

Dolphins, Porpoises, and Whales

**An Action Plan for the Conservation of
Biological Diversity: 1988-1992**

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Foreword

The cetaceans are the major conservation flagship group of the marine environment, let alone the broader mammal world, and, as such, they draw considerable attention from environmentalists, the media, and the public at large.

With this Action Plan, one of many being produced for IUCN's Species Survival Commission by its active Specialist Groups, we have scientifically based schemes and plans laid out for conservation of both the whales and the smaller cetacean species.

It is with considerable pride that I write this short foreword, as this Specialist Group, under the most able leadership of Bill

Perrin, has consistently led the field, both in the Group's members' individual capacities and as a Group, in ensuring that IUCN has the best possible data available on which to lead the conservation thrust for these majestic creatures worldwide. The Plan provides for the next phase, one might say, for conservation action. It must be funded and the Action Plan turned into action.

I would like to take this opportunity to thank and congratulate the Cetacean Specialist Group on their Action Plan, and commend its findings for immediate funding.

Grenville Ll. Lucas
Chairman
IUCN Species Survival Commission

Introduction

Man has not yet driven any cetacean species to extinction. This may change, however, and soon. For some species, only a few hundred individuals remain. For others, populations of larger or unknown size may be declining rapidly. The primary goal of the Cetacean Specialist Group in putting forward this action plan is to precipitate activity to prevent extinction of the species and populations currently in danger. The proposed actions also aim to promote sustainable relationships between cetaceans and people, in order to secure the long-term future for all cetacean species and populations.

This plan focuses on the small cetaceans, in particular the river dolphins. There are several reasons for this focus. First, the most endangered species are small cetaceans. With the possible exception of the northern right whale, none of the great whales are in imminent danger of extinction. However, some of the river dolphins face extinction in this century unless present trends are reversed. Second, the river dolphins are largely tropical and therefore occur entirely within the boundaries of the developing nations, where human population growth is the greatest and environmental conservation is most difficult and in early stages of development. This problem is exacerbated by the fact that riverine habitat is restricted and highly vulnerable to degradation.

An additional reason for placing emphasis in this plan on the small cetaceans is that heretofore conservationists working to protect cetaceans have given most attention to the great whales. This has resulted in a substantive increase in much-needed research, legislation, and management, and in relatively well-organized systems of conservation monitoring and feedback. The

small cetaceans have received far less attention, despite the fact that many species face severe problems. There are many problems in conservation of the great whales yet to be solved, especially those regarding the regulation of whaling, but many organizations and agencies are working to solve the problems. This is not as true for the small cetaceans.

Secondarily, this plan emphasizes coastal small cetaceans. By comparison with pelagic habitats, coastal habitats are more restricted and more vulnerable to degradation and depletion.

The plan considers endangered populations as well as species and formally designated subspecies. Formal description and naming of subspecific taxa have not been a common practice in cetacean systematics in recent years. For example, Robineau (1986) suggested that the very distinctive Kerguelan race of *Cephalorhynchus commersonii* be accorded "subspecific status" but did not formally describe a subspecies or propose a trinomial. The morphologically distinct populations that have been defined but not formally named for several small cetaceans correspond in degree of distinctness to the entities in terrestrial mammals that have received subspecific scientific names. Thus, an endangered small-cetacean population that might find a place in lists of endangered "species" were it described as a subspecies does not receive such recognition. For this reason, the plan includes not only species that are formally designated in the Red List as Endangered, Vulnerable, etc., but also those nonlisted species for which one population or more may be in peril. The implication is that in these cases potentially significant genetic variability and unique components of regional ecosystems are at risk.

Acknowledgments

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of the Southwest Fisheries Center of the U.S. National Marine Fisheries Service, allowed the compiler to devote a large part of his time to this project and provided extensive institutional support. Special thanks are due to the World Wide Fund for Nature International, the United States National Marine Fisheries Service/NOAA, and the American Association of Zoological Parks and Aquariums for supporting the publication of this Action Plan.

Classification

As for most major groups, there is a certain amount of flux in the taxonomy of the cetaceans. They currently comprise 77 species: 66 toothed whales (Odontoceti) and 11 baleen whales (Mysticeti). The treatment here (Table 1) is not meant to be definitive or revisionary, but only to reflect the compiler's perception of mainstream thinking about the species and populations. The taxa above the species level follow Barnes et al. (1985), as later revised by Barnes (1985a,b). The monophyly of the cetaceans is now firmly established based on several lines of evidence (Barnes

1984, Barnes et al. 1985) and the odontocetes and mysticetes accordingly are included in the single order Cetacea. The species largely follow Honacki et al. (1982) and Jones et al. (1986) and incorporate revisions of the spotted dolphins by Perrin et al. (1987a) and the porpoises and platanistoid dolphins by Barnes (1985a,b). Treatment of the right whales follows Brownell et al. (1987). The first-listed common names of the species follow IWC (1977, 1980-1988), with minor changes (Perrin et al. 1987a, Perrin and Brownell in press).

Table 1. Classification of the living cetaceans, order Cetacea.

Suborder Odontoceti			
Superfamily Platanistoidea			
Family Platanistidae			
	<i>Platanista gangetica</i>	Ganges river dolphin, Ganges susu	
	<i>Platanista minor</i>	Indus River dolphin, Indus susu	
Family Pontoporiidae			
Subfamily Lipotinae			
	<i>Lipotes vexillifer</i>	baiji, Yangtze or Chinese river dolphin	
Subfamily Pontoporiinae			
	<i>Pontoporia blainvillei</i>	franciscana, cachimbo, La Plata dolphin	
Family Iniidae			
	<i>Inia geoffrensis</i>	boto, boutu, bufeo, Amazon river dolphin	
Superfamily Delphinoidea			
Family Monodontidae			
Subfamily Orcaellinae			
	<i>Orcaella brevirostris</i>	Irrawaddy dolphin, pesut	
Subfamily Delphinapterinae			
	<i>Delphinapterus leucas</i>	white whale, beluga	
Subfamily Monodontinae			
	<i>Monodon monoceros</i>	narwhal	
Family Phocoenidae			
Subfamily Phocoeninae			
	<i>Phocoena phocoena</i>	harbor porpoise	
	<i>Phocoena spinipinnis</i>	Burmeister's porpoise	
	<i>Phocoena sinus</i>	vaquita, Gulf of California harbor porpoise	
	<i>Neophocaena phocaenoides</i>	finless porpoise	
Subfamily Phocoenoidinae			
	<i>Australophocaena dioptrica</i>	spectacled porpoise	
	<i>Phocoenoides dalli</i>	Dall's porpoise	
Family Delphinidae			
Subfamily Steninae			
	<i>Steno bredanensis</i>	rough-toothed dolphin	
	<i>Sousa chinensis</i>	Indopacific hump-backed dolphin	
	<i>Sousa teuszii</i>	Atlantic hump-backed dolphin	
	<i>Sotalia fluviatilis</i>	tucuxi	
Subfamily Delphininae			
	<i>Lagenorhynchus albirostris</i>	white-beaked dolphin	
	<i>Lagenorhynchus acutus</i>	Atlantic white-sided dolphin	
	<i>Lagenorhynchus obscurus</i>	dusky dolphin	
	<i>Lagenorhynchus obliquidens</i>	Pacific white-sided dolphin	
	<i>Lagenorhynchus cruciger</i>	hourglass dolphin	
	<i>Lagenorhynchus australis</i>	Peale's dolphin	
	<i>Grampus griseus</i>	Risso's dolphin	
	<i>Tursiops truncatus</i>	bottlenose dolphin	
	<i>Stenella frontalis</i>	Atlantic spotted dolphin	
	<i>Stenella attenuata</i>	pantropical spotted dolphin	
	<i>Stenella longirostris</i>	spinner dolphin	
	<i>Stenella clymene</i>	clymene dolphin	
	<i>Stenella coeruleoalba</i>	striped dolphin	
	<i>Delphinus delphis</i>	common dolphin	
	<i>Lagenodelphis hosei</i>	Fraser's dolphin	
Subfamily Lissodelphininae			
	<i>Lissodelphis borealis</i>	northern right whale dolphin	
	<i>Lissodelphis peronii</i>	southern right whale dolphin	
Subfamily Cephalorhynchinae			
	<i>Cephalorhynchus commersonii</i>	Commerson's dolphin	
	<i>Cephalorhynchus eutropia</i>	black dolphin, Chilean dolphin	
	<i>Cephalorhynchus heavisidii</i>	Heaviside's dolphin	
	<i>Cephalorhynchus hectori</i>	Hector's dolphin	
Subfamily Globicephalinae			
	<i>Peponocephala electra</i>	melon-headed whale, electra dolphin	
	<i>Feresa attenuata</i>	pygmy killer whale	
	<i>Pseudorca crassidens</i>	false killer whale	
	<i>Orcinus orca</i>	killer whale	
	<i>Globicephala melas</i>	long-finned pilot whale	
	<i>Globicephala macrorhynchus</i>	short-finned pilot whale	
Superfamily Ziphiioidea			
Family Ziphiidae			
	<i>Tasmacetus shepherdi</i>	Shepherd's beaked whale	
	<i>Berardius bairdii</i>	Baird's beaked whale	
	<i>Berardius arnuxii</i>	Amoux's beaked whale	
	<i>Mesoplodon pacificus</i>	Longman's beaked whale	
	<i>Mesoplodon bidens</i>	Sowerby's beaked whale	
	<i>Mesoplodon densirostris</i>	Blainville's beaked whale	
	<i>Mesoplodon europaeus</i>	Gervais' beaked whale	
	<i>Mesoplodon layardii</i>	strap-toothed whale	
	<i>Mesoplodon hectori</i>	Hector's beaked whale	
	<i>Mesoplodon grayi</i>	Gray's beaked whale	
	<i>Mesoplodon stejnegeri</i>	Stejneger's beaked whale	
	<i>Mesoplodon bowdoini</i>	Andrews' beaked whale	
	<i>Mesoplodon mirus</i>	True's beaked whale	
	<i>Mesoplodon ginkgodens</i>	ginkgo-toothed beaked whale	
	<i>Mesoplodon carlhubbsi</i>	Hubbs' beaked whale	
	<i>Ziphius cavirostris</i>	Cuvier's beaked whale	
	<i>Hyperoodon ampullatus</i>	northern bottlenose whale	
	<i>Hyperoodon planifrons</i>	southern bottlenose whale	
Superfamily Physeteroidea			
Family Physeteridae			
Subfamily Physeterinae			
	<i>Physeter macrocephalus</i>	sperm whale	
Family Kogiidae			
	<i>Kogia breviceps</i>	pygmy sperm whale	
	<i>Kogia simus</i>	dwarf sperm whale	
Suborder Mysticeti			
Family Balaenidae			
	<i>Balaena mysticetus</i>	bowhead whale	
	<i>Eubalaena australis</i>	southern right whale	
	<i>Eubalaena glacialis</i>	northern right whale	
Family Neobalaenidae			
	<i>Caperea marginata</i>	pygmy right whale	
Family Eschrichtiidae			
	<i>Eschrichtius robustus</i>	gray whale	
Family Balaenopteridae			
Subfamily Balaenopterinae			
	<i>Balaenoptera acutorostrata</i>	minke whale	
	<i>Balaenoptera borealis</i>	sei whale	
	<i>Balaenoptera edeni</i>	Bryde's whale	
	<i>Balaenoptera musculus</i>	blue whale	
	<i>Balaenoptera physalus</i>	fin whale, finback	
Subfamily Megapterinae			
	<i>Megaptera novaeangliae</i>	humpback whale	

The Problems Faced by Cetaceans

The number and complexity of factors preventing effective conservation of whales, dolphins, and porpoises are ever increasing. As the world human population booms and industrialization proceeds, there are shifts in the types of problems that are the most immediate and urgent, but the old problems do not necessarily disappear. Indigenous peoples still take whales and dolphins with harpoons; in some areas direct exploitation takes place side-by-side with degradation of habitat by modern petroleum and hydroelectric developments and development of crucial wetlands.

It is also becoming more difficult to identify and assess the problems in time to effect solutions. Industrial and agricultural development, especially, can operate to the detriment of cetaceans in subtle or hidden ways that often are recognized only after much damage has been done or after the momentum of development is so great that conservation of the mammals becomes impossible or impractical. Thus it is very important that the level of action addressing such problems increase now, because there will be even more and difficult problems to cope with in the future.

And, of course, there is the moral dilemma created by attempts to balance the short-term welfare and interests of specific human populations with the longer-term benefits of conserving species and ecosystems. Such considerations permeate nearly every problem of conservation of cetaceans. The policy of the Cetacean Specialist Group (CSG) on such conflict is that of IUCN, i.e., to promote rational utilization and management on a sustainable basis, recognizing that decisions about the relative importance to be given to wildlife conservation and short-term human welfare must rest with national peoples and governments. These goals are also embodied in the UNEP Global Plan of Action for Marine Mammals (FAO/IUCN/IWC/UNEP 1985, Nielsen 1986). There is much correspondence between the two plans. Our main concerns in the CSG are to identify the most critical and immediate conservation problems and help prevent extinction of species and populations wherever such efforts are possible and welcomed.



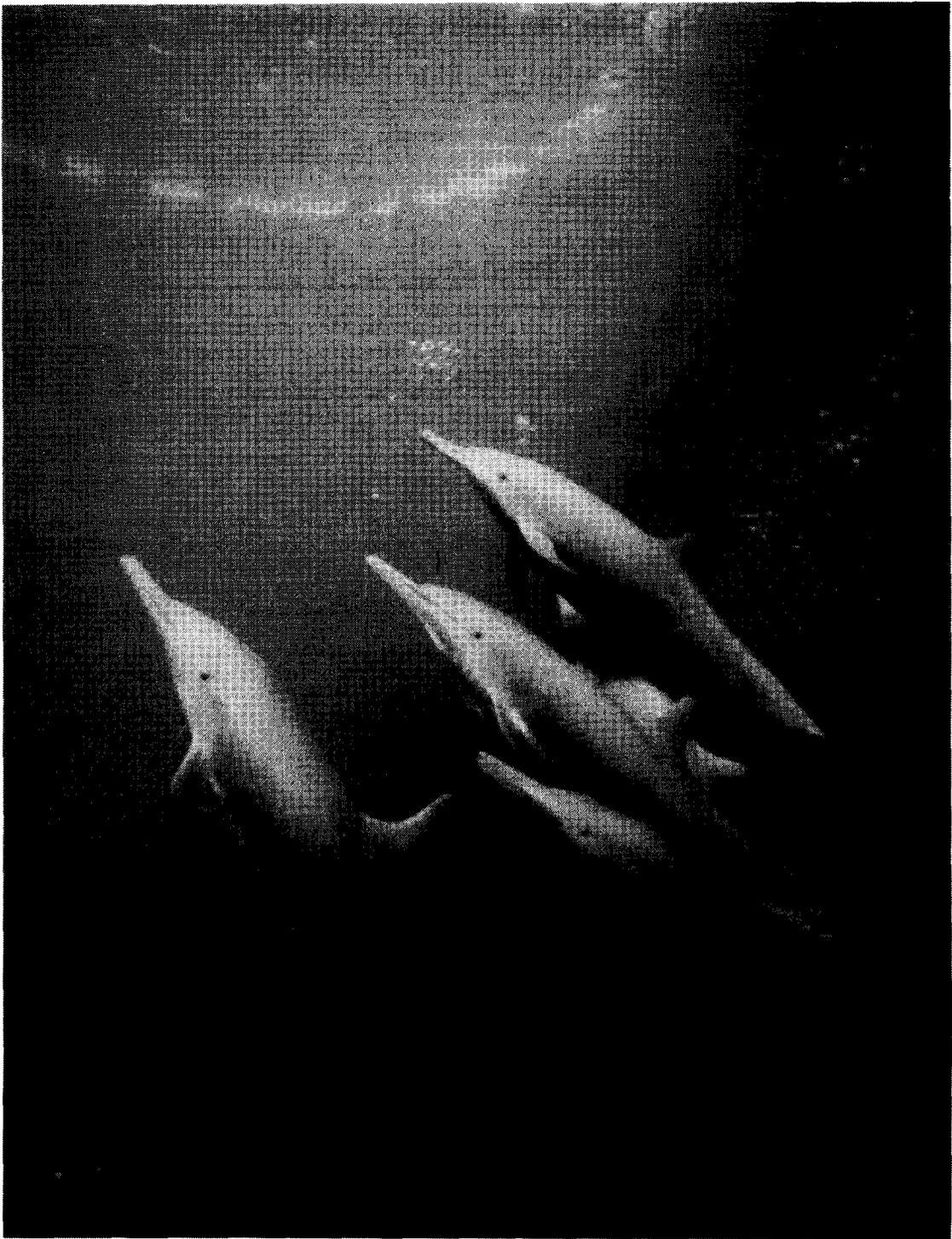
Dall's porpoise (*Phocoenoides dalli*) are harpooned in large numbers in the coastal waters of northern Japan. (Photograph by W. F. Perrin)

Direct Exploitation

To date, the main danger faced by the great whales has been overhunting. Whaling in the last hundred years has greatly reduced the populations of most species. Most whaling is now regulated through the IWC, with the stated management goal of sustainable exploitation. However, as explained lucidly by Holt (1986), it has been extremely difficult to determine what is sustainable, and modern exploitation in practice has seriously overshot sustainable levels in many cases and resulted in further depletion of the whale stocks. An IWC-mandated moratorium on commercial whaling is in effect until at least 1990, to provide an interval during which better ways of assessing the whale populations and the impacts of whaling can be developed and overexploited whale stocks can be given a chance to recover. It is to be expected that large-scale commercial whaling will recommence at some point; the resources are too extensive and valuable to escape systematic exploitation for long. In point of fact, substantial "research whaling" that could be construed as thinly disguised commercial whaling by some nations has continued during the supposed moratorium.

This action plan focuses on the small cetaceans, which also are exploited directly. Much of the take is for subsistence. Subsistence hunting can also deplete a population; for example, as noted below in the section on status of populations, several white whale stocks in Canada have been severely depleted by native hunters; other exploited populations of white whales in the USSR and populations of narwhals and harbor porpoise in Canada and Greenland are of unknown status. While the takes from such populations are for subsistence by indigenous hunters, growing human populations and the increasing use of modern technology (for example, rifles) have caused some hunts to exceed the long-standing levels of indigenous harvests in some regions. In other small-cetacean fisheries for subsistence, recent takes have fluctuated around levels that have existed for very long periods of time, for example in the Faroe Islands, where catches of pilot whales comparable to current catches have occurred cyclically over the last 500 years or more (Joensen and Zachariassen 1982, Hoydal 1986). In even these cases, however, downward trends in abundance could be masked by changes in fishing methods and intensity, and a long history of exploitation cannot be assumed to indicate necessarily that no problem exists.

Most of the remaining commercial directed fisheries for small cetaceans are operated out of Japan (IWC 1987b). Small whaling vessels equipped with harpoon guns take short-finned pilot whales from local stocks and Baird's beaked whales; smaller boats take Dall's porpoise, pilot whales, and dolphins of several species with hand harpoons; and drive fisheries annually capture thousands of dolphins and small whales, mainly striped dolphins, spotted dolphins, bottlenose dolphins, common dolphins, pilot whales, and false killer whales (Anon. 1987). Some of these takes are large enough to lead to concern about possible depletion of populations (see section on status of species and populations). It



Incidental kills in tuna purse seines have reduced the population of the eastern spinner dolphin (a morphologically distinct race of *Senella longirostris* endemic to the eastern Pacific) to less than half its original size. (Photo by J. A. Thompson, courtesy of Nu Venture Films)

is possible that the demand for small-cetacean meat in Japan may increase as the supplies of whale meat decline because of the moratorium on commercial exploitation of the great whales. Such an increased demand would increase the pressure on the populations of dolphins, porpoise, and small whales.

A special category of directed fishery that is unsettling in its implications is that in which incidental take becomes transformed into a directed fishery. This has happened in Peru (Gaskin et al. 1987), where some incidental catch of dolphins and porpoises in coastal gillnet fisheries for sciaenids and sharks has been known to occur since at least the 1960s (Mitchell 1975); the meat was sold locally for human consumption. In the 1970s, unfavorable oceanographic conditions combined with overfishing to drive the Peruvian stocks of anchoveta to near extinction. The anchoveta fishery was at the time the largest fishery in the world, and its collapse put thousands of fishermen out of work. It now appears that many of these fishermen shifted to using gillnets to hunt dolphins, in particular *Lagenorhynchus obscurus*, exploiting the market created previously by the sale of dolphins caught incidentally in other fisheries. The catch of dolphins in the directed fishery may now exceed 10,000 in some years and may be sufficient to endanger the population(s). By-catches of dolphins and porpoises occur in hundreds of gillnet and purse-seine fisheries around the world (discussed below); the meat is marketed in many regions. The Peruvian example suggests that economic dislocations could well cause the fishermen to shift from smaller accidental to larger directed takes imperiling the cetacean populations. The likelihood is increased by the fact that such shifts are most likely to happen in the least developed and most impoverished and isolated parts of the world and thus often escape notice and regulation.

Even very small directed catches can be significant if the species or population is already depleted. For example, river dolphins are still hunted (illegally) in India, Pakistan, and Nepal (Perrin and Brownell in press), where the remaining populations are either critically endangered or rapidly declining toward that condition. In such cases the catches, although small, are obviously significant.

Incidental Catch in Fisheries

By far the largest takes of cetaceans today are by-catches. For example, in 1986 the international fleet of tuna seiners in the eastern tropical Pacific killed an estimated 129,000 dolphins, primarily *Stenella attenuata*, *Stenella longirostris*, and *Delphinus delphis* (Allen 1985, Hall and Boyer 1987), and gillnet fisheries for salmon and squid operated by several nations in the North Pacific may have killed as many as 16,000 Dall's porpoise annually in recent years (Dolan 1987). In both these cases the incidentally caught mammals are not utilized but rather thrown back into the sea. There are many other gillnet fisheries around the world that take small cetaceans (and some great whales) incidentally. In the developed nations, the by-catch is usually discarded or retained for scientific analysis only (for example in California—DeMaster et al. 1985, Barlow 1987); in less prosperous nations the catch is usually marketed locally for human consumption (for example, in Sri Lanka, where as many as 42,000 dolphins and small whales, mainly *Stenella longirostris*, *Stenella*

coeruleoalba, *Stenella attenuata*, *Tursiops truncatus*, and *Grampus griseus*, are taken annually in gillnets as by-catch and marketed—Alling 1985). As noted above, such incidental catches can easily become directed catches. Fisheries that take or could take cetaceans incidentally are listed and briefly described in an excellent recent worldwide review of interactions between marine mammals and fisheries commissioned by FAO (Northridge 1984).

The impacts of the incidental catches on the populations are unknown in nearly all cases. In the case of the largest known kills, in the tuna fishery in the eastern tropical Pacific, there is little doubt that some of the dolphin populations have declined. However, debate continues about the extent of the declines and whether or not the populations are continuing to decline (Smith 1983, Buckland and Anganuzzi 1987, IWC 1988). Current assessment efforts for that fishery are concentrating on detection of population trends rather than on estimating absolute abundance and degree of depletion. Many of the catches in other fisheries are large enough that they may be non-sustainable; such fisheries must be considered to be dangerous to the well-being of populations until they are shown not to be. As in the case of directed takes, even small incidental takes can be dangerous to a severely depleted species or population. An example is the baiji in the Yangtze River (Perrin and Brownell in press), which is accidentally snagged in small but significant numbers on bottom long lines set for fish.



Bottlenose dolphins (*Tursiops truncatus*) and other dolphins and small whales are taken incidentally in gillnet fisheries around Sri Lanka. (Photograph by S. Leatherwood)

Competition and Culls

There are at least two situations in which cetaceans have been suspected of competing with fishermen for prey and have, therefore, been systematically culled on a large scale (IUCN 1981). In Norway, coastal killer whales were thought to be preventing recovery of an important stock of herring (*Clupea harengus*), so at least 327 whales were culled during the period 1978-1980 (IWC 1980, 1981, 1982). At Iki Island, Japan, fishermen became convinced in the 1960s that dolphins and small whales were eating, damaging, or scaring away most of the yellowtail (*Seriola* sp.) and squid on which the local fishery depended, so a massive program of government-supported culls ensued. The peak years

of the control program were 1976-1980, when 934, 1332, 1646, and 1819 small cetaceans were killed, respectively; the species involved were *Tursiops truncatus*, *Pseudorca crassidens*, *Lagenorhynchus obliquidens*, and *Grampus griseus* (Kasuya 1985).

In Norway, the action was taken based on a general perception of adverse impact by the cetaceans, rather than on quantitative assessments. A later modeling study was "unable to find any combination of initial size, growth rate, and predation rate of the local killer whale population which could allow a take of a few hundred whales per year to be justified as expediting the recovery of the herring" (IUCN 1981). In the case of Iki Island, the cetaceans were undeniably interfering with the operations of the fisheries (stealing catches and scaring away fish and squid), but as yet there is no scientific basis for supposing any significant dynamic interactions between cetacean and fish or squid populations; the falling catch-per-effort in the fisheries could well be caused by overfishing (IUCN 1981), a problem for many of the Japanese home-island fisheries. In any case, the culls in both Norway and Japan were precipitated by falling fish catches, and thus it is likely that, whether or not cetaceans really are competitors with man for fishery resources to a significant degree (and they could be), many more such perceived conflicts will arise as human populations increase and fishery resources decline.

Habitat Loss and Degradation

Riverine habitats are highly vulnerable, and the great declines in many river dolphin populations can be attributed mainly to impingement by human activities other than hunting or fishing (Perrin and Brownell in press). Construction of dams and barrages on the Indus River and its tributaries has divided the population of Indus river dolphins into many small fragments, some of which have disappeared, perhaps because of disruption of their food supplies (Khan and Niazi in press). The same thing is happening to the Ganges river dolphin in Nepal (Shrestha in press) and India (Mohan in press) and may happen to the boto in Brazil if planned developments proceed (Best and da Silva in press). Dams and other water impoundments along the Yangtze River may have affected the supplies of fish that sustain the baiji, of which

probably less than 400 remain (Chen and Hua in press). Another detrimental factor is the substantial and growing boat traffic on the rivers in developing nations that support populations of dolphins; for example, several baiji are thought to die annually in collisions with vessels on the Yangtze. Rivers are also extremely vulnerable to pollution by industrial effluent and agricultural runoff. Pollution is thought to be a major problem for the Ganges river dolphin in India (Mohan in press).

Coastal marine habitats as well as riverine habitats can be damaged by development and pollution, and populations of the cetaceans that are found only in shallow coastal waters or must migrate through them (e.g., *Sousa chinensis*, *Sousa teuszii*, *Neophocaena phocaenoides*, *Orcaella brevirostris*, *Eschrichtius robustus*, *Balaena mysticetus*, *Eubalaena* spp., *Megaptera novaeangliae*) can be put at risk by this degradation. For example, if petroleum exploration and development were to be allowed in the breeding lagoons of the gray whale in Mexico, the single remaining viable population of the species could be endangered. Even the high seas are not immune; plastic debris (including lost, or "ghost" fishing nets) may be responsible for the continuing decline of the Pribilof Islands fur seal herd (Fowler 1985) and could be entangling or otherwise affecting cetaceans as well.



The pantropical spotted dolphin (*Stenella attenuata*) is captured incidentally in tuna purse seines in large numbers in the eastern tropical Pacific. (Photo by W. High, courtesy of U.S. National Marine Fisheries Service)

Status of the Species and Populations

The Species

The cetacean species considered by the IUCN to be threatened are included in the Red List (IUCN 1988) under several categories:

Endangered: In danger of extinction, survival unlikely if causal factors continue operating. Includes taxa whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction. Also included are taxa that are possibly already extinct but have definitely been seen in the wild in the past 50 years.

Vulnerable: Taxa believed likely to move into the Endangered category in the near future if the causal factors continue operating. Included are taxa of which most or all of the populations are decreasing because of overexploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security has not yet been assured and taxa with populations that are still abundant but are under threat from severe adverse factors throughout their range.

Insufficiently Known: Taxa that are suspected but not definitely known to belong to any of the above categories, because of lack of information.

There are three additional available categories not currently applied to any cetacean species:

Rare: Taxa with small world populations that are not at present Endangered or Vulnerable but are at risk. These taxa are usually localized within restricted geographical areas or habitats or are thinly scattered over a more extensive range.

Indeterminate: Taxa known to be Endangered, Vulnerable, or Rare, but where there is not enough information to say which of the three categories is appropriate.

Out of Danger: Taxa formerly included in one of the above categories, but which are now considered relatively secure because effective conservation measures have been taken or the previous threat to their survival has been removed.

In addition to the standard categories, the additional category of Not Threatened* has recently been developed for cetaceans (M. Klinowska, in litt.). These are taxa not at present sufficiently threatened to be included in one of the above categories but which are likely to qualify if the causal factors continue operating.

The Red List (IUCN 1988) status for each threatened cetacean species is given in Table 2; the non-threatened species are listed in Table 3. Summary accounts for status all the species will be given in a new Red Data Book under development (M. Klinowska,

in litt.); the status of some species is under review, and their classifications may change.

Populations at Risk for Non-threatened Species

For many cetacean species that are not threatened with extinction or likely to be (Red List categories Endangered, Vulnerable, or Insufficiently Known), one or more populations are extinct, severely depleted, or currently under heavy pressure. For example, the striped dolphin inhabits warm-temperate and tropical waters around the world and is in no danger of extinction as a species, but the population that passes annually through the coastal waters of Japan has probably been overexploited in recent years and may have declined (IWC 1983a, Kasuya 1985). This action plan includes consideration of such threatened populations as well as entire threatened species. The inclusion of populations for the small cetaceans in the following summary list of populations at risk is conservative, i.e., if a population has been considered in recent years to be at least possibly at risk, it is included. For the whales that have been managed in the IWC (indicated with asterisk), all management units classified as Protection Stocks are included, with the exception of the stocks of *Caperea marginata*, for which there is no evidence of significant present or past exploitation (IWC 1987a). The list is, of course, provisional, as many situations involving directed or incidental exploitation of cetaceans are dynamic and volatile. It is certainly not comprehensive; new cases needing attention will continue to come to light.

Phocoena spinipinnis--Populations in Peruvian coastal waters (Gaskin et al. 1987)

Neophocaena phocaenoides--Yangtze and Chinese coastal populations (Wang 1984b)

Phocoenoides dalli--Western-central North Pacific, Bering Sea, and Japanese coastal populations (IWC 1984, Jones et al. 1987, Breiwick 1987, Miyashita and Kasuya 1987)

Sousa chinensis--All populations (of unknown but probably small size and highly susceptible to habitat degradation, e.g., in South African waters--Ross et al. 1987)

Sousa teuszii--All populations (small and highly susceptible to habitat encroachment--Maigret 1980)

Sotalia fluviatilis--Riverine populations in Brazil (da Silva and Best 1984)

Lagenorhynchus obscurus--Peruvian population (Gaskin et al. 1987)

Table 2. List of threatened cetacean species (IUCN 1988).

Endangered

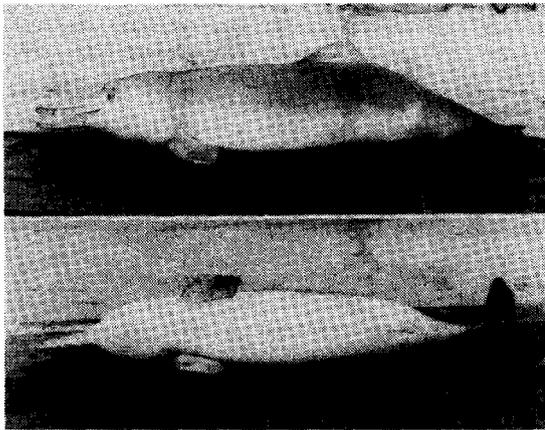
<i>Platanista minor</i>	Indus river dolphin
<i>Lipotes vexillifer</i>	baiji, Yangtze river dolphin
<i>Balaenoptera musculus</i>	blue whale
<i>Megaptera novaeangliae</i>	humpback whale
<i>Balaena mysticetus</i>	bowhead
<i>Eubalaena glacialis</i>	northern right whale

Vulnerable

<i>Platanista gangetica</i>	Ganges river dolphin, Ganges susu
<i>Inia geoffrensis</i>	boto, Amazon river dolphin
<i>Phocoena sinus</i>	vaquita
<i>Hyperoodon ampullatus</i>	northern bottlenose whale
<i>Eubalaena australis</i>	southern right whale
<i>Balaenoptera physalus</i>	fin whale

Insufficiently Known

<i>Pontoporia blainvillei</i>	franciscana, La Plata dolphin
<i>Orcaella brevirostris</i>	Irrawaddy dolphin
<i>Delphinapterus leucas</i>	white whale, beluga
<i>Monodon monoceros</i>	narwhal
<i>Phocoena phocoena</i>	harbor porpoise
<i>Cephalorhynchus</i> spp.	(4)



The baiji, or Yangtze river dolphin (*Lipotes vexillifer*), is the most endangered cetacean; only about 300 remain. (Photo by Zhou Kaiya)

Table 3. List of non-threatened species. See text for explanation of Not Threatened* category.

Not Threatened*

<i>Phocoena spinipinnis</i>	Burmeister's porpoise
<i>Neophocaena phocaenoides</i>	finless porpoise
<i>Australophocaena dioptrica</i>	spectacled porpoise
<i>Phocoenoides dalli</i>	Dall's porpoise
<i>Sousa chinensis</i>	Indopacific hump-backed dolphin
<i>Sousa teuszii</i>	Atlantic hump-backed dolphin
<i>Sotalia fluviatilis</i>	tucuxi
<i>Lagenorhynchus obscurus</i>	dusky dolphin
<i>Lagenorhynchus australis</i>	Peale's dolphin
<i>Tursiops truncatus</i>	bottlenose dolphin
<i>Stenella attenuata</i>	panropical spotted dolphin
<i>Stenella longirostris</i>	spinner dolphin
<i>Stenella coeruleoalba</i>	striped dolphin
<i>Eschrichtius robustus</i>	gray whale

Not Threatened

<i>Steno bredanensis</i>	rough-toothed dolphin
<i>Lagenorhynchus albirostris</i>	white-beaked dolphin
<i>Lagenorhynchus acutus</i>	Atlantic white-sided dolphin
<i>Lagenorhynchus obliquidens</i>	Pacific white-sided dolphin
<i>Lagenorhynchus cruciger</i>	hourglass dolphin
<i>Grampus griseus</i>	Risso's dolphin
<i>Stenella frontalis</i>	Atlantic spotted dolphin
<i>Stenella clymene</i>	clymene dolphin
<i>Delphinus delphis</i>	common dolphin
<i>Lagenodelphis hosei</i>	Fraser's dolphin
<i>Lissodelphis borealis</i>	northern right whale dolphin
<i>Lissodelphis peronii</i>	southern right whale dolphin
<i>Peponocephala electra</i>	melon-headed whale
<i>Feresa attenuata</i>	pygmy killer whale
<i>Pseudorca crassidens</i>	false killer whale
<i>Orcinus orca</i>	killer whale
<i>Globicephala melas</i>	long-finned pilot whale
<i>Globicephala macrorhynchus</i>	short-finned pilot whale
<i>Tasmacetus shepherdi</i>	Shepherd's beaked whale
<i>Berardius bairdii</i>	Baird's beaked whale
<i>Berardius arnuxii</i>	Arnoux's beaked whale
<i>Mesoplodon</i> spp.	(12)
<i>Ziphius cavirostris</i>	Cuvier's beaked whale
<i>Hyperoodon planifrons</i>	southern bottlenose whale
<i>Physeter macrocephalus</i>	sperm whale
<i>Kogia breviceps</i>	pygmy sperm whale
<i>Kogia simus</i>	dwarf sperm whale
<i>Caperea marginata</i>	pygmy right whale
<i>Balaenoptera borealis</i>	sei whale
<i>Balaenoptera edeni</i>	Bryde's whale
<i>Balaenoptera acutorostrata</i>	minke whale

Lagenorhynchus australis—Population in waters of Chile (Cárdenas et al. 1987) and Argentina (Goodall and Cameron 1980)

Grampus griseus—Populations in the Indian Ocean, e.g., off Sri Lanka (Alling 1985, Kruse et al. 1987)

Tursiops truncatus—Black Sea population (IWC 1983a), population off Natal, South Africa (Ross et al. 1987), populations off Peru (Gaskin et al. 1987), and likely others

Stenella attenuata—“Northern offshore stock” in eastern tropical Pacific (Smith 1983, Buckland and Anganuzzi 1987, IWC 1988), populations in coastal waters of Indian Ocean (Alling 1985, Kruse et al. 1987)

Stenella longirostris—“eastern stock” and “northern whitebelly stock” in eastern tropical Pacific (Smith 1983, Buckland and Anganuzzi 1987, IWC 1988), populations in coastal waters of Indian Ocean, e.g., off Sri Lanka (Alling 1985)

Stenella coeruleoalba—Population passing through waters of Japan during annual migration (IWC 1983a), populations in the Indian Ocean (Alling 1985, Kruse et al. 1987)

Delphinus delphis—Black Sea population (IWC 1983a), north-eastern Mediterranean population(s) (Aguilar 1986), coastal populations in eastern tropical Pacific (Hall and Boyer 1987, Buckland and Anganuzzi 1987)

Globicephala melas—North Atlantic population(s) (exploited at Faroes, but status unknown—IWC 1987b)

Globicephala macrorhynchus—Population in northern Japanese waters (IWC 1987b)

Berardius bairdii—Western Pacific population(s) (exploited but status unknown—IWC 1986)

*Physeter macrocephalus**—North Pacific stock (western division) (Note: the status of this and other stocks around the world has been the subject of much scientific controversy within the IWC; e.g., see IWC 1983b).

*Eschrichtius robustus**—Western [Pacific] stock

*Balaenoptera acutorostrata**—Sea of Japan/Yellow Sea/East China Sea stock, West Greenland stock, West Norway/Faroe Islands stock

*Balaenoptera borealis**—All southern hemisphere stocks, all North Pacific stocks, Nova Scotia stock

*Balaenoptera edeni**—East China Sea stock

Recommended Conservation Action

Specific Projects and Actions

The following is a list of projects that the Cetacean Specialist Group believes should have priority for initiation or assistance. The brief explanatory comments are only meant to introduce the projects; fuller proposals or more details can be obtained from members of the Group (Appendix 1) or from research entities, governmental agencies, or conservation organizations in the region involved (Appendix 2). In many cases the cost estimates are rough initial approximations only—no detailed budgets have yet been compiled—but full proposals are being prepared and will be available on request.

There is an emphasis in these projects on regional, national, and local planning and participation in research and conservation activism; this is of course necessary if conservation and management of cetaceans is ever to be carried out on a continuing basis in the developing nations where most of the problems of survival of species and populations occur.

Several projects are of the very highest priority, clearly relating to risk of imminent extinction of species or populations. These are indicated with asterisks (*).



The vaquita or Gulf of California harbor porpoise (*Phocoena sinus*) has the most limited distribution of any cetacean species, being limited to the upper Gulf of California. Incidental takes in gillnets set for sharks and fish are a threat to the species. (Photo by A. Robles)

North America

1.* Monitor incidental catches of vaquita in Gulf of California, Mexico \$20,000

The vaquita or Gulf of California harbor porpoise, *Phocoena sinus*, is endemic to the upper Gulf of California. Large numbers have been killed in gillnet fisheries, and the species' status is uncertain; it is rare and thought to be vulnerable because of its limited range (Barlow 1987). A census survey is in progress (in 1987), but field surveys and monitoring are needed to determine the rates of incidental kill in all gillnet fisheries within the range. A report on the problem will be submitted to the Mexican government, with recommendations for fishery management actions and an educational program to increase lay awareness of the uniqueness of this endemic Mexican species and the threats to its survival. The cost estimate is for one year of fieldwork and data collation and preparation of the report.

South America

2.* Reduce illegal use of small cetaceans for crab bait in South America \$50,000

Several thousand dolphins and porpoises are harpooned annually for use as bait in the Chilean crab fishery, along with fur seals, sea lions, penguins, guanacos, and other wildlife (Leatherwood et al. 1984, Cárdenas et al. 1986, 1987). The abundance of at least one dolphin, *Cephalorhynchus commersonii*, may have been drastically reduced. Other species involved are *Lagenorhynchus australis*, *L. obscurus*, *Cephalorhynchus eutropia*, and *Phocoena spinipinnis*. Only 4 of 26 crab companies operating in the Magallanes area provide bait to the crab fishermen, and even in those cases the amount supplied is grossly inadequate. The crab fishery is expanding rapidly and now extends to the area south of the Beagle Channel, which is being fished extremely heavily at present. The multimillion-dollar catch is exported to the U.S.A., Germany, France, Holland, Belgium (a re-exporter), Japan, and Italy. The fishery operates freely in an illegal mode because of isolation of the area and non-enforcement of national laws. Funds are needed to develop national and international information campaigns to inform the citizenry, environmental organizations, and the governments of the importing nations of the illegal nature and the serious environmental effects of the crab fishery. Support is also needed for the development of cetacean research projects in the area that involve the authorities, universities, NGOs, and liaison with similar programs and governmental agencies in Argentina, so as to establish a strong scientific presence in the region to foster local awareness of the importance of resource conservation and observance of wildlife laws. This program will also provide training for local and national researchers. Emphasis in the research will be on collection of more definitive statistics on bait usage, on survey of the marine mammal populations affected and on development of alternative sources of bait.

3. Continue work on fishery interactions and direct exploitation in Peru \$20,000

A survey conducted in 1984-1986 showed that a wide variety of small cetaceans is taken incidentally in gillnets and deliberately in seines and by harpoon and landed at several fishing ports

in Peru for human consumption (Gaskin et al. 1987). The major species involved are *Lagenorhynchus obscurus*, *Phocoena spinipinnis*, *Delphinus delphis*, *Tursiops truncatus*, and a pilot whale (*Globicephala macrorhynchus* or *G. melas*). More than 500 small cetaceans were landed at one small port during a period of about 200 days, and the total catch may approach 10,000 in some years. The impacts of this on the cetacean populations are unknown; the numbers taken of *L. obscurus* in particular is of concern. The official catch statistics presently collected are accurate, but do not break the catch down by species or number. Further funding is needed to produce training materials and conduct training sessions in species identification and the collection of dolphin-fishing effort data for the fishery officials who monitor the catches at the major ports. Planning should also begin for research to assess the status of the population(s) of *L. obscurus* and to address the possible need for regulation of the directed fishery for that species. Collection of biological samples from carcasses landed at several ports should continue, to provide baseline data which could be used to detect changes in reproductive parameters, body condition, or feeding habits related to exploitation and/or large-scale environmental changes such as occurred during the recent major El Niño event. The cost estimate is for the training program and for one year of continued sampling of the landings.

4. Conduct survey of coastal fishery interactions in Brazil \$30,000

Small cetaceans are killed incidentally in gillnets and seines and harpooned in many places along the central and northern coasts of Brazil (unpublished information from Fundação Brasileira Para a Conservação da Natureza). They are used for shark bait, for human consumption, and as a source of "love charms." *Sotalia fluviatilis* is known to be taken (Anon. 1985), but the degree of involvement of other species and the size of the kill are unknown. Preliminary data exist on the incidental kill and direct take of *Tursiops truncatus*, *Sotalia fluviatilis*, and *Pontoporia blainvillei* in southern Brazil (Anon. 1985, Praderi et al. in press), but more precise information is needed, particularly for the first two species. Preliminary surveys to identify landing ports and collect data on the size and species composition of the catches in northern and central Brazil are badly needed, and the survey work begun in southern Brazil should be expanded to collect additional data on species composition, size, seasonality, value, and utilization of the catches. The surveys would best be conducted in three parts: 1) northern Brazil from Belem to Salvador (Bahia) (major ports are Belem, São Luis, Parnaíba, Fortaleza, Natal, João Pessoa, Recife, Maceio, and Sergipe), 2) central Brazil from Salvador to São Paulo (Salvador, Ilheus, Vitória, Macae, Niteroi, Rio de Janeiro, Santos, and other, smaller ports), and 3) southern Brazil (Paranaguá, São Francisco do Sul, Itajaí, Florianópolis, Laguna, and Torres). The southern effort should be coupled with northward expansion of the existing stranding salvage program at Rio Grande Sul. This project would coordinate with an existing WWF-funded project by FBCN-GMA to monitor incidental catches of *Pontoporia blainvillei* in the Rio de Janeiro region and a national marine mammal stranding/salvage network presently being organized.

5. Continue monitoring of incidental kill of franciscanas in Uruguay \$15,000

The incidental take of *Pontoporia blainvillei* in Uruguayan coastal fisheries has been well documented and is presently at a relatively low level (Praderi et al. in press), but the situation needs monitoring on a continuing basis because of possible changes in operations or intensity of the shark gillnet fishery. In addition, the incidental catch should be monitored closely to detect any changes in age or sex composition, or in reproductive parameters. The ecological relationships between the dolphins and the exploited fishes and sharks should also be examined, as well as the mechanics of the incidental kill and possible solutions. Data should also be collected on other dolphins taken in the fishery. This project would coordinate with an existing similar effort in Brazil (No. 4 above). Funds are needed for field subsistence, supplies, and equipment, for purchase of incidentally killed dolphins, and for extraction of fishery statistics.

6. Improve statistics on fishery interactions in Argentina \$20,000

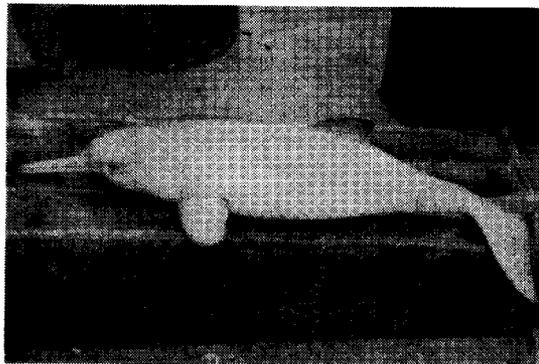
At least several hundred franciscanas, *Pontoporia blainvillei*, and unknown numbers of dolphins of other species are killed annually in gillnet fisheries in northern Argentina, but the data for several important ports are lacking or incomplete (Pérez Macri and Crespo in press). Along the central coast, *Globicephala melas* and *Tursiops truncatus* are known to be taken in trawl nets (Bastida and Lichtschein 1986), but the available data are fragmentary. In southern Argentina, *Cephalorhynchus commersonii*, *Phocoena spinipinnis*, and *Lagenorhynchus australis* are taken incidentally in crab nets and harpooned for crab bait (Goodall and Cameron 1980, Anon. 1985). The collection of kill statistics in both areas needs to be expanded and regularized and the impacts on the populations of small cetaceans assessed. This would most efficiently be done by division of the coastline into zones corresponding to the major fishery areas: 1) the coast north of Buenos Aires, 2) the Buenos Aires region, 3) northern Patagonia, and 4) southern Patagonia including Tierra del Fuego (where cetaceans are taken for crab-bait as in Chile (see No. 2 above); the subprograms would be based at universities and other institutions in the respective areas and would coordinate their activities closely. Funds are needed for an organizational meeting to develop a national research plan, for subsistence, for fuel and other supplies, and equipment for field work, and for collation and publication of data, technical reports, and reports to government agencies to recommend management actions.

7. Assess right whale habitat in Argentina \$5,000

The region surrounding the breeding habitat of the southern right whale, *Eubalaena australis*, near Peninsula Valdes in Argentina is undergoing rapid industrial development (Bastida et al. 1985). Commercial fishing in the area is increasing, and exploration for petroleum is likely to occur in the near future. An evaluation of the necessary extent of a breeding sanctuary and the probable impacts of the new developments is badly needed. The report of this evaluation will go to the Argentine agency responsible for establishment and management of wildlife reserves and to the agencies responsible for petroleum development.

8. Promote regional plan to coordinate research on franciscana in Brazil, Uruguay, and Argentina \$5,000

The franciscanas involved in gillnet fisheries in Brazil, Uruguay, and Argentina may belong to a single large population or may consist of two or more populations (Perrin and Brownell in press). There may be seasonal north-south migrations. Investigators in government agencies and other institutions in the three countries should meet to draft a cooperative plan for coordinated research, to maximize the cost efficiency of the research and to give attention to possible cross-boundary migration and fishery effects.



The franciscana (*Pontoporia blainvillei*) is one of the smallest cetaceans; adults may be less than 1.3 m long and weigh less than 30 kg. (Photo by R. Praderi)

9. Design survey to estimate population size of franciscana \$10,000

There is no estimate of abundance and it is not known how many populations exist. The probable incidental gillnet kill of tens of thousands over the last 30 years may have had a significant impact on the population(s) (Praderi et al. in press). Key researchers in Uruguay, Brazil, and Argentina should consult to select a survey method and site, and a pilot survey to establish feasibility and lay a basis for estimating overall costs should begin as soon as possible. This should be coupled with stranding surveys to determine seasonal changes in total range. Following the pilot survey, plans should be developed for a larger-scale comprehensive survey perhaps involving the territories and resources of more than one nation. The results of the survey, in combination with improved estimates of incidental kill (see 4, 5, and 6 above) will form the basis for recommendations for management action. The cost estimate is for the initial consultations, the pilot survey and the subsequent development of the overall survey plan.

10. Monitor incidental kill of dolphins in Amazon fisheries in Brazil \$25,000

Both *Inia geoffrensis* and *Sotalia fluviatilis* are killed incidentally in fisheries on the Amazon and its tributaries, and dolphin parts enter trade for use as love charms (Best and da Silva in press). Statistics collected to date are fragmentary. A minimum two-year pilot program to collect comprehensive data on incidental kills should be designed and started. The project should be

headquartered at INPA in Manaus, where the previous work has been done, and utilize field surveys at all of the significant fishing ports on the river. The field program should include collection of specimens and data from carcasses for studies of the reproductive capacity of the populations. At the end of two years, the results should be evaluated to determine if monitoring must continue on a permanent basis.

11. Promote establishment of river dolphin conservation areas in Brazil \$15,000

Development of the Amazon basin is proceeding rapidly, and riverbank deforestation, construction of hydroelectric dams, commercial fishing, and other activities are leading to massive degradation and loss of habitat essential to populations of river dolphins and other components of the riverine fauna such as manatees, crocodiles, turtles, endemic fishes, and aquatic birds (Best and da Silva in press). While there is still time, areas of prime aquatic habitat containing large numbers of river dolphins should be identified and be given protection as conservation areas in which the perturbing and destructive activities are prohibited or their impacts substantially minimized. The first step will be to prepare an inventory and prioritization of habitat areas. Some field survey may be required. The inventory and recommendations for designation and management of habitat reserve areas will be submitted to the appropriate Brazilian agencies and will be published for broader dissemination.

12. Promote legislation to fully protect river dolphins in Peru, Ecuador, Colombia, and Venezuela \$5,000

River dolphins (*Inia geoffrensis*) are explicitly protected in Brazil and Bolivia but have no protection, only partial protection, or are of uncertain status in the other countries including parts of the basins of the Amazon and Orinoco (Atkins in press). A thorough inventory of existing wildlife protection laws and regulations in these countries and an analysis of the adequacy of these legal measures given the known threats to river dolphins is needed, so that detailed recommendations and justifications can be prepared and given to the appropriate government agencies.

13. Promote enforcement of existing laws protecting river dolphins in South America \$8,000

Existing laws fully protect river dolphins in Brazil and Bolivia, and the dolphins are partially or implicitly protected by wildlife laws in Peru, Colombia, and Venezuela (Atkins in press). Enforcement of the relevant laws and regulations is not adequate because of shortages of resources, including patrol boats, enforcement agents, and field posts. Direct funding is required to recruit and train enforcement agents, purchase or refurbish patrol boats, construct or purchase field facilities, and provision field patrols. The first step would be to request information and preproposals from the respective national wildlife agencies and to develop a logistical plan and comprehensive proposal; the cost estimate is for this initial phase.

14. Establish dialogue on river dolphin conservation and management among Brazil, Peru, Venezuela, Colombia, Ecuador, and Bolivia \$10,000

The river basins that comprise dolphin habitat extend to all of these countries, and in some cases it is clear that dolphin popula-

tions are likely also shared (Best and da Silva in press). The goal in consultations and discussion among the countries should be to develop coordinated regional approaches to conservation of the riverine habitats and faunas. The first step would be a consultative meeting of scientists working with river dolphins in South America and representatives of the national wildlife and development agencies. The immediate goal would be to establish an ad hoc regional liaison committee and draft lists of concerns and recommendations. Possible umbrellas for this include the IUCN and the Treaty for Amazonian Cooperation, to which all of the nations involved are parties. Possible national cooperating groups are listed in Appendix 2.

Europe

15. Assess status of common dolphin in western Mediterranean \$20,000

The western Mediterranean population of *Delphinus delphis* seems to have declined precipitously in recent years. Museum records show that the common dolphin was an abundant species in the northern basin up to the early 1970s, but it has since become extremely rare. Since 1978, there have been no strandings in northern Spain or in northern Italy, and only 7 of 238 cetaceans stranded on the Mediterranean coast of France were of this species (Aguilar 1986). The species continues to be abundant in the southern basin (Duguy et al. 1983). The cause of the apparent decline is unknown, but possible causes include pollution, overfishing of food resources, unregulated direct exploitation in Spain and indirect catches (known to exist but of unknown size) in Spain, France, and Italy. It has also been suggested that the common dolphin has been replaced by an expanding population of the striped dolphin (*Stenella coeruleoalba*). Aerial and/or boat surveys are needed to determine present distribution, estimate density, and examine possible interaction and overlapping of distributions of the two species. Likely sources of mortality should be identified more clearly, and, if possible, quantified. Questions of stock identity (especially between Mediterranean and Atlantic populations) should be investigated by means of tagging studies using artificial or natural marks and biochemical approaches. Because the common dolphin and striped dolphin have been confused in the past (e.g., Richard 1936), a thorough review of existing data and specimens in Spain, Portugal, France, and Italy should be carried out. If human-related causes are implicated in change in abundance of the dolphin, appropriate recommendations for feasible action will be submitted to the governments of the nations bordering the western Mediterranean. The cost estimate is for field and laboratory work to examine density, distribution, and stock identity off Spain and in the Strait of Gibraltar, evaluation of the magnitude of direct catches off southern Spain, and review of all existing material.

Africa

16. Assess populations of bottlenose dolphins in Natal, South Africa \$10,000/yr for 3 yrs

Anti-shark nets off bathing beaches may have removed as much as 30-34% of the local population of bottlenose dolphins (the long-beaked "aduncus" form of *Tursiops truncatus*) off southern Natal during the period 1980-1985 (Ross et al. 1987).

The Indo-Pacific humpbacked dolphin, *Sousa chinensis*, is also involved. Aerial surveys have not proved effective because of water turbidity. A census based on individual-animal recognition is needed urgently, to allow assessment of the status of the population and estimate impact of the nets with more confidence.

17. Review incidental kills and direct exploitation of small cetaceans in West Africa \$40,000

There is a long history of subsistence take and incidental kill of small cetaceans in coastal fisheries of several West African nations (Cadenat 1959, Maigret 1980, 1981), but there has been no survey of the fisheries since the widespread introduction of monofilament gillnets. Large pelagic trawlers fishing the continental shelf also capture some small cetaceans. The species involved include *Delphinus delphis*, *Tursiops truncatus*, *Stenella attenuata*, *Stenella longirostris*, *Stenella frontalis*, *Stenella clymene*, *Steno bredanensis*, *Sousa teuszii*, *Kogia* sp., and possibly others. The nations known to be involved are Mauritania, Senegal, and the Ivory Coast; others likely have similar coastal fisheries and catches of cetaceans. A preliminary survey of the coastal fisheries in all of the West African nations is badly needed. This would be carried out in close collaboration with the respective national fishery services, which routinely collect fishery data through local contacts and agents. Funds are needed to commission the collection of additional information by the national agencies and to support an investigator to visit the nations involved and to collate and report the findings. The products will include reports to the appropriate governmental agencies of nations where potentially significant fishery interactions are identified, with recommendations for management action.

Asia and Australasia

18. Estimate catches and status of populations of dolphins in Taiwan \$14,000

Tursiops truncatus and dolphins of other species are captured in a drive fishery and other fisheries in Taiwan and sold for human consumption within the country (Wang 1984a). The bottlenose dolphins are of the long-beaked tropical "aduncus" variety of the species (see Ross 1984). At present the catches are not monitored, and the distribution, size, and status of the dolphin populations are unknown. A catch monitoring and sampling program needs to be established, and research to assess the bottlenose dolphin population should begin. The cost estimate is for first-year costs of the catch-monitoring program only. Four years of research on samples collected from the fishery would cost approximately \$40,000. The cost of aerial or ship surveys to census the population would depend on the survey platform chosen and the geographical extent of the surveys but would likely be less than \$100,000. Should this pilot study reveal a likely significant level of fishery take, the products will include recommendations to the Government of Taiwan for a broader investigation and/or management action.

19. Monitor incidental gillnet catches in Sri Lanka \$25,000

Many thousands of dolphins die annually in coastal gillnet fisheries in Sri Lanka (Alling 1985). The primary species are *Stenella longirostris*, *Stenella coeruleoalba*, *Stenella attenuata*, and *Grampus griseus*. A preliminary survey of the principal ports

has been carried out; the need now is for a network of observers to monitor the catches on a continuing basis, so that seasonal and regional variation can be accounted for in estimating total catches and in later assessment of the dolphin populations and the impacts of the catches. An ultimate goal of the program will be to develop recommendations for management actions such as seasonal or area closures to minimize the fishery impacts on the cetacean populations. Funds are needed to train village people to collect data in fisheries in their areas, to set up a system to gather the information in a central location, and to analyze the data and publish the results.



Bottlenose dolphins (*Tursiops truncatus*) are captured for human consumption in coastal waters of Taiwan. (Photo by N. C. H. Lo)

20. Monitor incidental gillnet catches in India \$20,000

Large numbers of dolphins are killed in Indian coastal gillnet fisheries (Mohan 1985). The meat is consumed locally. *Stenella longirostris* and *Tursiops truncatus* are the principal species. The size and status of the populations are unknown. The Central Marine Fisheries Institute in Calicut has recently established a system for collection of data on incidental catches, using personnel already sampling the fish catches. The monitoring centers are at Veraval, Bombay, Goa, Mangalore, Calicut, Cochin, Trivandrum, the Cape, Mandapam Camp, Madras, Kakinada, Waltair,

Puri, and Calcutta. The monitoring centers will also collect information on stranded cetaceans, including evidence of fishery involvement. Incidental catches, strandings, and sightings will be used to determine ranges of the species and populations in Indian waters. Funds are needed to train the samplers in cetacean identification and determination of sex, length, and reproductive condition, and to support collation and analysis of the data and publication of the results, including possible recommendations for management actions to ameliorate identified critical problems.

21. Examine status of dwarf spinner dolphin in Thailand
\$5,000

A dwarf form of *Stenella longirostris* has recently been discovered in the Gulf of Thailand (Perrin et al. 1987b). The range of the population may be limited and total abundance small. Carcasses are unloaded by fishing vessels at Bangkok and sold locally for human consumption. It is not known if these are captured intentionally or incidentally, nor are the size or the exact location of the catches known. Funds are needed for locally-based monitoring of the landings and for research into their source. Should the levels of incidental take prove potentially significant, a broader program of research to estimate the fishery impact and develop management recommendations will be designed.

22.* Census populations of Ganges river dolphin in India
\$30,000

No complete census of river dolphins, *Platanista gangetica*, has been carried out in India. It is thought that populations there are declining rapidly, primarily due to habitat degradation (Mohan in press), and it is very important that a baseline census be carried out so that trends can be monitored. It is especially important that the Brahmaputra River be surveyed in detail. Efforts will be made to standardize survey techniques with those used in other censuses of the species in Bangladesh and Nepal, so that results can be combined and compared. Funds are needed for training, support, and transportation of census personnel, and for hire of river vessels. The results of these studies and those of similar census efforts proposed for other parts of the range of the species (Nos. 26 and 27 below) will feed into the initiatives to establish reserves (Nos. 24 and 28) and develop regional approaches to assessment and conservation of the species (Nos. 30 and 31).

23. Develop alternative to use of dolphin oil as fish lure in India
\$10,000

The directed fishery for the Ganges river dolphin in India can be slowed or stopped if an inexpensive and readily available substitute can be found for the dolphin oil used by fishermen to lure catfish into their nets (Mohan in press). Biochemical analysis is needed to determine the active principle in the oil, and technological research is needed to test alternate substances in laboratory and field conditions.

24. Promote establishment of dolphin sanctuaries in the Brahmaputra River in India
\$4,000

Ganges river dolphin habitat is rapidly being degraded in India (Mohan in press). Field surveys are needed to identify and

inventory relatively intact stretches of prime habitat along the Brahmaputra River. The areas must be prioritized, and reports and recommendations directed to the agencies responsible for establishment of parks and reserves. This project would be carried out in conjunction with No. 22 above, the survey of population sizes. The cost estimate is for the preparation and publication of reports.

25. Investigate effects of dams on Ganges river dolphin in India
\$10,000

Draw-down of rivers, in particular, is thought to have had serious adverse effects on dolphin habitat and population size (Mohan in press). More impoundments and control projects are planned. Funding is needed to support field research on existing dams, impact assessment studies for planned dams and preparation of recommendations to governmental planning and development agencies.

26.* Census populations of Ganges river dolphin in Bangladesh
\$10,000

As in India, abundance of river dolphins in Bangladesh seems to be declining sharply (Aminul Haque in litt.) and the populations have not been adequately surveyed. Action is needed quickly to establish baseline population estimates. Funds are needed for training, support, and transportation of field personnel and for hire of river vessels.

27.* Census populations of Ganges river dolphin in Nepal
\$10,000

The two river systems surveyed to date contain less than 50 dolphins (Shrestha in press). Census surveys should be carried out on all of the rivers in Nepal containing or suspected to contain dolphins, and the populations should be monitored on a regular basis. Funds are needed for transportation and for hire of survey vessels.

28.* Inventory river dolphin habitat in Nepal and promote establishment of sanctuaries
\$4,000

Dolphin habitat in Nepal is different from that in India and Pakistan, involving deeper, clearer water and swifter currents, and is rapidly diminishing due primarily to hydroelectric development (Shrestha in press). The ecological characteristics of the dolphin habitat in the Karnali River (where a high dam is planned to be constructed in the near future) should be fully described and the likely future impacts of flood, drought, and oversilting evaluated. The information gained should be used to inventory prime areas of dolphin habitat throughout Nepal and identify those that are in danger from planned development and those that are the best candidates for dolphin sanctuaries. Funds are needed for field survey and preparation of reports and recommendations.

29. Reduce medicinal use of dolphin oil in Nepal
\$2,000

Dolphins are netted by Nepalese fishermen and marketed for their oil, which is used as a remedy for a wide variety of diseases (Shrestha in press). Support is needed for educational posters and lectures in the villages to inform local people of the endangered status of the dolphin and to suggest alternative and more efficacious medications.

30. Establish regional river dolphin research committee \$5,000

A regional research committee with members from India, Bangladesh, Nepal, and Bhutan should be formed and meet in a central location to discuss research plans, standardize methods, and evaluate results. As this committee would be international, the IUCN or WWF would be suitable parent organizations. Funds would be required for transportation to committee meetings; the cost estimate is for the initial organizational meeting.

31. Establish IUCN river dolphin project \$20,000

Focal centers of research on the Ganges river dolphin and its ecosystem should be established at major universities on the Ganges/Brahmaputra River systems. These would include Gauhati University on the Brahmaputra and Benares University on the Ganges in India, Chittagong University on the Karnaphuli and Mymensingh University on the Ganges in Bangladesh, Tribhuvan University in Nepal, and Thimphu University in Bhutan. Initial steps would include correspondence with professors to acquaint them with the important research and conservation problems that must be addressed for this species and placement of books, reports, and reprints in university libraries. Attempts would be made to initiate projects on reproductive biology and behavior, ecology, population dynamics and movements, in addition to the higher-priority projects identified in the Action Plan. Funds would be solicited and activities coordinated under an umbrella River Dolphin Project similar to the highly successful Tiger Project. The cost estimate is for the first two years of operation, including purchase and posting of reference materials and several very small "seed-money" research stipends. A heavy emphasis would be placed on developing recommendations to governments for conservation and management actions. The project could also serve as a base of coordination for the regional research review committee (No. 30 above).

32.* Reverse decline of Indus river dolphin in Punjab \$83,000

Only about 500 Indus dolphins remain (Khan and Niazi in press). Most of these (over 400) are in the dolphin reserve between the Guddu and Sukkur barrages in the Sind, where they are well protected. The situation in the Pakistan Punjab is critical; only 62-72 survive in the thousands of km of habitat above the Guddu Barrage in the Punjab in four isolated and unprotected populations, and monitoring surveys indicate that these populations are declining rapidly. Other populations known to have existed in the past in the region have disappeared. Field research is urgently needed to determine and quantify the cause(s) of mortality and to project the future course of the populations. It is likely that the establishment of one or more reserves and enforcement of legal bans on hunting by the governments of Pakistan and the Punjab will be needed if the species is not to become extinct in the Punjab and its overall range in Pakistan to shrink to a very small portion of its original size. In addition to bans on killing dolphins, a prohibition is needed on possession, sale or purchase of dolphin meat, oil, or bones. Funding is needed for survey of potential reserve areas, preparation of reports and recommendations, hiring and training of enforcement agents, boats and vehicles for research and patrol, field subsistence, and education of the villagers. The budget estimate is for a two-year program.

33. Expand research on Indus river dolphin in Sind, Pakistan \$30,000

In addition to continuing regular population censuses, research in Sind should concentrate on obtaining quantitative estimates of calf production and mortality and on determining limiting habitat parameters and precisely mapping and monitoring existing utilized and vacant habitat along the full length of the river. It is critical that it be determined whether the population is indeed increasing and what the future trend will likely be, so the recommendations can be made to the Sind Government for further management actions if necessary. Funding is needed for salaries, field surveys, equipment, supplies, laboratory work, and preparation of reports.

34.* Reduce kill of baiji in Yangtze River \$100,000

Despite legal protection, significant numbers of dolphins are killed incidentally in fisheries and accidentally by vessels and by explosions during river bank construction (Chen and Hua in press). Every effort must be made to eliminate or reduce the use of the "rolling hook" fishing gear in the regions of high dolphin density and to develop procedures to ensure that dolphins are absent or removed from the area before high explosives are used in construction on the river. Regulations concerning vessel traffic in existing and proposed reserves must be enforced. At present, resources available to enforce existing legal protection are not adequate. Funding is needed for a patrol vessel for enforcing regulations in the reserves and elsewhere along the river.

35.* Complete baseline studies for baiji reserve at Shi Shou, China \$35,000

Before dolphins can be placed in the proposed semi-natural reserve at Shi Shou, studies must be carried out on the probable effects of high-dam construction upriver, levels of contaminants in the water, bottom sediments and food fish, and seasonal changes in the quantity and nutritive quality of naturally occurring food fish. Funds are needed for hydrologic analyses, field surveys, and laboratory analyses.

36.* Continue monitoring baiji population \$20,000/yr

Only a few hundred baiji remain; it is the most endangered cetacean (Chen and Hua in press). At present, resources are not available to continue the population monitoring that began in 1985 and 1986. It is critical that the monitoring continue, so that the trajectory of the population can be estimated, the effects of existing protection measures assessed and additional measures recommended. The survey lasts several weeks and requires the charter of small fishing vessels as well as the use of research vessels.

37.* Determine movements and population structure of baiji \$63,000

The extent of movement of individual dolphins along the Yangtze is not known (Perrin and Brownell in press). This information is vital to population survey design and evaluation of results and to determine the degree of isolation of groups or subpopulations along the several thousand km of river. The results will be critical to evaluation of the effectiveness of existing and proposed reserves. Studies should begin immediately to



Several gray whales (*Eschrichtius robustus*) become entangled in coastal gillnets and die each year during seasonal migrations along the California coast. (Photo by S. Leatherwood)

monitor movements; possible techniques include use of conventional tags, radio-tracking, and compilation of a catalog of individuals using natural marks. Funding is needed for consultation with researchers experienced in studying dolphin movements, for photographic equipment and film, for radiotags, and for logistical support of field research, including charter of several fishing vessels for capture operations.

38. Survey the status of cetaceans in Chinese waters \$35,000

Very little is known about the marine cetacean fauna of China (Wang 1984a and b). A survey of coastal regions and fishing ports to determine the species present and document any involvement with fisheries is badly needed. A network of coastally located scientists, fishery officials, and other interested officials should be established to collect data on strandings and fishery catches. Creation of such a network will require availability of a Chinese-language guide to identification of cetaceans; such a guide does not exist and must be written and published. The cost estimate is for preparation of a guide, the initial establishment of the network and preparation of an interim report on fishery interactions to the appropriate governmental agencies.

39. Assess and reduce incidental kill of Hector's dolphin in New Zealand \$20,000

Hector's dolphin, *Cephalorhynchus hectori*, is endemic to New Zealand coastal waters. A survey of distribution and abundance in 1984-1985 indicated a total population of only 3000-4000 (Dawson and Slooten in press a and b). Entanglement in gillnets (commercial and recreational) may be a threat to continued existence of the species; in an area for which data were collected, 10-15% of the population is estimated to be killed in nets annually (Slooten and Dawson in press). Better data are needed on kill rate and population size. Funds are also needed to develop management strategies (e.g., net modifications and/or fishing regulations).

Non-regional

40.* Convene workshop on gillnets and cetaceans \$40,000

Many of the emerging problems of cetacean conservation involve coastal and pelagic gillnet fisheries. An international workshop meeting of national fishery experts and cetologists is needed to focus research and management efforts to define and ameliorate these problems. Emphases will be to identify gillnet fisheries that impact cetaceans, to design programs to collect adequate statistics on incidental kill and to discuss possible ways to reduce the incidental kills through technological research and innovative management. It will be especially important to involve participants from the developing nations that are placing high priority on coastal and offshore fishery development. Nations in which incidental kill in gillnets likely occurs but for which there is almost no information include Pakistan, Bangladesh, Indonesia, the Philippines, the Malagasy Republic, Papua New Guinea, Surinam, Brazil, Argentina, the French Antilles, Venezuela, Mozambique, Tanzania, Kenya, the Somali Republic, Burma, Thailand, Malaysia, Kampuchea, Vietnam, and many others. Participants should also be included from the nations where research and management programs have been developed

to address the problem, such as the U.S., Japan, Canada, and Australia.

41. Resolve taxonomy and distribution of the humpbacked dolphins, *Sousa* spp. \$8,000-10,000

Two species, the Indo-Pacific humpbacked dolphin, *S. chinensis*, and the Atlantic humpbacked dolphin, *S. teuszii*, are currently recognized by most cetologists Ross (1984), although some recognize a third, *S. plumbeus* (e.g., Zhou et al. 1980), or even a fourth, *S. lentiginosa*, and a fifth, *S. borneensis* (e.g., Pilleri and Gihir 1980). All are restricted to shallow coastal waters. Recent research indicates that it is possible that only a single species exists, with very greatly differentiated regional populations that differ in average coloration, size, shape, and skull characters (Ross 1984). These populations are presumably morphologically adapted to local ecological conditions. Because of the vulnerability of the local populations of these small coastal cetaceans to habitat degradation and direct and indirect exploitation, it is extremely important that the species structure of the group be critically examined, the regional populations identified and their ranges delineated. The problem is especially urgent in West Africa, where local populations may consist of less than 100 individuals (Maigret 1980). The undertaking will involve as a first phase the comprehensive examination of museum specimens, available photographs, and published and unpublished locality records. The cost of this first phase will depend on where the investigators are located. A second phase may include several field surveys to establish limits of distribution and delineate habitats (not included in cost estimate).

A third phase would include assessment of the status of the populations most at risk and development of recommendations for national management actions.

42.* Promote increased consideration of river faunas in internationally funded development \$20,000

Planning for the protection of river dolphins and the associated aquatic fauna should be an integral part of regional planning for the entire river system or basin (Perrin and Brownell in press). In this planning, consideration of the dolphins should be part of a broad attempt to accommodate the needs of wildlife, fisheries, and economic development. International funding agencies should be informed of the vulnerable position of the river dolphins and be requested to use appropriate guidelines in environmental assessments. Funding is needed to commission preparation (through correspondence) of detailed draft guidelines to be recommended to the organizations, such as the World Bank, multinational corporations, and international joint ventures, presently engaged in or planning developments in major tropical river basins. These guidelines would not be meant to substitute for expert on-site consulting, but would serve to alert the planners to the issues.

43. Review effects of disturbance on coastal and riverine cetaceans \$18,000

Rapidly increasing vessel traffic, mining, and petroleum developments and fishery activities are impinging progressively on the habitats of riverine and coastal dolphins, porpoises, and whales. Noise, physical intrusion, sea bottom destruction, and

overall habitat alteration are the consequences of these developments. Their effects on behavior and migrations have been investigated for large whales, especially in relation to petroleum resource developments (Geraci and St. Aubin 1980, Stirling and Calvert 1983, Sorensen et al. 1984), but nearly nothing is known of effects on small cetaceans. Research indicates that reaction of cetaceans to specific human activities varies according to the species, type, and intensity of human activity, feeding habits of the species studied, and possibly other factors (Sorensen et al. 1984, Watkins 1986). Funding is needed to commission a review of existing knowledge on both small and large cetaceans and to organize a workshop meeting of experts (about 50 people for 5 days, in Europe) to identify cetaceans populations most likely to be affected and to draw up and prioritize recommendations for research.

44. Conduct workshop on population-census methods for coastal and riverine dolphins \$25,000

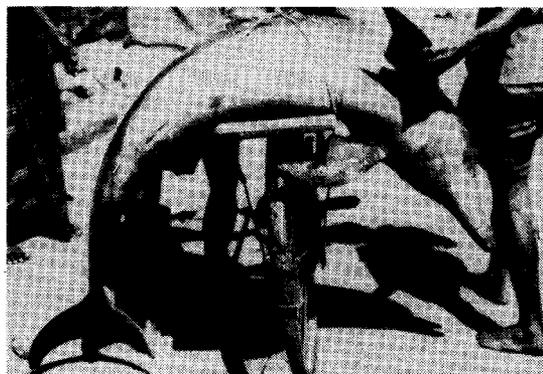
Census methods for oceanic cetaceans are well-advanced; the line transect method is in wide use and yields accurate and adequately precise estimates for management. However, the line transect method is not entirely suitable or practicable for dolphins in a nearshore habitat or in a river, and none of the other methods in use are fully satisfactory either (Perrin and Brownell in press). A workshop meeting is needed to compare and critique the methods presently in use and develop improved approaches. It is very important that survey methods be improved and standardized so that the results of the several survey efforts proposed or in the offing be reliable and comparable.

Other Issues and Projects to be Monitored

Many national and international agencies and organizations are actively endeavoring to conserve and manage cetaceans. In some cases these efforts are successful; in others the outcome is still uncertain. In some situations of obvious potential for overexploitation, research to assess the populations is underway; in some other situations, there is no apparent immediate or long-term risk of extinction of populations under present circumstances. IUCN's strong support for the internationally agreed moratorium on commercial whaling (that theoretically took effect in 1986), has been made clear in its statements to the annual International Whaling Commission meetings over the last several years. IUCN regrets that even now the moratorium has not been completely implemented. Some issues, such as what should constitute whaling under scientific permit issued by parties to the International Convention on Whaling, are under intensive debate and may or may not be resolved during the term of this Action Plan. In addition to attempting to launch or assist the specific projects recommended above, the Cetacean Specialist Group will monitor these issues and situations and, if necessary, add projects to the Plan in line with developments. The Group endorses the research ongoing in relation to these issues and believes that it should continue. The list that follows is not exhaustive; items will be added as they come to the attention of the Group. Background information on nearly all of these topics can be found in Report of the International Whaling Commission, Volumes 30-38 (1980-1988).

North America and Greenland

1. Status of white whales exploited by native peoples in Alaska, Canada, and Greenland.
2. Status of white whales exploited in the USSR.
3. Status of narwhals exploited by native peoples in Canada and Greenland.
4. Incidental kill of harbor porpoise in the Bay of Fundy, Canada.
5. Entrapment of large whales in fishing gear in eastern Canada.
6. Incidental kill of harbor porpoise, pilot whales, and gray whales in gillnets in California.
7. Incidental kill of Dall's porpoise in Japanese salmon gillnet fisheries in the North Pacific.
8. Incidental kill of cetaceans in squid and tuna gillnet fisheries of Japan, Taiwan, and Republic of Korea in the central North Pacific.
9. Population trends in dolphins killed incidentally in tuna purse-seine fisheries of the U.S., Mexico, and other nations in the eastern tropical Pacific.
10. Conservation of gray whale breeding habitat in Mexico.
11. Exploitation of harbor porpoise in Greenland.
12. Status of the bowhead population exploited by native peoples in Alaska and Greenland.
13. Status of the bowhead whale in eastern Canada and Greenland.
14. Population identity of humpback whales in the North Pacific and North Atlantic.
15. Status of right whales in the western North Atlantic.



Dolphins killed in gillnets off Sri Lanka are marketed locally for human consumption. (Photograph by A. Alling, courtesy of World Wide Fund for Nature)

South America

16. Protection of spinner dolphin habitat at Fernando de Noronha Island off Brazil.
17. Status of the right whale in the western South Atlantic.

Europe

18. Status of the northern bottlenose whale.
19. Incidental kill of harbor porpoise in gillnets in the eastern North Atlantic.
20. Exploitation of pilot whales at the Faroe Islands.
21. Status of the harbor porpoise in the North Sea and Baltic Sea.
22. Status of the dolphin and porpoise fishery and the exploited populations in the Black Sea.
23. Pollutant levels in dolphin populations of the western Mediterranean.

Africa

24. Recovery of right whales in the eastern South Atlantic.
25. Recovery of right whales off East Africa and stock identity in the Indian Ocean.
26. Incidental kill of small cetaceans in tuna purse-seine fisheries in the eastern tropical Atlantic.

Asia

27. Status of dolphins and small whales exploited in drive and harpoon fisheries in Japan, including dolphin culls.

28. Status of Baird's beaked whales off Japan.

29. Incidental kill of small cetaceans in Japanese coastal fisheries.

30. Status of the finless porpoise in the Sea of Japan.

31. Conservation of river dolphin (*Orcaella brevirostris*) habitat in Indonesia.

32. Monitoring of Indus river dolphin population in Sind, Pakistan.

33. Construction of baiji reserve at Tongling, China.

Australasia

34. Incidental kill of dolphins in gillnet fisheries off Australia.

Worldwide

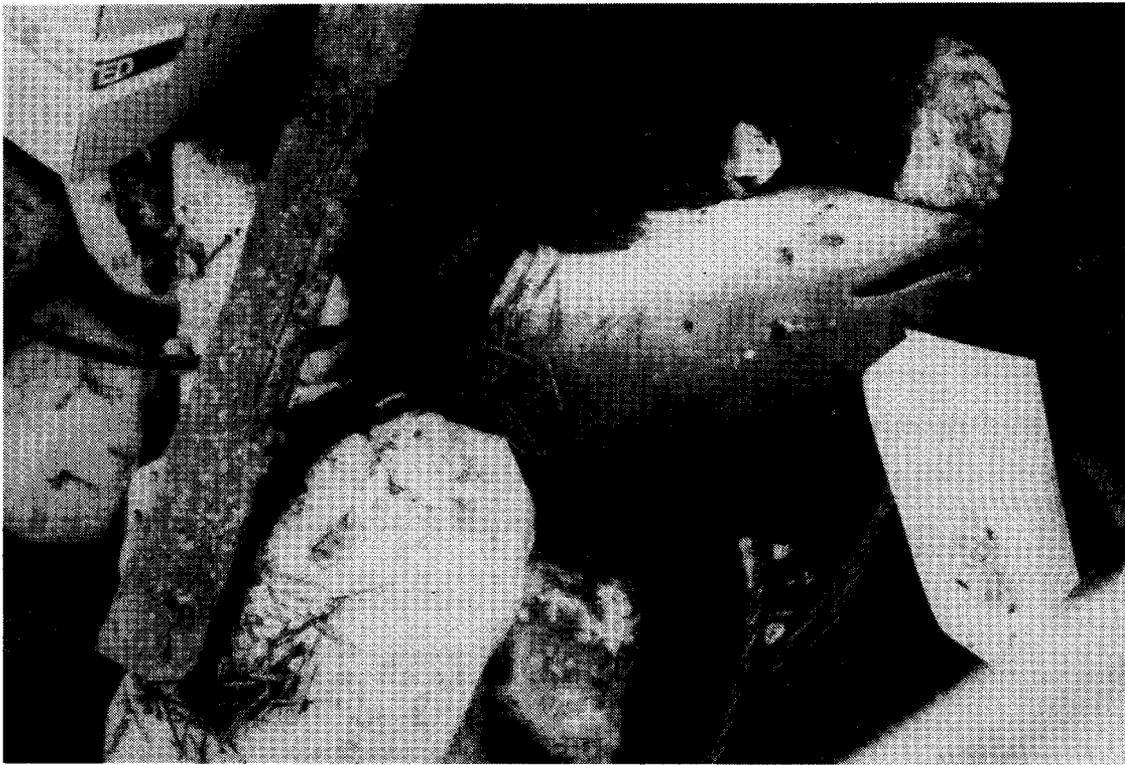
35. Whaling by IWC members under scientific permit.

36. Reporting of by-catches of small cetaceans by IWC members and their dependencies.

37. Local subsistence fisheries (e.g., Solomon Islands, Lesser Antilles, St Helena, Indonesia, Indian offshore islands, Senegal).

38. Interactions between recovering populations of protected whale species and fisheries, including direct conflicts and competition.

39. Effects of pollution on cetaceans.



Harbor porpoise (*Phocoena phocoena*) killed in herring gillnets and other fishing gear in the eastern North Atlantic are usually discarded rather than utilized. (Photo by J. M. Coe)

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Appendix 1

Members of the Cetacean Specialist Group of the IUCN Species Survival Commission

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Moh'd Amour Al Barwani Ministry of Agriculture and Fisheries Directorate General of Fisheries P.O. Box 467, Muscat Oman	Enrique A. Crespo Centro Nacional Patagonico 28 de Julio 28 9120 Puerto Madryn Chubut Argentina	James G. Mead Division of Mammals U.S. National Museum of Natural History Smithsonian Institution Washington, D.C. 20560 U.S.A.	Graham J. B. Ross Port Elizabeth Museum P.O. Box 13147 Humewood, 6013 Port Elizabeth South Africa
A. K. M. Aminul Haque Bangladesh Agricultural University Mymensingh Bangladesh	Luis Fleischer Centro de Investigaciones Pesqueras Km 1, Carretera Pichilingue La Paz, B.C.S. Mexico	Edward D. Mitchell, Jr. Arctic Biological Station P.O. Box 400 Ste Anne de Bellevue Quebec H9X 3L6 Canada	Michael F. Tillman National Marine Fisheries Service NOAA, Department of Commerce Washington, D.C. 20235 U.S.A.
John L. Bannister Western Australian Museum Francis Street Perth Australia 6000	Ray Gambell International Whaling Commission The Red House, Station Road Histon, Cambridge CB4 4NP United Kingdom	R. S. Lal Mohan Regional Centre of Coastal Marine Fisheries Research Institute West Hill, P.O. Calicut 673 005, India	Hal Whitehead Newfoundland Institute for Cold Ocean Science Memorial University of Newfoundland St. Johns, Newfoundland Canada A1B 3X7
Peter B. Best Whale Unit c/o South African Museum P.O. Box 61 8000 Cape Town South Africa	David E. Gaskin Department of Zoology College of Biological Science University of Guelph Guelph, Ontario N1G 2W1 Canada	Mohammad Sadiq Niazi Government of Pakistan Zoology Survey Department Block No. 61, Pakistan Sectt. Shahrah-e-Iraq Karachi Pakistan	Alexey V. Yablokov Koltzoff Institute of Developmental Biology U.S.S.R. Academy of Sciences Vavilov Street 26 Moscow 117334 U.S.S.R.
Peter J. H. van Bree Institute of Taxonomic Zoology University of Amsterdam 36 Plantage Kerklaan 1018 CZ Amsterdam Netherlands	R. N. P. Goodall Sarmiento 44 9410 Ushuaia Tierra del Fuego Argentina	Kenneth S. Norris Joseph M. Long Marine Laboratory Institute of Marine Sciences University of California Santa Cruz, California 95060 U.S.A.	Zhou Kaiya Department of Biology Nanjing Normal University Nanjing, Jiang Su People's Republic of China
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Douglas G. Chapman Center for Quantitative Science, HR-20 University of Washington 3737 15th Ave. N.E. Seattle, Washington 98195 U.S.A.	Khan Mohammad Khan Sind Wildlife Management Board Stratchen Road Karachi-1 Pakistan	Seiji Ohsumi Far Seas Fisheries Research Laboratory 5-7-1 Orido, Shimizu-shi Shizuoka-ken 424 Japan	
Chen Peixun Institute of Hydrobiology Academia Sinica Wuhan, Hubei People's Republic of China	Margaret Klinowska Physiological Laboratory Cambridge University Downing Street Cambridge CB2 3EG United Kingdom	William F. Perrin (Chairman) Southwest Fisheries Center P.O. Box 271 La Jolla, California 92038 U.S.A.	
Ivar Christensen Institute of Marine Research P.O. Box 1870-72 5000 Bergen Norway	J. Stephen Leatherwood Sea World Research Institute 1700 South Shores Road San Diego, California 92109 U.S.A.		

Appendix 2

List of National Agencies, Research Institutions, and Conservation Organizations in Problem Areas¹

North America

1. Centro de Investigaciones Pesqueras
Km 1, Carretera A, Pichilingue
La Paz, B.C.S., Mexico
2. Departamento de Biología Marina
Universidad Autónoma de Baja California Sur
Apartado Postal 219
La Paz, B.C.S., Mexico
3. Departamento de Biología, Facultad de Ciencias
Universidad Nacional Autónoma de Mexico
Apdo. Postal 70-572
04510 Mexico, D.F., Mexico
4. Laboratorio de Mastozoología
Instituto de Biología-UNAM
Apartado Postal 70-153
Mexico 20, D.F., Mexico
5. Centro de Investigaciones Biológicas de Baja California, A. C.
Jalisco y Madero, Apdo. Postal 128
23060 La Paz, B.C.S., Mexico
6. Unidad de Ciencias Marinas
Universidad Autónoma de Baja California
Apartado Postal 453
Ensenada, BCN, Mexico
7. Escuela de Ciencias Marítimas y Alimentarias
Instituto Tecnológico y de Estudios Superiores de Monterrey—
Unidad Guaymas
Guaymas, Sonora, Mexico
8. Centro Regional de Investigaciones Pesqueras
Instituto Nacional de la Pesca
Guaymas, Sonora, Mexico
4. Centro de Investigaciones
Facultad de Ciencias Exactas y Naturales
Universidad de Antioquia
A.A. 1226
Medellín, Colombia
5. Ministerio del Ambiente y de los Recursos Naturales Renovables
(MARNR)
Desarrollo Profesional y Rel. Int.
Apartado 6623
Caracas, Venezuela
6. Fundación para la Defensa de la Naturaleza (FUDENA)
Apartado 70376
Caracas 1071, Venezuela
7. Sociedad Venezolana de Ciencias Naturales
Apartado 1521, Carmelitas
Caracas 1010-A, Venezuela
8. Sociedad Conservacionista Audubon de Venezuela
Apartado 80450
Caracas, Venezuela
9. Asociación Nacional para la Defensa de la Naturaleza
Qta. Masapo, Ave. Norte
Alta Florida, Caracas 1050, Venezuela
10. Fundación para la Educación Ambiental (EDUCAM)
Ira Avenida, No. 203-102
Campo Alegre Chacao
Caracas, Venezuela
11. Instituto de Recursos Naturales Renovables
Universidad Simón Bolívar
Departamento Estudios Ambientales
A.P. 80659
Caracas, Venezuela
12. Instituto Nacional de Pesquisas da Amazônia (INPA)
Departamento de Biología de Mamíferos Aquáticos
Caixa Postal 478, Cep: 69.000 Manaus
Brazil
13. Instituto de Biologia, Sector de Ecologia
Universidade Estadual do Rio de Janeiro
Rua São Francisco Xavier 524
Rio de Janeiro, Brazil
14. Laboratório de Mamíferos Marinhos
Departamento de Oceanografia
Fundação Universidade do Rio Grande (FURG)
Caixa Postal 474, Cep: 96.200 Rio Grande do Sul-RS
Brazil

South America

1. Sección de Mamíferos
Instituto de Ciencias Naturales
Museo de Historia Natural
Universidad Nacional de Colombia
Apdo. Aéreo 7495
Bogotá, D.E., Colombia
2. División Fauna Terrestre, INDERENA
Apdo. Aéreo 13458
Bogotá, D.D., Colombia
3. Sociedad Colombiana de Ecología
A.A. 24228
Bogotá, D.E., Colombia

1. Relevant organizations not listed should contact the Chairman of the Cetacean Specialist Group, so that they may be included in future versions of this list.

15. Fundação Brasileira para a Conservação da Natureza (FBCN)
Rua Miranda Valverde 103, Cep: 22.281
Rio de Janeiro, Brazil
16. Divisão de Zoologia do Departamento de Biologia
Universidade Federal de Santa Catarina
Caixa Postal 5132, Campus Universitário
Cep: 88.000 Campo Grande-MS
Brazil
17. Instituto de Pesquisas da Marinha
Arraial do Cabo
Cep: 28.910 Rio de Janeiro
Brazil
18. Instituto Oceanográfico
Universidade de São Paulo
CEP-05508 São Paulo, Brazil
19. Companhia Energetica de São Paulo (CESP)
Coordenador de Meio Ambiente e Recursos Naturais
Av. Paulista, 2064-8o andar
01310-São Paulo-SP, Brazil
20. Coordenadoria de Pesquisa de Recursos Naturais da Secretaria de
Agricultura e Abastecimento de São Paulo
Parque de Agua Branca
C.P. 1322
01000 São Paulo-SP, Brazil
21. Fundação Zoobotanica do Rio Grande do Sul
C.P. 1188
90.000 Porto Alegre-RS, Brazil
22. Instituto Brasileiro de Desenvolvimento Florestal (IBDF)
Departamento de Parques Nacionais e Reservas Equivalentes
Palacio do Desenvolvimento
SBN 13o Andar
70.000 Brasília-DF, Brazil
23. Secretária Especial do Meio Ambiente (SEMA)
Ministério do Interior
Brasília-DF, Brazil
24. Associação Brasileira de Ecologia
Av. Atlantica, 734, Apto. 1201
Rio de Janeiro, Brazil
25. Associação de Defesa do Meio Ambiente
C.P. 832
04531 São Paulo-SP, Brazil
26. Fundação Pro-Natureza (FUNATURA)
SHIS-QI 07-CL Bloco B, Sala 201
Lago Sul, 71.600 Brasília-DF, Brazil
27. Departamento do Meio Ambiente
Estado do Rio Grande do Sul
Biblioteca, Av. Ipiranga, 389
90.000 Porto Alegre-RS, Brazil
28. Museo Nacional de História Natural de Montevideo
C. Correo 399
Montevideo, Uruguay
29. Departamento Científico y Tecnológico
Industria Lobera y Pesquera del Estado
Rbla. Baltasar Brum s/n esq. Fco. Tajes
Montevideo, Uruguay
30. Fundación Vida Silvestre Argentina--Grupo Cetáceos
Leandro N. Alem 968, Cep: 1001 Buenos Aires
Argentina
31. Centro Austral de Investigaciones Científicas (CADIC)
C. Correo 92
Cep: 9410 Ushuaia, Tierra del Fuego
Argentina
32. Museo Argentino de Ciencias Naturales "Bernardino Rivadavia"
(MACN)
Av. A. Gallardo 470, C. Correo 220
Cep: 1405 Buenos Aires
Argentina
33. Instituto Nacional de Investigación y Desarrollo Pesquero
(INIDEP)
C. Correo 175
Cep: 7600 Mar del Plata
Argentina
34. Centro Nacional Patagónico--CONICET
28 de Julio 28
9120 Puerto Madryn, Chubut
Argentina
35. Movimiento Ecológico Argentino
Callao 741
Buenos Aires, Argentina
36. Amigos de la Tierra
Anchorena 633
1170 Capital Federal
Buenos Aires, Argentina
37. Fundación NATURA
Av. 6 de Diciembre 5043 y el Comercio
Casilla 243
Quito, Ecuador
38. Departamento de Actos y Organismos Internacionales
Quito, Ecuador
39. Instituto del Mar del Peru (IMARPE)
Box 3732, Esquina General Valle y Gamarra
Apartado-22, Callao, Peru
40. Fundación Peruana para la Conservación de la Natureza (FPCN)
Scipión Llona 181-7, Casilla 5396
Lima 18, Peru

41. Pro Defensa de la Naturaleza (PRODENA)
Av. Nicolás de Piérola 742, of. 703
Edificio Internacional
Lima, Peru
42. Centro de Investigación y Manejo de Mamíferos Marinos
(CIMMA)
c/o Instituto de Zoología
Universidad Austral de Chile
C. Correo 567
Valdivia, Chile
43. Comisión de Investigación en Recursos Marinos
Comité Nacional pro Defensa de la Fauna y Flora (CODEFF)
C. Correo 3675
Santiago, Chile
44. Departamento de Oceanología
Universidad de Concepción
C. Correo 2407, Ap. 10
Concepción, Chile
45. Instituto de la Patagonia
Casilla 102-D
Punta Arenas, Chile

Europe

1. Cátedra de Zoología
Facultad de Biología
Universidad de Barcelona
Barcelona 28, Spain
2. Laboratorio Oceanográfico de Málaga
Paseo de la Farola 27
Málaga-16, Spain
3. Instituto Español de Oceanografía
P.O. Box 130, La Coruña, Spain
4. Departamento de Zoología
Facultad de Ciencias Biológicas
Universidad de Valencia
Dr. Molina 50
Burjasot, Valencia, Spain
5. CIESM Working Group on Marine Mammals
Institut Océanographique
Avenue Saint-Martin
Monaco-Ville
MC 98000 Monaco
6. Centre National d'Etude des Mammifères Marins
Port des Minimes
17000 La Rochelle, France
7. Université Paris VI, Station Zoologique
F-06230 Villefranche-sur-Mer
France
8. Laboratoire de Biologie Marine
Université d'Aix-Marseille III
rue Henri Poincaré
13397 Marseille Cedex 4, France
9. Instituto di Zoologia e di Anatomia Comparata
Universita di Messina
98100 Messina, Italy
10. Associaze Italiana per il World Wildlife Fund
Via P.A. Micheli 50
Rome 00197, Italy
11. Museo di Storia Naturale
Corso Venezia 55
2021 Milano, Italy
12. Institute of Animal Biology, Department of Ecology
University of Padova
Via Loredam 10
35100 Padova, Italy
13. UNEP Mediterranean Action Plan
Leoforos Vassileos
Konstantinou 48
Athens 11635, Greece

Africa

1. Port Elizabeth Museum
P.O. Box 13147
6013 Humewood
South Africa
2. Whale Unit
c/o South African Museum
P.O. Box 61
8000 Cape Town, South Africa
3. People's Trust for Endangered Species
P.O. Box 156
Hout Bay 7872, Cape Town, South Africa
4. Marine Mammal Laboratory
Sea Fisheries Institute
P.O. Box 251
Cape Town, South Africa
5. South African Nature Foundation
P.O. Box 456
Stellenbosch 7600, South Africa
6. Centre des Recherches Océanographiques
B.P. 2241, Dakar, Senegal
7. Laboratoire de Biologie General
Université Federal de Cameroun
B.P. 812, Yaounde, Cameroun
8. Centre National de Recherches Océanographiques et des Pêches de
Mouadhibou
B.P. 22, Mouadhibou, Mauritania
9. Department of Game and Wildlife
P.O. Box M239
Ministry Post Office
Accra, Ghana

10. Ministère de la Protection de la Nature et de l'Environnement
Abidjan, Ivory Coast
11. Nigerian Conservation Foundation
P.O. Box 467
Lagos, Nigeria
12. Departement de l'Environnement, Conservation de la Nature et
Tourisme
B.P. 868
Kinshasa 1, Zaire
13. UNEP Regional Seas Programme
Ocean and Coastal Areas Programme Activity Centre
P.O. Box 30552
Nairobi
Kenya
- Asia
1. UNEP/Asia and the Pacific
The United Nations Building
Rajadamnern Avenue
Bangkok 10200, Thailand
2. Wildlife Fund Thailand
8 Sukhumvit 12
Bangkok 10110, Thailand
3. Institute of Hydrobiology
Academia Sinica
Luojiashan, Wuhan, Hubei
People's Republic of China
4. Department of Biology
Nanjing Normal University
Nanjing, Jiang Su
People's Republic of China
5. Division of Natural Conservation
National Environmental Protection Agency
Baiwanzhuang, Beijing
People's Republic of China
6. Department of Biology
Shandong College of Oceanology
Qingdao
People's Republic of China
7. Bureau of Fisheries Management
Ministry of Agriculture, Animal Husbandry and Fisheries
31 Ming Feng Lane, Xidan
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Dalian, Liaoning
People's Republic of China
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Shanghai
People's Republic of China
10. Graduate School of Fisheries
National Taiwan College of Marine Science and Technology
Keelung, Taiwan
11. Institute of Zoology
Academia Sinica
Nankang, Taipei, Taiwan
12. Marine Science Laboratory
Chinese University of Hong Kong
Shatin, N.T., Hong Kong
13. Far Seas Fisheries Research Institute
5-7-1 Orido, Shimizu-shi
Shizuoka-ken 424, Japan
14. Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ko
Tokyo 164, Japan
15. National Science Museum
3-23-1 Hyakunin-cho, Shinjuku-ku
Tokyo 160, Japan
16. Department of Environment Conservation
Ehime University
3-5-7 Tarumi
Matsuyama 790, Japan
17. Whales Research Institute
3-32-11 Ohjima, Koto-ku
Tokyo 136, Japan
18. Sind Wildlife Management Board
Strachen Road
Karachi-1, Pakistan
19. World Wildlife Fund--Pakistan
P.O. Box 1312
Lahore, Pakistan
20. Punjab Wildlife Department
2 Sanda Road
Lahore, Pakistan
21. Marine Fisheries Department
Fish Harbour, West Wharf
Karachi, Pakistan
22. National Council for Conservation of Wildlife
485, Street 84
G-6/4 Islamabad, Pakistan
23. Government of Pakistan
Zoological Survey Department
Block No. 61, Pakistan Sectt.
Shahrah-e-Iraq
Karachi, Pakistan
24. Research Centre of Central Marine Fisheries Research Institute
(CMFRI)
Calicut 673005, Kerala, India

26. Centre of Advanced Study in Marine Biology
Annamalai University, Porto Novo
Tamil Nadu, India
27. Fisheries College
Tuticorin--628 008, India
28. Department of Zoology
University College
Trivandrum 1, Kerala, India
29. Department of Environment, Forests and Wildlife
Bikaner House, Shahjahan Road
New Delhi 110 011, India
30. World Wildlife Fund--India
The Baroda Rayon Corp., Ltd
Hoechst House, 17th Floor
Nariman Point
Bombay 400 021, India
31. Himalayan Natural History Society
Kannar Bldg., Village Bangti
Engineghar Banjauli
Shimla, H.P. 171 006, India
32. Centre of Wildlife and Ornithology
Aligarh Muslim University
Aligarh 202 001, India
33. National Museum of Natural History
Barakhamba Road
New Delhi, India
34. Centre for Environmental Education
Nehru Foundation for Development
Thaltej Tekra
Ahmedabad 380 054, India
35. Zoological Survey of India
34 Chittaranjan Avenue
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38. Ministry of Environment
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39. Center for Research on Indian Ocean Marine Mammals
National Aquatic Resources Agency
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Colombo 15, Sri Lanka
40. Faculty of Fisheries
Bangladesh Agricultural University
Mymensingh, Bangladesh
41. National Parks Board
Department of Environment and Conservation
P.O. Box 6601
Boroko, N.C.D., Papua New Guinea
42. Nature Conservation and Wildlife Management (PH and PA)
Director General
Jalan Ir H. Juanda 9
Bogor, Indonesia
43. Brunei Museum
Attn: The Director of Museums
Ministry of Culture, Youth and Sports
Kota Batu
Bandar Seri Begawan
Brunei Darussalam (via Singapore)
44. Wildlife and National Parks
Komplek Pejabat-Pejabat Kerajaan
Block k-19, Jalan Duta
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45. World Wildlife Fund (WWF) Malaysia
8th Floor, Wisma Damansara
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P.O. Box 19769
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46. Ecological Society of the Philippines
c/o 53 Tamarind Road
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47. International Center for Living Aquatic Resources Management
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Makati, Metro Manila, Philippines
48. Tribhuvan University
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49. Ministry of Agriculture
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