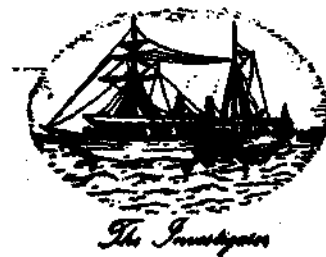


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**OBSERVATIONS ON THE BY-CATCH OF DOLPHINS *STENELLA LONGIROSTRIS*,
TURSIOPS ADUNCUS, *SOUSA CHINENSIS* AND *DELPHINUS DELPHIS*
TROPICALIS IN THE GILL NETS OFF CALICUT COAST, INDIA**

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ABSTRACT

Species composition, length distribution seasonal variation in occurrence and sex ratio of 174 dolphins from Calicut coast were studied for the period 1976 to 1980. The incidence of dolphins in the gill nets were found to be more during the colder months of the year from October to February. *Stenella longirostris* contributed 52.9% of the dolphins landed followed by *Tursiops aduncus* which formed 32.7%. *Delphinus delphis tropicalis* and *Sousa chinensis* were the other two species that occurred in the nets.

INTRODUCTION

OUR information on the dolphins along the Indian coast is mainly confined to their distribution, strandings and taxonomy. (Blanford, 1891; Lydekker, 1905; Pillay, 1926; Silas and Kumara Pillai 1961; Alagarswami *et al.*, 1973; Mohan (in press). Though the dolphins are caught in the gill nets set for fishes, we have no information on the magnitude of the catch, species composition, size range, seasonal variation and the sex ratio. The desirability of collecting more information on the above aspects has been expressed by earlier workers (Mitchell, 1975; Alling *et al.*; Ross, 1979). In the present study 174 dolphins were studied for their seasonal variation in occurrence, length composition and sex ratio.

The common dolphin, *Delphinus delphis* occurring along the Indian coast is treated as a subspecies *Delphinus delphis tropicalis* (Mohan, in press). The *Tursiops* sp. is treated as *Tursiops aduncus* following the nomenclature of Ross (1979).

I am thankful to Dr. E. G. Silas, Director, Central Marine Fisheries Research Institute,

Cochin for his guidance and encouragement throughout the study. I am also thankful to Dr. J. B. Graham Ross, South African Museum, Port Elizabeth for his help.

MATERIAL AND METHODS

174 dolphins belonging to the species *Stenella longirostris* Gray, *Tursiops aduncus* Ehrenberg, *Sousa chinensis*, Osbeck and *Delphinus delphis tropicalis* Mohan (Plates I and II) captured in the gill nets operated for fishes off Calicut, Kerala during 1976-1980 were examined. The gill nets were made of 0.5 to 0.7 mm nylon monofilament twine and measured 3-5 metres in wide and 10-15 m in length. Several such make a net. The nets were operated at 7-10 fathoms. The fishes commonly caught in the nets were *Scomberomorus guttatus*, *S. commersoni*, *Euthynnus affinis*, *Scoliodon* spp., *Galeocerdo* spp. etc. The nets were usually operated with sail boats. The dolphins get entangled when they attempt to prey upon the fishes gilled in the nets. Often the nets are damaged by the dolphins.

Body measurements were taken as suggested by Perrin (1975). The sexes were separated

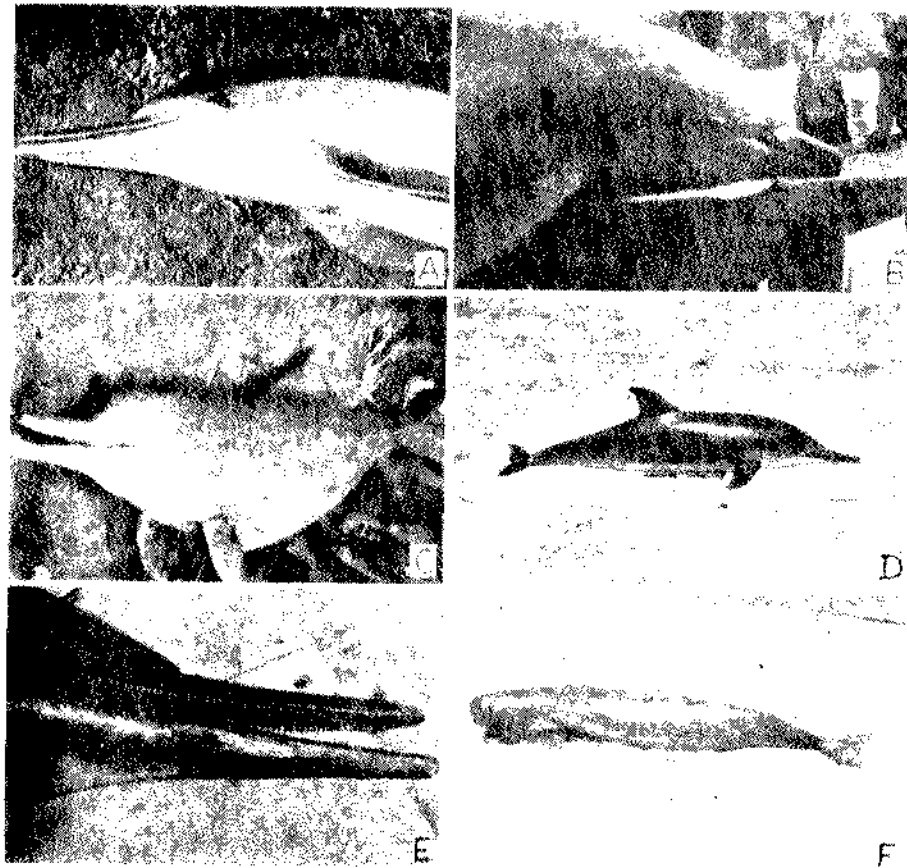


PLATE I. A. *Delphinus delphis tropicalis* with the characteristic flipper to lower jaw band, length 1480 mm, female, off Calicut; B. *Tursiops aduncus*, length 3250 mm, female, off Calicut; C. *Sousa chinensis*, length 2620, male, off Calicut; D. *Stenella longirostris*, length 1759 mm, female, off Calicut; E. Head of *D. delphis tropicalis* showing the detition, and F. *Neophocaena phocaenoides*, length 1386 mm, male, off Calicut.

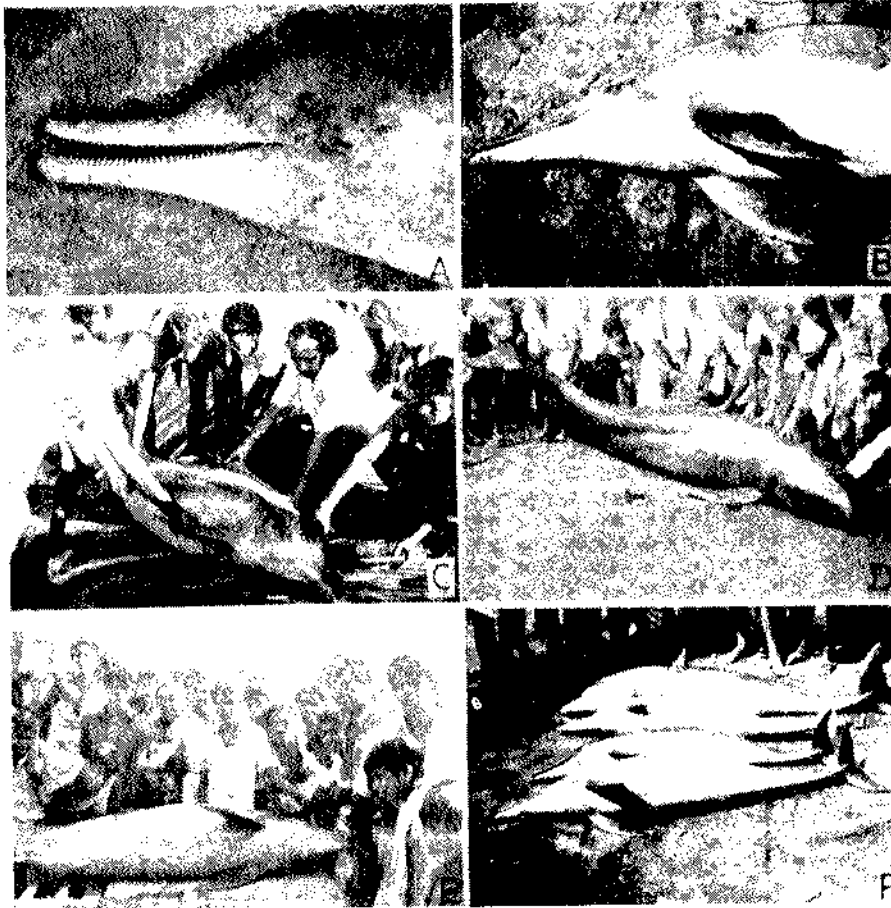


PLATE II. A. Head of *Sousa chinensis*, length 2620 mm. ; B. *Stenella longirostris*, with the flipper to eye band, length 1750 mm; C. *Sousa chinensis*, landed alive on 13-1-1981, length 2310 mm. ; D. *Pseudorca crassidens*, length 3375 mm female, 12-2-1977 off Calicut. ; E. *T. adonus* in the Calicut fish market. ; and F. By catch of dolphins in the Calicut fish market.

by examining external morphology. The length groups were classified in 250 mm intervals.

OBSERVATIONS

1. Seasonal variation in occurrence

The peak season of the occurrence of dolphins in the nets was from October to February. This period accounted for 92% of the dolphins landed. However, there were individual variations between the species in its seasonal occurrence.

Stenella longirostris

October to March contributed 97% of the total catch of this species. Variation between the years was also noticed. During the year 1978 all the landings of the species were reported from September to January whereas in 1979 this species was observed only during February. But in 1980 all the catches were from November to January.

Gill nets were not operated during June to August due to the rough condition of the sea.

Tursiops aduncus

The peak season for this species was from November to January contributing about 73% of the landings. However, during 1978, the landings for the period September to January was 90% whereas October to January accounted for all the dolphins during the year 1979. But in 1980 this species was observed only in September.

Delphinus delphis tropicalis

During the period of observation only 14 numbers were examined. 57.2% of them were landed during September and November. However, during first 8 months of year only 28.6% of the landings occurred.

Sousa chinensis

This species is also not very common in the dolphin catches. 11 specimens were only observed in the catch. The period October to December contributed 63.6% of the dolphins landed.

2. Variation in the by-catch between years

Variation in the occurrence of dolphins ranged from 12 to 53. Lowest number of dolphins were observed in 1979 and the highest in 1980.

Stenella longirostris

Occurrence of this species varied from 5 numbers in 1979 to 38 in 1977. The average number landed for the 5 year period was observed to be 18.4 (Table 1).

Tursiops aduncus

This species also showed marked variation in its occurrence between years. Though only 2 dolphins were landed during 1977, the number landed in 1980 was 34. The average number landed for a year based on the 5 year data was 11.4 (Table 1).

Delphinus delphis tropicalis

During the course of the study only 14 dolphins of this species were reported. Though 6 dolphins were recorded during 1980 it was not landed during the year 1979.

Sousa chinensis

This species was also not very common in the catches. Though the species was not caught in 1976, the highest number of 5 specimens were observed in 1977. The number of specimens landed during 1978 to 1980 ranged from 1 to 3. The average number landed during an year was 2.2.

Besides the above species 8 numbers of finless porpoise *Neophocaena phocaenoides* (Plate IF)

BY-CATCH OF DOLPHINS

TABLE 1. Sex ratio of *Stenella longirostris* off Calicut coast in relation to the total length

Length groups (mm)	Jan.		Feb.		Mar.		April		Aug.		Sep.		Oct.		Nov.		Dec.		Total		Ratio
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
750-990	2	1	—	—	—	—	—	—	—	—	—	—	1	1	1	—	1	—	5	2	1:0.4
1000-1249	1	1	—	—	—	—	1	—	1	—	—	—	3	—	2	3	—	—	6	6	1:1.0
1250-1499	—	1	—	—	—	—	—	—	—	—	—	—	2	1	5	5	1	2	8	9	1:1.1
1500-1749	—	1	—	—	2	1	—	—	—	—	—	—	6	6	2	4	1	2	11	14	1:1.4
1750-1999	—	—	—	—	—	—	—	—	1	—	—	—	5	7	1	1	1	1	7	10	1:1.4
2000-2249	—	—	1	1	—	1	—	—	—	—	—	—	—	2	1	1	1	—	3	5	1:1.6
2250-2499	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	1	—	2	2	1:1.0
2500-2749	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	1	1:1.0
Total	4	4	1	2	2	2	—	1	—	2	—	—	17	17	12	15	7	6	43	49	1:1.1
Ratio	1:1	1:2	1:1	0:1	0:1	—	—	—	—	—	—	—	1:1	1:1.2	1:0.8	—	—	—	—	—	—

TABLE 2. Sex ratio of *Tursiops aduncus* off Calicut coast in relation to total length

Length groups (mm)	Jan.		Feb.		Mar.		April		Sept.		Oct.		Nov.		Dec.		Total		Ratio	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
1000-1249	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	2	0	0:2.0
1250-1499	—	—	—	1	—	—	—	—	—	—	—	—	—	1	1	2	1	4	1	1:4.0
1500-1749	—	2	—	—	—	—	—	—	—	—	2	—	—	2	—	1	2	5	1	1:2.5
1750-1999	—	—	—	1	—	—	—	—	—	—	—	—	1	—	1	2	2	3	1	1:1.5
2000-2249	1	1	2	—	1	—	—	—	1	2	1	2	1	1	3	9	7	1	0.8	1:0.8
2250-2499	—	4	—	—	—	—	—	—	—	—	—	—	1	2	—	2	1	8	1	1:8.0
2500-2749	1	—	—	—	—	—	1	—	—	—	1	—	—	2	3	2	6	4	1	1:0.6
2750-2999	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	1:0
3000-3249	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3250-3449	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	0	0:1.0
Total	4	7	2	3	1	—	1	—	1	5	2	4	8	6	13	23	34	1	1.4	1:1.4
Ratio	1:1.7	1:1.5	1:1	1:0	0:1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

TABLE 3. Sex ratio of *Delphinus delphis tropicalis* off Calicut coast

Length groups (mm)	Jan.		Feb.		Mar.		April		Sept.		Oct.		Nov.		Dec.		Total		Ratio	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
1000-1249	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	0	0:1
1250-1499	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	0	0:1
1500-1749	—	—	—	—	—	—	—	—	1	1	—	—	—	1	—	1	1	3	1	1:3
1750-1999	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	1:0
2000-2249	—	—	—	—	—	—	1	—	1	—	—	—	2	1	—	—	—	2	3	1:1.25
2250-2499	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	1	1:1
Total	—	1	—	—	—	1	1	1	2	2	—	1	2	2	—	1	5	9	—	—
Ratio	0:1	—	—	—	0:1	1:1	1:1	1:1	0:1	1:1	0:1	1:1	0:1	1:1	0:1	—	—	—	—	—

measuring 1800 mm to 1920 mm and a *Pseudorca crassidens* (Plate IF) measuring 4200 mm were also observed in 1976 and 1978 respectively.

3. Relative abundance of species

Stenella longirostris formed 52.9% of the catch followed by *Tursiops aduncus* which contributed 32.7%. The other two species *Delphinus delphis tropicalis* and *Sousa chinensis* accounted for 8.1% and 6.3% respectively.

Monthly variation

The peak season for *S. longirostris* was October during which 36.9% of the landing was observed. 29.5% of the catch was landed in November. December and January shared 14.1% and 8.7%. Dolphins were not observed during the months of May to July due to the suspension of fishing activities because of rough sea condition.

December was observed to be the peak month for the *Tursiops aduncus* with 33.2% of the landings followed by November with 21.0%. October and January shared 12.3% and 19.3% respectively. Dolphin catch was not observed during the months of May to August.

More or less a similar trend was observed in *Delphinus delphis tropicalis*. In this species September and November contributed 28.6% each. 14.4% of the catch was observed during April.

The occurrence of *Sousa chinensis* was observed to be more during the month of December with 27.2% of the catch though the months of January, March, October and November shared 18.2% of the catch.

4. Size composition

Stenella longirostris

The total length of the species ranged between 930 to 2520 mm. The smallest and the largest length groups contributed only 7.6%

and 2.1% of the landings. The dolphins of length range 1500-1749 mm formed the model group with 27.2% of the catch.

Tursiops aduncus

The length range of the species was from 1010-3400 mm. The smallest and the largest groups contributed 3.5% and 1.7% of the catch respectively. The model length group was formed by 2000-2249 mm dolphins which accounted for 28.0% of the catch.

Delphinus delphis tropicalis

The length range of this species occurring in the gill nets varied between 1050 to 2415 mm. The smallest length group formed 7.1% and the largest group 14%. The model group was formed by the dolphins measuring 2000-2249 mm which formed 35.8%.

5. Sex ratio

S. longirostris

Sex ratio of this species was found to be 1.0 : 1.1 for the period of observation. The ratio was more or less same for January, March, October and December. Deviation from this pattern was observed during the months of February, April and August. But the landings during these months were less.

When the sex ratio was analysed based on length groups, a male dominance was observed in the 750-990 mm lengths where the ratio was 1 : 0.4 while female dominance was seen more pronounced in the length groups 1500-1749 mm, 1750-1990 mm and 2000-2249 mm. The ratio was equal in the 1000-2249 mm, 2250-2499 mm and 2500-2749 mm groups (Table 1).

Tursiops aduncus

The total male and female ratio was found to be 1 : 1.4 with more females. The ratio was about 1 : 2 during November and December. However, a male dominance with ratio of 1 : 0.4 was observed in October.

TABLE 4. Sex ratio of *Sousa chinensis* off Calicut Coast in relation to total length

Length groups (mm)	Jan.		Feb.		Mar.		Oct.		Nov.		Dec.		Total		Ratio	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1750-1999	..	—	—	—	—	—	1	—	1	—	—	—	2	—	1	0
2000-2249	..	—	—	—	—	1	—	—	—	1	1	—	1	2	1	2
2250-2499	..	—	1	—	—	—	—	—	—	—	—	—	—	1	0	1
2500-2749	..	—	1	—	—	1	—	—	—	—	—	1	1	2	2	1
2750-2999	..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3250-3449	..	—	—	—	—	—	—	1	—	—	—	—	—	1	—	1
Total	..	—	2	—	—	1	1	2	—	1	1	2	1	6	5	
Ratio	..	0	2	—	—	1	1	2	0	1	1	1	0.5	1	0.8	

TABLE 5. Number of Dolphins caught in the gill net off Calicut coast from 1976-'80

Name of the Species		1976	1977	Years			Total	%
				1978	1979	1980		
<i>Stenella longirostris</i>	..	28	38	10	5	11	92	52.9
<i>Tursiops aduncus</i>	..	5	2	12	4	34	57	32.7
<i>Delphinus delphis tropicalis</i>	..	2	5	1	—	6	14	8.1
<i>Sousa chinensis</i>	..	—	5	1	3	2	11	6.3
Total	..	35	50	24	12	53	174	
Percentage	..	20.1	28.7	13.8	6.8	30.6		

A dominance of females was seen in the younger age groups ranging from 1000-1999 mm and in 2250-2499 mm. However, in the model length group 2000-2249, the sex ratio was 1:0.8. But in the larger length groups a dominance of male was found (Table 2).

Delphinus delphis tropicalis

The sex ratio was found to be 1:1.8 with a dominance of females. This trend was continued during the months of January, March, October and December. The 1:1 ratio was observed during the months of April, September and November. The dominance of females was observed almost in all the length groups except 2250-2499 mm group (Table 3).

Sousa chinensis

Sex ratio of this species was found to be 1:0.8 with a dominance of males. During the month of January males were not observed while females were not observed in October. Male and female ratio was equal during the months of March and November.

DISCUSSION

We have practically no information on the magnitude of the by-catch of dolphins along the Indian coast. The analysis of the dolphins caught along the Calicut coast indicates that they get entangled in the gill nets mostly during the colder part of the year from September to

February. The peak occurrence of the dolphins *S. longirostris* and *Delphinus delphis tropicalis* was during October whereas *Tursiops aduncus* and *Sousa chinensis* were landed during the month of December. No landing was observed during the monsoon months of June, July and August as gill nets were not operated during this period due to rough weather. The

number of dolphins entangled annually varied from 12 to 53. In the present study the overall males to females ratio of *Stenella longirostris* was 1.0 : 1.1 and for *Tursiops aduncus* 1 : 1.4. The ratio for *Delphinus delphis tropicalis* showed a female dominance. However, such variations may be due to the limited number of specimens examined.

REFERENCES

- ALAGARISWAMI, K., P. BENSAM, M. E. RAJAPANDIAN AND A. BASTIN FERNANDO 1973. Mass stranding of Pilot whales in the Gulf of Mannar. *Indian J. Fish.*, 20 (2) : 262-279.
- ALLING, G. 1982. Small whales and dolphins. In : *WWF Netherlands Indian Ocean sperm whale study, 1981-82. Interim report*, 17 : 24.
- BLANFORD, W. T. 1981. *The fauna of British India including Ceylon and Burma*, Mammalia, 2 : 1-617. Tylor and Francis, London.
- FOOTE, D. C. 1975. Investigation of small whale hunting in Northern Norway, 1964. *J. Fish Res. Bd. Canada*, 32 : 799-983.
- LYDEKKAR, R. 1905. On the dolphins from Travancore : *Jour. Bombay Nat. Hist. Soc.*, 16 : 730-736.
- MITCHELL, E. 1975. Review of biology and fisheries for smaller Cetacean. *J. Fish. Res. Bd. Canada* 32 : 799-983.
- MOHAN, R. S. LAL (in press). Observations on a false killer whale *Pseudorca crassidens* from Calicut coast. *J. mar. biol. Ass. India*.
- PERRIN, W. F. 1975. Variation of spotted and spinner porpoises (Genus : *Stenella*) in the eastern pacific and Hawai. *Scripps Inst. Ocean. Bull.*, 21 : 1-206.
- PILLAY, R. S. N. 1926. A list of Cetaceans taken in Travancore from 1902 to 1928. *Jour. Bombay Nat. Hist. Soc.*, 31 (2) 815-817.
- ROSS, J. B. GRAHAM. 1979. *The smaller cetaceans of the South East Coast of South Africa*. Ph.D. Thesis, University of Port Elizabeth (Un published).
- SILAS, E. G. AND C. KUMARAPILLAI 1961. The stranding of two false killer whales *Pseudorca crassidens* (Owen) at Pozhikara, North of Cape Comorin. *Jour. Mar. Biol. Ass. India*, 2 : 268-271.