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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
1988年調査の概要

**Outline of 1988 Research on Marine Mammals,
particularly on Dall's Porpoise relating
to Salmon Gillnet Fisheries.**

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さけ・ます流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 1988 年調査の概要

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1988 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 10 条及び 1987 年に改定された日本と合衆国の了解覚書に従って実施された。具体的な調査計画は 1988 年 3 月 14 日～18 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。1988 年 6 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・ます流し網漁業

1988 年には母船式漁業による米国 200 海里内での操業は皆無となったが、1 母船とその付属独航船 43 隻(1987 年には 3 母船、129 付属独航船) が南公海及び北公海においてさけ・ます

流し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月中旬の漁期中に合計34回(1987年に90回)の船団操業と、延べ1,462回(同じく3,888回)の独航船の操業を行い、海産哺乳動物222頭(同じく808頭)を混獲した(表1)。混獲された海産哺乳動物はすべてイシイルカ型イシイルカであった。表2には1981～1988年における米国200海里内、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。1988年のイシイルカの混獲頭数は米国200海里内で0頭(1987年に676頭)、南公海で68頭(同じく43頭)及び北公海で154頭(同じく82頭)であった。米国海産哺乳動物視察員の乗船は皆無であったが、日本人視察員2名(1987年では1名)が独航船に乗船し、混獲された海産哺乳動物の調査を行った。

2) 基地式さけ・ます流し網漁業

1988年の基地式さけ・ます流し網漁業は5月下旬～6月下旬の漁期間中に793千反(1987年に1,156千反)を使用し、319頭(同じく458頭)のイシイルカを混獲した(表3)。

3) さけ・ます調査船

1988年には流し網を使用した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、52°N～56°N、160°W～134°Wのアラスカ湾及び178°E～167°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6日～8月6日までの間に、178回(1987年に180回)、総使用反数17,785反(同じく17,094反)の試験操業を行い、海産哺乳動物21頭(同じく21頭)を混獲した(表4)。内訳は、イシイルカが10回操業で14頭(すべてイシイルカ型)、セミイルカ1回、2頭、ネズミイルカ1回、1頭及びオットセイ4回、4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走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。

1988年に10隻のさけ・ます調査船が6月1日～8月1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450日、35,000海里にわたり目視調査を行った(表5)。

3. イシイルカの生物学的研究のための標本採集

1) 母船式さけ・ます漁業

1988年においては母船式さけ・ます漁業ではイシイルカの標本採集は行わなかった。

2) 基地式さけ・ます流し網漁業

基地式流し網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。1988年6月11日～25日に混獲されたイシイルカ15頭(1987年に54頭)が漁船により凍結標本として釧路港に持ち帰られた。イシイルカはすべてイシイル

カ型であった。これらの標本は、8月19日～31日に函館で解凍され、生物学的計測、頭骨、歯、生殖腺、その他の臓器等の採集が行われた。採集された資料の整理と分析は北海道大学及び国立科学博物館が行っている。

3) さけ・ます調査船

さけ・ます調査船の流し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。1988年の6月～7月の操業期間中、4隻の調査船がイシイルカ5頭の冷凍標本と1頭の部分標本、計6頭（全てイシイルカ型）、ネズミイルカ1頭（冷凍標本）及びセミイルカ1頭（冷凍標本）を釧路及び函館に持ち帰った。これらの標本は8月19日～31日に函館において解凍され、生物学的計測、頭骨、歯、生殖腺；その他の臓器等の採集が行われた。収集された資料の分析は北海道大学及び国立科学博物館が行っている。

4) イシイルカ専門調査船

イシイルカ専門調査船は1988年8月～9月に北西北太平洋及び北東太平洋において海産哺乳動物の目視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 1988年8月3日（気仙沼）～9月28日（気仙沼）

調査海域 40°～50°Nの北西北太平洋及び35°～50°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、東大海洋研究所、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1988年5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。また、水工研はICメモリーを用いた新音波発生器の試作を行っている。

1) ネズミイルカの対策行動の観察

北海道の函館周辺の定置網に入り込んだネズミイルカ2頭を使い、1988年5月に北海道大学の実験水槽において、網糸、ロープ、アクリル板、網等に対する行動を昼と夜に観察すると共に、クリックスの発生状況の調査も行った。

2) 新音波発生器の試作

あらかじめ収録したイルカの鳴音をテープレコーダーから再生し、そのクリックス部分について周波数、パルス巾、パルス間隔、パルス数等を解析し、それらの情報をICメモリーに記憶させる。海上ではこのICメモリーのデータを高速で順次読み出し、イルカのクリックスと同じ波型を作り出しながら、送波器から水中へ発射するシステムについて基本設計を行った。

1988年8月に試作器の発注を行った。

5. イシイルカの混獲防止のための改良漁具試験

1988年においては、全独航船が中空系及びマルチフィラメント網を用いてイシイルカの混獲防止試験を行った。43隻中、28隻が中空系網及び15隻がマルチフィラメント網を用いた。この流し網の操業結果は現在分析中である。

Table 1. Number of incidental take of marine mammals, catcher boat operations and gillnets used by mothership salmon driftnet fishery during 1978 to 1988.

Year	Total number of catcher boat operation	Total number of gillnets used (in tans)	Total number of incidental take	Break down by species				
				PD	PP	00	CU	EJ
1978	8,284	2,721,113	505	497	1	1	6	-
1979	8,611	2,798,002	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	3,888	1,282,327	808	801	-	1	6	-
1988 ^a	1,462	482,736	222	222	-	-	-	-

a: Preliminary

PD: Dall's porpoise
 CU: Northern fur seal
 EJ: Steller sea lion

PP: Harbour porpoise
 00: Killer whale

Table 2. Number of incidental take of Dall's porpoise, number of sets of gill nets in US 200 mile zone, southern and northern parts of high seas, 1981-1988.

Year	US 200 mile zone		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	2,808	676	383	43	697	82	3,888	801
1988 ^a	-	-	688	68	774	154	1,462	222

*: Including southern part of high seas

a: Preliminary

Table 3. Number of incidental take of marine mammals and gillnets used by land based salmon driftnet fishery, 1978-1988.

Year	Total number of gillnets used (in tans)	Dall's porpoise	Northern right whale dorphin
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	1,156,224	458	-
1988 ^a	792,736	319	-

a: Preliminary

Table 4. Number of incidental take of marine mammals, gillnet operation and number of gillnets used by Japanese salmon research vessels, 1978-1988.

Year	Number of total operation	Number of gillnets used (in tans)	Species									
			Dall's porpoise (PT)	PP	LO	LB	UD	CU	US	RS	ZX	
1978	355	44,622	27(22) ^b	-	-	-	-	-	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 [*]	258	33,352	39(26)	14(12)	1(1)	-	1(1)	-	-	-	-	-
1986 [*]	262	26,019	24(21)	3(3)	2(2)	-	-	1(1)	7(5)	-	-	1(1)
1987	180	17,094	16(13)	-	-	2(1)	-	-	3(3)	-	-	-
1988 ^a	178	17,785	14(10)	-	1(1)	-	2(1)	-	4(4)	-	-	-

*: Including Japanese FCZ

a: Preliminary

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

PT: truei type

CU: Nothern fur seal

PP: Harbour porpoise

RS: Ringed seal

LO: Pacific whiteside dorphin

ZX: Unidentified porpoise

LB: Northern right whale dorphin

US: Unidentified seal

Table 5. Sighting survey of marine mammals conducted by salmon research vessels, 1978-1988.

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 ^b	April 24 - Sept. 19	653	49,830
1983	10 ^b	April 20 - Sept. 10	608	43,116
1984	11 ^c	April 20 - August 21	588	50,614
1985	9 ^b	May 2 - Sept. 12	462	37,614
1986	11 ^b	April 19 - Oct. 5	544	48,534
1987	11 ^b	June 1 - Sept. 28	461	40,328
1988 ^a	11 ^b	June 1 - Sept. 28	450	35,000

a: Preliminary

b: Including dedicated vessel for Dall's porpoise research

c: b + Wakashio maru

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TRANSLATION

OUTLINE OF 1988 RESEARCH ON MARINE MAMMALS,
PARTICULARLY ON DALL'S PORPOISE RELATING TO
SALMON GILLNET FISHERIES

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Research on marine mammals was conducted in 1988 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 1988 March 14 to 18. The details of research conducted during 1988 June to September are as follows. Since some parts of these experiments and some analyses are still underway, an outline and progress 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. Statistics on incidentally taken marine mammals

(1) Mothership salmon driftnet fishery

In 1988, although there were no mothership salmon fisheries within the U.S. 200 mile zone, one mothership and 43 catcher boats (three motherships and 129 catcher boats in 1987) collected data on marine mammals incidentally taken by salmon gillnets in the southern high seas and northern high seas. From early June to mid July in 1988, there were a total of 34 fleet operations (90 in 1987) and 1,462 gillnet operations by catcher boats (3,888 in 1987). The incidental take in 1988 was 222 marine mammals (808 in 1987) and they were all dalli type Dall's porpoise (Table 1). Table 2 shows the number of Dall's porpoise incidentally taken within the U.S. Fishery Conservation Zone (200 mile zone), in the high seas portions of the fishing area in the North Pacific south of the U.S. 200 mile zone and in the high seas portions of the Bering Sea north of the U.S. 200 mile zone in years 1981 to 1988. In 1988, there was no incidental take of Dall's porpoise (676 in 1987) in the U.S. 200 mile zone, 68 (43 in 1987) Dall's porpoise were incidentally taken in the southern high seas and 154 (82 in 1987) in the northern high seas. There were no U.S. marine mammals observers on board, and two Japanese marine mammal observers on board the catcher boats (1 in 1987) in order to engage in the research on marine mammals caught incidentally.

(2) Landbased salmon driftnet fishery

In 1988, the landbased salmon driftnet fishery operated with a total of 793,000 (1,156,000) tans of gillnet and took incidentally a total of 319 (458 in 1987) Dall's porpoise during the fishing season from late May to late June (Table 3).

(3) Salmon research vessels

In 1988, eight salmon research vessels were engaged in the survey with gillnets from June to August in the North Pacific. Areas surveyed were waters west of 177°W in the northwestern Pacific, and 52° to 56°N, 160° to 134°W in the Gulf of Alaska, and 178°E to 167°W in the Bering Sea. These salmon research vessels conducted a total of 178 (180 in 1987) operations with 17,785 (17,094 in 1987) tans of gillnet used in total from June 6 to August 6 and a total of 21 (21 in 1987) marine mammals were taken incidentally (Table 4). A breakdown was 14 (all dalli-type) Dall's porpoises in 10 operations, 2 Northern right whale dolphins in 1 operation, 1 Harbor porpoise in 1 operation, and 4 Northern fur seals in 4 operations.

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.

In 1988, ten salmon research vessels from June 1 to August 1 and one dedicated research vessel from August 3 to September 28 conducted sighting surveys for a total of 450 days (35,000 miles) in 1988 (Table 5).

3. Sampling for biological studies of Dall's porpoise

(1) Mothership salmon driftnet fishery

In 1988, no sampling for Dall's porpoise in the mothership salmon driftnet fishery.

(2) Landbased salmon driftnet fishery

Effort to collect Dall's porpoise taken incidentally in the landbased salmon driftnet fishery was expanded to obtain biological information on Dall's porpoise found in the area of operations of this fishery. During 1988 June 11 to 25, 15 (54 in 1987) frozen Dall's porpoises (all dalli type) were brought back to Kushiro. These samples were thawed at Hakodate, biological measurements were made, and skulls, teeth, reproductive organs and other internal organs were collected from August 19 to 31. Collected samples are being sorted and analyzed at the Hokkaido University and 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, 1988 June to July, four research vessels brought back a total of six Dall's porpoises (all dalli type); five frozen samples and one partial sample, 1 Harbor porpoise (frozen sample) and 1 Northern right whale dolphin (frozen sample) to Kushiro and Hakodate. These samples were thawed at Hakodate from August 19 to 31, and biological measurements were made, and skulls, teeth, reproductive organs and other internal organs were collected. Collected samples are being analyzed at the Hokkaido University and National Science Museum, Japan.

(4) Dedicated vessel for Dall's porpoise research

In 1988, 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 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 1988 August 3 (departed from Kesen-numa)
to September 28 (returned to Kesen-numa)

Area the northwestern Pacific between 40° and 50°N and
northeastern Pacific between 35° and 50°N

Vessel Hoyo maru No. 12, 42 m length and 299 GT (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, Ocean Research Institute of Tokyo University, and Far Seas Fisheries Research Laboratory, etc.

4. Acoustic studies of Dall's porpoise

The research group, which consisted of members from the Nihon University, Kamogawa Sea World (aquarium) and the National Research Institute of Fishery Engineering, conducted acoustic studies of Dall's porpoise in May, 1988. Analyses of the results will be conducted by the National Research Institute of Fishery Engineering. The National Research Institute of Fishery Engineering is making the new sound generator using IC memories on an experimental basis.

(1) Observation on countermove behavior of Harbor porpoise

Observations on the behavior of porpoise against the thread of net, rope, acrylic plate and net were made using two Harbor porpoise which were entangled into the setnet surrounding Hokodate, Hokkaido in the experimental water tank of the Hokkaido University at day and night in May 1988 and the research on emitting conditions of clicks was conducted as well.

(2) Trial manufacture of new sound generator

We regenerated clicks of porpoise which had been recorded earlier on the tape recorder, analyzed frequency, pulse width, pulse interval, numbers of pulse for its clicks part, and record their information into IC Memories. The basic design was made for the system which emits waves from the transmitter to the water with reading successively the data of this memory at high speed and making the same wave patterns as those of clicks of porpoise.

We gave an order for the trial manufacture of a new sound generator in August 1988.

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

In 1988, all catcher boats conducted experiments of reduction of incidental take of Dall's porpoise using gillnets modified with three air-tube threads woven the central part of the nets and gillnets modified with multi-filament threads. Of 43 catcher boats, 28 vessels used air-tube thread gillnets and 15 vessels used multi-filament thread gillnets. Analyses of the results of operations with these modified gillnets area being made.

Tables 1 to 5 are in English in the Japanese document.