

The species has received detailed ecological studies and some conservation input. Three important extensions to current work are necessary:

- Top priority: Purchase of the 10,000 ha Rancho Sombrenillo in Chihuahua. The ranch, which is currently for sale for around U.S.\$ 100,000, includes the largest northern population of the Bolson tortoise, which is dense and actively reproducing. By year 2000 it could be the only viable population outside the Mapimi Reserve. Funding requirements must include provisions for fencing, maintenance, and wardening.

**Contact persons:** Gustavo Aguirre and David Morafka

**Budget:** U.S. \$50,000 start up, U.S. \$3,000 annually thereafter.

- Continuation of radiotelemetric tracking of hatchery tortoises when released into the wild.

**Contact person:** Gustavo Aguirre

**Budget:** U.S. \$15,000 (over 5 years)

- Microbial and nutritional studies to improve captive hatching viability and growth. To be coordinated with other similar projects by the T&FWT Specialist Group Captive Breeding Subcommittee (Walter Sachsse).

**Contact persons:** Gary Adest, Gustavo Aguirre, and David Morafka.

**Budget:** U.S. \$7,500

## Habitat protection for the gopher tortoise (*Gopherus polyphemus*)

Habitat loss and fragmentation caused by new developments are the major causes of the decline of this species in the southeastern U.S.A. A number of relocation studies are currently underway to establish whether doomed populations can be successfully translocated to new, safe sites. Initial results have not been encouraging, and this emphasizes the priority of securing key sites before they become threatened.

Funds are required for field work to identify the best privately-owned tortoise sites and to prepare nature reserve proposals. The results will be coordinated by The Nature Conservancy and the Gopher Tortoise Council, and specific funding appeals will be launched as sites are identified or become available.

**Contact person:** Dale R. Jackson

**Budget:** U.S. \$20,000 (for hire and coordination of field personnel)



## 6.4 Neotropical Realm

### Conservation of the Central American river turtle (*Dermatemys mawii*) in Chiapas, Mexico

This large river turtle is being decimated throughout much of its range in southern Mexico, Guatemala, and Belize because it is very easy to catch and has excellent white meat. Eggs are also frequently taken. The previously inaccessible northern Chiapas region has recently been opened up by a new road rendering the turtle populations vulnerable to full exploitation. It is a very poorly studied species but is of particular interest in being the sole member of the family Dermatemydidae and having a completely vegetarian diet.

Comparative status survey and population ecology studies are urgently required to evaluate the potential for sustainable yield harvesting and to establish a pilot management programme. Populations to be studied are located along the Rio Tsendales and Rio San Pedro, within the fully protected Montes Azules Reserve, the Rio Lacantun in the Lacandone Forest of southern Chiapas, and the Rio Papaloapan in southern Veracruz. These areas include the last known untouched populations of this species, as well as tropical rainforest, in southern Mexico. Parallel studies of populations in large lakes and market surveys at Alvarado, Lerdo de tejada, Minatitlan, Coatzacoalcos, Villahermosa, and Catazaja will be carried out.

The current closed season must be fully enforced and realigned if found not to coincide with the principal nesting period.

Harvesting model studies will be coordinated through the T&FWT Specialist Group to provide a comparable basis with similar pilot projects on heavily exploited, large river turtles in South America, Asia, and New Guinea. Other freshwater turtle species found in association with *Dermatemys* will be included in the study, to provide a comprehensive evaluation of the conservation management required for the whole turtle fauna of the area. This will include species of *Kinosternon*, *Staurotypus*, *Pseudemys*, and *Chelydra*.

Initial survey work was started in October 1987, funded by the Consejo Nacional de Ciencia y Tecnologia de Mexico. First results suggest that juveniles are relatively easy to rear and that the species is herbivorous throughout its life cycle. Recaptures from previous studies show that natural growth rates are faster than previously believed.

Contact person: Richard Vogt

Budget: U.S. \$80,000 (\$65,000 still required)

### Conservation programme for large river turtles (*Podocnemis* spp.) in northern South America

The single greatest conservation problem facing neotropical chelonians is the vast over-exploitation of the large, sometimes colonially nesting *Podocnemis* species. Formerly very abundant, most species are now excessively hunted for eggs and food. Most species are nominally protected in most countries within their ranges, but enforcement is generally lacking. In Brazil, despite strict protection of some nesting beaches of *P.*

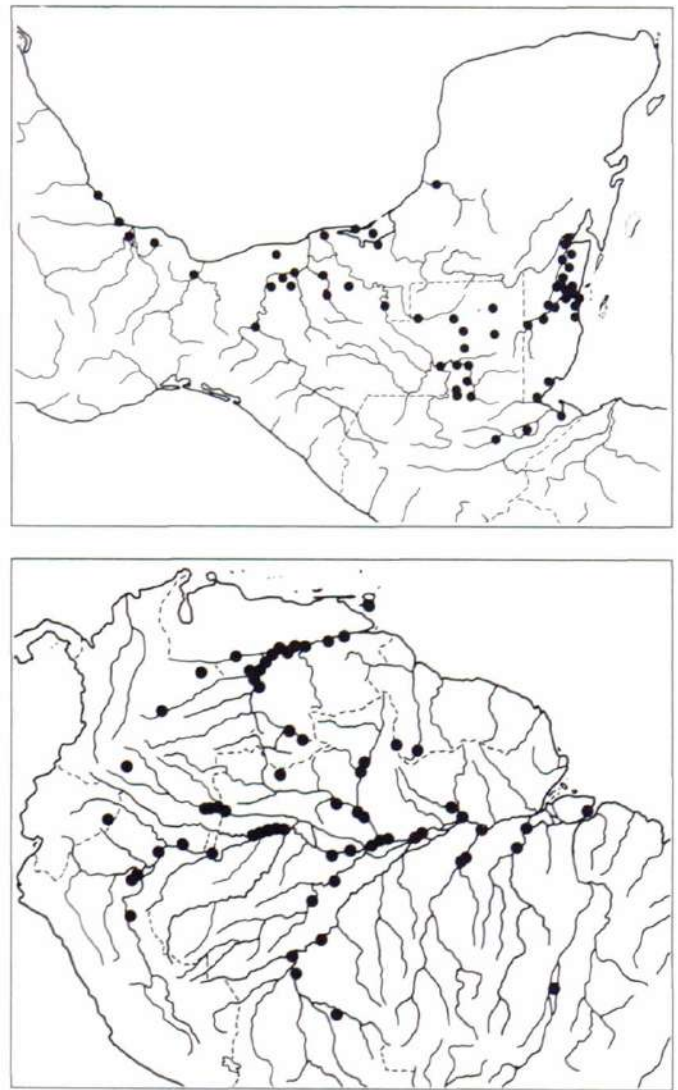


Figure 4. Top: Distribution of the Central American river turtle (*Dermatemys mawii*).

Bottom: Distribution of the giant South American river turtle (*Podocnemis expansa*). (From Iverson 1986.)

*expansa*, heavily armed poachers have been reported to launch raids and drive off the forestry service personnel.

There needs to be strong international pressure to encourage Brazilian authorities to increase resources for the nesting beach protection programme and to effect some spectacular arrests. Stronger conservation regulations and enforcement are also necessary in Colombia, Peru, and Venezuela to control the increasing pressure from hunters.

Most of the species have potential as economic, easily managed, renewable natural resources. Coordinated research is needed in each of the major catchments to evaluate the possibility of sustainable yield management. Extensive nest beach protection is required, as well as more general protection by means of fully enforced close seasons and catch limits. This will often require further training and motivation of the enforcement and protection agencies.



Habitat destruction is also an important cause of decline. There needs to be much greater emphasis on land protection along the Orinoco and Amazon catchments.

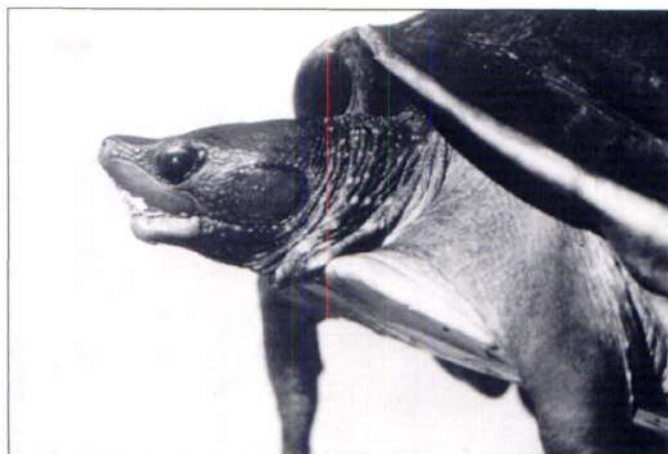
### Colombia

Protection of *P. expansa* and establishment of the Cahuinari National Park along the Rio Caqueta. This is virtually the last stronghold of the species in Colombian Amazonia; the population has declined markedly due to widespread taking of adults and eggs. The proposed National Park area supports many other rare species of reptiles, birds, and mammals. The programme involves participation of local Indian communities, who will, we hope, refuse to cooperate with dealers, thus reducing commercial exploitation.

Wider ranging status surveys are needed for *P. expansa* and *P. unifilis*, focusing on the socio-economic importance of turtles in the study areas, and taking full account of local people's attitudes and needs.

**Contact persons:** Patricio von Hildebrand and Olga Castaño

**Budget:** U.S. \$80,000



Two of the larger species of river terrapin in need of conservation.

Top: The Central American river turtle (*Dermatemys mawii*). (Photo by P.C.H. Pritchard.)

Bottom: The "Tuntong" (*Balagur baska*) from southeast Asia. (Photo by E.O. Moll.)

### Brazil

Expansion and increased effectiveness of nest beach protection programme of Instituto Brasileiro de Desenvolvimento Florestal (IBDF), coupled with detailed population surveys, particularly along the Rios Trombetas and Tapajos in the lower Amazon basin, where *P. expansa*, *P. unifilis*, and *P. sextuberculata* occur sympatrically. Specific data are required on movement patterns of released hatchlings from the IBDF project to monitor the effectiveness of the programme.

**Contact person:** Jeanne Mortimer

**Budget:** U.S. \$20,000 (population and movement studies)

Further population surveys are required for other pleurodiran turtles in the Amazon catchment. Studies will focus on the rarer species of *Phrynops*, *Podocnemis*, *Peltecephalus*, and *Chelus* over a wide area to establish key areas where viable populations can be protected. Radio-telemetry studies of turtle home ranges will be an essential part of reserve design, and reproductive studies will determine critical periods for maximum wardening effort.

**Contact person:** Richard Vogt

**Budget:** U.S. \$50,000 for survey and project establishment; U.S. \$25,000 annual maintenance budget

### Peru

Full protection for *P. expansa* and *P. unifilis* in the National Reserve of Pacaya-Samiria, along the Rio Pacaya. Nesting beaches must especially be guarded and a closed season enforced. Regular monitoring of these species along Rio Pacaya is needed to assess current exploitation levels.

**Contact person:** Pekka Soini

**Budget:** U.S. \$10,000

### Venezuela

Excessive hunting pressure is causing a marked decrease in the wild populations of *P. expansa*. The Venezuelan National Guard is currently responsible for carrying out a special annual operation between January and May to protect the nesting colonies of this species on the beaches of the Orinoco River. The limited resources available to the National Guard mean that relatively little of the 400 km stretch of nesting habitat can be adequately protected.

Funding is urgently needed for the provision of three motor launches and sufficient supplies to enable teams of guards to cover the nesting area and remain on site for lengthy periods.

Population studies to monitor exploitation and the effectiveness of the nest beach protection scheme for *P. expansa* should be carried out. Where applicable these should also include *P. unifilis* and *P. vogli*.

**Contact persons:** Stefan Gorzula and Major José Lara

**Budget:** U.S. \$28,000 for project establishment; U.S. \$13,000 annual maintenance and recurrent costs; U.S. \$12,000 for population monitoring



## Guyana

Almost no data are available on the status of either *P. expansa* or *P. unifilis* in the Essequibo River. However, both are apparently heavily exploited and are, therefore, in need of some active conservation.

**Contact person:** Peter Pritchard

**Budget:** U.S. \$12,000

## Status surveys of *Trachemys* species in Hispaniola, Puerto Rico, and Great Inagua

The most endangered slider turtles of the genus *Trachemys* in the Caribbean are *T. decorata* on Hispaniola, and *T. stejnegeri* on Hispaniola, Puerto Rico, and Great Inagua (Bahamas).

Official interest in conservation of these sometimes heavily exploited species needs to be fostered by demonstrating the current population status of the species. Detailed population data are needed for developing an effective conservation programme, protective laws, and an education campaign. Baseline ecological data could be supplied from field surveys in Hispaniola, Puerto Rico and Great Inagua (for *T. stejnegeri malonei*). The latter is limited to a small number of freshwater ponds on the northwest corner of Great Inagua. These are vulnerable to the effects of brine floods (from the local solar salt industry) and sludge waste dumping. Large areas of the island are already protected by the Bahamas National Trust, but currently no turtle habitat is included. If the distribution and relative importance of turtle ponds can be established, there is a strong likelihood of obtaining protection of the critical habitat areas.

**Contact persons:** Michael Seidel and Karen Bjorndal

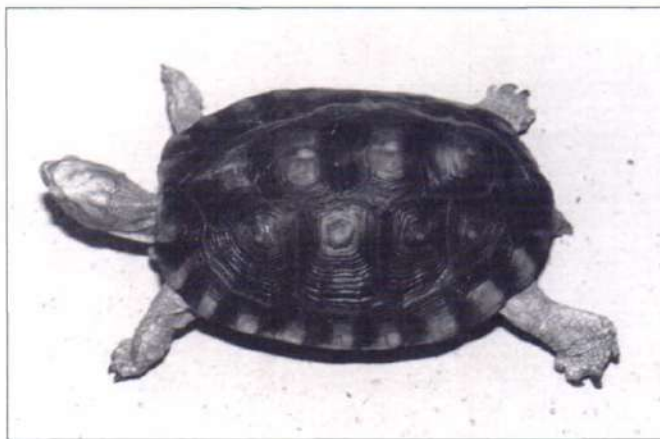
**Budget:** U.S. \$5,500

## Status surveys of rare turtles in central and northwestern South America

A series of status surveys is required for a number of freshwater turtles of restricted distribution in Central America and Colombia. Very little is known about each of these species but all are believed to be rare and vulnerable because of their limited or fragmented range. A major difficulty in carrying out population evaluations, and hence in assessing critical habitat, is that several of these species are very secretive and are generally only seen after rain.

*Rhinoclemmys areolata*, a species inhabiting forests and savannahs, to be surveyed in Yucatan, southeast Mexico. Some reports indicate locally abundant populations, especially on Cozumel Island, but this needs confirmation.

*Rhinoclemmys rubida*, a terrestrial living species of lowland dry forests in western Mexico (central Oaxaca and Michoacan, Colima, and Jalisco). Information from collectors and locals suggests it is disappearing because of food and pet trade



Mexican spotted wood turtle (*Rhinoclemmys rubida perixantha*), a terrestrial emydid turtle from Colima and Michoacan, on the Pacific coast of Mexico. (Photo by P.C.H. Pritchard.)

exploitation. An assessment of local attitudes and willingness to cooperate with a conservation management programme will therefore form a necessary part of the study.

*Kinosternon angustipons*, a species of shallow swamps, slow streams, and lagoons in Caribbean Costa Rica. To be surveyed in Costa Rica with the help of local workers.

*Kinosternon dunni*, known only from Río Baudo, Río Decapado, and Río San Juan drainages in the Departamento del Chocó, on the Colombian Pacific Coast.

*Kinosternon oaxacae*, known only from southern Oaxaca, southern Mexico. Could be combined with *R. rubida* for a more cost-effective exercise.

**Contact person:** John Iverson

**Budget:** U.S. \$25,000

## Status surveys of rare species of *Phrynops* in South America

Survival recommendations are required for five rare species of side-neck chelid turtles. Full status surveys are needed for a basis of effective conservation effort. Voluntary restraints should be negotiated with major land owners to protect key habitats. Automatic back-up should be provided by coordinated captive breeding programmes.

*Phrynops dahlí*: Very restricted range in vicinity of Sincelejo, Bolívar, Colombia. Its preferred habitat of ponds and small brooks within forest is largely destroyed.

*Phrynops hogeni*: Limited to southeastern Brazil, in low-lying areas of the Rio Paraíba drainage in the states of Rio de Janeiro and southern Minas Gerais, and the Rio Itapemirim of southern Espírito Santo. Depleted by habitat loss and water pollution.



*Phrynops rufipes*: Mostly confined to the Río Vaupes drainage in southeast Colombia, along small, closed-canopy black water creeks in primary rain forest. Apparently rare throughout its range, but this may be due to secretive, nocturnal habits.

*Phrynops zuliae*: Only recorded from basins draining into the eastern shore of Lake Maracaibo, Venezuela. Habitat alterations in this single swamp area are probably posing a severe threat to this species.

*Phrynops vanderhaegei*: Confined to the Río Parana basin, from which there are very few locality records (in Paraguay and northern Argentina). One abundant population 60 km east of Asunción has recently been identified.

**Contact person:** Peter Pritchard

**Budget:** U.S. \$30,000

### Conservation of threatened turtles in Colombia

A number of sympatric freshwater turtle species occur in the Río Magdalena drainage in northern Colombia and are considered seriously threatened. A two stage project is envisaged:

1. Status and distribution studies of:

*Podocnemis lewyana*

*Rhinoclemmys* sp. (undescribed; currently listed as *melenosterna*)

*Trachemys scripta callirostris*

This will include an evaluation of the socio-economic importance of the species in the study areas to take full account of local attitudes and needs.

2. Specific conservation management and education programme based on the results of stage 1.

**Contact person:** Olga Castaño

**Budget:** U.S. \$20,000

### Protection programme for *Geochelone carbonaria* and *G. denticulata* in Venezuela

The National Guard already operates a protection programme for tortoises in Venezuela, that until about 1984 was fairly effective. Every year during a 90-day period before Easter, intensive checks are made by guards posted along major routes. This serves to discourage many would-be collectors, and confiscated tortoises are returned to the wild. This operates in tandem with an educational programme, which utilizes the tortoise as a symbol for the conservation of fauna.

The effectiveness of the protection programme has been eroded by the construction of new roads; an inability to set up check points in strategic passes; a change in the routine of smugglers, who are now operating earlier in the season; and easy access to new hunting areas due to the expansion of the

Guri Lake impoundment on the Río Caroni. In order to increase efficiency it is necessary to:

- Set up new control points along principal routes.
- Carry out terrestrial and fluvial patrols in hunting areas.
- Intensify the education campaign.

Funds are needed for extra equipment (jeeps and launches) and for re-publishing educational posters and leaflets.

**Contact persons:** Stefan Gorzula and Major José Lara

**Budget:** U.S. \$ 65,000

### Status survey of rare *Acanthochelys* species in the Chaco and Pantanal regions

*Acanthochelys macrocephala* has recently been found in a small area of the Pantanal region of western Brazil. No population data exist, and a full status survey is needed.

*Acanthochelys pallidipectoris* is mostly confined to the Chaco region of northern Argentina. This is likewise a very little known species in need of status survey.

**Contact person:** To be determined, meanwhile any inquiries should be addressed to Specialist Group Co-chairman, Peter Pritchard.

**Budget:** U.S. \$25,000 (to be confirmed)

### Conservation of the tortoises *Geochelone chilensis* and *G. donosobarrosi* in Argentina

These are the most threatened of the South American testudinids. In Argentina there is widespread destruction of its preferred Chaco (open forest and grassland) habitat, and tens of thousands of animals are caught each year for the international pet trade. Others are taken for food, and eggs are taken too. Despite legal protection, controls are not enforced, and even hatchery programmes, in some cases, appear to be "covers" for large-scale collection of wild specimens.

Fully enforced legal protection to tighten trade controls and a ban on sale of tortoise artifacts as tourist souvenirs is recommended. Protected reserves covering remaining areas of prime habitat should be established and effectively warded. This should be coupled with an education programme to deter hunting and collecting.

The taxonomic status of *G. donosobarrosi* in northern Patagonia needs confirmation, and habitat protection covering its range in the volcanic region of El Nevado, Mendoza, is essential. It is the only tortoise inhabiting volcanic, arid mountain habitat in continental South America. Therefore, a survey to establish the critical habitat area is needed in order to determine the most effective protection programme.

**Contact persons:** Tomas Waller, Susana Salas, and Enrique Richard

**Budget:** U.S. \$ 10,000 for survey of *G. donosobarrosi*. Amount for reserve establishment to be determined.



## 6.5 Indomalayan Realm

### Conservation and management of the river terrapin or "Tuntong" (*Batagur baska*) and related species in tropical Asia

The river terrapin is a large species inhabiting brackish and freshwater riverine habitats over a wide but increasingly fragmented range in Asia. It is very heavily exploited for its eggs and meat and has declined drastically in many areas. The best remaining populations are probably those in peninsular Malaysia and possibly Bangladesh, whereas in Thailand and Burma the species is thought to be close to extinction.

The conservation programme for *Batagur baska* contains three main elements:

- Full status assessment of populations in the Sunderbans of India and Bangladesh, the Irrawaddy River delta in Burma and the Indragiri River in Sumatra.
- Establishment of hatchery and nest site protection in Peninsular Thailand. Populations occur in Thale Sap and Thale Luang near Phattalung, from Amphur Ranote in Changwat Songkhla and from river mouth in Changwat Ranong. This should be complemented by an educational programme for local inhabitants and lobbying for legislation to protect adults.
- Monitoring, expansion, and improvement of the existing hatchery programme in Malaysia, in Perak, Kedah and Terengganu states, including long-term life history studies to investigate potential for sustainable yield management. Basic components are hatcheries, head-starting, protection of adults and nesting sites, and licensing of egg collectors. The Perak project also includes captive breeding facilities.

Despite existing efforts, the threats to the populations remain, chiefly from pollution, habitat modification, and over-exploitation of eggs. Further action points to be incorporated are:

- Creation of a sanctuary on the Perak River at Bota.
- Habitat restoration of nesting beaches at the Kedah sites.

The Perak River project will incorporate protection and study of the "Tuntong Laut", *Callagur borneoensis*.

In Malaysia, all states should be encouraged to pass and enforce laws protecting the river terrapin and controlling the exploitation of its eggs. Additional efforts are needed to convince the federal authorities and state governments to reduce rate of habitat destruction and control water pollution, both serious deleterious factors for *Batagur* in Malaysia. A countrywide education programme in collaboration with the Department of Wildlife is needed.

**Contact persons:** Ed Moll and Rom Whitaker

**Budget:** U.S. \$40,000 initially; U.S. \$5,000 per year for 10 years

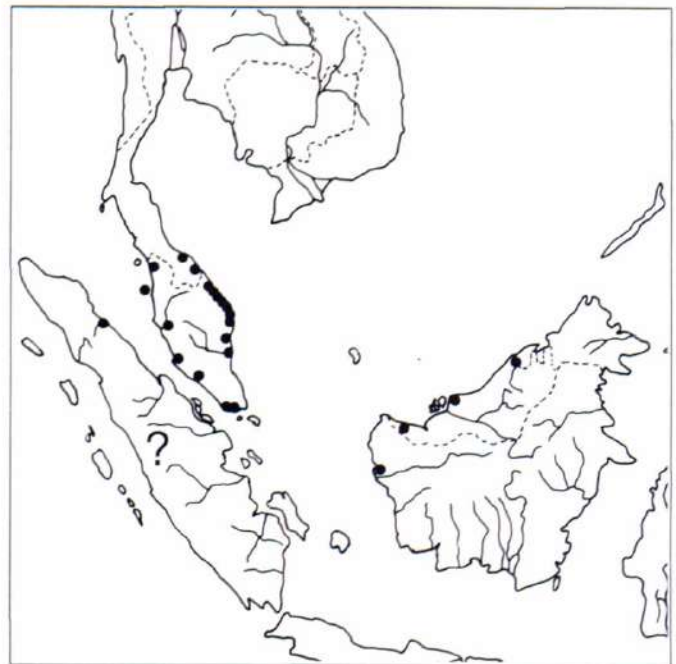


Figure 5a. Distribution of the "Tuntong" or river terrapin (*Batagur baska*).

Figure 5b. Distribution of the "Tuntong Laut" or painted terrapin (*Callagur borneoensis*). (From Iverson 1986.)



## Sanctuary and hatchery programme for *Callagur borneoensis* in Malaysia

Like *Batagur*, this species is heavily exploited for its eggs and meat in southeast Asia. It inhabits estuarine and tidal sections of rivers from Thailand to Borneo, but is reported to be very rare and generally declining. It is unusual for its habit of migrating to coastal beaches, where it nests alongside marine turtles. Most east coast Malaysian nesting areas are licensed for egg collectors, and the harvest is almost total. Apart from a few eggs hatched each year at the Rantau Abang Hatchery, there is no current conservation action.

A sanctuary is needed on the Setiu-Chalok river system (supporting the largest known breeding population remaining; >200 females), and at the Kuala Baharu nesting beach, Terengganu. This would also help save a major nesting beach for olive ridley, green, and leatherback sea turtles. This should be associated with tighter licensing controls and an expanded hatchery programme. The purchase of eggs for the Rantau Abang Hatchery should be increased to at least 50% of those being taken from licensed beaches (ca. 8,000, based on 1978 estimates).

**Contact person:** Ed Moll

**Budget:** U.S. \$20,000 establishment costs; U.S. \$3,000 per year for 10 years

## Turtle conservation along the Irrawaddy basin, Burma

The lower reaches of the Irrawaddy River support one of the richest assemblages of freshwater turtles in the world, and most of these are thought to be under threat, or otherwise of conservation concern. Species recorded from this area are:

*Batagur baska*  
*Cyclemys dentata*  
*Hardella thurjii*  
*Heosemys grandis*  
*Kachuga trivittata*  
*Morenia ocellata*  
*Notochelys platynota*  
*Platysternon megacephalum*  
*Lissemys scutata* (endemic to Irrawaddy and Salween rivers)  
*Amyda cartilaginea*  
*Nilssonina formosa*

The little known and rare terrestrial species *Geochelone platynota* is endemic to the Irrawaddy valley and should be incorporated into the regional conservation plan. *Indotestudo elongata* and possibly *Manouria impressa* may also occur within the project area.

Population surveys are required for each species, together with local market surveys to assess exploitation levels. Suitable reserve and sanctuary areas need to be identified and the potential for establishing hatcheries or a sustainable yield harvesting system evaluated. The attitudes of local people

towards turtles and their dependence on them for food and trade will be crucial in determining the direction and emphasis of any future conservation management programme.

**Contact persons:** Brian Groombridge and Ed Moll

**Budget:** U.S. \$40,000

## Status surveys of terrestrial tortoises in Southeast Asia

None of the four testudinids from Southeast Asia has been investigated in any detail, yet each is believed to be under some threat from over-exploitation.

Field surveys of status and ecology are required for each species, in at least the following countries and localities:

### N.E. India

*Indotestudo elongata* Jalpaiguri District of W. Bengal,  
 Goalpara District of Assam-Sal  
 forests in Orissa, Bihar, W.  
*Manouria emys* Chachar and Naga Hills, Assam

### Bangladesh

*Indotestudo elongata* Chittagong Division  
*Manouria emys* Chittagong Division

### Burma

*Geochelone platynota* Pegu region, Irrawaddy Valley  
*Indotestudo elongata* Upper Irrawaddy, north of Mandalay  
*Manouria emys* Throughout Burma?  
*Manouria impressa* Karenni and Shan Hills, eastern Burma

### Thailand

*Indotestudo elongata* Throughout Thailand?  
*Manouria emys* Changwat Nakhon Si Thammarat, Changwat Ranong, but possibly widespread in montane habitats  
*Manouria impressa* Northwest highlands, Tak and Mae Hong Son provinces

### Malaysia

*Indotestudo elongata* Forested hills in northern Malaysia  
*Manouria emys* Forested hills in northern Malaysia  
*Manouria impressa* Isolated uplands of the Kedah, and the Larut and Frasers Hills, South Perak

Some of these species and areas are being covered by Operation Tortoise (see Chapter 4), but the full information required will necessitate supplementary work. Work in Burma is particularly essential, as local conditions permit.

**Contact persons:** Ian Swingland, Ed Moll, and Indraneil Das

**Budget:** U.S. \$60,000



## Freshwater turtle conservation in the Ganges Delta, Bangladesh, and West Bengal

Exploitation of turtles in the Ganges Delta is believed to be extremely heavy. The Sunderbans area supports a wide variety of turtle species, representing a major food source for the human population. So great is the collecting pressure that several species might be locally extirpated and collectors are bringing stock from further and further afield.

Detailed population studies of the principal food species are urgently needed to evaluate the potential for a management plan relating to sustainable-yield harvesting. Sanctuaries and close season restrictions will be vital to the successful implementation of conservation in this region. Possible establishment of hatcheries should be investigated. Captive breeding back-up should be provided by the Madras Crocodile Bank for each species of conservation concern.

The following species of conservation concern occur in the delta:

<i>Batagur baska</i>	Mongla River, Passur River, Sunderbans
<i>Geoclemys hamiltonii</i>	Throughout
<i>Kachuga kachuga</i>	Padma River, district of Rajshahi, Ganges
<i>Chitra indica</i>	Padma and Jamuna rivers
<i>Pelochelys bibroni</i>	Distribution in Bangladesh unknown, West Bengal Sunderbans

Other commoner species that would benefit from conservation action in the delta are: *Hardella thurjii*, *Kachuga dhongoka*, *K. smithi*, *K. tecta*, *K. tentoria*, *Morenia petersi*, *Lissemys punctata*, *Aspideretes gangeticus*, and *A. hurum*. The strength of the populations of these commoner species will be crucial in determining the long-term viability of turtles as a resource in these river systems, and at the same time allowing for stronger protection of the threatened species.

A further area of major concern is the widespread use of insecticides and their effects upon aquatic organisms. These aspects need to be studied, since they are likely to have a strong bearing on the dynamics of freshwater turtle populations, and could seriously alter the validity of the exploitation levels calculated for sustainable harvesting.

**Contact persons:** Rom Whitaker, Ed Moll, and Charles Fugler

**Budget:** U.S. \$50,000

## Revision of Wildlife Act, CITES listings, and promotion of law enforcement in India

In support of the previous project proposal, there needs to be a more realistic assignment of protected status on both the Indian Wildlife (Protection) Act and CITES, to ensure that the endangered species are properly safeguarded. Enforcement of these regulations and closed seasons is essential for any realistic prospect of recovery of the turtle populations.

Wildlife officers must be better trained and provided with clear identification manuals for the relevant species. Proposed amendment to protected listings are given by Moll 1984 (see Appendix 3). The T&FWT Specialist Group will urge the relevant authorities to effect these changes.

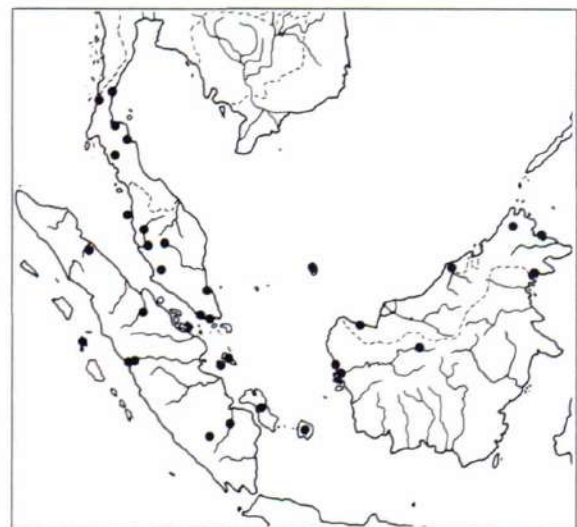
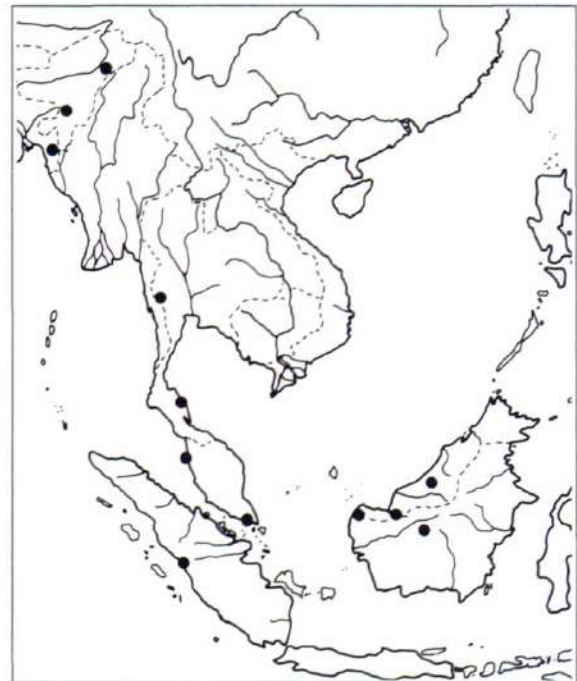
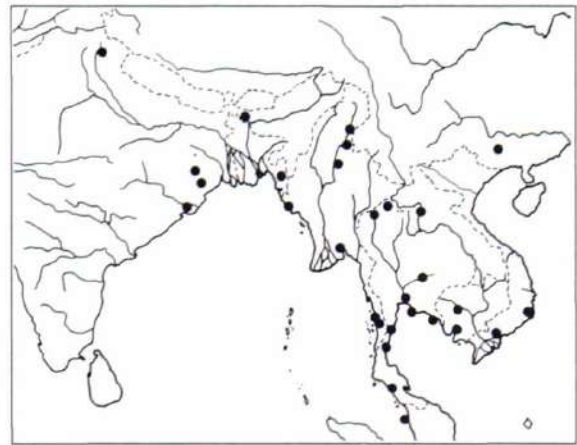


Figure 6. Top: Distribution of the elongated tortoise (*Indotestudo elongata*).

Middle: Distribution of the Asian brown tortoise (*Manouria emys*).

Bottom: Distribution of the spiny turtle (*Heosemys spinosa*). (From Iverson 1986.)



## Protected area management for the Cochin forest cane turtle (*Geoemyda silvatica*), the Travancore tortoise (*Indotestudo forstenii*), and other endemic reptiles in the forests of South-western India

*Geoemyda silvatica* is a recently rediscovered species, known only from the dense, semi-evergreen hill forests of Kerala above 300 m altitude. Localities where populations of *G. silvatica* have been confirmed are upland primary rain forest on the western fringes of the Anaimalai Hills. None of these areas is protected, although the species might exist in the Indira Gandhi National Park.

The Travancore tortoise (*Indotestudo forstenii*) is another localized endemic found naturally only in rain forest and mesic forest in the Travancore Hills in Kerala state. These tortoises are among several distinctive and poorly-known endemic reptiles and amphibians, as well as birds, mammals, and plants from the forest region of southwestern India.

Habitat protection is vital to the survival of this important faunal assemblage. Population surveys are needed to establish suitable critical habitat areas for establishing tortoise reserves. Existing protected areas offering potentially suitable habitat also need surveying for the possible occurrence of this species—e.g., the Parambikulam Wildlife Sanctuary, Kerala.

**Contact person:** Brian Groombridge

**Budget:** U.S. \$15,000

## Conservation of the spiny turtle (*Heosemys spinosa*) in Southeast Asia

This attractive species is much sought after by the pet trade, yet does not survive well in captivity. Its sluggish, diurnal habits render it conspicuous to man. It is threatened by forest felling in its fragile natural habitat, and is believed to be endangered over much of its range in Malaysia and Thailand. Some island populations in Indonesia may still be viable.

Full, enforced legal protection is a primary requirement for this species. A status survey is needed to provide basis for appropriate forestry and watershed management. Field work needs to concentrate in the Perak region of west Malaysia.

**Contact person:** To be determined, meanwhile any inquiries should be addressed to Specialist Group Deputy Chairman, Ed Moll

**Budget:** U.S. \$15,000 (to be confirmed)

## Conservation of the black softshell turtle (*Aspideretes nigricans*) at Chittagong, Bangladesh

This species is known only from a few hundred semi-captive individuals in a single artificial pond at the shrine of the Islamic

Saint Byazid Bostami (at Nasirabad, near Chittagong). No other populations have ever been recorded. The temple pond holds very dirty water, and many older animals appear to suffer from skin infections. The turtles are strictly protected at the shrine but inherently threatened because of extremely limited range (i.e., 100m x 80m).

Other populations should be established in order to alleviate the risk of disease wiping out the entire known population. Suitable alternative sites must be located nearby or created. Associated studies on the reproductive biology of the species are needed. The taxonomic status of the species needs verification. A survey of the area is required to determine whether or not there are any other populations surviving.

Other species in the general area that could benefit from conservation input are several species of *Kachuga*, *Lissemys punctata*, *Aspideretes hurum*, and *A. gangeticus*.

**Contact person:** Mohd. Reza Khan

**Budget:** U.S. \$15,000

## Status surveys of poorly known localized endemics in Asia

In addition to the specific projects outlined above, status surveys are urgently required for a series of species of very restricted distribution in isolated and scattered localities throughout the Indomalayan region. Because of their isolated localities, it is unlikely that these species can easily be incorporated into other major turtle or tortoise projects in the region.

<i>Annamemys annamensis</i>	Phuc Son and Fai Fo, central eastern Vietnam
<i>Cistoclemmys galbinifrons</i>	Tam Dao (Tonkin), Bach-Na (Annam), Linh-Lan (Ha-Tinh, Annam), northern Vietnam
<i>Cistoclemmys hainanensis</i>	Hainan Island, China
<i>Cuora yunnanensis</i>	Yunnan fu and Tongchuan fu, Yunnan Province, China.
<i>Heosemys depressa</i>	Arakan Hills, western Burma (could be linked with tortoise surveys in Burma)
<i>Kachuga sylhetensis</i>	Cachar Hills (Assam), Garo and Khasi Hills (Meghalaya), and Naga Hills (Nagaland)

One area that would merit close study is Hainan Island in the South China Sea. There is a large number of chelonian taxa recorded from the island but with little supplementary information. An un-named subspecies of *Cistoclemmys galbinifrons*, a new species of *Ocadia*, and a new species of *Sacalia* are all believed to occur.

**Contact person:** P.C.H. Pritchard, Ed Moll, and David Stubbs.

**Budget:** Undetermined



## Investigation of chelonian conservation requirements in Vietnam

Vietnam supports an extremely rich freshwater chelonian fauna, yet is probably the most poorly known of any country. From Iverson's world checklist (1986) a total of 20 freshwater and 2 terrestrial species are reported from this country. The sparse distribution information suggests three main areas of research:

- Southern Vietnam, Mekong Delta; Cochin China.
- Central Vietnam, around Hue and Da Nang; Annam.
- Northern Vietnam, along the Song Koi (Red River) and its delta; Tonkin.

### Distribution in Vietnam

Species in Vietnam	South	Central	North	APR
<i>Annamemys annamensis</i>		+		2
<i>Cistoclemmys galbinifrons</i>		+	+	2
<i>Cuora amboinensis</i>	+			
<i>Cuora trifasciata</i>			+	
<i>Cyclemys dentata</i>		+		3
<i>Cyclemys tcheponensis</i>		+	+	
<i>Geoemyda spengleri</i>		+	+	3
<i>Heosemys grandis</i>	+			
<i>Hieremys annandalii</i>	+			
<i>Malayemys subtrijuga</i>	+			3
<i>Mauremys nigricans</i>			+	
<i>Notochelys platynota</i>	+			3
<i>Ocadia sinensis</i>		+		
<i>Pyxidea mouhotii</i>		+	+	3
<i>Siebenrockiella crassicolis</i>	+			
<i>Platysternon megacephalum</i>			+	3
<i>Indotestudo elongata</i>	+	+		1
<i>Manouria impressa</i>		+		1
<i>Pelochelys bibroni</i>		+		3
<i>Amyda cartilaginea</i>		+		3
<i>Pelodiscus sinensis</i>			+	
<i>Palea steindachneri</i>		+	+	



Egyptian tortoise (*Testudo kleinmanni*), a dwarf tortoise from Israel to Libya, threatened by habitat destruction and over-collection. (Photo by P.C.H. Pritchard.)

Research should focus on establishing up-to-date distribution information, assessing habitat quality, investigating the economic importance of chelonians in the country—market surveys would be particularly appropriate—and reviewing the potential for specific protection measures. This will provide the basis for future direct conservation action, where necessary. The possible occurrence of *Batagur baska* in the south should also be investigated. In view of the majority of species occurring in the central Annam region, and the fact that this includes most of the species of conservation concern (those accorded an APR number), this area should be the priority starting point for the project.

**Contact persons:** To be determined; most appropriate investigators would be Soviet or Czech biologists in association with local field workers. Meanwhile inquiries should be addressed to Specialist Group Deputy Chairman Ed Moll.

**Budget:** U.S. \$20,000



## Appendix 1. Regional Species Lists

N.B. Recommended changes and additions to the 1988 IUCN Red List of Threatened Animals are shown in parentheses.

### 1. Australasia and Oceania

Species		RDB	APR
<b>Carettochelyidae</b>			
<i>Carettochelys insculpta</i>	Pig-nosed turtle	K	1
<b>Trionychidae</b>			
<i>Pelochelys bibroni</i>	Asian giant softshell turtle	(K)	3
<b>Chelidae</b>			
<i>Chelodina expansa</i>	Giant snake-necked turtle		
<i>Chelodina longicollis</i>	Common snake-necked turtle		
<i>Chelodina novaeguineae</i>	New Guinea snake-necked turtle		
<i>Chelodina oblonga</i>	Narrow-breasted snake-necked turtle		
<i>Chelodina parkeri</i>	Parker's snake-necked turtle		
<i>Chelodina rugosa</i>	Northern Australian snake-necked turtle		
<i>Chelodina siebenrocki</i>	Siebenrock's snake-necked turtle		
<i>Chelodina steindachneri</i>	Steindachner's snake-necked turtle		
<i>Chelodina</i> sp.	(northern Western Australia)	2	
<i>Chelodina</i> sp.	(eastern Papua New Guinea)	2	
<i>Elseya dentata</i>	North Australian snapping turtle		
<i>Elseya latisternum</i>	Serrated snapping turtle		
<i>Elseya novaeguineae</i>	New Guinea snapping turtle		
<i>Elseya</i> sp.	(southern New Guinea)	2	
<i>Elseya</i> sp.	(Manning and Bellingen Rivers)	2	
<i>Emydura australis</i>	Australian big-headed side-necked turtle		
<i>Emydura krefftii</i>	Krefft's river turtle		
<i>Emydura macquarrii</i>	Murray River turtle		
<i>Emydura signata</i>	Brisbane short-necked turtle		
<i>Emydura subglobosa</i>	Red-bellied short-necked turtle		
<i>Emydura victoriae</i>	Victoria short-necked turtle		
<i>Emydura</i> sp.	(Cooper Creek, Queensland)	2	
<i>Emydura</i> sp.	(Batten Creek, Northern Territory)	2	
<i>Emydura</i> sp.	(Fraser Island, Queensland)	2	
<i>Rheodytes leukops</i>	Fitzroy turtle	2	
<i>Pseudemydura umbrina</i>	Western swamp turtle		

### 2. Afrotropical Realm

Species		RDB	APR
<b>Testudinidae</b>			
<i>Aldabrachelys elephantina</i>	Aldabran giant tortoise	R	X
<i>Chersina angulata</i>	South African bowsprit tortoise		
<i>Geochelone pardalis</i>	Leopard tortoise		
<i>Geochelone radiata</i>	Radiated tortoise	V	X
<i>Geochelone sulcata</i>	African spurred tortoise		3
<i>Geochelone yniphora</i>	Angonoka	E	X
<i>Homopus areolatus</i>	Beaked Cape tortoise		
<i>Homopus bergeri</i>	Berger's tortoise	K	2
<i>Homopus boulengeri</i>	Boulenger's Cape tortoise		
<i>Homopus femoralis</i>	Karoo Cape tortoise		
<i>Homopus signatus</i>	Speckled cape tortoise		
<i>Kinixys belliana</i>	Bell's hinge-back tortoise		
<i>Kinixys erosa</i>	Serrated hinge-back tortoise		
<i>Kinixys homeana</i>	Home's hinge-back tortoise		
<i>Kinixys natalensis</i>	Natal hinge-back tortoise	(K)	2
<i>Malacochersus tornieri</i>	African pancake tortoise	K	1
<i>Psammobates geometricus</i>	Geometric tortoise	V	X
<i>Psammobates oculifera</i>	African serrated star tortoise		
<i>Psammobates tentorius</i>	African tent tortoise		
<i>Pyxis arachnoides</i>	Common spider tortoise	I	3
<i>Pyxis planicauda</i>	Flat-shelled spider tortoise	I	2
<b>Trionychidae</b>			
<i>Cyclanorbis elegans</i>	Nubian flapshell turtle		
<i>Cyclanorbis senegalensis</i>	Senegal flapshell turtle		
<i>Cycloderma aubryi</i>	Aubry's flapshell turtle		
<i>Cycloderma frenatum</i>	Zambesi flapshell turtle		
<i>Trionyx triunguis</i>	African softshell turtle		
<b>Pelomedusidae</b>			
<i>Erymnochelys madagascariensis</i>	Madagascan big-headed side-necked turtle	I(V)	1
<i>Pelomedusa subrufa</i>	Helmeted turtle		
<i>Pelusios adansonii</i>	Adanson's mud turtle		
<i>Pelusios bechuanicus</i>	Okavango mud turtle		
<i>Pelusios broadleyi</i>	Turkana mud-turtle		2
<i>Pelusios carinatus</i>	African keeled mud turtle		
<i>Pelusios castaneus</i>	West African mud turtle		
<i>Pelusios castanoides</i>	East African yellow-bellied mud turtle		
<i>Pelusios chapini</i>	Central African giant mud turtle		
<i>Pelusios gabonensis</i>	African forest turtle		
<i>Pelusios nanus</i>	African dwarf mud turtle		





<i>Kinosternon herrerae</i>	Herrera's mud turtle			<i>Podocnemis lewyana</i>	Rio Magdalena river turtle	I(E)	3
<i>Kinosternon hirtipes</i>	Mexican rough-footed mud turtle			<i>Podocnemis sextuberculata</i>	Six-tubercled Amazon river turtle	K	3
<i>Kinosternon integrum</i>	Mexican mud turtle			<i>Podocnemis unifilis</i>	Yellow-spotted Amazon river turtle	V	1
<i>Kinosternon leucostomum</i>	White lipped mud turtle			<i>Podocnemis vogli</i>	Savanna side-necked turtle		
<i>Kinosternon oaxacae</i>	Oaxaca mud turtle	I	3				
<i>Kinosternon scorpioides</i>	Scorpion mud turtle						
<i>Kinosternon sp.</i>	(Jalisco, Mexico)		2				
<i>Claudius angustatus</i>	Narrow-bridged musk turtle						
<i>Staurotypus salvinii</i>	Chiapas giant musk turtle						
<i>Staurotypus triporcatus</i>	Mexican giant musk turtle						
<b>Testudinidae</b>				<b>5. Indomalayan Realm</b>			
<i>Geochelone carbonaria</i>	South American red-footed tortoise		3	<b>Species</b>		<b>RDB</b>	<b>APR</b>
<i>Geochelone chilensis</i>	Chaco tortoise	V	1	<b>Emydidae; Batagurinae</b>			
<i>Geochelone denticulata</i>	South American yellow-footed tortoise		3	<i>Annamemys annamensis</i>	Annam (Vietnam) leaf turtle	K	2
<i>Geochelone donosobarrosi</i>	Argentine giant tortoise		2	<i>Batagur baska</i>	River terapin, "Tutong"	E	1X
<i>Geochelone nigra</i>	Galapagos giant tortoise	E	1X	<i>Callagur borneoensis</i>	Painted terrapin	E	1X
<b>Chelidae</b>				<i>Chinemys nigricans</i>	Chinese red-necked pond turtle		
<i>Acanthochelys macrocephala</i>	Big-headed Pantanal swamp turtle	K(I)	2	<i>Chinemys reevesii</i>	Chinese three-keeled pond turtle		
<i>Acanthochelys pallidipectoris</i>	Chaco side-necked turtle	R	2	<i>Cistoclemmys flavomarginata</i>	Yellow-margined box turtle		
<i>Acanthochelys radiolata</i>	Brazilian radiolated swamp turtle			<i>Cistoclemmys galbinifrons</i>	Indochinese box turtle	K	2
<i>Acanthochelys spixii</i>	Black spine-necked swamp turtle	K	3	<i>Cistoclemmys hainanensis</i>	Hainan box turtle	K	2
<i>Chelus fimbriatus</i>	Matamata			<i>Cuora amboinensis</i>	Malayan box turtle		2
<i>Hydromedusa maximiliani</i>	Maximilian's snake-necked turtle			<i>Cuora chriskarannarum</i>			2
<i>Hydromedusa tectifera</i>	S. American snake-necked turtle			<i>Cuora mccordi</i>			2
<i>Phrynops dahl</i>	Dahl's toad-headed turtle	I(R)	2	<i>Cuora trifasciata</i>	Chinese three-striped box turtle		
<i>Phrynops geoffroanus</i>	Geoffroy's side-necked turtle			<i>Cuora yunnanensis</i>	Yunnan box turtle (highland Yunnan)	K	2
<i>Phrynops gibbus</i>	Gibba turtle			<i>Cuora sp.</i>			2
<i>Phrynops hilarii</i>	Hilaire's side-necked turtle			<i>Cyclemys dentata</i>	Asian leaf turtle	(K)	3
<i>Phrynops hogen</i>	Hoge's side-necked turtle		2	<i>Cyclemys tcheponeensis</i>	Stripe-necked leaf turtle		
<i>Phrynops nasutus</i>	Common toad-headed turtle			<i>Geoclemys hamiltonii</i>	Spotted pond turtle	I(E)	3
<i>Phrynops raniceps</i>	Amazonian toad-headed turtle			<i>Geoemyda silvatica</i>	Cochin forest cane turtle	V	2
<i>Phrynops rufipes</i>	Red-footed Amazon side-necked turtle	K	3	<i>Geoemyda spengleri</i>	Black-breasted leaf turtle	(K)	3
<i>Phrynops tuberculatus</i>	Tuberculated toad-headed turtle			<i>Hardella thurjii</i>	Crowned river turtle		3
<i>Phrynops tuberosus</i>	(Colombia to Guyana)			<i>Heosemys depressa</i>	Arakan forest turtle	K	2
<i>Phrynops vanderhaegei</i>	Vanderhaege's toad-headed turtle			<i>Heosemys grandis</i>	Giant Asian pond turtle		
<i>Phrynops williamsi</i>	Williams's South American side-necked turtle			<i>Heosemys leytensis</i>	Palawan pond turtle	I	2
<i>Phrynops zuliae</i>	Zulia toad-headed turtle	K(R)	2	<i>Heosemys spinosa</i>	Spiny turtle	(E)	1
<i>Platemys platycephala</i>	Twist-necked turtle			<i>Hieremys annandalii</i>	Yellow-headed temple turtle		
<b>Pelomedusidae</b>				<i>Kachuga dhongoka</i>	Three-striped roof turtle		3
<i>Peltocephalus dumerilianus</i>	Big-headed Amazon River turtle			<i>Kachuga kachuga</i>	Red-crowned roof turtle	I(E)	1
<i>Podocnemis erythrocephala</i>	Red-headed Amazon River turtle	K	3	<i>Kachuga smithii</i>	Brown roofed turtle		
<i>Podocnemis expansa</i>	Giant S. American river turtle	E	1X	<i>Kachuga sylhetensis</i>	Assam roofed turtle	K	2
				<i>Kachuga tecta</i>	Indian roofed turtle		
				<i>Kachuga tentoria</i>	Indian tent turtle		
				<i>Kachuga trivittata</i>	Burmese roofed turtle	K	1
				<i>Malayemys subtrijuga</i>	Malayan snail-eating turtle	(I)	3
				<i>Mauremys mutica</i>	Asian yellow pond turtle (Fukien, China)		2
				<i>Mauremys sp.</i>	(Northern Burma)		2
				<i>Melanochelys tricarinata</i>	Tricarinate hill turtle	I(E)	3
				<i>Melanochelys trijuga</i>	Indian black turtle		
				<i>Morenia ocellata</i>	Burmese eyed turtle	K	3
				<i>Morenia petersi</i>	Indian eyed turtle		
				<i>Notochelys platynota</i>	Malayan flat-shelled turtle	(K)	3
				<i>Ocadia sinensis</i>	Chinese stripe-necked turtle		

<i>Ocadia</i> sp.	(Hainan)		2	<b>6. Eastern Palaearctic</b>	<b>Species</b>	<b>RDB</b>	<b>APR</b>
<i>Orlitia borneensis</i>	Malaysian giant turtle	K	3				
<i>Pyxidea mouhotii</i>	Keeled box turtle		3	<b>Emydidae; Batagurinae</b>	<i>Chinemys reevesii</i>	Chinese three-keeled pond turtle	
<i>Sacalia bealei</i>	Four-eyed turtle						
<i>Sacalia</i> sp.	(Hainan Island)		2				
<i>Siebenrockiella crassicollis</i>	Black marsh turtle						
<b>Platysternidae</b>							
<i>Platysternon megacephalum</i>	Big-headed turtle		3				
<b>Testudinidae</b>							
<i>Geochelone elegans</i>	Indian star tortoise						
<i>Geochelone platynota</i>	Burmese star tortoise	K	2				
<i>Indotestudo elongata</i>	Elongated tortoise	K	1				
<i>Indotestudo forstenii</i>	Travancore tortoise	R	2				
<i>Manouria emys</i>	Asian brown tortoise	K	3				
<i>Manouria impressa</i>	Impressed tortoise	K(R)	1				
<b>Trionychidae</b>							
<i>Lissemys punctata</i>	Indian flapshell turtle						
<i>Lissemys scutata</i>	Burmese flapshell turtle						
<i>Chitra indica</i>	Narrow-headed softshell turtle		3				
<i>Pelochelys bibroni</i>	Asian giant softshell turtle	(K)	3				
<i>Pelochelys taihuensis</i>	Chinese giant softshell turtle		2				
<i>Amyda cartilaginea</i>	Asiatic softshell turtle	(K)	3				
<i>Amyda nakornsrithammarajensis</i>							
<i>Nilssonia formosa</i>	Burmese peacock softshell turtle		3				
<i>Aspideretes gangeticus</i>	Indian softshell turtle						
<i>Aspideretes hurum</i>	Indian peacock softshell turtle						
<i>Aspideretes leithii</i>	Leith's softshell turtle						
<i>Aspideretes nigricans</i>	Black softshell turtle	R(E)	2				
<i>Pelodiscus sinensis</i>	Chinese softshell turtle						
<i>Palea steindachneri</i>	Wattle-necked softshell turtle						
<i>Dogania subplana</i>	Malayan softshell turtle		3				
<b>7. Western Palearctic</b>							
<b>Species</b>							
<b>RDB</b>							
<b>APR</b>							
<b>Emydidae; Batagurinae</b>							
<i>Mauremys caspica</i>							
Caspian turtle							
<i>Mauremys leprosa</i>							
Mediterranean turtle							
<b>Emydidae; Emydinae</b>							
<i>Emys orbicularis</i>							
European pond turtle							
<b>Testudinidae</b>							
<i>Testudo graeca</i>							
Spur-thighed tortoise							
<i>Testudo hermanni</i>							
Hermann's tortoise							
<i>Testudo horsfieldii</i>							
Horsfield's tortoise							
<i>Testudo kleinmanni</i>							
Egyptian tortoise							
<i>Testudo marginata</i>							
Marginated tortoise							
<b>Trionychidae</b>							
<i>Rafetus euphraticus</i>							
Euphrates softshell turtle							
<i>Trionyx triunguis</i>							
African softshell turtle							



## Appendix 2. Policy Statements

The 1981 inaugural meeting of the Tortoise Specialist Group adopted three policy resolutions. These are repeated here with amendments to take account of the recent amalgamation of the Tortoise and Freshwater Turtle Specialist Groups, and also of subsequent developments within IUCN and SSC. It should be stressed that these statements have not been reviewed by IUCN or SSC, nor have they been formally adopted by the new amalgamated Group. Their eventual adoption by a wider community of conservationists will also require review by the following SSC Specialist Groups: Trade; Veterinary; Captive Breeding; Introductions; Reintroductions; and Ethnozoology. All the Group's policy matters will be reconsidered at the time of the First World Congress of Herpetology, at Canterbury, U.K., in September 1989.

### Trade

The IUCN/SSC Tortoise and Freshwater Turtle Specialist Group declares that the international commercial trade in chelonians for food, pets, and luxury and gift products is at present excessive and harmful to the survival of most of the species concerned. The Group expresses grave concern at the large-scale pet trade because of the high mortality of imported animals, due to the poor ability (especially of tortoises) to adjust to climatic changes and captive conditions.

The Group reminds governments that the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) requires that all species listed on Appendix I are banned from the international commercial trade. For species listed on Appendix II, the trade is legal, provided that the correct CITES exporting and importing papers are issued. Governments are urged to ratify and accede to the convention as a matter of priority.

The Group recommends that the international bulk trade in tortoises and freshwater turtles can only be endorsed if it is shown that the exploitation is being carried out at a sustainable level. It is aware of commercial farming and ranching operations concerning crocodilians and marine turtles, but feels that such ventures offer little identifiable potential for conservation of freshwater turtles and tortoises at this time.

### Museum Collecting

The IUCN/SSC Tortoise and Freshwater Turtle Specialist Group advocates a conservative position in taking and killing series of wild tortoises and freshwater turtles for scientific collections, and urges that such collections not be random but be made with careful consideration of the population status of the species concerned, and the real scientific need for the specimens taken.

The Group urges that dead chelonians found in the wild be collected and deposited in museum collections either as spirit or osteological specimens, with full locality and other data recorded.

The Group recommends that chelonians that die in zoological or private collections or in captive breeding programmes be preserved and offered to museums or for other scientific use, again with full data on the origin and history of the specimens recorded. Generally, very rare species or those with complete collection data are suitable for museum purposes, and others can be used for teaching, anatomical, post-mortem, and pathological studies.

### Captive Breeding

The IUCN/SSC Tortoise and Freshwater Turtle Specialist Group urges all institutions or individuals having chelonians in their care to endeavour to breed them, successful captive reproduction being the best

criterion of sound captive management. Much behavioural and husbandry information may also result from well designed captive culture programmes.

The Group nonetheless cautions against acquisition of chelonians by institutions or individuals with the justification of the intention of captive breeding, especially when captive breeding is more of a fond hope than a confident expectation.

The Group urges that in all cases preservation of chelonian populations and species by habitat maintenance and controls on collection be the preferred technique. Captive breeding is essentially an extreme approach to be used when habitat has collapsed or when the species is becoming so rare that natural reproduction is unlikely.

Wherever possible captive breeding should be undertaken within the natural range of the species, or at least in an area offering similar climatic conditions. All captive propagation programmes should make use of the expert advice available in the IUCN/SSC Captive Breeding Specialist Group, and in the Captive Breeding Subcommittee of the Tortoise and Freshwater Turtle Specialist Group.

There are a number of strong reasons cautioning against the reintroduction of captive bred animals to the wild, and these form the basis of the following precautions which should be followed if such a method is considered necessary:

- a. The cause of a species' rarity or absence from the wild should be fully understood and these causal factors should no longer be operating.
- b. The habitat requirements of the species to be released must be satisfied.
- c. Genetic pollution should be vigorously avoided by utilizing stock of known origin and releasing subsequent generations in the same general area as that from which the stock was obtained; stock of unknown origin should only be used for extremely rare and localized forms.
- d. Care should be taken to avoid the introduction of parasites or bacteria to wild populations in the course of release of captive-bred individuals.
- e. Care should be taken to avoid shell distortions caused by over-rapid growth or nutritional deficiencies in chelonians propagated for release.
- f. Release of captive chelonians anywhere and by anyone should be coordinated with accepted scientific and conservation authorities, ideally members of the IUCN/SSC Tortoise and Freshwater Turtle and Reintroductions Specialist Groups.
- g. Any release project must have the full backing and understanding of the local community and authorities of the area in question. This is especially vital for the reintroduction of species that were once persecuted. In such cases an educational programme should be undertaken to improve local attitudes before reintroduction takes place.
- h. The releases should be timed to coincide with the onset of optimal conditions of temperature, light, and rainfall.
- i. Chelonians for release should be uniquely and permanently marked and full records maintained.

The IUCN/SSC Tortoise and Freshwater Turtle Specialist Group's policies in this area should be considered in the light of the following Policy Statements issued by IUCN in 1987:

- Captive breeding
- Translocation of living organisms: introductions, reintroductions, and restocking.



### Appendix 3. Suggested Revisions in Protected Listings of Indian Freshwater Turtles

The following revisions in the listings of Indian freshwater turtles on the Schedules of the Indian Wildlife (Protection) Act 1972 and on the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora have been suggested by Moll (1984):

Species	Present		Revised		Explanation*
	IWL(P)A	CITES	IWL(P)A	CITES	
<i>Batagur baska</i>	-	I	I	I	1
<i>Geoclemys hamiltonii</i>	-	I	I	I	1
<i>Hardella thurjii</i>	-	-	IV	-	1
<i>Geomyda silvatica</i>	-	-	I	-	2
<i>Kachuga tecta</i>	I	I	-	-	3,4
<i>Kachuga kachuga</i>	-	-	I	-	1
<i>Kachuga dhongoka</i>	-	-	IV	-	5
<i>Melanochelys tricarinata</i>	IV	I	I	I	6
<i>Chitra indica</i>	IV	-	IV	-	3,4
<i>Pelochelys bibronii</i>	IV	-	I	-	4,6
<i>Aspideretes gangeticus</i>	I	I	IV	II	3,5
<i>Aspideretes hurum</i>	I	I	IV	II	3,5
<i>Aspideretes leithii</i>	IV	-	IV	-	3,4
<i>Lissemys punctata</i>	I	I	IV	-	3,5

#### \*Explanation:

1. Serious declines in population numbers or small population numbers indicated.
2. Limited range with threats to habitats.
3. Survey indicates moderate to large populations.
4. More extensive range than previously known.
5. Heavy trade in this species needs monitoring
6. Insufficient data available on species.

### Appendix 4. Recently Published Name Changes

This action plan presents the most up-to-date species list available. This is based to a large extent on the world checklist by Iverson (1986), but with many more recent additions and published name changes included. Since this is a conservation document, we are very aware of the potential confusion among field workers caused by regular changes in scientific names, which are often far from universally accepted. The list below gives some long-standing but now obsolete names of species, with their most recent assignment.

Former nomenclature	New name	Authority
<i>Heosemys silvatica</i>	<i>Geomyda silvatica</i>	Moll et al. 1987
<i>Mauremys nigricans</i>	<i>Mauremys mutica</i>	Iverson in prep.
<i>Geochelone elephantopus</i>	<i>Geochelone nigra</i>	Pritchard 1986
<i>Geochelone gigantea</i>	<i>Aldabrachelys elephantina</i>	Pritchard 1986
<i>Trionyx cartilagineus</i>	<i>Amyda cartilaginea</i>	Meylan 1987
<i>Trionyx euphraticus</i>	<i>Rafetus euphraticus</i>	Meylan 1987
<i>Trionyx ferox</i>	<i>Apalone ferox</i>	Meylan 1987
<i>Trionyx muticus</i>	<i>Apalone mutica</i>	Meylan 1987
<i>Trionyx spiniferus</i>	<i>Apalone spinifera</i>	Meylan 1987
<i>Trionyx formosus</i>	<i>Nilssonina formosa</i>	Meylan 1987
<i>Trionyx gangeticus</i>	<i>Aspideretes gangeticus</i>	Meylan 1987
<i>Trionyx hurum</i>	<i>Aspideretes hurum</i>	Meylan 1987
<i>Trionyx leithii</i>	<i>Aspideretes leithii</i>	Meylan 1987
<i>Trionyx nigricans</i>	<i>Aspideretes nigricans</i>	Meylan 1987
<i>Trionyx sinensis</i>	<i>Pelodiscus sinensis</i>	Meylan 1987
<i>Trionyx steindachneri</i>	<i>Palea steindachneri</i>	Meylan 1987

<i>Trionyx subplanus</i>	<i>Dogania subplana</i>	Meylan 1987
<i>Homopus signatus peersi</i>	<i>H. signatus cafer</i>	Boycott 1986
<i>Testudo hermanni hermanni</i>	<i>T. hermanni boettgeri</i>	Bour 1987
<i>T. hermanni robertmertensi</i>	<i>T. hermanni hermanni</i>	Bour 1987

It is also important to note that several references to the South American land tortoises have elevated the subgenus *Chelonoidis* to generic status, in place of *Geochelone*. This has not been accepted by all authorities and we retain *Geochelone* as the genus for *G. carbonaria*, *G. chilensis*, *G. nigra*, and *G. denticulata*. There is also apparently good reason to consider the large subspecies of *G. chilensis*, *G. c. donosobarrosi* as a full species.

Among the Testudinidae there is some debate concerning the possible elevation of other subgenera to generic status. Thus some references to *Astrochelys* may appear in the literature in place of *Geochelone* for *G. radiata* and *G. yniphora*. Likewise *Xerobates* may be used in place of *Gopherus* for *G. agassizii* and *G. berlandieri*. *Testudo horsfieldi* is sometimes given as *Agrionemys horsfieldi*.

A number of people also still refer to *Pseudemys scripta* more readily than the new *Trachemys scripta*. We use the latter, based on the review by Seidel and Smith (1986). The taxonomic status of cooters and sliders is still generally unresolved with opinions varying from lumping them all under *Chrysemys* to separating the painted turtles (*Chrysemys*) from the cooters (*Pseudemys*) and the sliders (*Trachemys*).

*Lissemys scutata* is not considered distinct from *L. punctata* by Meylan (1987), and Pritchard (pers. comm.) suggests that *Chinemys megaloccephala* may not be valid, probably being no more than



large-headed individuals of *C. kwangtungensis* (now included in *C. nigricans*, see note 2 below) or *C. reevesii*.

### Notes from main checklist (Chapter 1)

1. *Annamemys annamensis* may be just the southernmost population of *Mauremys mutica*. The status of *Annamemys grochovskiae* Dao, 1957 is still not clear.
2. *Chinemys nigricans* includes *Chinemys kwangtungensis* (J. Iverson, pers. comm.) and two subspecies may exist (W. McCord, pers. comm.). *Chinemys megalcephala* is deleted from our current list.
3. These are wide-ranging, variable taxa, whose subspecific allocations are still unclear.
4. The range of *Cyclemys tcheponensis* includes parts of China and Thailand, and up to four potential subspecies may ultimately be recognized.
5. The relationship between *Sacalia bealei* and *Sacalia quadriocellata* remains unclear.
6. The sub-species *Terrapene nelsoni klauberi* is generally accepted but may not be distinct.
7. The form *gaigeae* is considered as a full species by Ward (1984) and by Garrett and Barker (1987), but Moll and Legler (1971) assert that *gaigeae* is known to intergrade with *Trachemys scripta elegans*.
8. Smith and Smith (1980) perpetrated the new name *Trachemys scripta hartwegi* as a deliberate *nomen nudum*, pending its official description by other workers; this has not yet occurred.
9. *Trachemys scripta ornata* is currently used for several isolated Mexican Pacific coast forms, ranging from Sinaloa south at least to Acapulco; however, no members of the complex have been reported from the intervening states of Michoacan and Colima, and it is possible that the northern and southern representatives will be found to be distinct.
10. *Trachemys scripta* is not uniform in the Caribbean drainages; e.g. unusually large turtles are found in the Nicaraguan and Costa Rican sector, and relatively small ones in Panama and the Rio Atrato (Colombia).
11. Seidel (1988) has recently synonymized *Trachemys felis* with *T. terrapen*, *T. stejnegeri granti* with *T. decussata angusta*, and *T. d. plana* with *T. d. decussata*.
12. The subspecies *Kinosternon hirtipes megacephalum* is apparently recently extinct, and is omitted from our list.
13. Much confusion surrounds the nomenclature of the Aldabra and Seychelles tortoises. It is assumed here that all natural populations outside Aldabra are extinct, and that the marked differences between the giant tortoise populations on north Aldabra (Malabar and Picard) and those of south Aldabra (Grand Terre) result from environmental conditions, and are not genetic in nature.
14. The tortoises of Charles Island (*Geochelone n. nigra*), Barrington Island (*G. n. ssp.*) and of southwest Chatham Island (*G. n. chathamensis*) are now extinct, and so are excluded here. *G. n. phantastica* may also be extinct and only one individual survives of *G. n. abingdoni*. *G. n. duncanensis* (a *nomen nudum* of Garman 1917) is used instead of *G. n. ephippium* for the Duncan Island form, since the type specimen of *Testudo ephippium* was in fact an Abingdon Island tortoise (Pritchard in press). The Albemarle Island populations from Cerro Azul to Volcán Darwin are considered to be referable to a single sub-species; the northern and southernmost representatives of this form (at Tagus Cove and Cabo Rosa) were found to be indistinguishable by Van Denburgh (1914), and lowland populations exist, or have recently existed, between each pair of volcanoes thought to have an "isolated" tortoise population. But *G. n. becki* of Volcan Wolf is considered morphologically distinct and thus a valid sub-species. We still believe it important to preserve and maintain the genetic integrity of the tortoise populations in each of the "galapaguera" areas of Albemarle Island.
15. *Indotestudo forstenii* was long used for the tortoises of Sulawesi (Celebes), but it has recently been suggested (Hoogmoed and Crumly 1984) that the Sulawesi tortoises are identical to those of southern India, usually called *Indotestudo travancorica*. The name *forsteni* is much older than *travancorica* and thus has priority. We provisionally accept this conclusion but strongly recommend that the tortoises of Sulawesi be studied in the field and in greater numbers before this reallocation is considered definitive.
16. *Phrynops tuberosus* (included in *P. geoffroanus*) and *P. williamsi* represent the northernmost and southernmost forms of the *P. geoffroanus* complex; others will undoubtedly prove distinct at either the species or subspecies level, with separable taxa occupying isolated drainage systems, or separate parts of the Amazon catchment. The Colombian and the Venezuelan populations of *P. tuberosus* are apparently well isolated and may ultimately be distinguished taxonomically.

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## References

- The bulk of the information used in this action plan came from correspondence and liaison with members of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group and various active workers in this field. Several people sent summaries of project proposals and manuscripts from unpublished reports and short notes. Below is a list of the main identifiable reports and publications consulted during the compilation of this action plan.
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