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Species diversity, deasonal variation and capture method of small cetaceans on the west coast of Sri Lanka

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Abstract

Species diversity, seasonal variation and capture methods were examined, in small cetacean catches and offshore sightings at the fishing sites and adjacent waters of Beruwal a and Negombo, on the west coast of Sri Lanka, from May to October 1994.

325 and 263 individual specimens of 12 and 9 species of small cetaceans *(Stenella longirostris, Stenella coeruleoalba, Stenella attenuata, Tursiops truncatus, Grampus griseus, Peponocephala electra, Pseudora crassidens, Feresa attenuata, Kogia breviceps, Kogia simus, Steno bredanensis, Lagenodelphis hosei)* were recorded in the landings at Beruwala and Negombo respectively. Offshore sightings contained 114 and 565 individuals, of two species (*Stenella longirostris, Tursiops truncatus*) off Beruwala and Negombo respectively. Species diversity between sites was not significantly different for the catch but was significant for sightings, while diversity between catch and sightings at each site was significantly different. Seasonal variation was observed in peak catches but there was no clear seasonality for offshore sightings. Capture method did not differ significantly between sites indicating increased harpooning.

Many species not sighted offshore were found in catches at both sites, indicating even deep sea stocks of small cetaceans are exposed to threat by fisheries. The finding that intentional harpooning is spreading both in area and extent should be noted and investigated further.

Key Words : small cetacean, species diversity, seasonal variation, capture method.

1. Introduction

Studies on cetaceans in Sri Lanka were limited to the examination of a few stranded individuals and collection of skeletal specimens by researchers of the Ceylon Museum in the early part of this century as detailed in DERANIYAGALA (1945) and DE SILVA (1987). Since the early 1980's more systematic research on cetaceans concentrating on the occurrence of large whales was initiated by the National Aquatic Resources Agency of Sri Lanka and studies were carried out by researchers attached to the marine mammal program of this Agency. In the course of these studies several species of small cetaceans were identified and it was discovered that small cetaceans are killed both as a fisheries bycatch and by direct harpooning in Sri Lanka (LEATHERWOOD and REEVES 1989). However, most studies which included a small cetacean component, concentrated on trying to estimates the annual catch and the results of successive studies yielded extremely disparate estimates ranging from a high of 49,863 (LEATHERWOOD and REEVES 1989) subsequently revised to between 8,042 and 11,821 (LEATHERWOOD 1990), to a low of 5,181 (DAYARATNE and JOSEPH 1993). A major draw back of these studies was that the collected catch data were not analyzed using accepted diversity indices to quantify species diversity and none of them included an offshore occurrence or sighting component for small cetaceans.

Therefore, the present study was undertaken at the two selected fish landing sites of Beruwala 6^0 05'N, 80^0 01'E and Negombo 7^0 02'N, 79^0 09'E on the west coast of Sri Lanka (where small cetacean catches were known to occur) and adjacent offshore waters (Figure 1). The Study was carried out with a view to determining significant variation in species richness, species abundance and species diversity between the catch and offshore sightings within sites, and between sites with regard to catch and sightings of small cetaceans. This study also attempted to determine seasonal variation of numbers and species in the catch and occurrence of small cetaceans. An attempt was also made to determine catch percentage according to variation in capture method and to ascertain if there is a seasonal variation in this regard. The chosen parameters were examined using a statistical approach as it was felt that such a study would contribute important information towards an understanding of the impact of the catch on populations of small cetaceans in Sri Lanka's waters. It is expected that the results obtained will provide the base line which is currently lacking for more long-term studies, which are necessary for formulation of a comprehensive, rational management and/or conservation plan for small cetaceans in Sri Lanka.

Materials and Methods

The small cetacean catch was monitored on ten fishing days per month at each of the two sites for a period of six consecutive months from May to October 1994. The ten monitoring days were selected on a systematic basis by starting on the first Monday of each month at Beruwala and the first Tuesday of each month at Negombo, and sampling on alternate days till a total of ten days of sampling was completed for each site. The date, species, sex, total length and capture method were recorded for each specimen of small cetacean in the catch on these monitoring days. Species were identified using LEATHERWOOD and REEVES (1983), and specimens were sexed by examining external genitalia. The total length (tip of snout to fluke notch) was measured using a 12 meter, steel measuring tape held taut. Specimens were examined individually to determine method of capture by the presence of net marks or external harpoon wounds. Once a month an offshore survey was carried out off each site during the same period of monitoring. An 82 km transect was carried out off each site (Figure 1) to cover an area located an equal distance offshore from each site, using a three and a half ton, mechanized fishing boat. A Suunto KB 14/ 360R compass was used to get bearings for navigation and small cetaceans sighted upto a distance of 0.5 km in any direction off the transect line were recorded. All small cetaceans sighted were approached as close as possible (2-20 meters), species were indentified and numbers were recorded along with sea state, distance from shore, direction of movement, behavior (feeding, bow riding etc.), associated organisms and the time of sighting. Where animals were not approached closer than 10 meters 10X50 Nikon binoculars were used for counting and species identification. Species were identified using LEATHERWOOD and REEVES (1983), the principal authors experience (over a decade) of marine mammal identification at sea, and photographs obtained using a Pentax K1000 camera with a 60-300mm zoom lens, to ensure positive identification.

Where appropriate statistical comparisons were made using the Shannon Weiner Index (MAGURRAN 1988), Students t-Test (MAGURRAN 1988), t-Test for Related Measures (BRUNING and KINTZ 1987) and X^2 Test of Independence (BRUNING and KINTZ 1987). In statistical computations level of significance was set at $P<0.05$ as significant and $P<0.001$ as highly significant.

Results

Species Diversity

A total of 588 specimens of small cetaceans were recorded in the fisheries catch : 325 specimens of 12 species at Beruwala and 263 specimens of 9 species at Negombo (Table 1). The most abundant species in the catch at both sites was the Spinner dolphin (*Stenella longirostris*), comprising 56.6% of the total recorded catch at Beruwala and 62.7% at Negombo. Other species commonly caught at both sites were Striped dolphin (*Stenella coeruleoalba*), Spotted dolphin (*Stenella attenuata*), Bottle-nose dolphin (*Tursiops truncatus*) and Risso's dolphin (*Grampus griseus*) (Table 1). In addition to these more abundantly caught species Melon-headed whale (*Peponocephala electra*), Rough toothed dolphin (*Steno bredanensis*), False killer whale (*Pseudorca crassidens*), Pygmy sperm whale (*Kogia breviceps*), Pygmy killer whale (*Feresa attenuata*), Dwarf sperm whale (*Kogia simus*) and Fraser's dolphin (*Lagenodelphis hosei*) were recorded in smaller numbers (each comprising less than 2.0% of the total catch) from Beruwala. At Negombo, in addition to the five most common species only the four species of *S. bredanensis, L.hosei, F. attenuata* and *P. electra* were recorded and of these only *S. bredanensis* was recorded in significant numbers comprising 3.4% of the total catch for this site. The species diversity of the catch between the two sites was not significantly different according to the Shannon Weiner Index and Students t-Test ($t=1.437$, $df=559.8$, $P<0.20$).

During the offshore transects a total of 679 small cetaceans were sighted : 114 animals from 10 separate sightings recorded off Beruwala and 565 animals from 13 separate sightings off Negombo (Table 2). Only the two species of *S. longirostris* and *T. truncatus* were recorded in sightings off both sites. The percentage of sightings and number of animals sighted varied widely between sites. *S. longirostris* comprised 13.2% and 99.3% of the number of animals sighted at Beruwala and Negombo respectively while accounting for 10% and 86.7% of the number of separate sightings at the two sites respectively. *T. truncatus*, on the other hand, comprised 86.8% and 0.7% of the number of animals sighted off Beruwala and Negombo respectively while accounting for 90.0% and 13.3% of the number of separate sightings at the two sites respectively. The average number of individuals per sighting of *S. longirostris* was 40.4 as against 9.2 for *T. truncatus*. The Shannon Weiner Index and Students t-Test showed a highly significant difference between the diversities in offshore sightings for each site ($t=5.575$, $df=135.2$, $P<0.001$). The difference between the species diversity in the catch and offshore sightings for each site were also highly significant

(Beruwala t=12.301, df=361.7, P<0.001; Negombo t=17.263, df=295.6, P<0.001).

Seasonal Variation

The largest number of specimens in the catch were recorded in the months of September and October at both sites while the largest number of the most commonly caught species *S. longirostris* was caught in the month of September at both sites (Table 1). Species that were not common in the catch were caught more frequently in the first three months of monitoring: at Beruwala the majority of specimens of *P.electra, P.crassidens, F. attenuata, K.breviceps* and *L.hosei* were recorded in the month of May with a few in June and July; at Negombo *F. attenuata, S. bredanensis* and *L.hosei* had a majority of specimens caught in the months of May, June and July (Table 1). The t-Test for Related Measures showed that monthly variation between sites was significant only for the month of July (t=3.500, df=9, P<0.01)

With regard to offshore sightings of small cetaceans the largest number of animals sighted off Beruwala was in the month of September (42). The number of sightings per transect was two for all months except in the months of July and August when it was one per transect. At Negombo, large numbers of animals totalling well over a 100 per transect were sighted in the months of May (185), August (147) and October (169) while the number of separate sightings were also high in the same three months with a peak (six separate sightings) in the month of October. The seasonal difference in small cetacean sightings between sites was not significant according to the t-Test for Related Measures (t=2.235, df=10, P<0.10).

When the catch data were categorized into a monsoonal (May-July) and post monsoonal (August to October) season based on weather and sea state off the west coast, higher numbers were recorded for both sites in the post monsoonal season. The t-Test for Related Measures showed that the variation between seasons was highly significant at Beruwala (t=4.623, df=11, P<0.001) and significant at Negombo (t=3.362, df=8, P<0.01). When offshore sightings were tested for differences between monsoonal and post monsoonal seasons there was no statistically significant variation for either of the two sites (Beruwala t=0.450, df=1, P<0.50; Negombo t=1.340, df=1, P<0.50).

Capture Method

Of the total recorded catch at Beruwala and Negombo 47.4% and 45.2% respectively were intentionally harpooned while 52.6% at Beruwala and 54.5% at Negombo were a result of accidental entrapment in nets (Table 3.2). At Beruwala 52.2% of *S. longirostris* (the dominant species in the catch) specimens were harpooned while most of the other commonly caught species had a higher percentage being accidentally entrapped in nets (Table 3.1). Of the more common species caught at Negombo, *S. attenuata* had a larger percentage of harpooning while *T. truncatus* had an equal incidence of harpooning and net entanglement. The difference between intentional harpooning and accidental net entrapment was not statistically significant according to the X^2 Test of Independence for the total recorded catch (X^2=0.271, df=1, P<0.70) or for the predominantly caught species *S. longirostris* (X^2=0.642, df=1, P<0.30). With regard to numbers of animals harpooned, at Beruwala there was a peak in the month of September while the largest numbers of harpooned animals at Negombo were recorded in the months of September and October. However, as a percentage of the total catch harpooning showed a peak in August at both sites (Table 3.1).

Discussion

The present study recorded 12 and 9 species of small cetaceans from the catch at Beruwala and Negombo respectively. JOSEPH and SIDDEEK (1985) studied the catch at the same two sites and recorded 11 species collectively, without specifying the species recorded from each site separately. Further, they have not recorded *P.electra* and *S.bredanensis* which were recorded from both sites in the present study. Although three species not recorded in the catch at Negombo were recorded at Beruwala in the present study, the diversity between the catch at the two sites was not significantly different, indicating that there is no localization in the distribution of these species.

The most common species in the catch at both sites in the present study was *S. longirostris*. This is in agreement with results of previous studies along the west coast (JOSEPH and SIDDEEK 1985:34.1%,; ALLING 1983:40%) as well as island wide (LEATHERWOOD and REEVES 1989: dominant species"; DAYARATNE and JOSEPH 1993: 58.2%). Although JOSEPH *et.al.* (1983) and JOSEPH and SIDDEEK (1985) recorded the species *Orcella brevirostris* as one of the most common species in the catch at Negombo, not a single specimen of this species was recorded in the present study, confirming results of LEATHERWOOD and REEVES (1989)

and DAYARATNE and JOSEPH (1993) who also did not record *O. brevirostris* from Negombo or any other site in the island. This means that a species that was common in the catch in the earl 1980's is no longer being caught for some unknown reason. Alternatively, this discrepancy may be due to an error in the initial identification by JOSEPH *et. al.* : the immature specimens (which comprise the majority of the catch) of *G. griseus* which is a commonly caught species are lighter in color than adults and are similar to *O. brevirostris* in general shape, which could lead to confusion between these two species.

The present study was the first in Sri Lanka to undertake an offshore component and report on offshore occurrence of small cetaceans simultaneously with monitoring of catches. As none of the previous studies had an offshore component comparison between this particular component of the present study with previous studies was not possible. However, this aspect of the present study enabled statistical comparison between catch and offshore occurrence data and also comparison between occurrence between sites. Diversity between sites in offshore occurrence of small cetacean species was highly significant due to a disparity in species abundance rather that species richness in sightings. *S. longirostris* was the most common species in sightings off Negombo while the majority of sightings off Beruwala were of *T.truncatus* and the number of animals per group sighted deferred largely between species. All sightings of *S.longirostris* from both areas numbered in excess of 10 individuals with one sighting off Negombo with a number as high as 171 animals. In contrast the largest number recorded in a single sighting of *T. truncatus* was only 35 individuals with a majority of sightings containing less than 10 individuals. This disparity in group sizes for these two species resulted in much larger numbers being recorded off Negombo where the majority of sightings were of *S. longirostris*. This indicates that of the two species recorded in offshore sightings *S. longirostris* is the more gregarious, moving around in large schools in the coastal waters off the west coast of Sri Lanka. LEATHERWOOD and REEVES (1983) have also reported similar group sizes for these two species.

Statistical comparison of diversity indices between catch and offshore sightings for each site clearly indicated a highly significant difference, with the catch having a much larger number of species than were recorded in offshore sightings. This may be due to the fact that the transect surveys were carried out only to a distance of 16 km off the coast, where only two species which frequently inhabit these near shore or coastal waters were sighted. With the development of the fisheries fleets in these sites

on the west coast most mechanized boats, have of recent times, been converted for multi-day fishing, and they operate further offshore than boats going out every evening to return the next morning which was the earlier practice. Therefor, the ten species of small cetaceans recorded in the catch but not in sightings are most likely caught in deep-sea areas, well beyond the continental shelf break and the 16 km limit of the surveys carried out in the present study.

The species most frequently sighted off Beruwala, *T. truncatus* was only the fourth most commonly caught species at the same site. (7.7% of the total catch) while at Negombo it was the second most frequently caught species but accounted for only 0.7% of offshore sightings there. In contrast *S. longirostris* the most commonly caught species at both sites accounted for only 13.2% of the animals sighted and 10% of the number of separate sightings off Beruwala but off Negombo this species comprised 99.3% of the number of animals sighted and 86.7% of the number of separate sightings. This is indicative of some localization in the distribution of *S.longirostris* and *T.truncatus* within the coastal waters off the west coast. On the other hand, the same argument does not hold true in deep-sea areas beyond the continental shelf, from where the majority of the catch is brought.

Results of the present study on seasonal variation of the catch differ from previous studies where JOSEPH *et. al.* recorded equal peaks at Negombo in the months of November and January, while LEATHERWOOD and REEVES (1989) recorded peak catches for Trincomalee (east coast) in October 1984, July 1985 and April 1986. Meanwhile, DAYARATNE and JOSEPH (1993) record peak catches for the west and south-west sectors in the month of November. However, comparison of this factor is difficult as the duration of these studies range between 4 and 30 months while the present study was of 6 months duration. The results of the present study revealed that catches at both sites increased in the post monsoonal period, once the south-west monsoon diminished, reaching peak numbers in September/ October. This may indicate a relationship between peak catches of small cetaceans off the west coast and weather patterns. The present study also found species richness to be higher in May and June in the monsoonal period. It is possible that the less commonly caught species, generally inhabit deep offshore waters but move towards inshore waters in response to the movement of food sources, during the onset of the south-west monsoon, when strong winds and corresponding rough-seas prevail off the west coast. LEATHERWOOD and REEVES (1983) report that most species of small whales and dolphins may move coastward seasonally in response to changes in water temperature that affect food availability in the form of a coastward

movement of particular food sources. This kind of movement at the onset of the monsoon could make these less common species vulnerable to being caught during these months. The present study also indicated that there is no significant seasonal variation in the catch between the two sites which are both on the west coast of Sri Lanka.

Unlike in the catch, offshore sightings did not reveal a single clear peak, seasonal trend or any significant difference between the monsoonal and post monsoonal periods. Therefore it is possible that the occurrence of small cetaceans in the coastal waters is dependent on non-weather related sources of food in the form of nutrient rich river out-falls and associatied food sources. This conclusion is corroborated by the fact that on days when large numbers of dolphins were encountered, they were often in associaton with species of fish such as Yellow-fin tuna (*Neothunnus macropterus*) or Flying fish (*Exocoetus volitans*) and sea birds such as Bridled terns (*Sterna anaethetus*), Wedge-tailed shearwaters (*Puffinus pacificus*), Flesh-footed shearwaters (*Puffinus carneipes*) and Wilson's storm petrels (*Oceanites oceanicus*) which indicated a general abundance of food in the area.

In the present study both incidental entrapment and intentional harpooning were observed in the small cetacean catch at both sites. JOSEPH *et. al.* (1983) and JOSEPH and SIDDEEK (1985) found no harpooned specimens at Beruwala or Negombo, while ALLING (1985) also found no harpooned specimens at Beruwala. Subsequently, LEATHERWOOD and REEVES (1989) recorded some harpooning at Negombo and DAYARATNE and JOSEPH (1993) recorded harpooning on a very small scale at both Negombo and Beruwala (99 specimens out of 738 examined at Beruwala and 17 out of 477 examined at Negombo). In contrast to all these studies, the present study found that there was no statistically significant difference between the two methods of capture (harpooning and net entanglement) at either of the sites. If as earlier records show, harpooning was not a major method of capture, a statistical test should have resulted in a significant difference between the two methods because accidental entrapment should have been far greater than harpooning. While intentional catch by harpooning has been known at Negombo since the mid 1980's it was not recorded at Beruwala till the 1990's and even in 1991/1992 DAYARATNE and JOSEPH only indicated the practice to be of a minute scale. Therefore, the present study reveals a considerable increase in the rate of harpooning in recent times, at both sites, which is a matter for concern. The present study also found that the rate of harpooning at Beruwala is even higher than at Negombo where the practice is not new, indicating not only an increase in harpooning at both sites but also a spread of the practice along the coast line.

The Present study also found a link between the seasonal increase in total number of small cetaceans caught and capture method. At Beruwala the peak of intentional harpooning in the month of September, corresponded with the increase in the total number of animals caught, while at Negombo the peak in net entrapment occurred in October and the largest numbers harpooned were equal for September and October, corresponding to a peak in the total catch. The percentage of harpooning increased at both sites in the month of August, clearly indicating a relationship between this method of capture and the change in sea state due to weather patterns off the west coast. The south-west monsoon which affects the west coast of Sri Lanka prevails from May to September, but results in strong winds, rough seas and heavy rain only from may to July, resulting in a decreased fishing effort at this time. The sea becomes calmer by August and facilitates increased fishing effort, specially in Negombo where fishermen engage in lagoon and nearshore fisheries during the rough months and begin offshore fisheries such as gillnetting (the principal cause for accidental entanglement of small cetaceans) once more in August. Likewise, harpooning is possible only in calm weather, as using a hand held harpoon accurately off the bow of a boat which is being constantly tossed in a rough sea is difficult, even for the most skilled fisherman, specially because dolphins are fast moving, agile creatures, unaffected by the rough seas.

Both LEATHERWOOD and REEVES (1989) and DAYARATNE and JOSEPH (1993) report that harpooning of small cetaceans is practiced by fishermen as a means of compensation when fish catches are particularly low. DAYARATNE and JOSEPH go on to state that harpooning is therefore practiced in coastal or nearshore waters on the return journey and species with a high relative abundance in nearshore waters may be represented more in the harpooned category of the catch. In contrast to these observations the present study which also monitored nearshore occurrence of small cetaceans, found that more than 40% of the catch of the species *S. longirostris, S. coeruleoalba* and *G. griseus* at Beruwala were harpooned while only *S. logirostris* was recorded as occurring at all in nearshore waters off this site while the other two species were never sighted. Meanwhile the most commonly occurring species in nearshore waters off this site, *T. truncatus* had a lower percentage of harpooning than the above species. Likewise, at Negombo the species with the highest percentage of harpooning (75%) *S. attenuata* was never sighted in the coastal waters off this site. Therefore the present study concludes that small cetaceans are harpooned not only as a means of compensating for poor fish catches or only in nearshore waters but at any distance and when ever fishermen have the opportunity

and right conditions to practice intentional harpooning. This conclusion is further substantiated by the fact that when harpooning increased at both sites in the month of August and continued to remain high in September and October, during the present study, there was no decrease in fish catches at either site.

This study shows that many species of small cetaceans not sighted in nearshore waters are found in the catch. This indicates that even deep sea stocks of small cetaceans are exposed to threat by the fisheries industry off the west coast of Sri Lanka. Further, the results indicate that the practice of intentional harpooning of small cetaceans is spreading both in area and extent and this should be further investigated in other parts of Sri Lanka's coast line.

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Figure 1 **Study Area and Cruise Track**

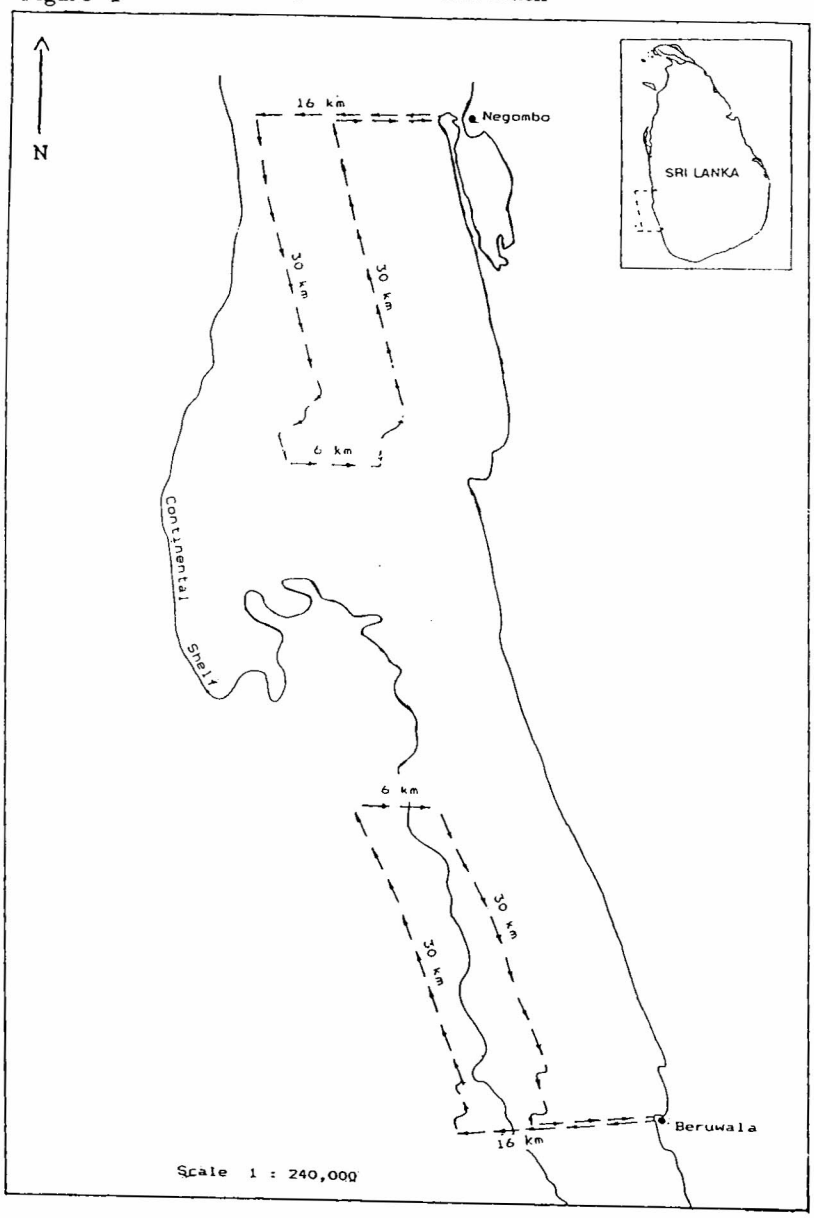

Table 1

Small Cetacean Catch by Species, Month and Site

Species	May		Jun.		Jul.		Aug.		Sep.		Oct.		Total	
	B	N	B	N	B	N	B	N	B	N	B	N	B	N
Slo	16	20	18	16	28	15	32	24	60	49	30	41	184	165
Sco	1	4	4	16	10	2	7	4	9	0	13	6	44	17
Sat	4	2	3	2	2	2	3	6	5	0	4	4	21	16
Ttr	4	1	3	4	2	5	7	7	6	3	3	6	25	26
Ggr	10	3	2	3	2	2	7	4	2	5	8	5	31	22
Pel	5	0	0	0	1	0	0	1	0	0	0	0	6	1
Pcr	0	0	1	0	1	0	0	0	1	0	0	0	3	0
Fat	1	1	0	2	0	0	0	0	0	0	0	0	1	3
Kbr	2	0	0	0	0	0	0	0	0	0	0	0	2	0
Ksi	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Sbr	1	0	0	5	0	3	0	1	2	0	3	0	6	9
Lho	1	0	0	0	0	3	0	1	0	0	0	0	1	4
Total	45	31	31	33	46	32	57	48	85	57	61	62	325	263

Note : Species names in the above table and all other tables in this paper are abbreviated as;

Slo = Stenella longirostris, Sco= Stenella coeruleoalba, Sat=Stenella attenuata,

Ttr = Tursiops truncatus, Ggr = Grampus griseus, Pel = Peponocephala electra,

Pcr = Pseudorca crassidens, Fat = Feresa attenuata, Kbr = Kogia breviceps,

Ksi= Kogia simus, Sbr = Steno bredanensis, Lho = Lagenodelphis hosei.

Site names under each month are abbreviated as; B=Beruwala and N=Negombo

Table 2

Small Cetacean Sightings by Species, Month and Site

Number of Individual Animals Sighted

Species	May		Jun.		Jul.		Aug.		Sep.		Oct.		Total	
	B	N	B	N	B	N	B	N	B	N	B	N	B	N
Slo	0	183	15	0	0	23	0	147	0	39	0	169	15	561
Ttr	17	2	2	2	16	0	8	0	42	0	14	0	99	4
Total	17	185	17	2	16	23	8	147	42	39	14	169	114	565

Number of Separate Sightings

Species	May		Jun.		Jul.		Aug.		Sep.		Oct.		Total	
	B	N	B	N	B	N	B	N	B	N	B	N	B	N
Slo	0	2	1	0	0	1	0	3	0	1	0	6	1	13
Ttr	2	1	1	1	1	0	1	0	2	0	2	0	9	2
Total	2	3	2	1	1	1	1	3	2	1	2	6	10	15

Note : All abbreviations as in Table I

Table 3.1

Method of Capture for Common Species in the Small Cetacean Catch

Species	Beruwala				Negombo			
	H	N	H	N	H	N	H	N
Slo	96	88	52.2%	47.8%	79	86	47.9%	52.1%
Sco	19	25	43.2%	56.8%	3	14	17.6%	82.4%
Sat	8	13	38.1%	61.9%	12	14	75.0%	25.0%
Ttr	9	16	36.0%	64.0%	13	13	50.0%	50.0%
Ggr	14	17	45.2%	54.8%	6	16	27.3%	72.7%

Table 3.2

Seasonal Variation in Method of Capture of the Small Cetacean Catch

Month	Beruwala				Negombo			
	Number		Percentage		Number		Percentage	
	H	N	H	N	H	N	H	N
May	16	29	35.6%	64.4%	5	26	16.1	83.9%
June	8	23	25.8%	74.2%	10	23	30.3%	69.7%
July	13	33	28.3%	71.7%	18	14	56.3%	43.8%
August	36	21	63.2%	36.8%	28	20	58.3%	41.7%
September	48	37	56.5%	43.5%	29	28	50.9%	49.1%
October	33	28	54.1%	45.9%	29	33	46.8%	53.2%
Total	154	171	47.4%	52.6%	119	144	45.2%	54.8%

Note : In Tables 3.1 and 3.2 above H=Harpooned and N=Net entangled.