

さけ・ます流し網漁業に関連した海産哺乳動物、  
特にイシイルカに関する  
1987年調査の概要

Outline of 1987 Research on Marine Mammals,  
particularly on Dall's Porpoise relating  
to Salmon Gillnet Fisheries.

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1987年のさけ・ます流網漁業に関連した海産哺乳動物の調査研究は、1978年に改定された「北太平洋の公海漁業に関する国際条約」の第10条及び1987年に改定された日本と合衆国間の了解覚書に従って実施された。具体的な調査計画は1987年3月10日～13日に東京で開かれた海産哺乳動物科学者会議で検討された。1987年4月から9月までに行われた調査研究項目は以下のとおりである。なお、これらの調査研究の一部及び結果の分析は現在行われている途中であり、ここでは調査の経過と概要を報告する。

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## 1. 混獲された海産哺乳動物の統計資料

### 1) 母船式さけ・ます流網漁業

1987年は、3母船とその付属独航船129隻(1986年には4母船、172付属独航船)が、さけ・ます流網に混獲された海産哺乳動物に関するデータを収集した。6月上旬～7月中旬の漁期間中に合計90回(1985年に164回及び1986年に136回)の船団操業と、延べ3,888回(同じく7,051回及び5,854回)の独航船の操業が行われ、海産哺乳動物806頭(同じく2,751頭及び1,857頭)が混獲された(表1)。その内訳は、イシイルカ(すべてイシイルカ型)801頭(同じく2,747頭及び1,856頭)、オットセイ5頭(同じく4頭及び1頭)であった(表1)。イシイルカの混獲頭数は1985年の29%、1986年の43%に減少した。表2には1981～1987年の米国F C Z、南公海及び北公海におけるイシイルカの混獲頭数を示した。1987年のイシイルカの混獲頭数は米国F C Z内で676頭(1985年に2,423頭及び1986年に1,607頭)、南公海で43頭(同じく28頭及び35頭)及び北公海で82頭(同じく296頭及び214頭)であり、米国F C Z内で1985年の28%及び1986年の42%に大きく減少した。また、北公海でも大巾に減少した。米国海産哺乳動物視察員(1船団6名ずつ合計18名)は6月中旬から7月中旬にかけて、各々23日～25日間船団に滞在した(表6)。なお、例年と同様日本人視察員も1船団1名合計3名が乗船した。

### 2) 基地式さけ・ます流網漁業

1987年の基地式さけ・ます流網漁業は5月下旬～7月上旬の漁期間中に1,156千反(1986年に1,436千反)を使用し、458頭(同じく404頭)のイシイルカを混獲した(表3)。

### 3) さけ・ます調査船

1987年には流網を使用した8隻のさけ・ます調査船が6月～8月に北太平洋水域において活動した。調査海域は177°W以西の北西北太平洋、45°～56°N、145°W～133°Wの北東北太平洋(アラスカ湾を含む)及び178°E～170°Wのベーリング海であった。これらのさけ・ます調査船は6月4日～8月7日までの間に、180回、総使用反数17,094反の試験操業を行い、海産哺乳動物21頭を混獲した(表4)。内訳は、イシイルカが13回操業で16頭(すべてイシイルカ型)、カマイルカ1回、1頭及びオットセイ3回、3頭であった。

## 2. イシイルカの豊度推定のための目視調査

イシイルカの豊度推定のため、さけ・ます調査船及びイシイルカ専門調査船は航行中に乗組員及び専門調査員による海産哺乳動物の目視調査を行った。この目視調査結果は遠洋水研で分析される。

1987年に8隻のさけ・ます調査船が6月1日～8月16日、1隻のイシイルカ専門調査船が8月3日～9月28日に、両者合計して延べ400日、36,000海里にわたり目視調査を行った(表5)。

目視調査は38°以北の北西北太平洋、45°N以北の北東北太平洋及び61°N以南のベーリング海で行われた。

### 3. イシイルカの生物学的研究のための標本収集

#### 1) 母船式さけ・ます流網漁業

母船に乗船した米国視察員は日本側の協力を得て、独航船が持ち帰ったイシイルカの生物学的計測、解剖、標本採集(函、臓器等)を行った。1987年には米国F C Z内から306頭、南公海から17頭及び北公海から25頭、合計348頭のイシイルカが母船に持ち帰られた(表6)。

#### 2) 基地式さけ・ます流網漁業

基地式流網漁業水域に生息するイシイルカの生物学的情報を得るため、基地式漁船に混獲されたイシイルカの収集が行われた。1987年6月9日～7月2日に混獲されたイシイルカ54頭(1986年は15頭)が漁船により凍結標本として釧路港に持ち帰られた。内訳はイシイルカ型53頭、リクゼンイルカ型1頭であった。これらの標本は、8月6日～16日に釧路で解冻され、生物学的計測、頭骨、函、生殖腺、その他の臓器等の採集が行われた。収集された資料の整理と分析は国立科学博物館が行っている。

#### 3) さけ・ます調査船

さけ・ます調査船の流網操業で混獲された海産哺乳動物は、船上において生物学的計測、解剖等を行ったり、あるいは冷凍標本として基地に持ち帰った後、同様の処理がなされる。

1987年の6月～7月の操業期間中、3隻の調査船がイシイルカ8頭(全てイシイルカ型)とカマイルカ2頭を冷凍標本として釧路及び函館に持ち帰った。これらの標本中イシイルカ7頭は8月6日～16日に釧路において生物学的計測、解剖等の処理がなされた。これらの収集した資料の整理と分析は国立科学博物館が行っている。また、イシイルカ1頭とカマイルカ2頭の標本処理、資料の整理及び分析は北海道大学が行っている。

#### 4) イシイルカ専門調査船

イシイルカ専門調査船は1987年には8～9月に北西北太平洋及びアラスカ湾を含む北東北太平洋において海産哺乳動物の目視調査と突きん棒によるイシイルカの捕獲を目的として航海した。昨年と同様、北東北太平洋海域におけるイシイルカの資料収集を主な目的とした。

調査期間 1987年8月3日(気仙沼)～9月28日(気仙沼)ただし、補給のため合衆国シアトル市に8月25日～29日(現地時間)に寄港した。

調査海域 40°～50°Nの北西北太平洋及び45°～55°Nの北東北太平洋

調査船 第12宝洋丸(水産庁用船) 全長42m, 299トン

この調査で得られた資料は国立科学博物館、鯨類研究所、東大海洋研究所、愛媛大学、遠洋水研等で分担して分析される予定である。

### 4. イシイルカの音響学的生態調査

北洋いるか対策調査グループ(日本大学、鴨川シーワールド、水産工学研究所)はイシイルカ

等の音響学的生態調査を1987年1月と6月～7月に行った。この調査結果の分析は水工研により行われる。

#### 1) 超音波発生器の効果試験

1985年に試作した20～15 KHZの超音波パルスをランダムに発生する新音波発生装置の実験を昨年に引き続き行った。母船付属独航船2隻(明洋丸船団第58 幸進丸、喜山丸船団第68 弁天丸)に各々3台の音波発生器を積み込み、流網の片側半分に音波発生器を取り付け操業を行った。1987年6月～7月の漁期間中に60回の操業を行い、混獲されたイシイルカの頭数、水平・垂直分布を調べ、混獲防止の効果を調査した(表7)。

#### 2) ネズミイルカに関する音響学的実験

調査グループは1987年1月に鴨川シーワールドにおいて、イシイルカと類似種であるネズミイルカ3頭を用い、次の音響学的実験を行った。

- a. ネズミイルカが投げ与えられた餌に接近し、餌を捕食する時のクリックスを録音した。
- b. ネズミイルカに対し、超音波パルスを発射し、反応行動を観察した。
- c. 水槽中央にさけ・ます流網を張り、それに対するネズミイルカの行動を観察した。

### 5. イシイルカの混獲防止のための改良漁具試験

母船式さけ・ます漁業は、米国200海里漁業水域内における海産哺乳動物の混獲頭数を規制されており、さらに年々改良漁具の使用増大が義務付けられている。1987年においては、全独航船が中空糸網、マルチフィラメント網及び音響発生器付中空糸網によるイシイルカ混獲防止試験を行った。

#### 1) 中空糸付き改良漁具

1987年には、網の中央部に3本の中空糸を設置した改良流網(AT-1)を各船団33-34隻(先航船を含む)、計100隻が使用して操業を行った。この漁具の操業回数は3,013回で、全操業回数の77%をしめた(表7)。

#### 2) マルチフィラメント付改良漁具

1987年には、網の中央部に3本のマルチフィラメント糸を設置した改良流網(MT-1)を各船団(先航船を含む)9隻、計27隻が使用して操業を行った。この漁具の操業回数は815回で、全操業回数の21%をしめた(表7)。

#### 3) 超音波発生及び中空糸付改良流網

4の1)で述べた超音波発生器(SG-4)を取り付けた中空糸付改良流網を2隻の独航船が使用し、60回の操業(全操業回数の2%)を行った(表7)。

1986年以前と異なり、1987年では全独航船が改良流網を用いて操業した。ゆえに、普通網と改良網との比較による効果の判定はできなかった。マルチフィラメント糸は中空糸より音の反射率が高いといわれているので、MT-1船とAT-1船の混獲頭数を比較を行った。ただし、昨年同様、先航船は調査業務に従事するため、比較の対象から除外した。MT-1船の操

業回数当りの混獲頭数 ( CPUE ) は 0.19 であり, A T - 1 船のそれは 0.21 であった。A T - 1 船の CPUE を 100 とした場合, M T - 1 船のそれは 91 となった。また, 隣接した A T - 1 船と M T - 1 の CPUE の比較を行うと, 前者が 0.25 , 後者は 0.18 であった。隣接 A T - 1 船の CPUE を 100 とした場合, M T - 1 船のそれは 72 となった。この流網の操業結果の分析は M. M. チームにより行われている。

Table 1. Number of incidental take of marine mammals, catcher boat operations and gillnets used by mothership salmon driftnet fishery during 1978 to 1987.

Year	Total number of catcher boat operation	Total number of gillnets used (in tans)	Total number of incidental take	Break down by species				
				Dall's porpoise	PP	00	CU	EJ
1978	8,284	2,721,113	505	497	1	1	6	-
1979	8,611	2,798,022	688	682	3	-	3	-
1980	9,551	3,145,913	1,004	1,000	4	-	-	-
1981	8,811	2,902,231	1,370	1,361	-	-	9	-
1982	8,957	2,942,443	3,199	3,190	-	-	8	1
1983	8,967	2,953,699	2,990	2,986	-	-	4	-
1984	8,333	2,739,857	2,675	2,670	-	-	5	-
1985	7,051	2,322,160	2,751	2,747	-	-	4	-
1986	5,854	1,929,626	1,857	1,856	-	-	1	-
1987 <sup>a</sup>	3,888	1,282,327	806	801	-	-	5	-

a: Preliminary

PP: Harbour porpoise  
00: Killer whale

CU: Northern fur seal  
EJ: Steller sea lion



Table 2. Number of incidental take of Dall's porpoise, number of sets of gillnets in US FCZ, southern and northern parts of high seas, 1981-1987.

Year	US FCZ		Southern part of high seas		Northern part of high seas		Total	
	No. of sets	No. of take	No. of sets	No. of take	No. of sets	No. of take	No. of sets	No. of take
1981	6,150	1,137	-	-	2,661*	224*	8,811	1,361
1982	6,271	2,389	1,207	208	1,479	593	8,957	3,190
1983	6,217	2,399	1,329	136	1,421	451	8,967	2,986
1984	5,694	2,129	1,329	176	1,310	365	8,333	2,670
1985	5,672	2,423	407	28	972	296	7,051	2,747
1986	4,660	1,607	332	35	862	214	5,854	1,856
1987 <sup>a</sup>	2,808	676	383	43	697	82	3,888	801

\* Including southern part of high seas

a: Preliminary

Table 3. Number of incidental take of marine mammals and gillnet used by land based salmon driftnet fishery, 1978-1987.

Year	Total number of gillnets used (in tans)	Dall's porpoise	Northern right whale dorpin
1978	3,371,736	303	-
1979	3,218,490	127	-
1980	3,144,187	139	-
1981	3,233,925	696	-
1982	2,961,730	1,641	-
1983	3,113,681	1,291	-
1984	2,823,704	812	1
1985	2,442,430	781	-
1986	1,436,175	404	-
1987 <sup>a</sup>	1,156,224	458	-

a: Preliminary

Table 4. Number of incidental take of marine mammals, gillnets operations and Number of gillnets used by Japanese salmon research vessels, 1978-1987.

Year	Number of total operation	Number of gillnets used (in tans)	Species									
			Dall's porpoise		LO	LB	UD	CU	US	RS	ZX	
			(PT)	PP								
1978	355	44,622	27(22) <sup>b</sup>	-	-	-	-	-	1(1)	1(1)	-	-
1979	268	34,615	20(16)	-	-	1(1)	-	-	17(12)	-	-	-
1980	276	38,080	57(26)	1(1)	1(1)	-	3(1)	3(2)	19(10)	-	-	-
1981	287	40,739	21(15)	1(1)	-	-	3(2)	-	15(13)	-	-	-
1982	317	40,262	48(37)	2(2)	-	-	-	-	15(11)	-	-	-
1983	321	39,730	31(26)	-	-	-	-	-	2(2)	-	-	-
1984	351	44,579	39(31)	-	1(1)	1(1)	3(1)	-	6(6)	-	1(1)	-
1985 <sup>*</sup>	258	33,352	39(26)	14(12)	1(1)	-	1(1)	-	-	-	-	-
1986 <sup>*</sup>	262	26,019	24(21)	3(3)	2(2)	-	-	1(1)	7(5)	-	-	1(1)
1987 <sup>a</sup>	180	17,094	16(13)	-	-	2(1)	-	-	3(3)	-	-	-

\*: Including Japanese FCZ

a: Preliminary

b: The figures in parentheses indicate the number of operations when marine mammals were taken.

PT: Truey type

PP: Harbour porpoise

LO: Pacific whiteside dorphan

LB: Northern right whale dorphan

CU: Northern fur seal

RS: Ringed seal

ZX: Unidentified porpoise

US: Unidentified seal

Table 5. Sighting survey of marine mammals conducted by salmon research vessels, 1978-1987.

Year	Number of research vessels	Periods of survey	Accumulated days sighted	Accumulated distance sighted (N.M.)
1978	9	May 10 - Sept. 14	563	36,505
1979	9	May 10 - August 11	533	42,969
1980	9	April 21 - August 13	548	44,744
1981	9	April 23 - August 16	639	46,232
1982	10 <sup>b</sup>	April 24 - Sept. 19	653	49,830
1983	10 <sup>b</sup>	April 20 - Sept. 10	608	43,116
1984	11 <sup>c</sup>	April 20 - August 21	588	50,614
1985 <sup>*</sup>	9 <sup>b</sup>	May 2 - Sept. 12	462	37,614
1986 <sup>*</sup>	11 <sup>b</sup>	April 19 - Oct. 5	544	48,534
1987 <sup>a</sup>	10 <sup>b</sup>	June 1 - Sept. 28	400	36,000

a: Preliminary

b: Including dedicated vessel for Dall's porpoise research

c: b + Wakashio maru

\*: Including sighting surveys in Japanese FCZ.

Table 6. Number of marine mammals brought back to motherships for biological samplings and period during U. S. scientific observers on board in 1987.

Name of motherships	Period during U.S. scientific observers on board motherships	Number of marine mammals brought back to motherships			
		U.S. FCZ	Southern part of high seas	Northern part of high seas	Total
		Dall's porpoise			
<u>Kizan maru</u>	June 11-June 29 (25 days) July 7-July 12	83	7	10	100
		Dall's porpoise			
<u>Meiyo maru</u>	June 11-June 30 (24 days) July 8-July 11	111	5	11	127
		Dall's porpoise			
<u>Nojima maru</u>	June 11-July 3 (23 days)	112	5	4	121
		Dall's porpoise			
	Total	306	17	25	348

Table 7. Number of Dall's porpoise incidentally taken by catcher boats with air-tube threads, with multifilament threads and with sound generators in 1987 fishing season.

Catcher boats	Gears*	Number of sets	Incidental take
Catcher boats with air-tube threads	AT-1	2,634	561
Scout boats with air-tube threads	AT-1	379	73
Catcher boats with multifilament threads	MT-1	628	122
Scout boats with multifilament threads	MT-1	187	33
Catcher boats with sound generators	SG-4+AT-1	60	12
Total		3,888	801

\*: See text.

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OUTLINE OF 1987 RESEARCH ON MARINE MAMMALS,  
PARTICULARLY DALL'S PORPOISE RELATING TO SALMON GILLNET FISHERIES

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Research on marine mammals was conducted in 1987 in accordance with Article 10 of the International Convention for the High Seas Fisheries of the North Pacific Ocean, as amended in 1978, and the Memorandum of Understanding between the Governments of Japan and the United States amended in 1987. In addition, the research plan was presented and reviewed at the scientific meeting on Marine Mammals, INPFC, held in Tokyo during 1987 March 10 to 13. The details of research conducted during 1987 April to October are as follows. Since some parts of these experiments and some analyses are still underway, an outline only is reported.

Outline of research

1. Collection of statistical data on incidentally taken marine mammals in the following operations--
  - (1) Mothership salmon driftnet fishery
  - (2) Landbased salmon driftnet fishery
  - (3) Salmon research vessels
  
2. Sighting survey for estimating abundance of Dall's porpoise
  
3. Sampling for biological studies of Dall's porpoise in the following operations--
  - (1) Mothership salmon driftnet fishery
  - (2) Landbased salmon driftnet fishery
  - (3) Salmon research vessels
  - (4) Dedicated vessel for Dall's porpoise research
  
4. Acoustic studies on Dall's porpoise
  - (1) Test of the effect of the sound generator
  - (2) Acoustic study on Harbor porpoise



5. Gear modification experiments for the purpose of reduction or elimination of incidental take of Dall's porpoise

- (1) Gillnets modified with air-tube threads
- (2) Gillnets modified with multi-filament threads
- (3) Supersonic wave generators

1. Statistics on incidentally taken marine mammals

(1) Mothership salmon driftnet fishery

In 1987 three motherships and a total of 129 catcher boats attached those motherships (four motherships and a total of 172 catcher boats in 1986) collected data on marine mammals incidentally taken by salmon gillnets. (Hereafter, figures in parentheses are those for 1985 and 1986--in that order). From early June to mid-July in 1987, there were a total of 90 fleet operations (164 and 136) and 3,888 gillnet operations by catcher boats (7,051 and 5,854). The incidental take in 1987 (Table 1) was 806 marine mammals (2,751 and 1,857) of which 801 were Dall's porpoise--dalli type only--(2,747 and 1,856) and 5 were northern fur seals (4 and 1). The number of individual Dall's porpoise incidentally taken in 1987 decreased to the level of 29 and 43% of those in 1985 and 1986, respectively.

Table 2 shows the numbers of Dall's porpoise incidentally taken within the U.S. Fishery Conservation Zone (FCZ) in the high seas portions of the fishing area in the North Pacific south of the U.S. FCZ and in the high seas portions of the Bering Sea north of the U.S. FCZ in the years 1981 to 1987. In 1987, a total of 676 (2,423 and 1,607) Dall's porpoise were incidentally taken in the U.S. FCZ, 43 (28 and 35) in the southern high seas area and 82 (296 and 214) in the northern areas; the number of Dall's porpoise incidentally taken in the U.S. FCZ decreased significantly to the level of 28 and 42% of those in 1985 and 1986, respectively. Similarly, the numbers of Dall's porpoise incidentally taken in the northern high seas areas decreased greatly.

A total of 18 U.S. marine mammal observers (six for each fleet) were accommodated by the fleets for 23 to 25 days during mid-June to mid-July (Table 6). In addition, a total of three Japanese marine mammal observers (one for each fleet) were on board the fleets as in previous years.

(2) Landbased salmon driftnet fishery

In 1987, the landbased salmon driftnet fishery operated with a total of 1,156,000 (1,436,000 in 1986) tans of gillnet and took incidentally a total of 458 (404) Dall's porpoise during the fishing season from late May to early July (early June to mid-July in 1986) (Table 3).

(3) Salmon research vessels

In 1987, eight salmon research vessels were engaged in the survey with gillnets from June to August in the North Pacific. Areas surveyed were waters of 45° to 56°N and 145° to 133°W in the northeastern North Pacific (including the Gulf of Alaska) and waters of 178°E to 170°W in the Bering Sea. These salmon research vessels conducted a total of 180 operations with 17,094 tans of gillnet and took a total of 21 marine mammals incidentally from 1987 June 4 to August 7 (Table 4). Of those, 16 Dall's porpoise (all are dalli type) were taken in 13 operations, 1 Pacific white-sided dolphin, and 3 northern fur seals in 3.

2. Sighting survey for estimating abundance of Dall's porpoise

For estimating abundance of Dall's porpoise, sighting surveys were conducted by crew members and investigators on board the salmon research vessels and one dedicated research vessel during the cruises. The results will be analyzed at the Far Seas Fisheries Research Laboratory.

Eight salmon research vessels from June 1 to August 16 and one dedicated research vessel from August 3 to September 28 conducted sighting surveys for a total of 400 days (36,000 miles) in 1987 (Table 5). The areas surveyed were the northwestern Pacific north of 38°N, northeastern Pacific north of 45°N and the Bering Sea south of 61°N.

3. Sampling for biological studies of Dall's porpoise

(1) Mothership salmon driftnet fishery

The U.S. observers who were on board each mothership conducted biological measurements and dissection and collected samples such as teeth and internal organs of Dall's porpoise brought back by the catcher boats in cooperation with Japan. In 1987, a total of 348 Dall's porpoise were brought back to the motherships; 306 from the U.S. FCZ and 17 and 25 from the high seas portions south and north of the U.S. FCZ, respectively (Table 6).

(2) Landbased salmon driftnet fishery

Effort to collect Dall's porpoise taken incidentally in the landbased salmon driftnet fishery was expended to obtain biological information on Dall's porpoise found in the area of operations of this fishery. During 1987 June 9 to July 2, 54 (15 in 1986) frozen Dall's porpoise (53 dalli type and 1 truei type) were brought back to Kushiro. These samples were thawed at Kushiro, biological measurements were made, and skulls, teeth, reproductive organs, and other internal organs were collected from August 6 to 16. Collected samples are being sorted and analyzed at the National Science Museum, Japan.

(3) Salmon research vessels

For marine mammals taken incidentally by driftnet operations of the salmon research vessels, biological measurements, dissection, etc. were conducted on board the vessels or at the respective base ports after unloading and thawing.

During the survey period, 1987 June to July, three research vessels brought back a total of eight Dall's porpoise (all dalli type) and two Pacific white-sided dolphins as frozen samples to Kushiro or Hakodate. Seven of the Dall's porpoise specimens were measured and sampled when dissected during August 6 to 16 at Kushiro. Samples collected for these Dall's porpoise are being sorted and analyzed at the National Science Museum, Japan.

For the remainder of the specimens (1 Dall's porpoise and 2 Pacific white-sided dolphins), similar procedures were taken to collect samples and these samples are being sorted and analyzed at Hokkaido University.

(4) Dedicated vessel for Dall's porpoise research

In 1987, the vessel dedicated to Dall's porpoise research conducted a sighting survey of marine mammals and captured Dall's porpoise with harpoons in the northwestern Pacific and in the northeastern Pacific including the Gulf of Alaska during August to September. The main objective for this vessel was to collect data on Dall's porpoise in the northeastern Pacific as in the previous year.

Period 1987 August 3 (departed from Kesen-numa) to September 28  
(returned to Kesen-numa) with entry into Seattle for  
refueling during August 25 to 29 (local time)

Area the northwestern Pacific between 40° and 50°N and the northeastern Pacific between 45° and 55°N

Vessel Hoyo maru No. 12, 42 m length and 299 GRT (chartered by the Fisheries Agency of Japan)

Responsibility for analyses of data and materials obtained will be shared among the following research bodies; the National Science Museum, Whales Research Institute, Ocean Research Institute of Tokyo University, Ehime University, Far Seas Fisheries Research Laboratory, etc.

#### 4. Acoustic studies of Dall's porpoise

The research group, which consisted of members from Nihon University, Kamogawa Sea World (aquarium), and the National Research Institute of Fishery Engineering, conducted acoustic studies of Dall's porpoise in January and during June to July in 1987. Analyses of the results will be conducted by the National Research Institute of Fishery Engineering.

##### (1) Test of effects of the sound generator

As a continuation of the previous year's test of sound generators that were newly designed and manufactured in 1985, and emit random supersonic pulses of 20 kHz to 50 kHz, two catcher boats (Koshin maru No. 58 and Ben-ten maru No. 68) attached to the motherships Meiyo maru and Kizan maru, respectively, used gillnets equipped with three sound generators. The generators were attached to a half side of a set of salmon gillnet. A total of 60 operations were conducted during the fishing season from June to July and the following were examined; number of Dall's porpoise taken incidentally, horizontal and vertical distributions of the net where entanglement occurred, and effect in reducing or eliminating the incidental take (Table 7).

(2) Acoustic survey on Harbor porpoise

The research group conducted the following acoustic study on three Harbor porpoise, a species similar to Dall's porpoise, in the Kamogawa Sea World aquarium:

- (a) Recording of clicks when the porpoise swam close to and fed on fish put into the water tank
- (b) Observation of response when supersonic pulses were emitted toward them
- (c) Observation of their behavior to a salmon gillnet set in the middle of the water tank

5. Gear modification experiments for the purpose of reduction or elimination of incidental take of Dall's porpoise

The incidental take of marine mammals by the mothership salmon driftnet fishery in the U.S. 200 mile fishing zone has been regulated and use of modified gear is required with an increasing percentage stipulated year by year. In 1987, all catcher boats used the following gears as experiments to avoid or reduce the incidental take of marine mammals; gillnets modified with air-tube threads including air-tube thread gillnets equipped with sound generators or multi-filament threads.

(1) Gillnets modified with air-tube threads

In 1987, a total of 100 catcher boats (33 to 34 for each fleet including scout boats) conducted commercial operations using gillnets modified with three air-tube threads woven into the central part of the nets (AT-1). A total of 3,013 operations with this type of modified gear accounted for 77% of the total gillnet operations (Table 7).

(2) Gillnets modified with multi-filament threads

In 1987, a total of 27 catcher boats (nine for each fleet including scout boats) used gillnets modified with three multi-filament threads woven into the central part of the nets (MT-1) and conducted a total of 815 operations (12% of the total gillnet operations) (Table 7).

(3) Supersonic generators attached to the air-tube modified gillnets

Two catcher boats conducted a total of 60 operations (2% of the total gillnet operations) using sets of the air-tube modified gillnets equipped with the supersonic generators mentioned above in 4 (1) (SG-4) (Table 7).

Differing from previous years, in 1987, all catcher boats operated with modified gillnets. Therefore, it was not possible to determine the effectiveness of the modified gillnets in reducing incidental take through comparison between modified nets and standard nets. Since it is said that reflection rate for multi-filament is higher than that for mono-filament, the number of Dall's porpoise incidentally taken by MT-1 nets and AT-1 was compared. However, the data from the scout boats were eliminated from the comparison as in the previous year's, because they were engaged in exploration activities. Average incidental take per operation (CPUE) was 0.19 for the multi-filament modified gillnets (MT-1) and represented 91 when CPUE (0.21) for the air-tube modified gillnets (AT-1) was considered as 100. Comparing the CPUE values between operations with the AT-1 net and MT-1 net, which were made side-by-side, the average value of CPUE was 0.18 for the latter and represented 72 when CPUE (0.25) for the former was considered as 100. Analyses of the results of operations with the multi-filament modified gillnets are being made by the Marine Mammal Project Team.

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TABLES 1 TO 7 ARE IN ENGLISH IN THE JAPANESE DOCUMENT

