SC/42/SM18

Composition of the Incidental Kill of Small Cetaceans in the US Purse-Seine Fishery for Tuna in the Eastern Tropical Pacific During 1989

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ABSTRACT

The composition of the 1989 incidental kill of small cetaceans during 123 fishing trips by the US tuna purse-seine fleet is given by area, species, stock, sex, length, and, for females, reproductive condition. This year was the first of three consecutive years (1989-1991) in which 100% of the fishing trips will be observed. Mortality was reported for spotted dolphins from the northern offshore and southern stocks, spinner dolphins from the eastern stock and northern and southern whitebelly stocks, common, striped, bottlenose and roughtoothed dolphins and a short-finned pilot whale. The number of females from which reproductive samples were collected and for which species/stock was known increased from 767 in 1988 to 1,323 in 1989.

INTRODUCTION

Dolphins have been taken incidentally in the yellowfin tuna purse-seine fishery in the eastern tropical Pacific Ocean (ETP) since 1959. National Marine Fisheries Service (NMFS) biological technicians have observed at least some of the fishing trips on US vessels since 1968 for the collection of data on mortality, stock identity and life history and have done so in a systematic manner for estimates of fishing mortality since 1975 (Lo *et al.*, 1982). In January 1979, the Inter-American Tropical Tuna Commission (IATTC) began a complementary program on US and non-US vessels and has reported on the total mortality of dolphins in recent years (Hall and Boyer, 1986; 1987; 1988; 1989; 1990).

The composition of the observed kill of dolphins has been reported to the IWC by the NMFS since 1979 (Perrin and Oliver, 1982; Oliver et al., 1983; Wahlen et al., 1986; 1987; 1988; Chivers et al., 1989; 1990). The dolphin species primarily taken are spotted dolphins (*Stenella attenuata*), spinner dolphins (*S. longirostris*) and common dolphins (*Delphinus delphis*), while several other species are taken in low numbers. This report documents the composition of the observed kill on US-registered vessels during 1989.

METHODS

Data were collected by IATTC and NMFS biological technicians (observers) aboard US-registered tuna purseseine vessels in the ETP. In previous years, only a sample of the vessels carried observers (Lo *et al.*, 1982) except for 1987 when virtually all fishing trips on US vessels were observed. In 1989, a 3-year program of 100% observer coverage began. However, three 1989 trips were not observed in their entirety. These trips departed in late 1988 and were not initially scheduled to carry observers. Observers were placed on these vessels between 4–21 January 1989. Only 44 of 6,708 fleet days (0.01%) were not observed during 1989.

¹ Current address: National Marine Fisheries Service, Office of Protected Resources, 1335 East-West Highway, Silver Spring, MD 20910, USA The observers collect an extensive set of data on the location, date, time and circumstances of each set as well as information on the school of dolphins. The number of dolphins killed during a set in which mortality occurred is tallied with, when possible, data on the stock, sex and, for spotted dolphins, relative age (colour phase). A subset of the animals killed is brought on board the tuna vessel making them available for the collection of life-history data and samples. The procedures for collection of life-history data have been described by Perrin *et al.* (1976). Samples of data-collection forms are given in Perrin and Oliver (1982), although the life-history form has changed since that report (Fig.1).

The number of small cetaceans observed killed has been summarised by geographic area, species, sex and length as in previous years' reports and described by Henderson *et al.* (1980). Reproductive condition for females has been summarised by species. For spotted and spinner dolphins, data on kill and reproductive condition have also been stratified by stock using the stock designations of Perrin *et al.* (1985).

RESULTS

There were 123 trips on US-registered tuna purse-seine vessels fishing in the ETP during 1989, 106 of which reported dolphin kill. These trips resulted in an observed kill of 12,548 small cetaceans. The geographic distribution of purse-seine sets with kill observed is shown by 5° block (Fig. 2) and by species/stock and sex, when available (Tables 1-2).

Life-history data were collected on 90 trips. Data were collected from spotted, spinner, common, striped (*S. coeruleoalba*), and bottlenose (*Tursiops truncatus*) dolphins. This represented a sample of 1,756 females for which length data and/or reproductive samples were collected and 1,384 males for which length was collected, excluding 44 spinner dolphins for which stock was unidentified (Tables 3 and 4). No life-history data were collected from 13 rough-toothed dolphins (*Steno attenuata*) or one pilot whale (*Globicephala macrorhynchus*) observed killed. No reproductive data or samples were collected from striped or bottlenose dolphins.

493

NAA FORM 88-129 CETACEAN LIFE HIST	ORY FORM U.S DEPT. OF COMM.
CRUISE # SPECIMEN # CARP YR MO DAY 1 <th>SET # LATITUDE N/S LONGITUDE E/W 21 22 27 32 COASTAL [] UNID [] COSTA RICAN [] UNID []</th>	SET # LATITUDE N/S LONGITUDE E/W 21 22 27 32 COASTAL [] UNID [] COSTA RICAN [] UNID []
OTHER SPECIES/STOCK:	33 34
SEX : M [] F [] 35 LENGTH (cm)	39 GIRTH (cm)
LACTATING : Y [] N [] ↔ FETUS ≥ 25 cm: M [] F []	45 LENGTH (cm)
WERE INESE COLLECTED /: YES NO YES NO [] [] TESTIS [] [] TEETH so [] [] TESTIS [] [] FETUS < 25 cm	rES NO s1 [] [] OVARIES & UTERUS s2 s4 [] [] HEAD s5 s7 [] [] OTHER s6
SPOTTED: Mark the box next to the best description:	BELLY
 {] < 1m (NEONATAL) {] ≥ 1m AND NO SPOITING (TWO-TONE) [] DISCRETE DARK VENTRAL SPOTS (SPECKLED) 	
I VENTRAL SPOTS CONVERGING (MOTTLED) I VENTRAL SPOTS FUSED (FUSED)	
SPINNER: Mark the box for each category CAPE which best illustrates the features of this specimen	FIN []
PREDOMINANT APPEARANCE OF ADULT SPINNERS IN SCHOOL: (Mark one): { } EASTERN	
[] WB [] [] COSTA RICAN [] UNDETERMINED 61	
CARD 2 12 13 107LL WEIGHT (gm) L COMAD =/eg/ (gm) L COMAD =/eg/(gm) R COMAD	42 43Ln (mm) SC € 42 43Ln (mm) SC € 47 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
48 TUBULE 31 FOLL 54 55 57 59 61 1 63 2 65 3 67 4 65 DIAM (mm) DIAM (mm) CL C.L. DIAMS. (mm) C.A. IN LEFT OVARY	9 6 71 0 73 1 75 2 77 3 79 4 12 13 5 15 6 C.A. IN RIGHT OVARY
	C.A. diems. (mm) by Type
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Fig.1. Current version of the cetacean life-history form.

DISCUSSION

Data on the level of incidental mortality and biology of dolphins taken by the tuna purse-seine fleet in the ETP have been collected since 1968. In only one year prior to 1989, in 1987, have virtually all fishing trips been observed (in 1987, 123 of 134 trips and 95% of fleet days were observed). A relatively low level of biological sampling occurred during most of the 1980s. This level increased during 1987 (from 370 sets of reproductive samples from females for which species/stock was known in 1986 to 912 in 1987). The sampling rate (proportion of observed kill from which samples were collected) in 1987 increased slightly during 1988, from 6% to 7%, but because only 50% of the fishing trips were observed in 1988, fewer samples were collected (n=767). In 1989, the sampling rate increased to 11% and the number of reproductive samples collected to

increased to 1,323 from females of all species for which species/stock was known.

ACKNOWLEDGEMENTS

We thank the staff of the IATTC and NMFS Southwest Region and Southwest Fisheries Science Center, including the biological technicians who spent time aboard the tuna vessels, for providing data for this report. A. Jackson helped in tallying the number of cruises in 1989 with and without observers and the number of vessel days that were unobserved. R. Allen prepared Fig. 2. The manuscript was reviewed by D. DeMaster, A. Jackson and W. Perrin (SWFSC, P.O. Box 271, La Jolla, CA 92038, USA) and M. Hall (IATTC, c/o Scripps Institution of Oceanography, La Jolla, CA 92093, USA).



Fig.2. Geographic distribution of the observed incidental kill of dolphins during 1989 on US-registered vessels by 5° block. The numbered blocks without shading are regions where incidental kill was observed but no life-history data were collected. The shaded blocks show those regions where life-history data as well as mortality data, were collected.

Table 2
Total kill of common, striped bottlenose, rough-toothed and unidentified dolphin specied by set. (M = male, = female) and geographic location (number of the corresponding? Sugure shown in Figure 2). One short- finned pilot whale of unknown set was taken in block 106.



Table 3

Length frequencies of dolphins for which species/stock was known. Forty-four (44) spinner dolphins with stock unidentified were excluded. No kill was reported for coastal spotted dolphins.

Length (cm)	Northern offshore spotted		Southern offshore spotted		Eastern spinner		Northern whitebelly spinner		Southern whitebelly spinner		Common		Striped		Bottle	
	м	F	м	F	м	F	м	F	м	F	м	F	м	F	м	F
0-74	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	6
75-79	1	3	0	0	0	0	2	2	1	Ó	Ö	0	0	0	0	- 0
80-84	3	3	0	0	ı	0	0	3	5	0	0	0	0	0	0	(
85-89	6	4	0	0	0	0	1	1	4	2	0	0	0	0	0	
90-94	6	7	0	0	0	0	2	1	0	0	0	0	0	0	0	
95-99	6	3	0	0	2	0	0	3	2	0	0	0	0	0	0	
100-104	4	9	0	0	2	0	1	1	0	0	0	1	0	0	0	
105-109	9	3	0	1	1	1	3	1	0	0	0	1	0	0	0	
110-114	5	7	0	0	0	0	1	2	0	0	0	0	0	0	0	
115-119	4	5	1	2	0	5	1	1	0	0	1	0	0	0	0	
120-124	16	11	1	0	1	3	1	1	1	0	2	0	0	0	0	(
125-129	6	8	0	1	2	4	3	3	0	0	1	2	0	0	0	
130-134	15	13	1	1	3	4	2	2	0	0	2	1	0	0	0	(
135-139	13	14	0	0	4	2	S	6	4	1	0	1	0	0	0	(
140-144	13	12	0	1	3	4	7	4	2	1	0	1	0	0	0	4
145-149	24	22	1	0	15	17	14	7	1	1	3	0	0	0	0	(
150-154	19	29	1	1	10	20	11	8	1	1	3	1	0	0	0	6
155-159	52	37	1	1	19	19	27	19	3	3	4	4	0	0	0	
160-164	61	55	1	2	21	28	26	40	1	2	2	8	0	1	0	
165-169	57	61	2	1	18	37	32	44	3	7	7	12	0	0	0	
170-174	73	81	0	3	27	27	35	60	5	15	6	11	1	0	0	1
175-179	51	99	3	5	27	19	37	57	9	14	9	11	1	2	0	- (
180-184	61	131	0	9	17	10	26	26	16	11	11	7	2	2	0	
185-189	46	151	1	8	6	1	19	11	13	9	8	13	3	1	0	- 1
190-194	47	119	3	5	1	0	11	4	4	3	10	18	1	0	0	1
195-199	38	61	0	1	2	0	0	1	1	0	14	21	4	2	0	- (
200-204	46	12	1	1	0	0	0	0	0	0	8	8	0	1	0	
205-209	35	5	0	0	0	0	0	0	0	0	7	6	0	1	0	
210-214	11	1	1	0	0	0	0	0	0	0	2	3	2	1	0	
215-219	3	1	0	0	0	0	0	0	0	0	3	0	2	1	0	
220-224	2	0	0	0	0	0	0	0	0	0	4	1	1	0	0	(
225-229	0	0	0	0	0	0	0	0	0	0	2	0	1	6	0	(
230-234	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(
235-239	0	0	0	Ó	0	0	0	0	0	0	0	0	0	Ð	Ð	
240-244	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(
Total	716	968	18	43	182	201	267	309	74	70	109	131	18	12	0	-

Table 1 Total kill of spotted and spinner dolphins by stock, see (M = male, F = female) and 5° square (see Fig.2 for location of blocks). No kill was reported for constait spotted dolphins. Zo3 spinner dolphins not identified to sock were excluded from the table.

	Spotled dolphine							Spinner dolphins								
	Northern offshore			Southern			1	Easiern			Northern whitebelly			Southern whitebelly		
block	м	F	Total	м	F	Total	м	F	Total	м	F	Total	м	F	Tota	
24	0	0	0	1	0	1	0	0	0	0	0	0	7	9	16	
45	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	
66	0	0	0	1	0	3	0	0	0	0	0	0	5	4	19	
67	0	1	1	8	27	53	0	0	0	0	0	0	58	56	552	
68	0	0	0	3	4	17	0	0	0	0	0	0	3	1	9	
69	Ó	Ö	0	10	25	63	0	0	0	0	0	0	8	9	50	
84	13	16	186	0	0	0	4	6	11	0	0	0	0	0	0	
85	12	20	73	ō	õ	0	0	0	0	4	7	15	0	0	0	
86	15	19	60	ō	ō	0	0	0	0	3	4	16	0	0	0	
87	1	0	4	ō	Ō	Ó	0	Ó	0	4	9	20	0	0	0	
88	ź	8	33	ō	ō	Ó	0	0	0	1	ò	3	0	0	0	
89	ó	8	21	ŏ	ŏ	õ	ō	ŏ	ō	ò	õ	1	0	0	0	
90	ĭ	2	8	ŏ	ŏ	ě	ō	ŏ	ŏ	1	ō	i	ó	ō	0	
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107	57	81	200	ň	ň	ő	š	12	42	ž		- îș	ŏ	ŏ	ŏ	
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115	15	6	\$2	ň	ň	ŏ	ŏ	ă	õ	7	10	36	ō	ō	ō	
124		19	32	ň	ň	ŏ	ō	ŏ	ŏ	ò	ő	0	ŏ	Ö	Ó	
125	4	87	310	ň	ő	ŏ	105	112	416	ŏ	ŏ	ŏ	ŏ	ŏ	ŏ	
126	20	29	89	ň	ň	ŏ	24	29	109	ŏ	ŏ	ŏ	ō	ō	ō	
127	42	55	214	ă	ő	ő	100	118	597	ő	ő	é	ő	0	ō	
128	25	30	103	ŏ	ŏ	ŏ	39	40	120	õ	ŏ	ō	ō	ō	ō	
129	12	45	294	ŏ	ŏ	õ	30	26	90	ŏ	ē	õ	ō	ō	ō	
130	10	2	36	ŏ	ŏ	õ	1	0	3	ž	ĩ	6	ō	õ	0	
131	63	, m	239	å	ň	ã	18	14	40	29	34	85	ō	õ	0	
132	72	96	305	ŏ	ŏ	ŏ		10	0	25	31	97	ō	ō		
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Treet	1 202	1 (70	(224	24		138	262	784	1 407	444	409	2 192	81	80	647	

Table 4 Reproductive condition of female dolphins for which reproductive samples were collected. 'Maturity undetermined' indicates that some life-history data (such as length) but not complete sets of gonads were

	Nor offsi spc	hern hore sted	Southern offshore spotted		Eastern spinner		Northern whitebelly spinner		Southern whitebelly spinner		Common		
Reproductive condition	N	%	N	%	N	96	N	%	N	%	N	96	
Maturity undetermined	256	25.9	12	24.5	62	30.5	66	21.4	17	22.4	20	15.2	
Sexually immature	275	27.9	13	26.5	94	46.3	100	32.4	21	27.6	60	45.5	
Sexually mature													
Pregnant only	134	13.6	3	6.1	13	6.4	25	8.1	6	7.9	9	6.8	
Presnant and lactating	19	1.9	2	4.1	2	1.0	5	1.6	1	1.3	14	10.6	
Lactating only	201	20.4	11	22.4	25	12.3	74	23.9	18	23.7	25	18.9	
Resting with a corpus Juteum	17	1.7	0	0.0	0	0.0	2	0.6	2	2.6	2	1.5	
Resting without a corpus luteum	74	7.5	5	16.3	5	2.5	32	10.1	9	11.8	2	1.5	
Post-reproductive	6	0.6	0	0.0	0	0.0	1	0.3	1	1.3	0	0.0	
Condition undetermined	5	0.5	0	0.0	2	1.0	4	1.3	1	1.3	0	0.0	
Total	987	100.0	49	100.0	203	100.0	309	100.0	76	100.0	132	100.0	

REFERENCES

- Chivers, S.J., Hohn, A.A. and Miller, R.B. 1989. Composition of the 1987 incidental kill of small cetaceans in the US purse-seine fishery for tuna in the eastern tropical Pacific. Rep. int. Whal. Commn 39:315-9
- Chivers, S.J., Miller, R.B. and Hohn, A.A. 1990. Composition of the 1988 incidental kill of small cetaceans in the US purse-seine fishery for tuna in the eastern tropical Pacific. Rep. int. Whal. Commn 40:455-8.
- Hall, M.A. and Boyer, S.D. 1986. Incidental mortality of dolphins in the eastern tropical Pacific tuna fishery: description of a new method and estimation of 1984 mortality. *Rep. int. Whal. Commn* 36:375-81.
- Hall, M.A. and Boyer, S.D. 1987. Incidental mortality of dolphins in the eastern tropical Pacific tuna fishery in 1985. Rep. int. Whal. Commn 37:361-2.
- Hall, M.A. and Boyer, S.D. 1988. Incidental mortality of dolphins in the eastern tropical Pacific tuna fishery in 1986. Rep. int. Whal. Commn 38:439-41.
- Hall, M.A. and Boyer, S.D. 1989. Estimates of incidental mortality of dolphins in the eastern Pacific fishery for tropical tunas in 1987. Rep. int. Whal. Comm 39:321-2.
- Hall, M.A. and Boyer, S.D. 1990. Incidental mortality of dolphins in
- Hall, M.A. and Boyer, S.D. 1990. Incloental mortality of dophnis in the tuna purse-seine fishery in the eastern Pacific Ocean during 1988. *Rep. int. Whal. Commn* 40:461-2.
 Henderson, J.R., Perrin, W.F. and Miller, R.B. 1980. Rate of gross annual production in dolphin populations (*Stenella* spp. and *Delphinus*) in the eastern tropical Pacific, 1973-1978. Southwest Ethologic Centre, J. Lett. C. A. Advisi, Ber. J. 49, 002. Slope Fisheries Center, La Jolla, CA, Admin. Rep. LJ-80-02, 51pp.

- Lo, N.C.H., Powers, J.E. and Wahlen, B.E. 1982. Estimating and Do, N.C.H., Fowers, S.E. and Walleh, D.E. 1962. Estimating and monitoring incidental dolphin mortality in the eastern tropical Pacific tuna purse-seine fishery. *Fish. Bull.*, US 80(2):396-401. Oliver, C.W., Walker, G.J. and Miller, R.B. 1983. Time/area
- distribution and composition of the incidental kill of small cetaceans in the U.S. purse-seine fishery for tuna in the eastern tropical Pacific during 1981. Rep. int. Whal. Commn 33:603-15.
- Perrin, W.F. and Oliver, C.W. 1982. Time/area distribution and composition of the incidental kill of dolphins and small whales in the U.S. purse-seine fishery for tuna in the eastern tropical Pacific, 1979-80. Rep. int. Whal. Commn 32:429-44.
- Perrin, W.F., Coe, J.M. and Zweifel, J.R. 1976. Growth and reproduction of the spotted porpoise, *Stenella attenuata*, in the offshore eastern tropical Pacific. *Fish. Bull.*, US 74(2):229-69.
- Perrin, W.F., Scott, M.D., Walker, G.J. and Cass, V.L. 1985. Review of geographical stocks of tropical dolphins (*Stenella* spp. and *Delphinus delphis*) in the eastern Pacific. NOAA Technical
- Report NMFS 28 (unpublished). 28p.
 Wahlen, B.E., Walker, G.J., Miller, R.B. and Oliver, C.W. 1986. Composition of the incidental kill of small cetaceans in the US purse-seine fishery for tuna in the eastern tropical Pacific, 1982 through 1984. Rep. int. Whal. Commn 36:369–74. Wahlen, B.E., Miller, R.B. and Macky, C.J. 1987. Composition of
- the incidental kill of small cetaceans in the US purse-seine fishery for tuna in the eastern tropical Pacific during 1985. Rep. int. Whal. Commn 37:353-5.
- Wahlen, B.E., Miller, R.B. and Ladiana, S.J. 1988. Composition of the incidental kill of small cetaceans in the US purse-scine fishery for tuna in the eastern tropical Pacific during 1986. *Rep. int. Whal. Commn* 38:403-5.