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Composition of the Incidental Kill of Small Cetaceans in the US Purse-Seine Fishery for Tuna in the Eastern Tropical Pacific during 1985

Bruce E. Wahlen, Ruth B. Miller, and Carolyn J. Macky

Southwest Fisheries Center, National Marine Fisheries Service, NOAA, P.O. Box 271, La Jolla, California 92038, USA

ABSTRACT

Composition of incidental kill of small cetaceans by US registered purse-seiners fishing in the eastern tropical Pacific during 1985 is reported by area, species, stock, sex, length and reproductive condition. The data were collected by technicians of the Inter-American Tropical Tuna Commission and of the National Marine Fisheries Service during 53 vessel-trips.

INTRODUCTION

Several papers describing small cetacean kill incidental to fishing activities of tuna purse-seiners in the eastern tropical Pacific (ETP) have been published, as noted by Wahlen, Walker, Miller and Oliver (1986) and by Hall and Boyer (1986; 1987). In this fourth in a series of papers (Perrin and Oliver, 1982; Oliver, Walker and Miller, 1983; Wahlen, *et al.*, 1986), we report the incidental kill of small cetaceans by US registered vessels in the ETP during 1985. These kills are classified by area, species, stock, sex, length and reproductive condition. Species represented in this report are: pantropical spotted dolphins, *Stenella attenuata*; spinner dolphins, *S. longirostris*; striped dolphins, *S. coeruleoalba*; common dolphins, *Delphinus delphis*; rough-toothed dolphins, *Steno bredanensis*; and bottlenose dolphins, *Tursiops truncatus*.

DATA AND METHODS

Data were collected by Inter-American Tropical Tuna Commission (IATTC) and National Marine Fisheries Service (NMFS) technician-observers aboard a sample of US registered tuna purse-seine vessels fishing in the ETP (Lo, Powers and Wahlen, 1982). Data collected aboard US registered tuna seiners chartered by non-US companies were also included.

Observed kills by area, species, stock and sex, if determined, were obtained from the 'tally' databases. Length frequencies by sex and reproductive condition for females were obtained from the 'life history' databases containing extensive biological data for those dead animals which were available for 'hands-on' inspection by the technicians. The life history databases thus contain biological data for only a subset of the animals reported as killed in the tally databases, since the technicians are unable to physically examine each animal killed. See Perrin and Oliver (1982) for detailed descriptions of data recorded in these databases.

We allocated kills of offshore spotted and whitebelly spinner dolphins to geographic stocks as in Perrin and Oliver (1982). Laboratory procedures for processing specimens and determining sexual maturity are referenced in Perrin and Oliver (1982), as is the methodology of the computer programs used to summarize the reproductive condition data.

RESULTS AND DISCUSSION

Kill data were collected from each of 53 observed trips, including five trips by US seiners chartered by non-US companies. The geographical distribution of the kill is presented in Fig. 1. Kill data are summarized by stock, sex and area for 5,484 spotted dolphins (Table 1) and 2,863 spinner dolphins (Table 2); by sex and area for 431 common, 23 striped, 1 rough-toothed and 37 bottlenose dolphins (Table 3); and by area only for 157 unidentified dolphins (Table 3). In Tables 1-3, which were obtained from the tally databases, the stock or species totals may be larger than the sum over sexes because the sex of some animals in the tally databases was not determined. The unidentified dolphins (Table 3) were likely spotted or spinner dolphins which were not seen closely enough for identification.

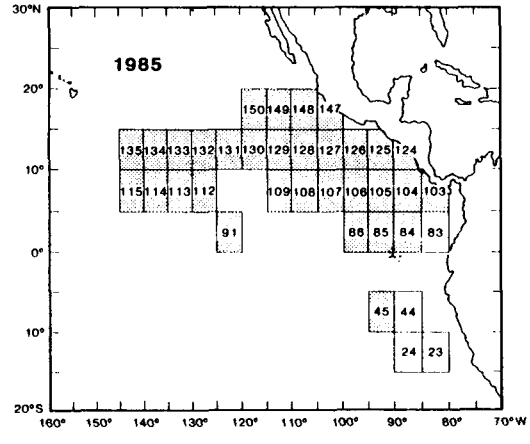

Fig. 1. Five-degree blocks in the eastern tropical Pacific Ocean in which dolphins were killed during fishing operations of US vessels in 1985. Numbered blocks without shading indicate areas in which tally data only were collected. Numbered blocks with shading indicate areas in which both tally and life history data were collected. Blocks without a number indicate areas in which no dolphin kills were recorded.

Length frequencies for sexed animals are tabulated by stock for 1,495 spotted and 586 spinner dolphins (Table 4) and by species for 176 common, 1 striped, 1 rough-toothed

and 14 bottlenose dolphins (Table 5). The length frequency totals (Tables 4 and 5) are less than or equal to the kill by sex and area totals (Tables 1-3) because lengths were obtained from the life history databases, which contain data for only a subset of the animals in the tally databases. Female reproductive condition results are reported by stock for 810 spotted and 294 spinner dolphins (Table 6) and by species for 83 common and 6 striped dolphins (Table 7).

Table 1

Total kill of spotted dolphins by observed US vessels during 1985, by stock, sex (M = male, F = female), and 5 degree block. No kills were reported for the coastal stock.

5°	Northern offshore			Southern offshore			5°	Northern offshore			Southern offshore		
block	M	F	Total	M	F	Total	block	M	F	Total	M	F	Total
23	0	0	0	1	4	16	115	0	1	2	0	0	0
24	0	0	0	3	7	24	124	5	4	96	0	0	0
44	0	0	0	3	1	19	125	167	180	767	0	0	0
83	1	3	10	0	0	0	126	23	26	86	0	0	0
84	4	8	46	0	0	0	127	8	11	166	0	0	0
85	7	5	61	0	0	0	128	42	49	443	0	0	0
86	7	3	21	0	0	0	129	0	4	13	0	0	0
91	15	6	21	0	0	0	130	2	2	94	0	0	0
103	2	1	3	0	0	0	131	6	9	78	0	0	0
104	26	34	140	0	0	0	132	72	91	235	0	0	0
105	74	74	847	0	0	0	133	23	29	71	0	0	0
106	110	126	590	0	0	0	134	18	12	105	0	0	0
107	64	95	702	0	0	0	135	2	2	9	0	0	0
108	30	44	300	0	0	0	147	0	3	7	0	0	0
109	1	1	2	0	0	0	148	4	6	15	0	0	0
112	14	13	35	0	0	0	149	38	37	117	0	0	0
113	49	55	173	0	0	0	150	2	7	97	0	0	0
114	9	15	73	0	0	0	Total	825	956	5,425	7	12	59

Table 2

Total kill of spinner dolphins by observed US vessels during 1985, by stock, sex (M = male, F = female), and 5 degree block number. Reported kill of 65 unidentified spinner dolphins is not included. No kills were reported for the Costa Rican stock.

5°	Eastern			Northern whitebelly			Southern whitebelly		
block	M	F	Total	M	F	Total	M	F	Total
24	0	0	0	0	0	0	76	79	267
44	9	5	18	0	0	0	0	0	237
45	0	0	0	0	0	0	1	0	2
84	0	1	2	0	2	3	0	0	0
85	1	3	7	4	4	33	0	0	0
86	0	0	0	2	2	11	0	0	0
103	0	0	0	0	1	1	0	0	0
104	0	0	0	0	4	4	0	0	0
105	0	0	1	4	8	58	0	0	0
106	8	9	18	14	19	58	0	0	0
107	10	10	86	17	11	122	0	0	0
108	8	4	64	4	5	25	0	0	0
109	1	0	1	0	0	0	0	0	0
112	0	0	0	4	5	16	0	0	0
113	0	0	0	19	30	72	0	0	0
114	0	0	0	3	11	190	0	0	0
115	0	0	0	10	3	14	0	0	0
124	0	0	1	0	0	0	0	0	0
125	108	102	321	0	0	1	0	0	0
126	22	27	135	2	1	3	0	0	0
127	8	6	41	0	1	2	0	0	0
128	44	38	401	0	0	1	0	0	0
129	0	0	10	0	0	0	0	0	0
130	7	8	24	0	0	0	0	0	0
131	4	1	22	3	2	6	0	0	0
132	1	2	5	21	18	81	0	0	0
133	0	0	0	12	8	29	0	0	0
134	0	0	0	19	21	195	0	0	0
135	0	0	0	23	25	177	0	0	0
147	0	1	1	0	0	0	0	0	0
148	0	1	3	0	0	0	0	0	0
149	2	3	15	0	0	0	0	0	0
150	1	1	79	0	0	0	0	0	0
Total	234	222	1,255	161	181	1,102	77	79	506

Table 3

Total kill of common, striped, rough-toothed and bottlenose dolphins by observed US vessels during 1985, by sex (M = male, F = female) and 5 degree block number. Total kills only are included for unidentified dolphins since sex was not determined for these animals. T = total. Unid. = unidentified.

5°	Common			Striped			Rough-toothed			Bottlenose			Unid.
block	M	F	T	M	F	T	M	F	T	M	F	T	T
103	2	1	3	0	0	0	0	0	0	0	0	0	0
104	10	15	34	0	0	0	0	0	0	0	0	0	0
105	60	56	310	0	0	0	0	0	0	0	0	1	0
106	8	11	28	0	0	0	0	0	0	3	0	3	0
107	0	0	0	0	0	0	0	0	0	0	0	2	124
108	0	0	0	0	0	0	1	0	1	0	0	0	2
112	0	0	0	0	0	0	0	0	0	2	0	2	0
113	0	0	0	0	0	0	0	0	0	0	0	0	10
124	13	8	34	0	0	0	0	0	0	0	0	0	0
125	14	8	22	0	0	0	0	0	0	3	8	21	16
126	0	0	0	0	0	0	0	0	0	2	0	3	0
127	0	0	0	0	0	0	0	0	0	1	0	1	0
128	0	0	0	0	0	0	0	0	0	0	0	4	2
131	0	0	0	1	0	23	0	0	0	0	0	0	1
133	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	107	99	431	1	0	23	1	0	1	11	8	37	157

Table 4

Length frequencies of northern offshore spotted dolphins and of eastern and northern whitebelly spinner dolphins killed by observed US vessels during 1985, by sex (M = male, F = female). Reported kills of one male southern offshore spotted dolphin in each of three length categories (160-164 cm, 175-179 cm, 195-199 cm) and of 22 unidentified spinner dolphins are not included. No kills were reported for coastal spotted, Costa Rican spinner, or southern whitebelly spinner dolphins.

Length	Northern offshore		Eastern		Northern whitebelly	
(cm)	M	F	M	F	M	F
0–59	0	0	0	0	0	0
60–64	0	1	0	0	0	0
65–69	0	0	0	0	0	0
70–74	0	0	0	0	0	0
75–79	0	2	1	0	0	0
80–84	2	0	0	0	0	1
85–89	5	5	1	0	0	0
90–94	2	3	0	0	2	1
95–99	4	8	1	0	1	0
100–104	7	8	0	1	5	3
105–109	5	6	2	1	0	2
110–114	4	6	1	3	3	2
115–119	8	6	0	2	0	0
120–124	7	5	1	4	1	1
125–129	7	11	3	5	1	0
130–134	8	9	1	1	0	1
135–139	16	7	4	2	3	3
140–144	10	10	1	2	4	5
145–149	14	20	5	11	4	5
150–154	15	15	6	7	4	10
155–159	33	23	23	16	2	10
160–164	46	38	13	20	17	6
165–169	64	57	34	31	10	17
170–174	75	67	33	28	12	25
175–179	84	78	20	13	16	19
180–184	49	94	18	13	19	13
185–189	49	103	7	1	7	7
190–194	44	131	1	0	6	1
195–199	37	58	0	0	0	0
200–204	34	26	0	0	0	0
205–209	23	10	0	0	0	0
210–214	20	3	0	0	0	0
215–219	8	0	0	0	0	0
220–224	1	0	0	0	0	0
225–229	1	0	0	0	0	0
230–	0	0	0	0	0	0
Total	682	810	176	161	117	132

Perrin, Scott, Walker and Cass (1985) reviewed all body length data for specimens collected through 1981. Some of the male northern offshore spotted dolphin specimens were quite large (Table 4); however, all lengths were

within the range of body lengths observed by Perrin *et al.* (1985). The female northern offshore spotted dolphin in the 60-64 cm length category (Table 4) may have been an aborted fetus.

Finally, it should be noted that Hohn and Scott (1983) have identified a sampling bias in the life history data resulting from the collection process. The magnitude of the effect of this bias on the life history statistics presented here (Tables 4-7) is unknown but will probably not significantly affect life history parameter estimates (A. Hohn, Southwest Fisheries Center, P.O. Box 271, La Jolla, California, 92038, USA, pers. comm., May 1986).

Table 5

Length frequencies of common and bottlenose dolphins killed by observed US vessels during 1985, by sex (M = male, F = female). Reported kills of one male striped dolphin (210–214 cm) and one male rough-toothed dolphin (170–174 cm) are not included.

Length (cm)	Common		Bottlenose		Length (cm)	Common		Bottlenose	
	M	F	M	F		M	F	M	F
0–89	0	0	0	0	190–194	11	14	1	0
90–94	0	2	0	0	195–199	11	11	0	0
95–99	1	0	0	0	200–204	10	15	0	0
100–104	1	3	0	0	205–209	11	6	0	1
105–109	4	0	0	0	210–214	12	1	1	0
110–114	1	3	0	0	215–219	8	0	0	0
115–119	0	1	0	0	220–224	4	0	1	0
120–124	1	0	0	0	225–229	0	0	0	0
125–129	1	1	0	0	230–234	0	0	1	0
130–134	1	1	0	0	235–239	0	0	2	0
135–139	1	0	0	0	240–244	0	0	0	2
140–144	0	0	0	0	245–249	0	0	0	1
145–149	1	0	0	0	250–254	0	0	0	1
150–154	2	0	0	0	255–259	0	0	1	0
155–159	2	1	0	0	260–264	0	0	1	0
160–164	1	4	0	0	265–269	0	0	0	0
165–169	0	0	0	0	270–274	0	0	0	0
170–174	3	3	0	0	275–279	0	0	1	0
175–179	3	5	0	0	280–	0	0	0	0
180–184	1	4	0	0					
185–189	4	6	0	0	Total	95	81	9	5

Table 6

Reproductive condition of female northern offshore spotted dolphins and of female eastern and northern whitebelly spinner dolphins killed by observed US vessels during 1985. Both sample sizes (N) and percentages (%) are indicated. Reproductive condition information was not obtained for coastal spotted, southern offshore spotted, Costa Rican spinner or southern whitebelly spinner dolphins. U = Maturity undetermined; I = Sexually immature; MU = Sexually mature, condition undetermined; P = Pregnant only; PL = Pregnant and lactating; L = Lactating only; RCL = 'Resting' with corpus luteum; R = 'Resting' without corpus luteum; PR = Post-reproductive.

Reproductive condition	Northern offshore		Eastern		Northern whitebelly	
	N	%	N	%	N	%
U	472	58.3	103	63.6	63	47.7
I	150	18.5	40	24.7	37	28.0
MU	5	0.6	1	0.6	1	0.8
P	43	5.3	5	3.1	2	1.5
PL	12	1.5	1	0.6	1	0.8
L	87	10.7	7	4.3	15	11.4
RCL	3	0.4	0	0.0	2	1.5
R	37	4.6	4	2.5	10	7.6
PR	1	0.1	1	0.6	1	0.8
Total	810	100.0	162	100.0	132	100.0

Table 7

Reproductive condition of female common and bottlenose dolphins killed by observed US vessels during 1985. Both sample sizes (N) and percentages (%) are indicated. Reproductive condition information for striped and rough-toothed dolphins is not included; none were females. Abbreviations are as in Table 6.

Reproduct. condition	Common		Bottlenose		Reproduct. condition	Common		Bottlenose	
	N	%	N	%		N	%	N	%
U	47	56.6	2	33.3	L	9	10.8	3	50.0
I	16	19.3	0	0.0	RCL	0	0.0	0	0.0
MU	1	1.2	0	0.0	R	1	1.2	0	0.0
P	7	8.4	1	16.7	PR	0	0.0	0	0.0
PL	2	2.4	0	0.0	Total	83	100.0	6	100.0

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REFERENCES

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. Paper SC/38/SM5 (published in this volume).

Hohn, A.A. and Scott, M.D. 1983. Segregation by age in schools of spotted dolphins in the eastern tropical Pacific. Abstract, Fifth Biennial Conference on the Biology of Marine Mammals, Boston, USA.

Lo, N.C.H., Powers, J.E. and Wahlen, B.E. 1982. Estimating and monitoring incidental dolphin mortality in the eastern tropical Pacific tuna purse seine fishery. *Fish. Bull.*, U.S. 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., 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. U.S. Dep. Commer., NOAA Tech. Rep. NMFS 28, 28 pp.

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.