Annex K

Report of the Standing Sub-Committee on Small Cetaceans

Members: Read (Chair), Baba, Beasley, Berggren, Bjørge, Borodin, Borsani, Branch, Braulik, Bravington, Brown, Brownell, Burnell, Cawthorn, Childerhouse, Cipriano, Da Silva, Dalebout, DeMaster, Ensor, Fossi, Fujise, Gibbs, S., Gill, Hakamada, Hammond, Haug, Hedley, Jefferson, Kasuya, Kawahara, Kemper, Kim, Kingsley, Kishiro, Kock, Kreb, Lauriano, Lawrence, Lens, Lento, Mandelc, Martin, McCulloch, Miyashita, Morishita, Murase, Nishiwaki, Northridge, O'Hara, Okamura, Palazzo, Palka, Parra, Pérez-Cortés, Perrin, Perry, Phillips, Rambally, Reeves, Reijnders, Reilly, Robineau, Rogan, Rojas-Bracho, Rose, Rosenbaum, Rowles, Ryan, Sakamoto, Sayeg, Senn, Simmonds, Slooten, Smith, B., Tamura, Tanakura, Taylor, Thiele, Trujillo, Urbán, Wade, Walters, Wang, Yamamura, Yoshida, Zeh.

1. ELECTION OF CHAIRMAN

Read was elected Chairman.

2. ADOPTION OF AGENDA

The adopted Agenda is given as Appendix 1.

3. APPOINTMENT OF RAPPORTEURS

Martin, Northridge and Rogan acted as rapporteurs.

4. REVIEW OF AVAILABLE DOCUMENTS

Documents relevant to the work of the sub-committee were: SC/52/SM1-34, SC52/O14, SC52/O24, Baird and Mounsouphom (1997), Borsani (1999), Parra and Corkeron (1999), Parsons and Wang (1998), Reeves *et al.* (2000), Smith and Smith (1998), Smith *et al.* (2001), Stacey and Arnold (1999) and Stacey and Leatherwood (1997).

5. REVIEW OF THE STATUS OF FRESHWATER CETACEANS

Freshwater dolphins and porpoises are among the world's most threatened mammal species (Reeves *et al.*, 2000). The habitat of these animals has been highly modified and degraded by human activities, often resulting in dramatic declines in their abundance and range. One species of freshwater cetacean, the baiji, exists only as a very small population and is considered to be in imminent danger of extinction (Reeves *et al.*, 2000). As its priority topic in 2000 the sub-committee considered the status of freshwater cetaceans, together with marine populations of the tucuxi, Irrawaddy dolphin and finless porpoise.

5.1 Irrawaddy dolphin

5.1.1 Distribution and stock structure

The Irrawaddy dolphin (*Orcaella brevirostris*) occurs in the tropical and subtropical Indo-Pacific, from the Bay of Bengal to northeastern Australia. It is a coastal species, but also occurs in several major river systems of southeast Asia including the Mahakam River systems in Indonesia, the Ayeyarwady (Irrawaddy) River systems of Myanmar, the Mekong River of Cambodia, Vietnam and Lao PDR (Stacey and Leatherwood, 1997; Stacey and Arnold, 1999). Information on putative stocks of this species is presented in Table 1.

SC/52/SM32 described research on this species in the Mahakam River and its associated lakes, and in nearby coastal waters of East Kalimantan, Indonesia. Density sampling and direct count surveys were conducted along the entire stretch of river, including tributaries, from the delta upstream to a rapids area; line-transect surveys were conducted in the lakes and along the East Kalimantan coastline and bays. The middle section of the Mahakam River and tributaries between Muara Kaman (180km from the mouth) and Melak (350km from the mouth) was identified as primary dolphin habitat. The distribution changes seasonally and is influenced by water levels and perhaps variation in prey availability. Dolphins move into tributaries during high water and back into the main river when water levels recede. Most sightings were made at confluences and river bends. An apparent hiatus exists in the lower reaches of the Mahakam system, with no dolphins seen or reported downstream of Loa Kulu (approximately 80km from the river mouth). Irrawaddy dolphins were also sighted along the East Kalimantan coastline.

SC/52/SM5 described the distribution of Irrawaddy dolphins in the upper reaches of the Ayerarwady River, Myanmar, between Bhamo and Mandalay based on a seven day ecotourism trip covering 360km in 1998. Sightings were concentrated in tributary convergences, near mid-channel islands (which create counter currents) and defiles. In a different section of the river, between Yangon and Bhamo, Anderson (1879) observed Irrawaddy dolphins no further downstream than Prome (360km from the sea) during the low-water season and Yenanyoung (540km from the sea) during the high water season, suggesting a range hiatus.

Fine-scale surveys of a small group of Irrawaddy dolphins were conducted in a small, deep pool (approximately 450m wide) in the Mekong River system in Lao PDR during the low-water season in March-April 1998 (Borsani, 1999). Dolphins were recorded both visually and acoustically.

SC/52/SM29 presented information on the distribution of Irrawaddy dolphins in the Malampaya Sound, Palawan. Vessel surveys and interviews with fishermen indicated that Irrawaddy dolphins were restricted to very shallow waters (< 3m) of the upper sound, close to the shore. No sightings were made during surveys of the adjacent Sulu Sea. Perrin reported that an earlier record for *Neophocaena* in the Turtle islands (Philippines) was, in fact, an *Orcaella*.

Smith *et al.* (2001) included information on the distribution of this species in coastal waters of southeast Bangladesh. Four to six Irrawaddy dolphins were observed between Cox's Bazaar and the mouth of the Karnaphuli River during January 1999. A 105cm neonate (dead) was recorded in February from the same area.

SC/52/SM33 reported preliminary studies of geographical variation in the cranial morphology of *Orcaella*. Skulls from Australia/Papua New Guinea (coastal marine waters) were measured and compared with skulls from marine and freshwaters of southeast Asia (Singapore, Thailand, Malaysia, Cambodia, Kalimantan, Myanmar, Brunei, India and Vietnam). The results of this work suggest that Irrawaddy dolphins in Australia/New Guinea and southeast Asia belong to separate forms. However, preliminary analysis found no significant differences in cranial morphometrics between freshwater and marine specimens.

5.1.2 Abundance

No statistically rigorous estimates of the abundance of this species are available from any portion of its range. The abundance of *Orcaella* is unknown or, at best, based on assessments made in small inshore or riverine areas. For coastal areas, very little information is available.

Parra and Corkeron (1999) reported a feasibility study on the use of photo-identification techniques to study Irrawaddy dolphins in Cleveland and Bowling Green bays in Northern Queensland, Australia. From December 1998 to November 1999, 78 boat-based surveys were conducted, resulting in 46 sightings. Mean group size for these encounters was 5.6 (±0.4) and a total of 38 individual adult dolphins were identifiable. All animals identified during 1998 were resighted in 1999, suggesting some degree of residency. It was concluded that, for this area, photo-identification techniques could be used to study this species. The sub-committee considered photo-identification a potentially useful tool for mark-recapture abundance estimation with this species, particularly if used in conjunction with other techniques. Photo-identification may be particularly useful for monitoring home ranges and movements of dolphins.

Information on the relative abundance of Irrawaddy dolphins in freshwater systems is restricted to small geographical areas. For example, during a survey of the section of the Ayeyarwady River between Bhamo and Mandalay (SC/52/SM5), between 55 and 70 individuals (best estimate 59) were counted, giving an encounter rate of 0.16 dolphins/km. Nine or 10 individuals, including two juveniles, were reported in a temporary pool in the Mekong (Borsani, 1999). Encounter rates and relative abundance estimates for the middle reaches of the Mahakam River in Indonesia were presented in SC/52/SM32. Encounter rates at medium, high and low water levels were 0.1 (CV = 13%), 0.042 (CV = 29%) and 0.158 (CV = 22%) dolphins per km. A minimum abundance estimate, based on surveys during the dry season, was 32 individuals.

5.1.3 Directed takes

Kreb and Beasley informed the sub-committee that recent live captures have occurred for the oceanarium trade in the Mahakam River and coastal regions of Indo-Malaysia. In both these areas there are also reports of direct killing. The sub-committee expressed concern about reports of live capture from small populations (e.g. Mahakam River system).

5.1.4 Incidental takes

Entanglement in fishing gear, particularly gillnets, has been reported from a number of areas (Table 1). There have been no systematic observer schemes in freshwater or coastal regions, but evidence of bycatch and the increase in the use of gillnets are causes for concern. In addition, fishing with explosives may adversely affect this species in some areas.

5.1.5 Habitat degradation

Habitat degradation may limit the distribution and abundance of Irrawaddy dolphins, particularly in freshwater. Dams (Baird and Mounsouphom, 1997), gold mining using mercury abstraction techniques (SC/52/SM5), increased sedimentation as a result of deforestation and other changes in river catchments, overfishing, harmful fishing techniques (poison and electrofishing), vessel traffic and noise pollution are all potential threats to this species. Coastal development with concomitant eutrophication (SC/52/SM29) is also a cause for concern.

5.1.6 Life history

The limited information existing on the life history of this species is summarised in Stacey and Arnold (1999). Gestation has been reported as 14 months, based on unspecified observations of captive animals. Length at birth is approximately 90cm. Maximum length is 2.75m. No new information on the life history of the Irrawaddy dolphin was presented to the sub-committee.

5.1.7 Ecology

Available information on diet was given in Baird and Mounsouphom (1965; 1977) and SC/52/SM32. Stomach content analysis of a small number of dolphins from the Mekong River revealed that this species eats cyprinid fish (e.g. *Cyclocheilichythyes enoplos, Cirrhinus lobatus*) and silurid catfish. SC/52/SM32 reported observations of dolphins chasing and capturing fish in the Mahakam River and identified a variety of fish species as potential prey items, including lais (*Crytopterus apagon*) and patin (*Pangasius polyuranodon*).

5.1.8 Other

No other information was presented to the sub-committee.

5.1.9 Status

The status of the Irrawaddy dolphin, for all of the areas examined, is largely unknown. The IUCN considers this species as 'data deficient'. Irrawaddy dolphins occur in only a few freshwater systems and in estuaries and nearshore marine waters. Densities appear to be low in most areas and several populations are believed to be seriously depleted and threatened with extirpation, particularly in freshwater areas of their distribution (Table 1).

The sub-committee **recommended** that further investigations be carried out using morphometric and genetic techniques to better elucidate stock structure over the

Table 1

Summary information regarding the status of the Irrawaddy dolphin (*Orcaella brevirostris*).

	Range	Abundance	Removals	Threats	Status	References
Mahakam (freshwater)	Mahakam river system, Kalimantan, Indonesia	33-50 counted in 1999	Since 1997: 7 taken for oceanaria, 3 killed; 12 bycaught and 2 struck by vessels	Bycatch; live capture; habitat degradation; vessel traffic	Reduction in range; reportedly depleted and declining	SC/52/SMWP4 Kreb, pers.comm.
Mekong (freshwater)	Mekong river system, Laos, Cambodia, Thailand (?) and Vietnam	Uncertain but thought to be low	1990-96, 24 bycaught in northern Cambodia and Laos	Bycatch, high dams (proposed)	Unknown but reportedly depleted and declining	Smith *et al*., 1997
Ayeyarwady (freshwater)	Ayeyarwady river system, Myanmar	55-70 counted in upper reaches (360km) in 1998	Unknown	Bycatch, possible mercury poisoning	Unknown	SC/52/SM5
Chilka (freshwater)	Chilka Lake, India	Rare	Unknown	Intensive fishing in lake entrance reinforces isolation. Bycatch, increasing sedimentation	Unknown but reportedly depleted and declining	Dhandapani, 1992
Songkhla (freshwater)	Songkhla Lake, Thailand	9 counted in 2000 during partial survey	Since 1990, 27 incidental mortalities reported	Intensive fishing in lake entrance reinforces isolation. Bycatch.	Interviews indicate a reduction in abundance and range. Intense fishing effort	Beasley, pers. comm.
Australia/New Guinea (marine)	Australia, Papua New Guinea and West Papua, Indonesia	Minimum 35 in Cleveland Bay, Townsville in 1999. Questionable estimate 1,000 (1989) in the western Gulf of Carpentaria, Australia	Unknown numbers taken in shark nets and gillnets	Shark nets and inshore gillnets; coastal development	Unknown	Freeland and Bayliss, 1989
Indo-Malay (marine)	Indonesia, Malaysia, Thailand, Cambodia Vietnam, Myanmar, Bangladesh, India, Singapore	Unknown	Live capture and hunting of unknown magnitude. Bycatch of unknown magnitude	Inshore gillnets; coastal development	Unknown	Beasley, pers. comm.
Malampaya (marine)	Malampaya Sound, Palawan, Philippines	20-50 estimated in 1999	Small reported bycatch	Bycatch and eutrophication	Unknown	SC/52/SM29

Table 2

Summary information regarding the status of the Boto (*Inia geoffrensis*).

Stock	Range	Abundance	Removals	Threats	Status	References
Amazon River Basin	Upper Amazon (Ecuador)	No information	No information	Oil spills from pipeline	Declining	SC/52/SM6
	Upper Amazon (Colombia)	No information	23 in 10 year	Bycatch, shooting, poisoning, pollutants	Unknown	SC/52/SM7; SC/52/SM13
	Upper Amazon (Peru)	No information	Unknown	Poisoning, bycatch	Unknown	Leatherwood, 1996; SC/52/SM13
	Central Amazon (Brazil)	No information	Unknown	Bycatch, pollutants, hydroelectric dams	Unknown	SC/52/SM13
	Lower Amazon (Brazil)	No information	Unknown	Bycatch, pollutants, hydroelectric dams	Unknown	SC/52/SM13
	Tucuruí Dam (Tocantins River)	No information	Unknown	Fragmentation of population	Unknown	Best and da Silva, 1989
	Serra da Mesa Dam (Tocantins River)	*Ca* 10 botos below dam; no information above dam	No information	Fragmentation of population and depletion of population below dam	Unknown	da Silva pers. comm.
	Lageado Dam (Tocantins River)	No information	No information	Fragmentation of population and depletion of population below dam	Unknown	da Silva, pers. comm.
	Balbina Dam (Uatumã River)	No information	Unknown	Fragmentation of population; small numbers of botos isolated above the dam	Unknown	da Silva, pers. comm.
	Curuá-Una dam (Curuá-Una River)	No information	Unknown	Fragmentation of population; small numbers of botos isolated above the dam	Unknown	
Bolivia	Beni/ Mamoré River Systems	No information	Unknown	No information	Unknown	SC/52/SM6; SC/52/SM13
Orinoco River Basin	Upper Orinoco (Colombia)	No information	20/4 years	Bycatch, shooting, pollution, oil spills	Unknown	SC/52/SM7
	Upper Orinoco (Venezuela)	No information	Unknown	Fisheries Interactions, pollutants	Unknown	McGuire and Winemiller, 1998; SC/52/SM7
	Lower Orinoco	No information	No information	No information	Unknown	
	Guri Dam (Caroni River)	No information	No information	Apparent depletion in the low reaches of the river	Unknown	Best and da Silva, 1989

geographical range of Irrawaddy dolphins and to examine potential differences between freshwater and marine habitats.

Given the paucity of data on distribution and abundance, the sub-committee **recommended** that comprehensive surveys be conducted to assess the abundance, distribution and habitat quality of Irrawaddy dolphins, with special emphasis on their fresh- and brackish-water range. The sub-committee also **recommended** that a review be carried out of the distribution and habitat preferences of the Irrawaddy dolphin in marine systems and to define oceanographic, bathymetric and biological features associated with high density areas.

Given the likely precarious status of these animals throughout their range, the sub-committee **recommended** an immediate cessation of live captures until affected populations have been assessed using accepted scientific practices.

The sub-committee expressed concern about increases in fishing effort, particularly with gillnets, in some parts of the range of this species. Given the apparently small size of some populations, some bycatches in these fisheries may be unsustainable. The sub-committee **recommended** that appropriate bycatch mitigation strategies be developed for use with this species.

5.2 Boto

SC/52/SM13 summarised published information and recent work on this species.

5.2.1 Distribution and stock structure

The boto (*Inia geoffrensis*) occurs throughout much of the Amazon and Orinoco watersheds, and in the Beni River system in Bolivia (Table 2). SC/52/SM13 tabulated existing records, both sightings and collections, of this species in Bolivia, Brazil, Colombia, Venezuela, Peru and Ecuador. SC/52/SM7 described the distribution of the species in the Amazon and Orinoco basins in Colombia.

Canonical discriminant analysis of skull characteristics by Da Silva (1994) has suggested the existence of three taxa, one in each of the major river systems. Bolivian animals exhibit clear differences in the number of teeth and other skull characteristics which enable them to be distinguished from Amazon and Orinoco animals. Genetic studies by Banguera, as yet unpublished, support this distinction. SC/52/SM7 pointed out that some apparent barriers between the Orinoco and Amazon systems were in fact passable by *Inia* seasonally. Animals in the Orinoco may thus have some limited exchange with those in the Amazon and it appears that a more complete separation exists between the Amazon and Beni systems. Boto in the Beni system may, in fact, constitute a separate species (Da Silva, 1994) although, at present, a single species is recognised. The sub-committee acknowledged that this was still an unreconciled issue and awaited the publication of the genetic work.

SC/52/SM15 described seasonal variation in distribution investigated at one site in the central Amazon of Brazil. Preliminary results show that most animals generally move only a few tens of kilometres between high and low water seasons. However, of more than 160 marked animals, three had been re-sighted more than 100km from the tag site.

In the central Amazon, large changes in water levels affect the local distribution of botos. A 10-15m increase in water level during the wet season leads to the inundation of large areas of forest. SC/52/SM15 noted that botos move out of the main river into channels and small lakes, and then into the forest itself, as the water rises.

There are 10 major dams at present in the Amazon basin, of which eight have isolated populations upstream. Some of these dams have, therefore, fragmented the population, but these fragments are still probably quite large (Table 2).

5.2.2 Abundance

There are few rigorous estimates of abundance in any area, but numerous reports have been made of minimum counts, encounter rates or densities for specific river stretches. SC/52/SM13 summarised such data throughout the range, but points out that differences in survey methodology, river morphology and hydrology make any meaningful comparisons between the numerous studies extremely difficult. Nevertheless, the density estimates for a 120km section of the Colombian Amazon are among the highest for any cetacean.

SC/52/SM15 described attempts to apply existing survey techniques to the study area. Working in a 30km stretch of channels and lakes, minimum counts were made to provide repeatable estimates of local density. Estimates of up to 25 animals per km^2 have been made during the dry season when animals are aggregated in the channel. In the river itself a strip transect method was employed, since it was found that virtually all botos are aggregated along the river's edge. Typical densities were around 0.6 animals per linear km. These compare with values of 2.0-4.8 reported by Vidal *et al.* (1997) in surveys of much narrower portions of the river upstream, suggesting that river width may not influence the number of botos it can hold. Trujillo pointed out that in some areas there may also be sandbars in central parts of the river, and that botos may also aggregate along such features away from the river bank during the low water season.

Reliable information on population trends is lacking. Trujillo informed the sub-committee that human population growth in the upper reaches of the Meta and other rivers in Colombia might have led to declines in dolphin populations. Overall, however, population densities of this species appear to be relatively high throughout much of its range.

5.2.3 Directed takes

There are no measures of the magnitudes of directed takes, and SC/52/SM13 reported no commercial hunting of *Inia* in Brazil. There are some records of body parts and oil being marketed but these are likely the result of incidental catches in nets. SC/52/SM7 also reported some trade in oil and body parts of *Inia*, but again the main source of mortality seems to be due to interactions with fisheries. In the Colombian Amazon some fishermen have killed *Inia* (including harpooning, shooting and deliberate poisoning) to deter gear interactions. In the Orinoco system and Peruvian Amazon there are also reports of some deliberate killings apparently due to interactions with fisheries.

5.2.4 Incidental takes

Most reports of anthropogenic mortality of this species involve incidental capture in fisheries. SC/52/SM7 and SC/52/SM13 reported that fishing activity is increasing throughout Colombia and Brazil. SC/52/SM7 reported 22 dead *Inia* collected from an 80km stretch of the Colombian Amazon over ten years, most of which had been the result of net entanglement. In the Orinoco study area, five of the 14 dead animals collected over a five-year period were the result of entanglement. Many fishermen in Colombia and Brazil believe that *Inia* are responsible for removing and damaging netted fish. SC/52/SM7 reported that when damaged fish were examined in detail, only a few exhibited tooth rakes attributable to *Inia*. Martin and Da Silva noted that there did not seem to be a very high level of incidental mortality in the study area, and that *Inia* appear to be adept at avoiding nets.

In general, incidental mortalities of this species appear to be seasonal and patchily distributed throughout its range. There are no estimates of total incidental mortality, and all accounts are anecdotal. It was agreed that, in the absence of any information on total numbers taken or total population size, it was impossible to assess the significance of this source of mortality. The sub-committee recognised that it would be extremely difficult to obtain reliable estimates of incidental mortality because of the small-scale nature of the fisheries involved. A more sensible approach to the issue might be, in the first instance, to try to determine the scale of incidental mortalities in different types of fishing gear in different regions.

5.2.5 Habitat degradation

Several issues were raised under this heading. Oil exploration and production were identified as a potential threat to *Inia.* Trujillo reported that in Colombia there had been many oil spills in recent years as a result of the ongoing guerilla war in the upland regions. Some of these had been very extensive, and represented a potential threat that had not been quantified. Anecdotal accounts of a decline in numbers in Ecuador were reported in SC/52/SM6. These reported declines had been linked to oil spills in the region, though the sub-committee noted that fluctuations in numbers would also be expected due to water level fluctuations, and that the sightings data presented in SC/52/SM6 did not support the suggestion of a decline in abundance. Nevertheless, the sub-committee expressed its concern at accounts of such large-scale oil spills into the fluvial environment, and suggested that further work might be done to clarify the effects of such spills on river dolphin populations.

Human populations are expanding rapidly in many areas of the range of the boto, especially in Colombia and Brazil. Such population increases result in increased agriculture, deforestation, cattle ranching and the establishment of plantations. The effects of these changes on the ecology of *Inia* have not been assessed but some impact might reasonably be expected. *Inia* has a high degree of cultural importance to many of the indigenous people of the area, but the influx of new people to the region was eroding this respect, and increasing conflicts should be expected. Despite these observations, in some areas such as Ecuador and Bolivia, human pressures remain fairly low, and densities of *Inia* appear to be high for the present throughout much of its range.

Hydroelectric schemes are also a potential threat to *Inia*. In Brazil there are now six small dams and four large ones, but another 70 have been planned. As yet there are no plans to dam the Orinoco or Amazon in Colombia. Based on the experience in Asia, it is to be expected that dam developments will lead to further fragmentation of *Inia* populations, and probably subsequent population decline. Furthermore, the water areas behind dams provided an impoverished environment for *Inia*, with lower oxygen concentrations, lower pH levels and fewer fish, as well as high levels of mercury deposition from gold mining activities further upstream. This results in toxic concentrations of mercury in some of the fish present in these lakes, which might present another threat to *Inia*, as well as to humans, though as yet this threat has not been quantified. The sub-committee expressed its concern about the potential threat that mercury contamination might pose and suggested that further work might be coordinated with current WHO funded analyses of the effects of this contamination on human health.

Smith drew a comparison with Asian river systems where a proliferation of barrages and dams has led to population fragmentation, and where a register of dams and barrages has now been established to try to understand how these structures might be affecting the meta-population. The sub-committee agreed that this would be a sensible approach to adopt with the river systems inhabited by the boto.

5.2.6 Life history

SC/52/SM15 provided some preliminary information on life history parameters from the study site near Tefe. A number of individual females are being followed in the study area, and reproductive data have been collected for about 40 mature females. Age at first parturition is estimated to be between 6 and 10 years of age, and inter-birth intervals are typically 4-5 years. Some females appear not to have reproduced over the five years of the study, while others have produced two calves. The annual pregnancy rate of mature females is around 10-15%. Further information from other areas in the Amazon was presented in SC/52/SM13. Birth occurs after peak water levels during the wet season, when waters are beginning to recede and fish concentrate in the channels and rivers. Females give birth to a single calf, and the estimated gestation period is 11 months. There was some evidence of simultaneous pregnancy and lactation.

It was previously believed that there was no sexual dimorphism in this species (Best and Da Silva, 1984), but males are in fact larger than females. The generally solitary nature of the species suggests either a polygynous or promiscuous mating system. Group size varies with ecological conditions, and although the species is predominantly solitary, aggregations of three or more individuals have been described in some locations in the Amazon, while Trujillo reported that groups of 4-7 individuals were the most frequent in the Orinoco and Arauca rivers.

5.2.7 Ecology

No information on feeding was presented, but SC/52/SM13 and SC/52/SM15 stressed the importance of the flooded forest in the ecology of botos in the central Amazon. For four months of the year animals forage in the inundated forest; during the rest of the year, they feed in rivers, channels and lakes. Throughout the year, botos prey largely on fish that rely on the annual forest flood.

5.2.8 Other

No other information was presented on this species.

5.2.9 Status

The IUCN considers the boto to be ‘vulnerable’. Populations of the boto appear to be large and, at present, there is little or no evidence of any decrease in numbers or range. The sub-committee noted the increasing human pressures on the region, and recognised that future anthropogenic effects are to be expected, with declines in range and population fragmentation the most likely consequences. The Asian river dolphins provide a model for the possible effects of increased human populations and dam construction. The sub-committee therefore agreed that there is a need for appropriate monitoring schemes and formulated its recommendations accordingly.

The sub-committee **recommended** that work on stock structure of *Inia* be conducted and existing studies should be brought to publication as soon as possible.

The sub-committee **recommended** that a registry of the distribution of this species should be established, recording in which waterways botos are present, and the locations of all existing and proposed dams and other large-scale engineering works. Information on other potential threats, such as the scale of fishing operations and the locations of oil pipelines might also usefully be included where practicable.

For each population, the sub-committee **recommended** that research should be directed towards detecting trends in abundance or any diminution of range, and identifying causes of any declines. Trends in abundance should be documented by making repeatable, statistically rigorous estimates of density in a range of regions and habitats.

The most significant anthropogenic impact on this species at present appears to be mortalities in fishing operations. These are either entirely incidental (entanglement) or to a greater or lesser extent deliberate, as fishermen are reportedly poisoning botos with baited fish, to limit net depredation, and also shooting and otherwise killing animals found in or near to nets. The sub-committee **recommends** that information should be collected to allow evaluation of the relative levels of mortality, both indirect and direct, associated with different fishing methods.

5.3 Tucuxi

SC/52/SM14 reviewed the available information on the tucuxi (*Sotalia fluviatilis*), including recent unpublished work. The sub-committee noted that relatively little information was available at this meeting on the tucuxi in marine ecosystems, although research on this form was currently being undertaken in several regions of South America.

5.3.1 Distribution and stock structure

There are still some unresolved aspects of taxonomy regarding *Sotalia*. Two forms of the same species are currently accepted, a marine and a freshwater form. Skull morphometrics and preliminary genetic work suggest that there may be two species, though sample sizes are still small. The sub-committee agreed to wait for the completion of the genetic analyses before considering the matter further.

The freshwater form of *Sotalia* is thought to be endemic to the Amazon freshwater system, but may also occur in the Orinoco system. It is widespread throughout much of Brazil, extending upstream into Peru, Ecuador, Colombia and parts of the Orinoco in Venezuela (Table 3). It is not clear whether the marine or freshwater form inhabits the Orinoco. The marine form often penetrates freshwater systems and the boundary between the two forms is not well defined.

Movements and migration are not well known, but current work in the Brazilian Amazon demonstrates that a few individuals were present repeatedly in the same area over a period of at least three years, indicating some form of residency. Photo-identification work at the Amazon River in Colombia also suggests some residency there (SC/52/SM8).

5.3.2 Abundance

There are no estimates of abundance for any population, although the species appears to be relatively abundant throughout its range. Numerous estimates exist of relative abundance in small areas, such as minimum number sighted, encounter rate and estimates of minimum density. These were summarised in SC/52/SM14. Estimates of density have ranged from 1.02-2.7 individuals per linear km in different studies in the Amazon and Orinoco, to 2.8 or 8.6 individuals per linear km in the upper Amazon (Vidal *et al.*, 1997). SC/52/SM6 presented some anecdotal evidence of population decline in Ecuador.

5.3.3 Directed takes

There are no records of past or present commercial fisheries directed at this species, nor any evidence of direct capture for human consumption in the Amazon. Some body parts are seen for sale but these are usually from incidental catches. The marine tucuxi has been taken for public display in oceanaria (SC/52/SM8).

5.3.4 Incidental takes

Most reported mortality is due to accidental entrapment in fishing gear. Fishing pressure has grown in recent years, but fishermen usually release tucuxi alive. The most pressing problems involve the use of small drift nets and fixed gillnets. The mesh size of some nets used for large catfish is also appropriate to catch tucuxi, for example, and drift nets are often set in mid-stream where tucuxi forage, so that when they are taken they are often caught in groups. There are no reliable estimates of total numbers taken anywhere, but anecdotal evidence suggest that large bycatches are not common in the central Amazon. Martin and Da Silva noted that, in their experience, *Sotalia* appears to be more vulnerable to mortality in gillnets than *Inia*.

In the Amazon estuary, however, large numbers of tucuxi are taken in gillnet fisheries. Beltrán (1998) recorded 938 animals taken in drift nets from the port of Arapiranga during the summer of 1996 and a further 125 taken during the winter. These data were collected by interviewing fishermen in the port after trips and collecting carcasses. The animals were generally large and may therefore have been the marine form, but this has not yet been confirmed. The sub-committee expressed its concern about the magnitude of these catches.

The sub-committee recognised that incidental catches of tucuxi are widespread, and noted that merely because little information is available on this matter does not mean that problems do not exist.

5.3.5 Habitat degradation

In Colombia, coastal developments and chemical pollution have led to habitat degradation that may affect the marine form of tucuxi (SC/52/SM8). Throughout the Amazon, human population growth and consequent forest clearance, oil and mercury contamination and dam construction are all potential threats to this species.

5.3.6 Life history

Life history information is sparse and limited by small sample sizes. Females appear to reach sexual maturity at lengths of between 128 and 138cm. Births occur during the low water season. Gestation appears to last for 10-11 months and calves are between 71 and 83cm at birth. Adult males have seasonally active and large testes with a combined testis mass of up to 5% of total body mass (Best and Da Silva, 1984). This is a gregarious species with individuals occurring in small groups.

5.3.7 Ecology

The tucuxi is sympatric with the boto throughout its range. The species is piscivorous.

Table 3

Summary information regarding the status of the Tucuxi (*Sotalia fluviatilis*).

Stock	Range	Abundance	Removals	Threats	Status	References
Amazon River Basin	Upper Amazon (Ecuador)	Rare	No information	Oil spills from pipeline	Declining	SC/52/SM6
	Upper Amazon (Colombia)	Abundant	9 in 7 years	Bycatch, pollution, habitat degradation	Unknown	SC/52/SM7; SC/52/13
	Upper Amazon (Peru)	Abundant	Unknown	Poisoning, bycatch	Unknown	Leatherwood, 1996; SC/52/SM13
	Central Amazon (Brazil)	Abundant	Unknown	Bycatch, pollutants	Unknown	SC/52/SM13
	Lower Amazon (Brazil)	Abundant	1,163 (Oct. - Dec. 1996)	Bycatch, pollutants	Unknown	SC/52/SM13

Table 4

Summary information regarding the status of the Indus susu (*Platanista gangetica minor*)[1].

Stock	Range	Abundance	Removals	Threats	Status	References
Sukkur-Guddu	Sukkur-Guddu barrages, Sindh Province	458	Since 1992, at least 12 died in irrigation canals	Movements interrupted partially or completely by barrages. Entrapment in irrigation canals. Unquantified bycatch and direct catches. Water extraction	No reliable information	SC/52/SM4; SC/52/SM9
Guddu-Taunsa	Guddu-Taunsa barrages, Punjab Province	143	Unknown	Movements interrupted partially or completely by barrages. Unquantified bycatch and direct catches. Potential for entrapment in irrigation canals. Water extraction	No reliable information	SC/52/SM4; SC/52/SM9
Taunsa-Chashma	Taunsa-Chashma barrages, Punjab Province	39	Unknown	Movements interrupted partially or completely by barrages. Unquantified bycatch and direct catches. Potential for entrapment in irrigation canals. Water extraction	No reliable information	SC/52/SM4; SC/52/SM9
Taunsa-Jinnah	Taunsa-Jinnah barrages, Punjab and NWF provinces	Unknown but thought to be very low. Two dead animals reported in 1999	Unknown	Movements interrupted partially or completely by barrages	No information	Braulik, pers. comm.

[1] Dolphins have been extirpated downstream of the Sukkur Barrage and upstream of the Jinnah and Panjnad barrages.

5.3.8 Other
No other material was presented to the sub-committee.

5.3.9 Status
The species is classified as 'data deficient' by the IUCN. The tucuxi is abundant and widely distributed in the central Amazon, but there are no estimates of total population size. *Sotalia* is vulnerable to the same threats that apply to *Inia*, including fisheries entanglement, habitat deterioration and fragmentation of populations by dam construction. The large numbers of animals taken as incidental catches in the Amazon estuary are a cause for concern, though it is not yet clear which form of *Sotalia* these represent. Little information exists regarding the marine form of this species, and in many areas, such as the Orinoco, it is not clear which form exists. At present, the two forms of the tucuxi should be considered as separate populations for conservation purposes.

The sub-committee **recommended** that research be directed towards detecting trends in abundance by making repeatable and statistically rigorous estimates of density in a range of regions and habitats.

The sub-committee **recommended** that information be collected to allow evaluation of the relative levels of incidental mortality of the tucuxi associated with different fishing methods.

The sub-committee also **recommended** that research be directed to determine which form of tucuxi occurrs in areas such as the Orinoco and Amazon estuaries.

5.4 Indus susu
Most of the information below derives from SC/52/SM4.

5.4.1 Distribution and stock structure
The Indus susu or bhulan (*Platanista minor*) is endemic to the Indus river drainage system. Although historically distributed throughout the Indus river mainstem, and in the Sutlej, Ravi, Chenab and Jhelum tributaries (Anderson, 1879), it is now limited to the mainstem in three areas located between the Chashma-Taunsa, Taunsa-Guddu and Guddu-Sukkur barrages (Reeves and Chaudhry, 1998; Reeves, 1998; see Table 4). A few scattered individuals may still occur upstream of the Chashma Barrage in the Indus and downstream of the Trimmu, Sidhnai and Panjnad barrages in the Chenab, Ravi and Sutlej rivers, respectively (Niazi and Azam, 1988; Chaudhry and Khalid, 1989; Reeves *et al.*, 1991).

Animals in each of the three main groups may be isolated from each other, or may occasionally receive 'recruits' from upstream if dolphins pass through barrage gates. It is highly unlikely that upstream movement occurs across barrages. The sub-committee considered the question of cross-barrage movement to be important in several contexts, and noted that it could be addressed using radio telemetry techniques.

5.4.2 Abundance
Direct-count surveys of the main distribution areas have been conducted regularly by the Sindh and Punjab wildlife agencies since the early 1980s. Reeves and Chaudhry (1998) recommended that the counts from these surveys be considered as 'no more than rough indicators of abundance' because described methods do not provide a basis for evaluating bias or estimating precision. The potential for permanent downstream migration of individuals further complicates analyses of survey data.

The largest sub-population is located in the Sindh Dolphin Reserve between the Guddu and Sukkur barrages at the downstream end of the species' range. The count for this segment in April/May 1996 was 458 individuals (Mirza and Khurshid, 1996). The second largest sub-population is located between the Taunsa and Guddu barrages, and the count here was 143 individuals in December 1996. The count for the sub-population at the upstream end of the species' current range between the Chasma and Taunsa barrages in December 1996 was 39 individuals. No dolphins were found during surveys below the Sukkur barrage in May/June 1996 (Mirza and Khurshid, 1996). A few scattered individuals may remain upstream of the Chasma and Panjnad barrages (Reeves *et al.*, 1991). Reeves (1998) interpreted the counts reported above to indicate a total of approximately 600-700 individuals for the species as a whole.

5.4.3 Directed takes
Deliberate killing for meat and oil was a traditional practice until at least the early 1970s (Pilleri and Zbinden, 1973; Pilleri, 1980). Hunting is now banned but poaching still occurs occasionally (Reeves *et al.*, 1991; Reeves and Chaudhry, 1998).

5.4.4 Incidental takes
Incidents of accidental killing and observations of dolphin carcasses and products are documented in Reeves *et al.* (1991) and Reeves and Chaudhry (1998). Little detailed information is available, but the level of take is not thought to be high, even though the Indus susu is vulnerable to gillnets. Permanent losses from the population also occur when animals swim into irrigation channels (SC/52/SM9). Since 1992 there have been reports of one or two dolphins becoming trapped in these channels annually, but ten were recorded in the winter of 1999/2000. Braulik reported that five of these animals were subsequently rescued and released back into the main river. The prolonged rescue and transport operations, carried out successfully with rudimentary equipment, indicated that this species is robust to handling out of water. Mechanisms are being put in place to expand and improve the capability of rescue operations. It is unclear whether the increase in entrapment reports was due to a real increase in entrapment or to greater public and official awareness of the problem. In either case, the sub-committee agreed that such losses could pose a significant threat to the viability of the population from which they came.

5.4.5 Habitat degradation
The most significant cause of decline in this species is habitat fragmentation and loss brought about by the construction of numerous irrigation barrages (Reeves *et al.*, 1991). Due to water abstraction, the Indus River becomes virtually dry in several places in the low-water season, especially downstream of the Sukkur Barrage, thereby eliminating suitable habitat in the lower reaches (Reeves *et al.*, 1991; Mirza and Khurshid, 1996). The greatest threat to the survival of the Indus susu is probably the continuing decline in water supply due to the construction of new diversion structures (e.g. the Ghazi-Gariala (Barotha) Dam in the upper Indus) and from increasing extraction from aquifers. Increasing human populations and both industrial and agricultural development in the area immediately surrounding this dolphin's range will inevitably lead to even greater habitat loss or damage.

Pollution may also be affecting the viability of the species, especially considering the decline in the flushing effect of moving water above barrages. Mercury and arsenic concentrations sampled from fish above the Guddu Barrage were high (Tariq *et al.*, 1996). Massive fish kills have apparently become common from industrial pollution in urban areas and the use of pesticides in the irrigated crops grown along the riverbank (Reeves and Chaudhry, 1998).

5.4.6 Life history

No detailed studies of the life history of Indus river dolphins have been conducted. The close taxonomic relationship, similar habitat and geographic proximity of this species and *P. gangetica* implies that their life history characteristics are probably similar.

5.4.7 Ecology

Little relevant information is available on the ecology of the Indus susu. The range of the species now overlaps with no other cetacean.

5.4.8 Other

The sub-committee noted plans for research and conservation efforts described in SC/52/SM3 and SC/52/SM10. It commended and supported programmes which would improve the conservation status of this endangered species either directly or through appropriate research.

5.4.9 Status

The dramatic decline in the range of the species, from the historical distribution mapped by Anderson (1879) of approximately 3,500km of river length to a range of less than 700km of river length (Reeves *et al.*, 1991), occurred presumably after the mainstem and major tributaries were segmented by barrages built between the 1930s and early 1970s. This implies a decline in abundance, especially considering that carrying capacity within the current range has likely decreased. The diminishing water supply and the consequent reduction in available habitat implies a continuing population decline.

The IUCN lists the Indus susu as ‘endangered’. The species has a low absolute abundance and a reduced and geographically fragmented range. The sub-committee concluded that there was no prospect of improvement in the quality of its habitat in the foreseeable future, and indeed every indication was that the status of this species would worsen still further.

The sub-committee commended the Sindh Wildlife Department for their initiative to return Indus dolphins to the Indus River from irrigation canals and **recommended** that future operations be conducted with application of a protocol that has been reviewed by specialists with prior experience of the capture and safe release of cetaceans. Opportunities for conducting conservation-oriented research on rescued animals should be fully utilised. Priority should be given to monitoring survival and movement of released animals, particularly with regard to the effects of barriers and irrigation canals.

The sub-committee **recommended** research be conducted to elucidate the possible effects of barrages and canal gates on dolphin movements, paying particular attention to the design of these structures.

The sub-committee commended the efforts of the Sindh and Punjab Wildlife Departments in conducting annual counts of dolphins in the Indus River, and **recommended** that surveys be further coordinated and standardised, so that conservation strategies can be prioritised and pursued at the metapopulation level. Surveys should include a strong emphasis on identifying and assessing the availability of suitable habitat and the distribution and magnitude of threats.

5.5 Ganges susu

Most of the information below is derived from SC/52/SM4.

5.5.1 Distribution and stock structure

The Ganges susu (*Platanista gangetica*) occurs throughout most of the Ganges and many of its tributaries, from the delta to below the Bijnor Barrage. A population in the Karnaphuli and Sangu Rivers of Bangladesh may be isolated from that in the Ganges unless there is a movement of animals along the coast of the Bay of Bengal (Smith *et al.*, 2001). The complete range includes parts of India, Nepal and Bangladesh. The linear extent of the susu’s distribution in the Ganges mainstem appears to have diminished by some 100km since the 19th century (Anderson, 1879), and hundreds of kilometres of tributary habitat have been lost due to reduction in water flow below irrigation barrages. The species is fragmented into at least eight sub-populations by dams and barrages (Table 5).

5.5.2 Abundance

Although the aggregate range-wide abundance of Ganges river dolphins was estimated by Jones (1982) as 4,000-5,000 individuals and more recently by Mohan *et al.* (1997) as fewer than 2,000 individuals, these were no more than educated guesses. Population assessment has generally been based on counts of dolphins on relatively small segments of rivers, with no estimates of precision. Results of recent surveys were reviewed in SC/52/SM4, which reported encounter rates of 0.2-0.5 dolphins per km of river, though some smaller tributaries were apparently devoid of susus. An encounter rate of 0.76 dolphins per km was reported for the geographically separate Karnaphuli-Sangu system with a higher rate of 1.36 dolphins per km for the lower Sangu (Smith *et al.*, 2001).

5.5.3 Directed takes

Deliberate killing of susus is believed to have declined in most areas but still occurs in the middle Ganges near Patna, India (Smith and Reeves, 2000), in the Kalni-Kushiyara River of Bangladesh (Smith *et al.*, 1998) and in the upper reaches of the Brahmaputra River in Assam, India (Mohan *et al.*, 1997). Dolphins are killed in the upper Brahmaputra for their meat and by fishermen in the middle reaches of the Ganges for their oil, which is used as a fish attractant (Smith and Reeves, 2000). The magnitude of direct take in recent years is unknown, but probably not high.

5.5.4 Incidental takes

Accidental killing is a severe problem for Ganges River dolphins throughout most of their range (Smith and Reeves, 2000). The primary cause is believed to be entanglement in fishing gear, most often nylon gillnets (Mohan, 1995). Ganges River dolphins may be particularly vulnerable to entanglement in gillnets because their preferred habitat is often in the same location as primary fishing grounds. No rigorous estimates of dolphin mortality have been published but the problem of accidental killing is expected to worsen as the demand for fish and for fishing employment increases.

5.5.5 Habitat degradation

Construction of at least 50 dams within the known or suspected historic range of susus (see Smith *et al.*, 2000) has dramatically affected their habitat, abundance and population structure. Dolphins have apparently been extirpated between the Madhya Ganga Barrage (low gated dam) at Bijnor and the Bhimgoda Barrage near Haridwar, at the farthest upstream extent of their historic range (Sinha *et al.*, 2000). Elsewhere in the Ganges mainstem, there are four extant sub-populations isolated by barrages, including the Farakka Barrage located at the approximate centre of the species range. The Kaptai dam has fragmented the population in the Karnaphuli-Sangu river system of Bangladesh and there no longer appears to be a viable population remaining upstream (Smith *et al.*, 2001).

In addition to fragmenting dolphin populations, dams and barrages degrade downstream habitat and create reservoirs with high sedimentation and altered assemblages of fish and invertebrate species. Luxuriant growth of macrophytes and excessive siltation have eliminated suitable habitat immediately above the Farakka Barrage (Sinha, 2000). The insufficiency of water released downstream of the barrage has eliminated dry-season habitat for more than 300km, or until the Ganges (Padma)-Brahmaputra confluence (Smith *et al.*, 1998) and resulted in salt water intruding an additional 160km into the Sundarbans Delta (Rahman, 1986), further decreasing the amount of suitable habitat for this obligate freshwater species (Reeves *et al.*, 1993).

A high dam is planned just upstream of the dolphins' current range in the Karnali River, Nepal. If built, the structure is expected to cause the extirpation of dolphins from the last river to have a potentially viable dolphin population in Nepal (Smith and Reeves, 2000). Disturbance and environmental degradation associated with geotechnical feasibility studies and bridge and road construction for the dam have already led to a decline in the number and range of dolphins above the Nepal-India border (Smith, 1993; Smith *et al.*, 1994). A high dam has been proposed for the Surma River in Cachar, India, which will certainly affect dolphins downstream in the Kalni-Kushiyara distributary (Smith *et al.*, 1994).

Approximately 3,500km of embankments have been constructed in the Ganges mainstem and Gandak, Buri Gandak, Bagmati, Kamala, Yamuna and Son tributaries (Mishra, 1999). Embankments cause sediments to be deposited in the riverbed instead of on the floodplain, thereby eliminating the eddy-counter currents where the dolphins are generally found (Smith *et al.*, 1998). They also restrict access to floodplain habitat critical to the reproduction and growth of riverine fish species (Boyce, 1990). Dolphins were apparently extirpated from at least 35km of the Punpun tributary of the Ganges after embankments were constructed in 1975 (Sinha *et al.*, 2000). Although plans for constructing an extensive system of embankments in the rivers of Bangladesh under the Flood Action Plan (FAP) coordinated by the World Bank (see World Bank, 1990) have been drastically scaled-down, several embankment projects are currently planned or being constructed that will have deleterious effects on dolphin habitat. Environmental assessments of these projects have not considered river dolphins, or the cumulative impacts of planned embankments and others built before the FAP, on the fish and crustacean species they prey upon.

Other sources of habitat degradation include dredging (Smith *et al.*, 1998) and the removal of stones (Strestha, 1989), sand (Mohan *et al.*, 1998) and woody debris (Smith, 1993). These activities threaten the ecological integrity of the riverine environments, especially in small tributaries where suitable habitat is more confined and therefore more vulnerable to local sources of degradation. Suitable habitat is also threatened by water abstraction from surface pumps and tube wells, especially in the Ganges where the mean dry-season water depth has been dramatically reduced in recent years (Ravindra Sinha, pers. comm. to Smith). The long-term implications of the reduction of dry-season flows in the Ganges are catastrophic for the survival of susus. New projects that divert dry-season flow, such as the Kanpur barrage in the upper Ganges, continue to be constructed (Smith *et al.*, 2000).

Organochlorine and butyltin concentrations in samples from the tissues of Ganges River dolphins were high enough to cause concern about their effects (Kannan *et al.*, 1993; Kannan *et al.*, 1994; Kannan *et al.*, 1997). Pollutant loads are expected to increase with industrialisation and the spread of intensive agricultural practices (Smith and Reeves, 2000). River dolphins may be particularly vulnerable to industrial pollution because their habitat in counter-current pools downstream of confluences and sharp meanders often places them in close proximity to point sources in major urban areas (e.g. Allahabad, Varanasi, Patna, Calcutta and Dhaka). Furthermore, the capacity of rivers to dilute pollutants has been drastically reduced in many areas because of upstream water abstraction.

5.5.6 Life history

In a study of 22 Ganges susus, Kasuya (1972) found that males attained sexual maturity at a body length of about 170cm and physical maturity at 200-210cm, while females attained sexual maturity at similar or slightly larger body lengths but physical maturity at about 250cm. The generally larger rostrum of females accounted for this sexual dimorphism, which becomes evident at a body length of about 150cm. Length at birth was estimated to be about 70cm. Gestation was found to last approximately one year, with possible peak calving seasons in early winter and early summer. Young began feeding on small prey at about one or two months and were weaned within a year.

5.5.7 Ecology

The range of this species overlaps with other cetaceans only in the Ganges delta, at the extremity of its distribution.

5.5.8 Other

Indus susus are legally protected from hunting in all range states. The Vikramshila Gangetic Dolphin Sanctuary, Bihar, India, between Sultanganj and Kahalgaon in the mainstem of the Ganges was designated as a protected area for dolphins in August 1991, but few protective measures have been instituted. In a few smaller tributaries, susus receive nominal protection by virtue of small portions of their habitat being included in or adjacent to national parks and sanctuaries (e.g. the Kazirunga National Park in Assam, India; the National Chambal Sanctuary in Uttar Pradesh, India; and the Royal Bardia National Park and Katerniya Ghat Gharial Sanctuary near the Nepal-India border).

The sub-committee noted and commended conservation and research efforts reported in SC/52/SM3, SM10 and SM21, and particularly applauded local conservation efforts in the face of considerable logistical and political difficulties.

Table 5

Summary information regarding the status of the Ganges river dolphin (*Platanista gangetica*)[1].

Stocks	Range	Abundance	Removals	Threats	Status	Reference
Bhimgoda - Madhya Ganga	Ganges River: Bhimgoda Barrage at Narora to Madhya Ganga Barrage at Bijnor	28-55 animals counted in 1996 and 35 in 1998	No reliable information	Movements interrupted partially or completely by barrages. Bycatch, pollution and demographic and genetic problems associated with small populations	Unknown	SC/52/SM4
Madhya Ganga - Lower Ganga	Ganges River: Madhya Ganga Barrage to Lower Ganga Barrage	No estimate	No information	Movements interrupted partially or completely by barrages. Bycatch and pollution	Unknown	SC/52/SM4
Lower Ganga - Farrakka[2]	Ganges River: Lower Ganga Barrage to Farrakka Barrage	No estimate	Unquantified directed takes. No information on bycatch	Movements interrupted partially or completely by barrages. Bycatch, fragmentation, directed takes and pollution	Unknown	SC/52/SM4
Brahmaputra - Meghna	Brahmaputra and Meghna river systems of India and Bangladesh, inclusive of the Ganges below Farakka	No range-wide estimate	Unquantified directed takes. No information on bycatch	Movements interrupted partially or completely by barrages. Bycatch, directed takes and pollution	Unknown	SC/52/SM4
Karnali	Karnali River (Ghaghara in India) above the Girja Barrage	23-30 dolphins counted in 1993	No information	Movements interrupted partially or completely by barrages, habitat degradation from proposed dam, and demographic and genetic problems associated with small populations	Unknown	SC/52/SM4
Kosi	Kosi River above the Kosi Barrage	3 dolphins counted in 1994	No information	Movements interrupted partially or completely by barrages. Bycatch and demographic and genetic problems associated with small populations	Almost extinct	SC/52/SM4
Son	Son River above the Indrapuri Barrage	No estimate	No information	Movements interrupted partially or completely by barrages. No information	Unknown	SC/52/SM4
Teesta	Teesta River between the lower and upper Teesta barrages	No information but probable occurrence as within range of known distribution	No information	Movements interrupted partially or completely by barrages. No information	Unknown	SC/52/SM4
Karnaphuli-Sangu	Karnaphuli-Sangu rivers	Minimum count of 125 dolphins in 1999	No information	Movements interrupted partially or completely by barrages. Bycatch, pollution and demographic and genetic problems associated with small populations	Unknown	SC/52/SM4
Kaptai	Kaptai Lake above the Kaptai Dam on the Karnaphuli River	Occasional reports of strandings. Surveys in 1999 observed no animals	No reliable information	Movements completely interrupted by dam Bycatch, altered ecological conditions and demographic and genetic problems associated with small populations	Unknown	SC/52/SM4

[1] Sub-populations that were isolated behind barrages and known to have been extirpated include the Ganges above Bhimgoda Barrage in India and the Mahakali above the lower Sarda Barrage and Narayani above the Gandak Barrage both in Nepal. [2] The Kanpur Barrage, which is currently under construction and scheduled to be completed in 2004, will further fragment this sub-population.

Table 6

Summary of information regarding the status of the finless porpoise (*Neophocaena phocaenoides*).

Stock	Range	Abundance	Removals	Threats	Status	References
Tokyo to Sendai Bay	Pacific coast of Japan north of Tokyo	Not available	No direct takes	Bycatch	Unknown	SC/52/SM22
Ise/Mikawa Bays	Pacific coast of central Japan	1,952	No direct takes	Bycatch	Unknown	SC/52/SM22; Miyashita *et al*., 1994
Inland Sea	Seto Inland Sea of Japan (may extend to northern Kyushu)	4,900 (1970s)	No direct takes	Bycatch	Declining	SC/52/SM22; Yoshida *et al*., 1997
Araike Sound/Tachibana Bay	Araike sound and Tachibana Bay, western Kyushu, Japan	3,093	No direct takes	Bycatch	Unknown	SC/52/SM22; Yoshida *et al*., 1997
Omura Bay	Omura Bay, western Kyushu, Japan	17	No direct takes	Bycatch	Unknown	SC/52/SM22; Yoshida *et al*., 1998
Yangtze River	Middle and lower reaches of China's Yangtze River and appended lakes	<2,000[1]	No direct takes	Bycatch, ship traffic and habitat degradation	Endangered/ declining	SC/52/SM17; Wang *et al*., 2000
Hong Kong	Southern and eastern waters of Hong Kong and surrounding parts of Guangdong Province	247	No direct takes	Bycatch, vessel collisions and pollutants	Unknown	SC/52/SM20; Jefferson and Braulik, 1999

[1] Abundance estimate approximate, not based on rigorous surveys.

5.5.9 Status

The IUCN considers the Ganges susu to be 'endangered'. There has been a dramatic decline in the extent of occurrence of Ganges susus, as well as in the quality of their habitat, especially in the Ganges river basin. This decline has been related to the construction, since the late 1950s, of an extensive network of barrages. The species is severely fragmented and additional barrages continue to be built (e.g. the Kanpur Barrage on the Ganges mainstem). Continuing mortality from deliberate and accidental killing threatens an already diminished species. Further reductions in the extent of occurrence and area of occupancy of the species are expected.

The sub-committee concluded that the Ganges susu is almost certainly declining in numbers and will continue to do so as habitat degradation shows no sign of abating. The current population size has been reduced by an unknown amount compared to historical levels, but is still large enough to be viable in the long-term if adequate conservation measures are taken soon.

The sub-committee **recommended** that the distribution, abundance and habitat of Ganges susus be assessed in areas where adequate surveys have not yet been conducted (e.g. Sundarbans and Damodar river system). Particular attention should be paid to documenting threats during these surveys.

The sub-committee **recommended** that an evaluation of population discreteness be conducted of Ganges susus among river systems, with particular attention to dolphins in the Karnaphuli-Sangu river systems.

The sub-committee **recommended** that the level and impact of direct and incidental catches of this species be assessed, with particular attention to the number of dolphins killed to support the use of their oil as fish attractant.

5.6 Finless porpoise

Most of the information below was taken from SC/52/SM17 and SM18.

5.6.1 Distribution and stock structure

This is a tropical to warm-temperate species, occurring mostly in nearshore and riverine waters. Its current range is coastal and may be discontinuous from the Persian Gulf around the rim of the Indian Ocean to the eastern islands of the Indo-Malay archipelago and central Japan. Studies of Japanese animals identified a minimum of five local populations (SC/52/SM22) and the sub-committee noted that similar local populations may exist elsewhere throughout the range of this species.

An isolated freshwater population occurs in the Yangtze River, extending to the Yiching, some 1,600km from the mouth (SC/52/SM17). There are many different geographical forms, and three sub-species are currently recognised. Jefferson reviewed *Neophocaena* taxonomy and suggested that two separate species, each with sub-species, may be warranted. The sub-committee agreed that a taxonomic re-examination of the genus is needed, but that it should await molecular genetic evidence which is currently lacking.

5.6.2 Abundance

Estimates of abundance have been made only for specific areas in China and Japan. Estimates of abundance are presented in Table 6. In the Inland Sea of Japan, Kasuya and Kureha (1979) estimated a peak abundance of 4,900 porpoises in spring months. SC/52/SM22 showed a decline in finless porpoise abundance in the Inland Sea between the 1970s and the present. The authors repeated vessel tracklines 22 years after the initial study by Kasuya and Kureha (1979) and observed significantly fewer finless porpoises on 12 of 18 such lines. The current population level was only 4% of that found in the original study in the eastern and central parts of the Inland Sea, and 60% in the western portion. Kasuya noted that it was not possible to rule out the possibility of a shift in distribution accompanied by a decrease in abundance in the Inland Sea.

The Yangtze population has been surveyed extensively; Zhang *et al.* (1993) estimated 2,700 animals in the middle and lower reaches of the river in 1991, and currently there may be fewer than 2,000 (Wang *et al.*, 2000). Zhou *et al.* (1998) estimated 700 in the lower reaches between Hukou and Nanjing. A new estimate for Hong Kong and surrounding waters is of at least 250 animals (SC/52/SM20). The methodology of this latter study was considered in some detail by the sub-committee, which commended its approach. The use of a towed acoustic detection device to calibrate $g(0)$ was discussed, and Jefferson emphasised that this element of the project was still under development. It was agreed that a hydrophone array capable of determining distance and bearing to the target would offer a better means of calculating sighting efficiency on or near the track line.

5.6.3 Directed takes

No large-scale hunts of this species have been recorded. Some local hunting occurred in China during the 1970s and earlier, but this has now almost come to an end (Liu, 1991; Reeves *et al.*, 1997; Zhang, 1997). A few tens of finless porpoises have been live-captured for public display and research in Japan, China and Thailand (IWC, 1984), although such takes do not occur currently in Japan. Wang *et al.* (1997) reported that 36 were live-captured from the Yangtze river between 1990 and 1996.

5.6.4 Incidental takes

Incidental mortality is probably substantial throughout the species' range. Catches in gillnet fisheries were reviewed by Jefferson and Curry (1994). Finless porpoises are killed in the Yangtze river by rolling hook longlines and encircling gillnets, and in Chinese coastal waters by pound nets, drift nets and stow nets (Zhou and Wang, 1994). Yang and Zhou (1996) estimated that 2,100 animals are killed incidentally each year in Zhejiang and Guangxi provinces alone. About 50 are killed each year in the Yellow Sea (IWC, 1994). In Japan, porpoises are taken incidentally in various fisheries, but the reported takes are low. The species is available in local markets in Korea (SC/52/SD6 and SD17); the source of these animals is believed to be from bycatch in coastal Korean waters (SC/52/ProgRepKorea).

5.6.5 Habitat degradation

The coastal margins of the Indo-Pacific region are developing rapidly, and this nearshore species is vulnerable to anthropogenically-induced habitat change. The impact of such change on finless porpoises has not been quantified. Developments of particular concern include increased fishing, chemical pollution, vessel traffic and habitat loss through land reclamation or modification. Levels of chemical pollutants have been investigated in finless porpoises from many areas. Heavy metal levels were higher in Yangtze river specimens than in Chinese coastal animals. Mercury levels in the livers of Hong Kong animals were high enough to be considered a potential health risk (Parsons, 1999). High DDT concentrations occurred in animals from Hong Kong and the Inland Sea (O'Shea *et al.*, 1980; Parsons and Chan, 1998; Jefferson and Braulik, 1999). Porpoises in the Inland Sea also carried high burdens of PCB (O'Shea *et al.*, 1980; Kannan *et al.*, 1989). Butyltin levels in Inland Sea porpoises were over five times greater than levels found among conspecifics along the Pacific coast (Tanabe *et al.*, 1998).

5.6.6 Life history
Maximum longevity is up to 25 years. In studies of Japanese finless porpoises, neonatal length ranged from 75-85cm, age at sexual maturity was 3-4 years in males and 4-5 years in females, and gestation lasted from 10.6-11.2 months (Kasuya and Kureha, 1979; Shirakihara *et al.*, 1993; Kasuya, 1999). Equivalent values for Chinese riverine and coastal populations were as follows: neonatal length from 72-84cm, age at sexual maturity from 4-6 years in males and from 5-5.5 years in females, and the duration of gestation from 10.1-11.5 months (Chen *et al.*, 1982; Zhang, 1992; Gao and Zhou, 1993). Much of the reported variation in life history parameters may be attributable to differences between allopatric populations of this species. The adult sex ratio may be skewed towards females in the Yangtze population (SC/52/SM17).

Yang *et al.* (1998) conducted a life table analysis for three Chinese populations of this species, including the riverine form. This analysis suggested low survival rates, and did not bode well for the continued existence of many Chinese finless porpoise populations.

5.6.7 Ecology
This species preys on a wide variety of fishes, cephalopods and crustaceans (Kasuya, 1999; SC/52/SM18). Seasonal movements have been reported in most areas where density has been studied, but the extent of individual movements has not been established. The species is sympatric with several other cetaceans in its range, notably the baiji, bottlenose dolphin, humpbacked dolphin and Irrawaddy dolphin.

5.6.8 Other
The sub-committee noted the presence of finless porpoises in the semi-natural reserve at Tian-e-Zhou (Shi Shou) in Hubei Province and learned both that reproduction has occurred within the reserve and that seven porpoises were accidentally killed there in 1993. Improvements to the reserve have been carried out, but some fishing still continues and a safe interface with the Yangtze River has not yet been completed.

5.6.9 Status
The finless porpoise is listed as ‘data deficient’ by the IUCN, although the Yangtze river population is classified as ‘endangered’. The species as a whole is in no immediate danger of extinction, but several populations (possibly representing separate taxa) are apparently declining. The sub-committee discussed, in particular, the Inland Sea of Japan, where this species has declined in abundance in recent years (SC/52/SM22). The causes of this decline are not fully understood. Incidental mortality in various kinds of fisheries is the only documented anthropogenic factor affecting the survival of finless porpoises (Shirakihara *et al.*, 1993). However, a number of anthropogenic influences such as chemical pollution, depletion of prey species, loss of habitat due to construction or extraction of sand, may all have contributed to the decline. Here, as elsewhere in the species’ range, human populations adjacent to the finless porpoise’s habitat are increasing in size and becoming more industrialised, so the expectation should be that anthropogenic pressures will continue and intensify.

The sub-committee **recommended** that molecular genetic and morphometric studies of finless porpoises be conducted to assist in clarifying taxonomy and stock structure in the genus *Neophocaena*. These studies should include analysis of existing specimens and new samples from areas that are currently under-represented in collections.

Recognising the unique nature of the population of finless porpoises in the Yangtze River, the sub-committee **recommended** that a detailed assessment is conducted of variation in the density of finless porpoises in this system, to identify areas of high porpoise abundance, such as the Poyang Lake, that may deserve special protection.

The sub-committee noted that the range of this species includes areas that support intensive coastal gillnet fisheries and that large bycatches have been documented in some of these fisheries. The sub-committee **recommended**, therefore, that the magnitude and effects of such bycatches is investigated as a matter of priority.

The sub-committee **recommended** that further research is conducted to determine the causes of the population decline of this species in the Inland Sea of Japan and how to best stop or reverse this decline.

The sub-committee recognised that inadequate information exists on the distribution of this species and **recommended** that surveys are conducted throughout its known and suspected range, particularly in areas where little current information exists, for example along the coasts of the Indian Ocean.

5.7 Baiji
Most of the information below is taken from SC/52/SM17, with additional material from Smith.

5.7.1 Distribution and stock structure
The Yangtze river dolphin or baiji is restricted to the Yangtze River mainstem from Yichang to the river mouth, a distance of some 1,600km. It was historically found in the Xinan River, a tributary of the Qiantang River (Chen, 1989) and Dongting and Poyang Lakes (Zhou *et al.*, 1977; Chen *et al.*, 1980), but may have been extirpated from those areas. In the Yangtze, its distribution is believed to have been reduced from approximately 50km upstream of the Gezhouba Dam near Yichang (Zhou *et al.*, 1977) to approximately 150km downstream of the dam site at Jingzhou or Shashi (Liu *et al.*, 2000). Baiji were once commonly observed as far downstream as the river mouth (Zhou *et al.*, 1977) but are now rare below Nanjing (Zhou and Li, 1989). No dolphins were found downstream of Fuanzhou, located 135km upstream of the mouth, during surveys in 1985-86 (Chen and Hua, 1987). The remaining baiji are found in the middle reaches between Tongling and Xuewenzhou and between Dongting and Poyang Lakes (SC/52/SM17).

5.7.2 Abundance
No precise estimates of current or past abundance are available. The population size was estimated to be 300 in 1986 (Chen and Hua, 1989), less than 200 in 1990 (Chen *et al.*, 1993) and currently is probably less than 100 (Chen *et al.*, 1997). Only thirteen animals were seen in a survey of the entire range in November 1997, and even fewer in 1998 and 1999 (although these surveys were less comprehensive). The ‘best guess’ of the current population size is a few tens of animals (Reeves *et al.*, 2000).

5.7.3 Directed takes

No directed takes have been recorded in recent years, although baiji were hunted for their flesh and skin in the late 1950s.

5.7.4 Incidental takes

Human activities account for the deaths of more than 95% of all collected specimens (Chen *et al.*, 1997) and entanglement in fishing gear has been estimated to account for half or more of the mortality of recovered carcasses (Lin *et al.*, 1985; Zhou and Li, 1989; Chen, 1989). The rolling hook fishery, which consists of long lines with thousands of unbaited hooks used for snagging bottom fish, accounted for 7 of the 13 entanglement deaths recorded in the lower Yangtze between 1978 and 1985 (Zhou and Li, 1989), and 15 of the 28 total deaths recorded in the middle reaches of the Yangtze between 1973 and 1983 (Zhou and Wang, 1994). Baiji often have scars and open wounds from rolling hooks, and hook remains are sometimes found in the stomachs of recovered carcasses (Lin *et al.*, 1985; Zhou and Li, 1989). Deaths from entanglement in gill and fyke nets have also been recorded. Electric fishing is widely practiced in the Yangtze River, particularly in the centre of the baiji's current distribution (Stacey and Arnold, 1999). One baiji was observed killed in February 1981 (Chen and Hua, 1989) and one carcass was collected in January 1997 (Wang Ding, pers. comm.), both deaths believed to have been caused by electric fishing.

Explosives, generally used for blasting river channels to improve navigation but also for fishing, are another source of baiji mortality. An explosion in February 1974 killed four baiji, including two pregnant females (Lin *et al.*, 1985). Two different explosions in March 1984 near Sanhaozhou killed six baiji, including one pregnant female (Zhou and Li, 1989). An explosion in February 1995 killed one baiji near Shishou.

Mortality from propeller collisions has been documented, particularly in the lower reaches of the river where there are high levels of vessel traffic (Zhou, 1992). In 1978, a live baiji was found with serious wounds from a ship's propeller and the dolphin died a short time later (Zhou and Zhang, 1991).

5.7.5 Habitat degradation

The Yangtze River runs through one of the densest areas of human occupation in the world, and the river is used intensively for transport, as a food resource and as a waste dump. As a habitat for the baiji it has been damaged in every conceivable way, including chemical and noise pollution, overfishing and risk of physical damage due to ship strike or entrapment in fishing gear. Construction of the Three Gorges Dam in the Xiling Gorge at Sandouping, 38km upstream from the Gezhouba Dam, began in 1994. Erosion from the water released below the dam is expected to eliminate counter-currents (see Item 5.7.7) for approximately 200km downstream to Ouchikou and degrade them for another 158km downstream to Chenglingji (Chen and Hua, 1987).

5.7.6 Life history

The following information is from Chen *et al.* (1997) and Liu (1988). Age at sexual maturity is approximately 4 years in males and >6 years in females. Gestation lasts for 10-11 months. Neonatal length is approximately 80cm. The mating season is from March-May and calving occurs in February and March. Observed pregnancy rates are approximately 30%.

5.7.7 Ecology

Baiji are generally found in large counter-currents, found below meanders and channel convergences (Hua *et al.*, 1989; Zhou and Li, 1989). A variety of fish species are taken as prey, including both surface- and bottom-feeders. The baiji is sympatric with the freshwater form of the finless porpoise.

5.7.8 Other

No other information was presented to the sub-committee.

5.7.9 Status

The baiji is listed as 'critically endangered' by the IUCN and is the most endangered of all cetacean species. Rapid and widespread development has degraded the Yangtze environment to such an extent that local scientists have judged that the river can no longer sustain the species (Zhou *et al.*, 1994; Zhou *et al.*, 1998).

Since 1993, the primary strategy for preventing extinction of the baiji has been to capture and translocate as many dolphins as possible into the Shishou Baiji Semi-natural Reserve, an oxbow channel of the Yangtze River, with the intention of establishing a self-contained breeding population (Zhou *et al.*, 1994; Zhang *et al.*, 1995; Zhou and Gao, 1995). This *ex-situ* approach was taken in light of the rapid decline in abundance of the species and deterioration of the Yangtze environment (Leatherwood, S., 1994; Leatherwood, S. and Reeves, 1994). Six capture expeditions, lasting 2-3 months each, were conducted between Chenglingji and Gongan since 1986. In 1995, an apparently healthy and sexually mature female was caught and translocated to the reserve (Liu *et al.*, 1998). Six months later, her emaciated carcass was found entangled in the net at the outlet of the reserve. The captive male held at Wuhan was never released into the semi-natural Reserve.

After lengthy discussion, the sub-committee was unable to reach consensus on the difficult question of whether or not to recommend the continuation of efforts to live-capture and place baiji in a semi-natural reserve. Arguments for and against this approach are discussed in Appendix 2. Based on the information submitted to the sub-committee, it was agreed that a suitable semi-natural habitat is not available at present. It was recognised that, notwithstanding the sub-committee's lack of consensus, domestic authorisation for continued baiji captures was likely. Therefore it **strongly recommended** that the following requirements be met prior to any further removals of baiji from the wild:

(1) the environmental quality and carrying capacity of the semi-natural habitat are ensured at levels adequate for the long-term maintenance a group of baiji;
(2) the semi-natural habitat is developed to ensure that dolphins cannot move into the river, regardless of flood level;
(3) there is no other cetacean species in the semi-natural habitat;
(4) the risk of baiji entanglement and mortality in fishing gear within the semi-natural habitat is eliminated;
(5) capture and relocation operations can be conducted with minimal risk of dolphin mortality (with advice and participation of relevant experts who have experience in the capture and handling of cetaceans);
(6) sufficient resources are available to ensure that a group of dolphins of adequate size and demographic composition can be established in the semi-natural habitat within a relatively short time;

(7) sufficient resources are available to support monitoring and management of the semi-natural habitat;
(8) a panel of independent international experts is established to evaluate conditions in the semi-natural reserve and determine that they are suitable. This panel would observe the capture and relocation operations and have full access to all sites, with adequate resources to undertake their tasks; and
(9) a parallel effort is made to enhance or restore the natural habitat for baiji in the Yangtze River system, aimed at future reintroduction.

Given the critically endangered status of the baiji, the sub-committee **requested** that the Scientific Committee ask that the Secretary of the IWC request the Government of China to report progress on the conservation of this species to the Scientific Committee on an annual basis.

5.8 General recommendations for freshwater cetaceans

Since the Wuhan Workshop in 1986 (Perrin *et al.*, 1989), there has been a wide array of efforts to study the biology and status of freshwater cetaceans and to develop and implement strategies for their conservation. The IUCN/SSC Cetacean Specialist Group assumed a lead role in establishing the Asian River Dolphin Committee, with representatives from China, Pakistan, India, Bangladesh and Nepal, to provide a forum for the regular exchange of information on *Platanista*, *Lipotes* and the Yangtze River population of finless porpoises. That committee generated a series of recommendations for research and conservation, some of which have been implemented through the support of governmental agencies and non-governmental organisations (Reeves and Leatherwood, 1995; Smith and Reeves, 2000). At present, the Asian River Dolphin Committee is inactive. In its place is an Indian River Dolphin Committee coordinated by WWF-India, a South Asian River Conservation Strategy coordinated by WWF-Pakistan (SC/52/SM10), an Asian River Cetacean Conservation Action Plan developed by the Whale and Dolphin Conservation Society (SC/52/SM3) and an Ocean Park Conservation Foundation Action Plan that includes numerous projects concerning freshwater cetaceans (Jefferson and Reeves, 1999). The sub-committee wished to acknowledge these previous and ongoing efforts and to encourage their continuation and expansion, particularly to include *Orcaella* and additional populations of *Neophocaena*. Moreover, the sub-committee noted that, although the conservation status of South American river dolphins is of less immediate concern, efforts at coordination and planning similar to those in Asia are desirable.

The sub-committee noted that many populations of freshwater cetaceans have been fragmented by dams and barrages. These projects have many other potentially adverse ecological effects on freshwater cetaceans, in addition to population fragmentation. The sub-committee **recommended**, therefore, that the impacts of water development on freshwater cetaceans should be investigated thoroughly and that future plans for water development projects and water usage in the range of these species take into account the habitat requirements of freshwater cetaceans and the demographic implications of population fragmentation.

The sub-committee recognised the potential value of protected areas in conserving populations of freshwater cetaceans. It noted, however, that many protected areas offered little real protection for these populations due to insufficient size, inadequacy of regulatory measures and/or a failure to enforce these measures. It **recommended**, therefore, that any future protected areas or time/area fishery restrictions intended to conserve populations of freshwater cetaceans be of appropriate size and location, that potential threats be eliminated or greatly reduced in such areas and, further, that such measures are enforced adequately.

The sub-committee noted that fishing effort was increasing rapidly in many areas where freshwater cetaceans occur and expressed concern over bycatches of freshwater dolphins and porpoises in gillnets and other fishing gear. The sub-committee **recommended** that the relative magnitude of this threat be assessed and that, where necessary, appropriate mitigation strategies be developed.

The sub-committee **recommended** that the effects of environmental contaminants, such as mercury, pesticides, antifoulants and oil, be evaluated for freshwater cetaceans, particularly with species that inhabit highly polluted areas. Such studies will require the development of new approaches, such as those being developed by the IWC programme POLLUTION 2000+.

The sub-committee noted that few reliable estimates of abundance were available for any species of freshwater cetacean and that the habitat and behaviour of these species posed particular problems for abundance estimation (Appendix 3). The sub-committee **recommended** that scientists with appropriate theoretical and/or analytical skills should be directly involved in river cetacean studies, so that surveys result in statistically robust estimates of abundance. Ideally, arrangements should be made for one or more of these scientists to obtain relevant experience at a suitable range of survey sites and to make recommendations for appropriate survey and analytical methods. The sub-committee further **recommended** that a workshop be held to provide appropriate analytical skills to people responsible for analysing survey data from each species/area. The workshop should be followed with site-specific training courses to provide theoretical background and field skills to researchers in each area who will be involved in the surveys.

6. PROGRESS OF THE IWC/ASCOBANS JOINT HARBOUR PORPOISE WORKING GROUP

At its meeting in 1998, the sub-committee convened a joint IWC/ASCOBANS Working Group to provide scientific advice to the Advisory Committee of ASCOBANS on issues relating to the assessment of the status of harbour porpoises in the North Sea and adjacent waters. The Working Group met at St Andrews, Scotland in March 1999 and outlined a simulation modelling approach that would allow ASCOBANS to develop algorithms to meet their conservation objectives. Northridge noted that this modelling work was initiated in January 2000 and will be completed by the end of this year. This work is being undertaken at the University of St Andrews, contracted by the UK Ministry of Agriculture, Fisheries and Food. The sub-committee looked forward to reviewing the modelling results at next year's meeting.

7. PROGRESS OF THE VAQUITA RECOVERY PROGRAMME

Progress made under this agenda item is summarised in Rojas-Bracho *et al.* (2000). Rojas-Bracho reminded the sub-committee that the mandate of the International Committee for the Recovery of the Vaquita (CIRVA) is to create a recovery plan based on the best available scientific information, which considers the socio-economic impacts of regulations on resource users in affected areas. Last year CIRVA recommended that bycatch of vaquitas be reduced to zero as soon as possible. However, it was not possible to implement such protection immediately, so CIRVA recommended that gillnet fishing be removed in three stages, starting with large-mesh gillnets and capping the numbers of fishing vessels (pangas) at present levels. However, recent civil unrest in one fishing community has made clear the need to provide a diversity of economic alternatives to affected fishermen. Rojas-Bracho introduced a conceptual framework (Sanchez and Rojas-Bracho, 2000) that includes economic and social incentives to the communities of fishermen in the Upper Gulf of California, to gain their support for the conservation of the vaquita. This framework will be used as terms of reference for a steering committee meeting of socio-economic experts this year.

Rojas-Bracho also reviewed progress on other CIRVA recommendations. A proposal to expand the southern boundary of the Biosphere Reserve was submitted to the appropriate governmental authorities and will be discussed at the coming evaluation meeting of the Upper Gulf and Delta of the Colorado River Biosphere Reserve. Acoustic surveys to address seasonal movements have started, funded by WWF, IFAW and Mexico's National Fisheries Institute. Permit revisions are being considered for alternate gear types, such as experimental shrimp fishing. Rojas-Bracho also reviewed an educational and outreach proposal, designed to create public awareness of the vaquita (Flores *et al.*, 2000). The main objective of this latter project is to create a sense of stewardship for the endangered vaquita amongst local peoples of the Upper Gulf of California. CIRVA also recommended that research be conducted to better define critical habitat of vaquita using data collected during the 1997 abundance survey. In this regard, Rojas-Bracho indicated that the bottom sediment samples had been analysed and that chlorophyll analysis was almost finished. The sub-committee welcomed this report and commended the government of Mexico for its continuing efforts to implement the recommendations of CIRVA and conserve the vaquita. The sub-committee looks forward to receiving an update on further progress on this matter at next year's meeting.

8. WHITE WHALE STOCKS OF PARTICULAR CONCERN (COOK INLET, SEA OF OKHOTSK)

Moore described the results of aerial surveys conducted 8-14 June 1999, to assess the distribution and abundance of white whales (*Delphinapterus leucas*) in Cook Inlet, Alaska. Whale distribution was found to be highly stratified, with nearly all sightings near a few river mouths in the Upper Inlet. The index count (based on un-corrected medium counts from each site) for 1999 was 217 whales, compared to 305, 281, 324, 307, 264 and 193 for 1993-1998 (SC/52/ProgRepUSA). An abundance estimate of 357 (CV = 20%) was calculated based on counts and video recordings made during the 1999 aerial surveys. There was no subsistence harvest from this stock in 1999, although maktak and meat was taken opportunistically from two of five or six white whales that stranded and died in the upper Inlet in late summer. Surveys have been completed in June 2000 and preliminary reports of the distribution and counts are similar to 1999. The US National Marine Fisheries Service has listed Cook Inlet white whales as 'depleted' under the Marine Mammal Protection Act, and continues to work with representation from Native subsistence hunting groups to establish a co-management agreement to manage harvests.

Last year, the sub-committee reviewed the status of white whales and expressed concern regarding a number of stocks that were depleted, likely depleted or known to be of small size (IWC, 2000). Three of these stocks, in Shelikov Bay, Sakhalin-Amur and Shantar, occur in waters of the Russian Federation in the Okhotsk Sea. Brownell noted that a harvest of white whales in the Okhotsk Sea was started in 1999 and that approximately 36 whales were killed and products from these animals used for export. Reeves noted that additional animals had been live-captured from these stocks for export to Canada and elsewhere. In its review last year, the sub-committee concluded that stocks of white whales in the Okhotsk Sea are likely depleted and noted that considerable uncertainty exists regarding stock structure in this region (IWC, 2000). The sub-committee reiterated its concern regarding these removals and **recommended** that further assessment be undertaken of these stocks, paying particular attention to status and stock structure.

9. OTHER PRESENTED INFORMATION ON SMALL CETACEANS

SC/52/SM2 described field studies of white whales in Svalbard, Norway. Research has been conducted on individual movements obtained by satellite telemetry, levels of organochlorine contaminants, assessment of diet through analysis of fatty acids in blubber, vocal behaviour and genetics.

SC/52/SM11 described the genetic discovery of a new species of beaked whale. A review of a database of mitochondrial DNA control region and cytochrome b sequence, assembled to assist with the identification of stranded beaked whales and resolve systematic relationships in this group, provided the first evidence for this new species. Over a period of four years in the 1970s, four beaked whales stranded within 50 miles of each other along the southern Californian coast, and were identified as Hector's beaked whales (*Mesoplodon hectori*) based on their cranial morphology (Mead, 1981), the first and only records for this species in the Northern Hemisphere. However, comparison of the published mtDNA sequence from the first calf to the other Hector's beaked whales in the database from strandings in the Southern Hemisphere suggested that it was not of this species, nor any other species in the database (Dalebout *et al.*, 1998). To investigate this disagreement between the morphological and molecular description of these animals, DNA was extracted from the teeth and cartilage remaining on the skulls of the other three animals using techniques developed for archaeological material. Phylogenetic analyses using mtDNA control region and cytochrome b sequences confirmed that the Californian animals are more closely related to at least four other species of beaked whales (*M. peruvianus*, *M. grayi*, *M. densirostris* and *M. stejnegeri*) than to the morphologically similar Hector's beaked whale, and represent a previously unrecognised species. The authors of SC/52/SM11 suggest that, in addition to traditional morphological descriptions, genetic information should be collected for all stranded and bycaught beaked whales and other cetaceans.

SC/52/SM12 described the results of aerial surveys of franciscana dolphins (*Pontoporia blainvillei*) from Uruguay and southern Brazil. Eight surveys were conducted in March 1996, in which 29 groups of franciscanas were sighted. Estimates of density were derived using distance sampling techniques and corrected for *g*(0). The mean density was

0.11 individuals/km^2 (95% CI = 0.075-0.15). Application of this density estimate to the entire study area yielded an abundance of 19,674 franciscanas (95% CI = 13,770-26,835). Comparison with previously published estimates of bycatches in gillnet fisheries suggests that between 2-11% of this stock is removed each year. The authors of SC/52/SM12 suggested that these bycatch levels may not be sustainable.

SC/52/SM25 reported the composition of bycatches of cetaceans in two California gillnet fisheries. Observers identified 480 cetaceans from 21 species taken in the swordfish and shark driftnet fishery between 1990 and 1999. The species most frequently taken was *Delphinus delphis* (55%), followed by *Lissodelphis borealis* (9%). Twenty cetaceans were observed in the California set-net fishery from 1990 to 1994, of which almost all were harbour porpoises (*Phocoena phocoena*). Species identification made by observers onboard fishing vessels was confirmed by genetic analysis. SC/52/O24 estimated the magnitude of cetacean bycatches in these two gillnet fisheries during 1999. Approximately 20% of an estimated 2,634 sets were observed in the California/Oregon swordfish and shark drift net fishery, yielding an estimated bycatch of 228 cetaceans, primarily short-beaked common dolphins (*Delphinus delphis*). In the Monterey Bay set-net fishery, 232 sets were observed on 165 trips, or approximately 23% of total fishing effort. Twenty-eight harbour porpoises were observed taken, yielding an estimated bycatch of 133 porpoises. SC/52/O24 reported that most fishermen in Monterey Bay have voluntarily agreed to use pingers to reduce this bycatch of harbour porpoises. The sub-committee welcomed these reports and thanked the authors of these papers for their annual contributions.

The sub-committee received SC/52/SM34, a research proposal addressing the distribution, natural history, genetics, taxonomy and pathology of common dolphins (*Delphinus delphis*) in coastal waters of the southeastern Pacific. In the absence of the author, the sub-committee did not discuss this proposal.

Bjørge introduced plans to survey the abundance of small cetaceans in Norwegian coastal waters, including fjords (SC/52/O14). The objective is to obtain abundance estimates for those areas where bycatches of harbour porpoises are most frequently reported. The first year is planned as a feasibility study to explore the possibility of obtaining data relevant for abundance estimation. These surveys are part of a wider programme at the Institute of Marine Research addressing stock structure, movements and life history of harbour porpoises. The sightings protocol for these surveys follows the standard outline for the NILS surveys, including two independent observer platforms, but modified to address some of the problems anticipated given the complexity of Norwegian coastal waters. The results and experiences from conducting the first survey will be reported for consideration by the sub-committee next year.

Finally, Brownell noted that the Government of Japan had increased its national quota for Baird's beaked whales (*Berardius bairdii*) from 54 to 62 animals, with the additional eight animals allocated to the Sea of Japan. As described in SC/52/ProgRepJapan, 62 Baird's beaked whales were taken from the Sea of Japan, Pacific coast and Okhotsk coast in 1999. The most recent abundance estimates for the Sea of Japan and Pacific coast are 1,260 (CV = 0.45) and 5,029 (CV = 0.56), made from 1983-1989 and 1991-1992 respectively (Miyashita, 1990; Miyashita and Kato, 1993). Furthermore, Brownell reminded the sub-committee of its previous conclusion regarding this species – that there is insufficient information to allow judgement of whether takes of this size are sustainable (IWC, 1991). Considering these developments, noting the small size of some affected populations, the existence of bycatches, and the availability of new information, the sub-committee invited the government of Japan to provide information that would allow it to determine whether sufficient new data exists to review the status of this species in 2002 or beyond.

10. TAKES OF SMALL CETACEANS IN 1999

As in previous years, the sub-committee noted that the table of recent catches of small cetaceans (Appendix 4) is incomplete. Therefore, the sub-committee reiterated its **recommendation** that member nations should submit full and complete information on direct and incidental takes in their progress reports. The sub-committee further noted that the catches reported in Appendix 4 are not summarised on a stock-by-stock basis, hampering its ability to assess the conservation status of particular stocks. The sub-committee **strongly recommended** that national progress reports, some of which provide catch statistics on a stock by stock basis, are published annually by the IWC.

11. REVIEW OF PROGRESS ON PREVIOUS YEAR'S RECOMMENDATIONS

The sub-committee was informed of progress on last year's recommendations under Items 6 and 7.

12. WORK PLAN

The sub-committee reviewed its schedule of priority topics (IWC, 2000, p.255). In light of concern expressed about the level of exploitation of Dall's porpoise in the Japanese hand harpoon fishery and Commission Resolution 1999-9, directing the Scientific Committee to review the status of the impacted stocks of Dall's porpoise at the 53rd Annual Meeting, the sub-committee agreed that the status of Dall's porpoise would be its only priority topic for its next meeting (Table 7). As noted in Item 9 above, the sub-committee invited the Government of Japan to provide information that would allow it to determine whether sufficient new data exists to review the status of this species in the years 2002 or beyond. In addition, at its next meeting the sub-committee will review briefly progress on: the IWC/ASCOBANS harbour porpoise working group, the Vaquita Recovery Programme, plans for improving survey methodology for freshwater cetaceans, the results of the Norwegian feasibility survey in coastal waters and conservation of the baiji.

Table 7

Schedule of priority topics.

Year	Topic	Justification
2001	Status of Dall's porpoise	IWC resolution 1999-9
2002 +	Systematics and population structure of *Tursiops*	Large amount of new research results
	Status of ziphiids in the Southern Ocean	Lack of previous assessment
	Status of small cetaceans in the Caribbean Sea	Lack of previous assessment; continuing catches and bycatches

13. OTHER BUSINESS

Borsani informed the sub-committee that the Government of Italy would hold a workshop in May 2001 on the use of acoustic deterrent devices to reduce interactions between fisheries and small cetaceans, primarily bottlenose dolphins.

14. ADOPTION OF REPORT

The report was adopted as amended on 22 June 2000.

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Appendix 1

AGENDA

1. Election of Chairman
2. Adoption of agenda
3. Appointment of rapporteurs
4. Review of available documents
5. Review of the status of freshwater cetaceans
   5.1 Irrawaddy dolphin
   5.2 Boto
   5.3 Tucuxi
   5.4 Indus susu
   5.5 Ganges susu
   5.6 Finless porpoise
   5.7 Baiji
   5.8 General recommendations for freshwater cetaceans
6. Progress of the IWC/ASCOBANS joint harbour porpoise working group
7. Progress of the Vaquita Recovery Programme
8. Beluga stocks of particular concern (Cook Inlet, Sea of Okhotsk)
9. Other presented information on small cetaceans
10. Takes of small cetaceans in 1999
11. Review of progress on previous year's recommendations
12. Work plan
13. Other business
14. Adoption of report

Appendix 2

RELOCATION OF THE BAIJI

After lengthy discussion, the sub-committee was unable to reach consensus on the question of whether to recommend for or against the continuation of efforts to live-capture and place baiji in a semi-natural reserve. Some members expressed the view that baiji should not be removed from the wild for placement in a semi-natural reserve. They stressed the following points.

(1) Although it has been assumed that the baiji is destined for extinction in the near future due to the effects of bycatch and habitat deterioration in the Yangtze River, it is also true that estimates of abundance are non-rigorous, survey coverage has not always been complete and young animals have been observed in the wild during the last few years.

(2) Since 1986 when the concept of catching and placing baiji in the semi-natural reserve was endorsed by an international workshop (Perrin and Brownell, 1989), one animal has been successfully caught and introduced to the reserve (after six capture expeditions lasting 2-3 months each). The cause of its death was not determined, but it was suggested that it was ill or that it sustained unspecified injuries during capture and transport. It appears, based on the record of finding and capturing baiji to date, very unlikely that more than a handful of individuals could be caught and transported to the reserve even with a massive and costly effort.

(3) Investment of the very large amounts of conservation resources required for baiji capture expeditions is difficult to justify when weighed against potential alternative ways of investing those resources, especially considering that *in-situ* conservation efforts on behalf of the baiji will also benefit the endangered population of Yangtze finless porpoises.

(4) Accepting the claim that nothing further can be done to protect the baiji and its habitat in the Yangtze could have serious implications. It would cast doubt on the value of trying to reduce harmful fishing activities, prevent pollution and mitigate the effects of water development projects.

(5) At present, the few remaining baiji comprise a single population (discounting the lone captive male). Any further removals from that population run the risk of reducing its viability. There is clearly substantial risk involved in a decision not to intervene, but there is also substantial risk associated with any further intervention. It is impossible to measure and compare these risks.

Other members expressed the view that efforts to relocate baiji from the river to the semi-natural reserve should continue, according to the following reasoning.

(1) Although there are no precise estimates of abundance, it is reasonable to conclude that few baiji remain. The crucial point is that the evidence clearly points to a downward trend and, without any reasonable expectation that the factors causing the decline will be removed, the inevitable consequence of no intervention is the extinction of the species. Exact numbers remaining are of little relevance; this will merely determine *when* extinction occurs.

(2) On the above assumption, any intervention which offers some hope of the continued survival of the species must be welcomed.

(3) Relocation of baiji to a *suitable* location, under *suitable* management, must offer some hope of continued species survival. What constitutes *suitable* in this context is a matter for further consideration and discussion.

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Appendix 3

REPORT OF THE WORKING GROUP ON RIVER CETACEAN SURVEY METHODS

Members: Beasley, Braulik, Da Silva, Hedley, Jefferson, Kreb, Martin, Parra, Reeves, Smith, B., Taylor, Trujillo, Wang.

Terms of Reference

(1) Determine the way forward to obtain standardised, repeatable, statistically robust estimates of absolute and relative abundance for obligate and facultative river cetaceans (i.e. *Inia, Sotalia, Lipotes, Platanista, Orcaella* and *Neophocaena*).

(2) Consider the need for one or more workshops or conferences to develop or adapt techniques to the special problems associated with estimating abundance of river cetaceans.

The Working Group recognised the following problems/difficulties in obtaining abundance estimates that are unique to, or more acute for, riverine cetaceans.

(1) Strong heterogeneity of animal density within study areas (e.g. river bank areas and confluences).

(2) Unevenness of habitat on temporal and small geographic scales, and the consequent need for composite approaches.

(3) Important differences in availability of survey platforms and equipment among survey areas.

(4) Problems of following desired tracklines and survey speeds in a riverine and estuarine environment (e.g. variable current speed and heavy vessel traffic).

(5) Difficulties related to sighting cues and detections (e.g. cryptic surfacing profiles and problems of distance estimation, defining groups and estimating their size).

(6) Extreme differences in encounter rate or density between/among studies (e.g. some species are very common and some are very rare).

(7) Lack of adequate, up-to-date maps for many study areas.

The Working Group determined the following.

(1) Due to the uniqueness of each species and study area, no universal methodology could be adopted, although

techniques should be standardised to the greatest extent possible.

(2) New theory or techniques will probably not be needed. Modifications of existing techniques (e.g. distance sampling techniques, mark-recapture analysis using photo-identification, acoustic survey methods, and in some specific cases, direct counts) should be sufficient.

Recommendations

(1) Scientists with the appropriate theoretical/analytical skills should be directly involved in river cetacean studies, so that surveys result in statistically robust estimates of abundance. Ideally, arrangements should be made for one or more of these researchers to obtain relevant experience at a suitable range of survey sites, and to make recommendations for appropriate survey and analytical methods.

(2) Organise a workshop designed to provide appropriate analytical skills to researchers responsible for analysing survey data for each species/area.

(3) Follow the workshop with site-specific training courses to provide theoretical background and field skills to field researchers in each area. These courses should involve practical, hands-on experience in the field (i.e. not just 'classroom' training).

Appendix 4

SMALL CETACEAN CATCHES 1996-1999

[See Table on following pages.]

SMALL CETACEAN CATCHES 1996-1999

All information was taken from National Progress reports unless otherwise stated. Catches are presented by nation, rather than ocean area, except in the case of the data submitted by the IATTC for the eastern tropical Pacif ic (ETP). In this case, the submitted estimated catches are not broken down by country and a summed total incidental catch for the participating countries is given. The reported catch columns include catches reported by observer programmes, from interviews with fishermen and incidental reports (e.g. stranded whales determined to have died in nets). Please note that catches should be tabled according to the calendar year in which they were taken. All direct and incidental removals (including live captures) should be recorded but **not** stranded animals. Further information can be found in Annex R.

	1996					1997					1998					1999				
	Direct		Indirect		Live	Direct		Indirect		Live	Direct		Indirect		Live	Direct		Indirect		Live
Species	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.
Argentina																				
Dusky dolphin	-	-	-	-	-	-	-	-	-	-	-	-	15[a]	-	-	-	-	-	-	-
Australia																				
Bottlenose dolphin	-	-	3	-	-	-	-	14	-	-	-	-	3	-	-	-	-	5	-	-
Common dolphin (?sp.)	1	-	6	-	-	-	-	7	-	-	-	-	7	-	-	-	-	8	-	-
Irrawaddy dolphin	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indo-pacific humpback	-	-	-	-	-	-	-	6	-	-	-	-	2	-	-	-	-	2	-	-
Spinner dolphin	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	1	-	-
Unidentified dolphin	-	-	12	-	-	-	-	1	-	-	-	-	27	-	-	-	-	11	2	-
Unidentified cetacean	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-
Brazil																				
False killer whale	-	-	1[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spinner dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bottlenose dolphin	-	-	1[a]	-	-	-	-	1[b]	-	-	-	-	-	-	-	-	-	-	-	-
Common dolphin	-	-	1[a]	-	-	-	-	1[a]	-	-	-	-	-	-	-	-	-	-	-	-
Franciscana	-		33	413-624	-	-	-	58	-	-	-	-	101[e]	25[f]	3[i]	-	-	17[j]	202[j]	-
Tucuxi	2	-	27	-	-	1	-	80[c]	20-25[d]	-	-	-	7[h]	3[g]	-	-	-	17[k]	141[k]	-
Spotted dolphin	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Atlantic spotted dolphin	-	-	1[a]	-	-	-	-	6[b]	-	-	-	-	-	-	-	-	-	-	-	-
Pantropical spotted dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Risso's dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rough-toothed dolphins	-	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	7	150	-
Striped dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Boto	11	-	3	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Unidentified dolphins	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified species	-	-	18[a]	-	-	-	-	11[a]	-	-	-	-	9[a]	-	-	-	-	-	-	-
Chile																				
Burmeister's porpoise	-	-	-	-	-	-	-	-	-	-	-	-	1[b]	-	-	-	-	1[d]	-	-
Long-finned pilot whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1[c]	-	-	-	-
Pygmy Sperm whale	-	-	-	-	-	-	-	1[a]	-	-	-	-	-	-	-	-	-	-	-	-
Denmark																				
Harbour porpoise	-	-	-	+	-	-	-	-	+	2	-	-	-	+	-	-	-	-	-	-
Unidentified species	-	-	-	+	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-

cont...

Small cetacean catches continued.

	1996					1997					1998					1999				
	Direct		Indirect		Live	Direct		Indirect		Live	Direct		Indirect		Live	Direct		Indirect		Live
Species	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.
ETP																				
Bottlenose dolphin	-	-	11[a]	11[a]	-	-	-	10[b]	10[b]	-	-	-	29	29	-	-	-	9	9	-
Pantropical spotted d.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northeastern	-	-	818[a]	818[a]	-	-	-	721[b]	721[b]	-	-	-	298	298	-	-	-	358	358	-
Western-southern	-	-	545[a]	545[a]	-	-	-	1,044[b]	1,044[b]	-	-	-	341	341	-	-	-	253	253	-
Coastal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spinner dolphin (? stock)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eastern	-	-	450[a]	450[a]	-	-	-	391[b]	391[b]	-	-	-	422	422	-	-	-	363	363	-
Whitebelly	-	-	447[a]	447[a]	-	-	-	498[b]	498[b]	-	-	-	249	249	-	-	-	192	192	-
Central	-	-	11[a]	11[a]	-	-	-	-	-	-	-	-	12	12	-	-	-	13	13	-
Striped dolphin	-	-	5[a]	5[a]	-	-	-	80[b]	80[b]	-	-	-	24	24	-	-	-	5	5	-
Common dolphin (?sp.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern	-	-	77[a]	77[a]	-	-	-	9[b]	9[b]	-	-	-	261	261	-	-	-	85	85	-
Central	-	-	51[a]	51[a]	-	-	-	114[b]	114[b]	-	-	-	172	172	-	-	-	34	34	-
Southern	-	-	30[a]	30[a]	-	-	-	58[b]	58[b]	-	-	-	33	33	-	-	-	1	1	-
Rough-toothed dolphin	-	-	-	-	-	-	-	20[b]	20[b]	-	-	-	-	-	-	-	-	-	-	-
Risso's dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-
Short fined pilot whales	-	-	-	-	-	-	-	5[b]	5[b]	-	-	-	-	-	-	-	-	-	-	-
Pygmy sperm whale	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
Unspecified dolphins	-	-	102[a]	102[a]	-	-	-	55[b]	55[b]	-	-	-	35	35	-	-	-	32	32	-
Faroes																				
Long-finned pilot whale	1,524[a]	-	-	-	-	1,162[b]	-	-	-	-	815[c]	-	-	-	-	608[d]	-	-	-	-
Atlantic white-sided d.	152[a]	-	-	-	-	350[b]	-	-	-	-	438[c]	-	-	-	-	0[d]	-	-	-	-
Bottlenose dolphin	21[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harbour porpoise	3[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
France																				
Long-finned pilot whale	-	-	2[a]	-	-	-	-	3[a]	-	-	-	-	1[a]	-	-	-	-	5[a]	-	-
Bottlenose dolphin	-	-	1[a]	-	-	-	-	5[a]	-	-	-	-	7[a]	-	-	-	-	7[a]	-	-
Striped dolphin	-	-	7[a]	-	-	-	-	12[a]	-	-	-	-	17[a]	-	-	-	-	14[a]	-	-
Common dolphin (?sp.)	-	-	16[a]	-	-	-	-	205[a]	-	-	-	-	19[a]	-	-	-	-	140[a]	-	-
Atl. white-sided dolphin	-	-	-	-	-	-	-	1[a]	-	-	-	-	-	-	-	-	-	-	-	-
Risso's dolphin	-	-	-	-	-	-	-	2[a]	-	-	-	-	2[a]	-	-	-	-	-	-	-
Common porpoise	-	-	-	-	-	-	-	9[a]	-	-	-	-	1[a]	-	-	-	-	8[a]	-	-
Unidentified dolphin	-	-	5[a]	-	-	-	-	87[a]	-	-	-	-	2[a]	-	-	-	-	18[a]	-	-
Unid./other cetacean	-	-	1[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1[a]	-	-
Germany																				
Harbour porpoise	-	-	6	-	-	-	-	4	-	-	-	-	5	-	-	-	-	3	-	-
Long-finned pilot whale	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White-beaked dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-

cont...

Small cetacean catches continued.

	1996					1997					1998					1999				
	Direct		Indirect		Live	Direct		Indirect		Live	Direct		Indirect		Live	Direct		Indirect		Live
Species	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.
Greenland																				
Narwhal	727[a]	-	-	-	-	797[b]	-	-	-	-	822[b]	-	-	-	-	c	-	-	-	-
White whale	521[a]	-	-	-	-	577[b]	-	-	-	-	746[b]	-	-	-	-	c	-	-	-	-
Harbour porpoise	1,824[a]	-	-	-	-	1,592[b]	-	-	-	-	2,131[b]	-	-	-	-	c	-	-	-	-
Long-finned pilot whale	67[a]	-	-	-	-	208[b]	-	-	-	-	365[b]	-	-	-	-	c	-	-	-	-
Ireland																				
Common dolphin	-	-	170	345	-	-	-	1[a]	-	-	-	-	14[c]	-	-	-	-	8[d]	-	-
Harbour porpoise	-	-	2[a]	-	-	-	-	3[b]	-	-	-	-	2[a]	-	-	-	-	4	-	-
White-sided dolphin	-	-	1	-	-	-	-	-	-	-	-	-	1[a]	-	-	-	-	-	-	-
Striped dolphin	-	-	65	134	-	-	-	-	-	-	-	-	14	-	-	-	-	1	-	-
Bottlenose dolphin	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pilot whale	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Risso's dolphin	-	-	1	-	-	-	-	1[a]	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified dolphin	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Italy																				
Striped dolphins	+	-	-	+	-	+	-	+	-	-	a	-	a	-	-	a	-	-	-	-
Bottlenose dolphins	+	-	-	+	-	+	-	+	-	-	a	-	a	-	-	a	-	-	-	-
Common dolphins	+	-	-	+	-	+	-	+	-	-	a	-	a	-	-	a	-	-	-	-
Japan																				
Baird's beaked whale	54	-	-	-	-	54	-	-	-	-	54	-	-	-	-	62	-	-	-	-
Killer whale	-	-	-	-	-	1	-	-	-	5	-	-	-	-	-	-	-	-	-	-
False killer whale	35	-	-	-	5	28	-	-	-	15	45	-	-	-	3	5	-	-	-	-
Short-finned pilot whale[a]	482	-	-	-	2	347	-	-	-	-	229	-	-	-	-	394	-	-	-	2
Pacific white-sided d.	-	-	2	-	19	-	-	-	-	-	-	-	1	-	-	-	-	-	-	11
Bottlenose dolphin	280	-	-	-	34	299	-	-	-	53	245	-	-	-	21	658	-	-	-	91
Pantropical spotted d.	67	-	-	-	-	23	-	-	-	-	460	-	-	-	-	38	-	-	-	-
Striped dolphin	303	-	-	-	-	602	-	-	-	-	449	-	2	-	-	596	-	1	-	-
Short-beaked common d.	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Risso's dolphin	369	-	5	-	3	228	-	14	-	-	442	-	-	-	3	489	-	-	-	-
Dall's porpoise	16,100	-	2	-	-	18,540	-	1	-	-	11,385	-	2	-	-	14,807	-	169	-	-
Finless porpoise	-	-	3	-	-	-	-	1	-	-	-	-	6	-	1	-	-	1	-	-
Unidentified dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified species	-	-	4	-	-	-	-	3	-	-	-	-	-	-	-	-	-	1	-	-
Korea																				
Baird's beaked whale	-	-	-	-	-	-	-	1[af]	-	-	-	-	-	-	-	-	-	1[gk]	-	-
Short-finned pilot whale	-	-	-	-	-	-	-	2[ag]	-	-	-	-	-	-	-	-	-	-	-	-
Pacific white-sided d.	-	-	32[ab]	-	-	-	-	2[ah]	-	-	-	-	7[kl]	-	-	-	-	3[kp]	-	-
Common dolphin	-	-	13[ac]	-	-	-	-	71[ai]	-	-	-	-	17[km]	-	-	-	-	25[k]	-	-
Risso's dolphin	-	-	45[ad]	-	-	-	-	2[j]	-	-	-	-	7[en]	-	-	-	-	2[ek]	-	-
Harbour porpoise	-	-	1[ae]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1[p]	-	-
Finless porpoise	-	-	-	-	-	-	-	-	-	-	-	-	2[ek]	-	-	-	-	14[q]	-	-
Stejneger beaked whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1[p]	-	-

cont...

Small cetacean catches continued.

	1996					1997					1998					1999				
	Direct		Indirect		Live	Direct		Indirect		Live	Direct		Indirect		Live	Direct		Indirect		Live
Species	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.
Mexico																				
Vaquita	-	-	-	-	-	-	-	1[c]	-	-	-	-	-	-	-	-	-	-	-	-
Bottlenose dolphin	-	-	-	-	12[b]	-	-	-	-	10[b]	-	-	-	-	4[d]	-	-	-	-	-
Netherlands																				
Long-finned pilot whale	-	-	16	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Atlantic white-sided d.	-	-	27	-	-	-	-	43	-	-	-	-	29	-	-	-	-	-	-	-
Common dolphin (?sp.)	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harbour porpoise	-	-	-	-	-	-	-	4	-	-	-	-	4	-	-	-	-	-	-	-
Unidentified dolphins	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
New Zealand																				
Long-finned pilot whale	-	-	-	-	-	-	-	-	-	-	-	-	1[b]	-	-	-	-	3	-	-
Bottlenose dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Common dolphin (?sp.)	-	-	2[a]	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Hector's dolphin	-	-	-	-	-	-	-	2	-	-	-	-	14[c]	-	-	-	-	5[d]	-	-
Dusky dolphin	-	-	1[a]	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-
Unidentified dolphin	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Peru																				
Dusky dolphin	-	-	-	-	-	-	-	-	-	-	-	-	7[g]	-	-	-	-	-	-	-
Long-beaked common d.	-	-	-	-	-	-	-	-	-	-	-	-	23[h]	-	-	-	-	-	-	-
Common dolphin (?sp.)	-	-	1[a]	-	-	-	-	-	-	-	-	-	1[j]	-	-	-	-	-	-	-
Bottlenose dolphin	-	-	1[b]	-	-	-	-	-	-	-	-	-	1[k]	-	-	-	-	-	-	-
Burmeister's porpoise	-	-	13[cd]	-	-	-	-	8[f]	-	-	-	-	16[l]	-	-	-	-	-	-	-
Unspecified species	-	-	1[e]	-	-	-	-	-	-	-	-	-	7[m]	-	-	-	-	-	-	-
South Africa																				
Bottlenose dolphin	-	-	62[a]	-	-	-	-	50[fg]	-	-	-	-	28	-	-	-	-	41[f]	-	-
Common dolphin (?sp.)	-	-	32[a]	-	-	-	-	90[fg]	-	-	-	-	7	-	-	-	-	11[f]	-	-
Indo-Pacific Humpbacked d.	-	-	4[e]	-	-	-	-	7[fg]	-	-	-	-	8	-	-	-	-	8[f]	-	-
Heaviside's dolphin	-	-	-	-	-	-	-	2[fh]	-	-	-	-	-	-	-	-	-	-	-	-
Risso's dolphin	-	-	1[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spinner dolphin	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Unidentified dolphins	-	-	1[a]	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Spain																				
Common dolphin (?sp.)	-	-	3	-	-	-	-	3	-	-	-	-	-	-	-	-	-	2	-	-
Cuvier's beaked whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
False killer whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Harbour porpoise	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Bottlenose dolphin	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Clymene dolphin	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-
Spinner dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Long-finned pilot whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Short-finned pilot whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Unidentified dolphin	-	-	-	-	-	-	-	3	-	-	-	-	5	-	-	-	-	4	-	-

cont...

Small cetacean catches continued.

	1996					1997					1998					1999				
	Direct		Indirect		Live	Direct		Indirect		Live	Direct		Indirect		Live	Direct		Indirect		Live
Species	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.	Rep.	Est. total	Rep.	Est. total	Rep.
St Lucia																				
Short-finned pilot whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8[a]	35[a]	-	-	-
Pygmy killer whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2[a]	18[a]	-	-	-
False killer whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3[a]	12[a]	-	-	-
Melon head whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+		-	-	-
Bottlenose dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2[b]	20[b]	-	-	-
Atlantic spotted dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12[b]	60[b]	-	-	-
Short-snouted Spinner dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Fraser's dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1[b]	6[b]	-	-	-
Common dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1[b]	10[b]	-	-	-
Striped dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Sweden																				
Harbour porpoise	-	-	17[b]	113[c]	-	-	-	8[d]	-	-	-	-	14	-	-	-	-	2	-	-
UK																				
White-beaked dolphin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Striped dolphin	-	-	-	-	-	-	-	-	-	-	-	-	1[e]	-	-	-	-	-	-	-
Common dolphin(?sp.)	-	-	-	-	-	-	-	6[a]	-	-	-	-	5[e]	-	-	-	-	4[h]	-	-
Risso's dolphin	-	-	2[b]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harbour porpoise	-	-	11[c]	752[g]	-	-	-	41[d]	791[g]	-	-	-	33[f]	-	-	-	-	19[i]	-	-
White-sided dolphin	-	-	-	-	-	-	-	2[b]	-	-	-	-	-	-	-	-	-	-	-	-
Bottlenose dolphin	-	-	-	-	-	-	-	1[b]	-	-	-	-	-	-	-	-	-	1[j]	-	-
Unidentified Delphinid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1[k]	-	-
USA																				
White whale	-	398-460[a]	-	-	-	-	315-346[j]	-	-	-	-	366[p]	-	-	-	-	-	-	-	-
Killer whale	-	-	-	-	-	-	-	2[t]	4[t]	-	-	-	1	1	-	-	-	-	-	-
Dwarf sperm whale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Long-finned pilot whale	-	-	8[cg]	11[cg]	-	-	-	1[l]	93[l]	-	-	-	-	-	-	-	-	-	-	-
Short-finned pilot whale	-	-	-	-	-	-	-	1[s]	6[s]	-	-	-	-	-	-	-	-	-	-	-
Pacific white-sided d.	-	-	3[d]	25[d]	-	-	-	3[k]	11[k]	-	-	-	1	1	-	-	-	-	-	-
Atlantic white-sided d.	-	-	2	114	-	-	-	6[m]	346[m]	-	-	-	-	-	-	-	-	-	-	-
Bottlenose dolphin	-	-	-	-	-	-	-	59[r]	-	-	-	-	-	-	-	-	-	-	-	-
Striped dolphin	-	-	7[h]	10[h]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Short-beaked common d.	-	-	27[d]	319[d]	-	-	-	21[q]	90[k]	-	-	-	9[q]	9	-	-	-	35[q]	-	-
Long-beaked common d.	-	-	1[d]	12[d]	-	-	-	4[k]	24[k]	-	-	-	-	-	-	-	-	1[q]	-	-
Common dolphin (sp.)	-	-	80[e]	1152[e]	-	-	-	7[n]	281[n]	-	-	-	-	-	-	-	-	-	-	-
Spotted dolphin	-	-	2[b]	2[b]	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-
Northern right whale d.	-	-	5[d]	27[d]	-	-	-	5[k]	25[k]	-	-	-	3	-	-	-	-	3[q]	-	-
Risso's dolphin	-	-	1[i]	25[i]	-	-	-	3[k]	8[k]	-	-	-	-	-	-	-	-	-	-	-
Harbour porpoise	-	-	100[f]	1540[f]	-	-	-	143[o]	1412[o]	-	-	-	1	2	-	-	-	26[q]	-	-
Dall's porpoise	-	-	2[d]	24[d]	-	-	-	10[u]	27[u]	-	-	-	7	9	-	-	-	-	-	-
Beaked whales	-	-	8[b]	13[b]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes on following page.

Argentina: (a) 5 caught by FV Humpback and 10 caught by FV Harengus between 2/4/98 to 13/4/98 (SC/51/SM45).
Brazil: All the information for the 1996, 1997 and 1998 catches was taken from the revised Prog.Rep. Brazil except for the 12 franciscana and 4 tucuxi caught on Northern RJ State (pers. comm . A.P. Di Beneditto and R. Ramos) 1998. The catches in 1999 are pers. comm. Salvatore Siciliano.
In the following notes the estimated catch is given, followed by the observed catch in brackets.
(a) Caught in Rio de Janeiro (pers. comm. A.P. Di Beneditto and R. Ramos - UENF). (b) 2 captured by boats operating from Ubatuba (SC/49/SM7) + 4 from Northern RJ State (pers. comm. A.P. Di Beneditto and R. Ramos - UENF). (c) Northeast 7,Southern/SC 6, Southern/PR 16, Southeast/BA 3, Amazon 36, Rio de Janeiro (UENF) 12. (d) Southern/SC. (e) 17 from Southern (north RS) + 61 from Southern (south RS) + 6 from SW Atlantic + 4 from Praia Grande – S.P. State + 12 from North of RJ State. (pers. comm. A.P. Di Beneditto and R. Ramos) + 1 from northern Rio de Janeiro (pers. comm. S. Siciliano). (f) 4 from Praia Grande – S.P. State + 6 from SW Atlantic + 15 from Northern Rio Grande do Sol (g) 3 from SW Atlantic. (h) 3 from SW Atlantic + 4 from Northern RJ State (pers. comm . A.P. Di Beneditto and R. Ramos). (i) From Praia Grande – S.P. State
(j) 178 [1986-1999] (1) from Northern Rio de Janeiro + 24 [Aug. 1998 - May 2000] (10) from Central São Paulo + 3 frm Northern Rio Grande do Sul + 3 from Northern Rio de Janeiro (pers. comm . A.P. Di Beneditto and R. Ramos). (k) 141 (4) from Northern Rio de Janeiro + 4 from Northern Espírito Santo + 2 from Paraíba + 7 from Northern Rio de Janeiro State (pers. comm . A.P. Di Beneditto and R. Ramos).
Chile: Figures are taken from SC/51/SM17 and are a mixture of direct and incidental catches.
(a) Carcass (IV) found floating in high intensity fisheries area during 1997-98 IWC SOWER blue whale cruise. (b) Port Punta de Choros IV R – Carcass (II) with net marks butchered openly on wharf; meat reportedly used for human consumption. (c) Stranded (III) , harpoon wounds; + witness evidence directed take; parts muscle and blubber removed. (d) Stranded with multiple cut marks and flukes severed.
ETP: (a) SC/49/SM4. (b) Annual Report of the Inter-American Tropical Tuna Commission 1997
Faroes: (a) NAMMCO Annual Report 1997: Faroe Islands Progress Report 1996. (b) NAMMCO Annual Report 1998: Faroe Islands Progress Report 1997. (c) NAMMCO Annual Report 1999: Faroe Islands Progress Report 1998. (d) Pers. comm. Daniel Pike.
France: (a) Includes those found stranded with marks indicating that they had been most probably caught in fishing gear. Data are provided by the CRMM-La Rochelle, France.
Greenland: (a) NAMMCO annual Report 1999: Greenland Progress Report 1997. (b) Pers. comm. Daniel Pike. (c) No information.
Ireland: (a) Bycatch determined from post-mortems. (b) Bycatch of 2 determined from post-mortem + 1 incidentally caught. (c) Bycatch of 1 determined from post-mortem + 13 incidentally caught in surface gillnet. (d) Bycatch of 1 determined from post-mortem + 7 incidentally caught in surface gillnet.
Italy: (a) Centro Studi Cetacei della Societa Italiana di Scienze Naturali 1998 and 1999 report in preparation.
Japan: (a) Northern and Southern forms.
Korea: (a) Kyeong-Buk area. (b) Figures composed as follows: 19 Coastal drift gillnet, 9 Set net, 3 Coastal trap, 1 Coastal gillnet. (c) Figures composed as follows: 10 Set net, 3 Coastal drift gillnet. (d) Figures composed as follows: 44 Set net, 1 Offshore angling. (e) Set net. (f) Coastal drift gillnet. (g) Drift gillnet. (h) Figures composed as follows: 1 Coastal trap, 1 Coastal gillnet. (i) Figures composed as follows: 48 Set net, 9 Coastal trap, 8 Coastal drift gillnet, 3 Offshore drift gillnet, 1 Coastal gillnet, 1 Drift gillnet, 1 Coastal longline. (j) Figures composed as follows: Kyeong-Nam area 1 Set net, Kang-Won area 1 Gillnet. (k) East sea. (l) Figure composed as follows: 4 set net, 2 gillnet, 1 drift gillnet (m) Figure composed as follows: 9 set net, 7 gillnet, 1 drift gillnet. (n) South sea. (o) Figures composed as follows: 20 Set net, 5 Gillnet. (p) Gillnet. (q) Figures composed as follows: 1 East sea 1 Gillnet, 13 Yellow sea Stow net.
Mexico: (a) See the ETP table for catches taken in the Eastern Tropical Pacific. They are not included here. (b) The animals were live captured at locations in the Gulf of California under permits issued by SEMARNAP. They are being kept in captivity at recreational facilities. (c) Captured in the Gulf of California. (d) Permits issued by SEMARNAP. The animals are being kept in captivity at recreational facilities.
New Zealand: (a) pers. comm. M. Donoghue. (b) pers. comm. R.G. Johnston. (c) From Govt observer program (covering about 10% of range of Hector’s dolphin). (d) No. beachcast.
Peru: Figures are taken from SC/51/SM17 and are a mixture of direct and incidental catches. All catches taken from Tables 1-4 have been tabled as incidental because it is not clear which were direct and which were incidental.
(a) Salaverry (Monitoring period 3 – 12 December 1996). (b) Chimbote. (c) Salaverry - 3 fresh heads + Pucusana - 1 fresh blubber remains, found on Naplo beach. (d) San Jose - 2 caught - in unspecified gillnet (Monitoring period 7–14 October 1996) + Salaverry - 2 caught (Monitoring period 3 – 12 December 1996) + 2 reportedly taken in seiners + 1 apparently caught in seiners + 1 caught + Cerro Azul - 1 caught - inshore gillnet fishery (Monitoring period 15–23 January 1996). (e) Cerro Azul – fisherman told observer, animals not seen; unidentified may be Dusky dolphin (Monitoring period 15–23 January 1996). (f) Salaverrry - collected during sealion census 15–28 February 1997 (5 were fresh heads). (g) Salaverry - 4 heads, and skulls/calvaria + Chimbote - 1 head + San Andres - 2 butchered. (h) Salaverry - 19 heads, and skulls/calvaria + Chimbote - 2 heads + Pucusana - 1 head, backbone & viscera on beach; young animal + 1 head found on beach; young animal. (j) Chimbote - relatively fresh head found on beach close to fishmarket. (k) Pucusana - Entire but cut specimen found on Naplo beach. (I) Salaverry- 9 heads, and skulls/calvaria + Chimbote - 4 relatively fresh heads found on beach close to fishmarket + 3 heads. (m) Chimbote – 2 + Pucusana – 1 freshly cut stomach of an unidentified small cetacean washed ashore on Naplo beach + 1 Blubber of an unidentified cetacean + 1 Blubber of an unidentified cetacean seen on Naplo beach + San Andres - 2. (n) Chancay 41 + Pucusana 3 + Cerro Azul 16 + Laguna Grande 1+ Salaverry 1. . (o) Chancay 6 + Matacaballo2 + Parachique 1 + Bayovar 7 + San Jose 3 + Pimental 1 + Santa Rosa 1 + Salaverry 1. (p) Zorritos 1 + Talara 2 + Bayovar 1. (q) Mancora 1 + Constante 1 + Bayovar 1 + San Jose 1 + Salaverry 4. (r) Chancay 4 + Pucusana 2 + Cerro Azul 5 + San Andres 1 + Talara 2 + Bayovar 2. (s) Chancay 21 + Pucusana 1 + San Andres 3 + Constante 10 + Bayovar 19 + San Jose 8 + Pacasmayo 1 + Salaverry 27 + Chimbote 10. (t) Mancora. (u) Chancay 16 + Cerro Azul 10 + Zorritos 1 + Constante 2 + Bayovar 3 + Salaverry 8 .
South Africa: (a) Annual catch of small cetaceans in shark nets (SC/49/SM34). (b) Fishery-related mortalities (excluding live-fishery) (SC/49/SM34). (c) Figure composed as follows: 57 in shark nets + 2 fishery-related mortalities (SC/49/SM34). (d) Figure composed as follows: 25 in shark nets + 1 fishery-related mortality (SC/49/SM34). (e) Figures composed as follows: 3 in shark nets + 1 fishery-related mortality (SC/49/SM34). (f) pers. comm. P. Best (g) Caught in shark nets. (h) Died in research trawl.
St Lucia: All caught in the Caribbean Sea. (a) Harpoon gun. (b) Harpoon gun/hand harpoon.
Sweden: (a) SC/48/SM25. bycatch in the Swedish codfish gillnet fishery in ICES area 4456. Reported catch taken during a total of 95 observer days at sea. (b) The bycatch observer schemes reported 6 harbour porpoises in the Skagerrak Sea and 8 in the Kattegat Sea. An additional 3 animals were collected in the Skagerrak Sea from the driftnet fishery during the satellite telemetry study. (c) Estimate for bycatch in the Swedish Skaggerak Sea cod fish gillnet fishery based on observer scheme data. (d) Two bycaught in Skagerrak Sea mackeral driftnets + 5 bycaught in Skagerrak Sea bottom set gillnets + 1 bycaught in Baltic Sea bottom set gillnet.

UK: (a) Bycatch determined from strandings post-mortems (England and Wales). (b) Bycatch determined from strandings post-mortems (Scotland). (c) Figure composed of: 3 from bottom set gillnets + 8 determined from strandings post-mortems (7 from England and Wales + 1 from Scotland). (d) Figure composed of: 25 from bottom set gillnets + 16 determined from strandings post-mortems (12 from England and Wales + 4 from Scotland). (e) Bycatch diagnosed at necropsy (England and Wales). (f) Figure composed of: 20 from gillnets, 12 unknown but diagnosed at necropsy, 1 reported to SWF in Shetland (2 from Scotland, 30 from England and Wales + 1 from Shetland). (g) SC/51/SM42. (h) Bycatch diagnosed at necropsy (England). (i) Figure composed as follows: 9 diagnosed at necropsy (England and Wales), 4 Gillnet fisheries (England), 1 Gillnet (E. Scotland), 3 Trawl (W. Scotland), 2 diagnosed at necropsy (W. Scotland). (j) Illegal salmon net (Moray Firth). (k) Gillnet fishery (England).

USA: Figures for the years 1996 were compiled by Janeen Quintal. (except for the White whale figures). The reported catch columns include catches reported by observer programs, from interviews with fishermen and incidental reports (e.g. stranded animals determined to have died in nets). There are no live captures to report. All information is taken from published US A National Marine Fisheries Service Annual Marine Mammal Stock Assessment Reports unless otherwise indicated. Stranded animals are not included. The 1997 information was taken from National Progress reports unless otherwise stated.

In the following notes the estimated catch is given, followed by observed catch in brackets.

(a) Includes 94-145 struck and lost + 304-315 landed (SC/52/ProgRepUSA). (b) New England pelagic drift gillnet. (c) May include some short-finned pilot whales; Atlantic swordfish gillnet and pair trawl fisheries. (d) SC/49/SM2. California swordfish/shark drift gillnet fishery (e) Figure composed as follows: 106 (74) NE pelagic drift gillnet + 43 (2) mid-Atlantic coastal sink gillnet + 63 (1) NE multispecies sink gillnet + 940 (3) Atlantic squid, mackerel, butterfish trawl. (f) Figure composed as follows: 1200 (52) NE multispecies sink gillnet + 311 (19) mid-Atlantic coastal sink gillnet and 29(29) No. Washington set gillnet fishery. (g) Western North Atlantic figure composed as follows: 11 (7) pelagic drift gillnet + (1) squid,mackeral,butterfish. (SC51\ProgRepUSA) (h) Western North Atlantic pelagic drift gillnet. (SC51\ProgRepUSA) (i) Bycatch in the U.S. Atlantic longline fishery - Gulf of Mexico (SC/51/SM25). (j) Includes 83-100 struck and lost + 232-246 landed (SC/52/ProgRepUSA). (k) California drift gillnet. SC/50/SM2. (l) No. Atlantic otter trawl. (m) Figure composed as follows: 140 (4) from NE multispecies sink gillnet + 161 (1) W. No. Atlantic mackerel fishery + 45 (1) Coastal sink gillnet (SC/52/ProgRepUSA). (n) Figure composed as follows: 11(3) California drift gillnet.(SC/50/SM2), + 16(2) mid-Atlantic coastal gillnet (SC/52/ProgRepUSA) + 161(1) Atlantic squid, mackerel, butterfish trawl (SC/52/ProgRepUSA) + 93(1) No. Atlantic bottom trawl (SC/52/ProgRepUSA). (o) Figure composed as follows: 50(50) California halibut/angel shark set-net. (This fishery has not been observed since July of 1994; consequently estimates of harbour porpoise were based on observations during the period 7/90-7/94. Using mean-per-unit estimation, an estimated 50 harbour porpoise were killed in this fishery during 3,215 effort days in 1997) + 775 (47) NE multispecies sink gillnet (SC/52/ProgRepUSA) + 572 (32) mid-Atlantic coastal sink gillnet (SC/52/ProgRepUSA) + 13 (13) Northern Washington marine set gillnet (SC/52/ProgRepUSA) + 2 (1) Alaska groundfish fisheries (trawl, longline and pot) (SC/52/ProgRepUSA). (p) K.J. Frost 1999. Harvest report: statewide summary for western Alaska beluga stocks, 1994/98. Report 99-1, Alaska Beluga Whale Committee; Cook Inlet figures - pers. comm DeMaster. Includes 39 struck and lost (except Cook Inlet, where no data were available). (q) SC/52/SM25. (r) Stranded animals that were verified as human interaction. Figure composed as follows: 36 No. Carolina + 9 So. Carolina + 1 Georgia + 7 Florida + 1 Alabama + 2 Mississippi + 1 Louisiana + 2 Texas (SC/52/ProgRepUSA). (s) California/Oregon thresher shark/swordfish drift gillnet fishery (SC/52/ProgRepUSA). (t) Figure composed as follows: 2 (1) Alaska groundfish fisheries (trawl, longline and pot) + 2 (1) Bering Sea/Aleutian Is. Groundfish trawl (SC/52/ProgRepUSA). (u) Figure composed as follows: 17 (4) California drift gillnet (SC/50/SM2) + 8 (5) Washington, Oregon, California (At-sea processing groundfish trawl fishery) (SC/52/ProgRepUSA) + 2 (1) Alaska groundfish fisheries (trawl, longline and pot) (SC/52/ProgRepUSA).