REP. INT. WHAL. COMMN 32, 1982

Annex H

Report of the Sub-Committee on Small Cetaceans

1. PARTICIPANTS, AGENDA AND INTRODUCTORY REMARKS

The meeting was chaired and the meeting report edited by Perrin. Members (M) of the Scientific Committee of the IWC and invited experts (E) attending all or part of the sessions were: Anderson (M), Balcomb (E), Braham (M), Brodie (M), Choi (M), Christensen (M), Dahlheim (E), Duguy (E), Finley (M), Fleischer (M), Gong (M), Hammond (E), Hay (M), Ivashin (M), Jarrell (M), Kapel (M), Kato (M), Klinowska (M), Leatherwood (E), Mitchell (M), Ohsumi (M), Øritsland (M), Wada (M), and Walker (E).

The draft agenda was discussed and approved with amendments (Appendix 1). Leatherwood and Walker were appointed as rapporteurs. Subgroups were convened and chaired as follows: abundance and stock assessments, Hammond; vital rates, Anderson; catch statistics, Dahlheim; and pollution and industrial development, Klinowska.

Due to time constraints it was agreed to concentrate on white whales, narwhals and killer whales and to simply highlight new information and problems on others. In addition to its usual charge, the sub-committee was asked to respond to a request to the Scientific Committee from Canada for scientific advice on five aspects of exploited white whale and narwhal populations within the extended fishing zone of Canada: (a) present stock sizes, initial stock sizes and present carrying capacity if considered different from initial; (b) replacement yields and sustainable yields, with comments if they are markedly different; (c) nature of assessments and comments on their general reliability; (d) 5-year or longer projections of the stock sizes given a continuation of current harvest levels; and (e) any other relevant infomation.

2. DOCUMENTATION

Documents available to the sub-committee and containing information on small cetaceans were SC/33/Prog Reps Australia, Brazil, Canada, Chile, Denmark (Greenland), France, Iceland, Japan, Korea, Mexico, New Zealand, Norway, Peru, South Africa, Spain, UK, USA and USSR; SC/33/Rep 4; IWC/33/11A–E; SC/33/SM2–4, 6, 8–11; SC/33/O 4, O 6 and O 8–O 12; and issues LXXXV and LXXXVI and the provisional issue LXXXVII of the International Whaling Statistics. Documents submitted to the sub-committee are listed in Appendix 2.

3. REVIEW OF NEW INFORMATION ON STOCKS, CATCHES AND STATUS

All takes of small cetaceans by IWC members for which statistics were available for the meeting are listed in Appendix 3. They total 112,006 dolphins, porpoises and small whales. Discussion was limited to species for which there is new significant information bearing on stock assessment and management.

3.1 Northern bottlenose whale

There was no new information available.

3.2 White whale

The distribution of the white whale is characterised by a disjunct circumpolar range with distinct concentrations occupying traditional, non-overlapping summering areas (IWC, 1980). These discrete groups are recognised as management units, or stocks, some of which are defined on the basis of morphometric differences, mainly in body size (Sergeant and Brodie, 1969; SC/33/SM9), and on responses (declines) of populations under hunting pressure without apparent recruitment from adjacent populations (Mitchell and Reeves, 1981; SC/33/SM9).

3.2.1 Distribution, migration, identity of stocks and abundance

(a) The Bering – Chukchi – Mackenzie area and Cook Inlet

Unpublished material cited in SC/33/SM9 indicates a population of 6–7,000 white whales in the Beaufort-Mackenzie Delta area. No new information was provided on other areas. The sub-committee again urges that studies be conducted to provide information on stock discreteness and on levels of take for the stock(s).

(b) Barents, Kara, White and Okhotsk Seas

SC/33/SM2 provided further evidence for the claim of Ognetov (1981) that the populations of the White, Barents and Kara Seas are all from one stock. Counts of animals in the White Sea ranged from a low of 232 in 1979 to a high of 1,570 in 1971 and were negatively correlated to severity of ice conditions in the Kara and Barents Seas. The information provided in 1980 and this year on the relation between White and Kara Sea white whales differs from previously published morphometric studies (Sergeant and Brodie, 1969). The new analyses indicate that whales from the two areas are not morphologically different. The sub-committee recommends that: (a) the Soviet data used by Sergeant and Brodie be compared with recent morphometric data (Ognetov, 1981) and that both sets be examined for any source of bias, and (b) if biases are absent or similar for the two data sets they be combined and re-analysed.

There is no new information on the Sea of Okhotsk population.

(c) Davis Strait – Baffin Bay, Cumberland Sound, and Hudson Bay – Ungava Bay

An estimate from aerial survey of 8,940 white whales wintering in Hudson Strait and Ungava Bay (SC/33/SM9) was regarded by the sub-committee as reasonable, though a probable under-estimate of the population. There was concern about the probability of duplicate counts, under-estimates and differences between counts from the two sides of the survey aircraft. It was recommended that, if possible, data be re-analysed, treating the two available transect sets or other strata as replicates to produce separate estimates, to provide information on variability.

Estimates were presented (SC/33/SM9) showing that white whales from western Hudson Bay, eastern Hudson Bay, and Ungava Bay over-winter together in pack ice in Hudson Strait. These animals separate in spring and migrate to their distinct, non-overlapping summering areas. Based on two pieces of evidence, these three groups should be considered separate stocks as defined above. First, the population levels of each stock have behaved independently, with little or no migration between regions. The West Hudson Bay stock has remained relatively stable at high numbers, while the other two stocks have separately suffered drastic declines due to heavy hunting. Second, the group have begun their summer migrations and are separated by the time of calving and calf-rearing (late May).

A further differentiation of these three stocks in the aggregate from that of Cumberland Sound has been made on morphometric grounds (SC/33/SM9).

The current and historic abundance of Canadian stocks and areas are given in Table 1.

3.2.2 Catches

The recent catches of white whales by Canada, Denmark and the USSR are presented in Tables 1 and 2. For selected stocks, Table 1 includes most recent catch figures and the rate of exploitation these catches represent.

3.2.3 Hunting loss rate

New information on loss rate was contained in SC/33/SM9. Losses in eastern Hudson Bay are minimal, because the whales are harpooned before they are shot and because the hunt takes place in clear, shallow water. In 1980 the sub-committee cited estimates of 20–60%, with higher values for deeper water (Seaman and Burns, 1981: 571). Because this problem is an important one for small stocks that are being harvested and for those stocks for which we have no reliable population size estimates, it is recommended that research on loss rates be carried out on white whales like that conducted on narwhals (SC/33/SM10).

3.2.4 Status

The sub-committee's consideration of status of stocks centred on new information available on populations in Hudson Bay and northern Quebec. It was noted that three stocks were severely depleted and continue to be exploited at high rates. The eastern Hudson Bay stock is estimated at less than 10% of original size, Ungava Bay at less than 20% of original, and Cumberland Sound at 12–14% of original (Table 1). The sub-committee concluded that these stocks should each be designated as a Protected Stock with zero catch.

The stock in the High Arctic in eastern Canada and western Greenland and that in the Beaufort Sea – Mackenzie River delta are at relatively high levels of abundance, and catches are relatively low. However, Canadian catch statistics are not complete, and the USA has not reported catch levels from the Beaufort Sea.

Little is known about stocks in the Bering and Chukchi Seas, the Barents – Kara – White Sea and Cook Inlet. The sub-committee recommends that the USA and USSR conduct research to determine identity of stocks, population sizes, and current exploitation rates.

3.2.5 Age determination and vital rates

There is valuable new information available on age determination. Results for several workers (Table 3) indicate that tooth reading techniques are comparable among them. Growth data for a captive animal support the hypothesis of two growth layer groups. (GLGs . . . terminology of Perrin and Myrick, 1980) per year (SC/33/SM7) and the sub-committee believes the hypothesis should be accepted on a provisional basis for the white whale.

Table 1

Historical and current abundance of currently exploited white whale stocks in Canada and Greenland. Unless otherwise noted, data are from SC/33/SM9 (A) or SC/33/ProgRep Canada (B)

	W. Hudson Bay	E. Hudson Bay	Ungava Bay	Cumberland Sound	High Arctic	Beaufort – Mackenzie
Historical	10,000 (Sergeant, 1973)	as many as 5,000 (A)	≥ 1,000 (A)	5,000 (Mitchell and Reeves, 1981)	—	—
Current	8–9,000 (A)[1]	< 500 (A)[4]	< 200 (A)[4]	600–700 (SC/32/SM17)	10–20,000 (A)	6–7,000 (A)
% of original	80–90%	< 10%	< 20%	12%	—	—
1980 Quota	—	—	—	40 (B)	—	—
1980 Take	251[2] (B)	156 (1979) (B)[2]	88 (1979) (B)[2]	43 (B)	567[2] (B) and SC/33/ProgRep Denmark	85 (B)[3]
1980 Take as % current population	2.8–3.1%	> 31%	> 44%	6–7%	2.8–5.6%	1–1.5%

[1] Extrapolated from proportion of total numbers estimated in Hudson Strait which were thought attributable to W. Hudson Bay stock(s).
[2] Canadian catch figures not complete.
[3] Western Canada only, does not include Alaskan catch; Canadian catch figures not complete.
[4] Finley clarification of several figures used in SC/33/SM9.

Table 2

Available catch data for white whales in Canada, Greenland, and the USSR 1976–1980[1] (from SC/33/ProgRep Canada, SC/29, 30, 32, 33/ProgRep Denmark, Seaman and Burns, 1981 and Ivashin and Mineev, 1981).

	USSR					Canada[2]				Greenland		
	Vessel	Land-based				Canadian Arctic		Hudson Bay			Est.	USA
	White, Barents and Kara Seas	Gulf of Yenisey	White Sea	Barents Sea	Bering Sea	Eastern	Western	Eastern[3]	Western	Reported catch	total catch	Reported catch
1976		170	302	38	21	239	154	546	146	1,059	1,200	—
1977	457	64	215		29	286	148	682	191	690	800	247
1978		19			32	161	127	297	118	519	600	177
1979		74	179		26	200	144	319	105	526	700	138
1980	60	81	75		20	133	85		124	264	550	—
Totals	517	408	771	38	128	1,019	658	1,844	684	3,058	3,850	562

[1] Grouping of catch by geographic area does not imply definition of stock.
[2] Canadian data are not complete because of incomplete reports from some villages and individual hunters.
[3] Catches from James and Ungava Bays and Northern Quebec are included with Eastern Hudson Bay.

Potential utility of other methods was discussed. Ageing based on assumed calving interval and count of ovarian scars is not possible because of high and variable corpora counts. Comparison of most recently deposited layers in teeth from animals caught at different seasons should be made. Such material is available or readily obtainable. Rates of racemization in aspartic acid of the eye lens nucleus could be determined from material currently available (Bada *et al.*, 1980).

Table 3

Estimated number of dentinal layers (GLGs) and age, assuming two GLGs/year, at attainment of sexual maturity

	Brodie (1971)		Sergeant (1973)		SC/33/SM9	
	GLGs	Age	GLGs	Age	GLGs	Age
Males	>14	>7	16–18	6.8	17–21	7.5–10.5
Females	9–11	4.5–5.5	8–13	4–6.5	11–13	5.5–6.5

3.2.6 Net reproductive rates and sustainable yields

After lengthy discussions, the sub-committee concluded that there is no good basis for estimating net reproductive rates in white whale populations. Estimates of gross annual reproductive rates exist (on the order of 10–12%—Anon., 1980), but data that would allow estimation of natural mortality rates are not available. A Leslie-matrix approach to very crudely approximate average adult natural mortality rate was considered for application to the body of age-frequency data in Sergeant (1973), but this proved not useful because the data do not conform to the assumption of constant mortality rate over the period represented.

Two estimates of sustainable yields do exist. Brodie *et al.* (1981) cited crude birth rates of 12–14% in the western Hudson Bay stock and estimated replacement yield for the Cumberland Sound stock by subtracting 4.5% natural mortality (by analogy with the long-finned pilot whale—Sergeant, 1962) from 12%, yielding 5% as 'surplus production'. This calculation was the basis for the quota of 40 whales that Canada internally set for 1980. Members of the group agreed that there is insufficient basis to suppose that natural mortality rates are the same in white whales as in pilot whales. Pilot whales are apparently later-maturing and longer-lived than white whales (age determination discussed above for white whale and in Sergeant (1962) for long-finned pilot whale) and may have different breeding systems, suggesting that the two species may have quite different mortality rates.

The second estimate of sustainable yield is that of Sergeant (1981), who regarded the 1949–1968 catch of white whales at Churchill, Seal River, and Whale Cove (all on western Hudson Bay) as 'nearly in balance with this population's natural increase'. He continued, 'if this is so, it follows that an annual catch of about 5% . . . would not be excessive'. However, the members of the sub-committee feel that this conclusion is questionable on several grounds, to wit:

(1) because there are no data on size of the population before the aerial survey of 1965, the rate of decline in abundance is unknown;
(2) there is no published evidence for the existence of a 'resident' stock said to be represented in 10% of the catches; and
(3) the decline in annual catch, 1951–68, and the decline in modal length of males in the catch (in spite of bonuses paid for larger animals) are indicative of exploitation of an unknown and not necessarily 'moderate' degree.

For these reasons, and pending further investigation of the catch history and status of the western Hudson Bay stock, the sub-committee believes that the 5% figure should definitely not be used as a 'rule-of-thumb' estimate of sustainable yield for white whale populations.

The group discussed and wishes to stress the importance of determining the way gross production may change with population density in the white whale. The sub-committee re-iterates the need for more comparative studies of calf ratios in greatly reduced stocks, such as the eastern Hudson Bay stock (estimated to be at 7% of original size) with those in stocks that may be closer to original size, such as the Cook Inlet or Lancaster Sound stocks. Because of the wide variation in water clarity and in behaviour in different areas, efforts should be given to developing methods for standardizing calf counts through quantifying sighting and behavioural conditions. Because of the selectivity inherent in existing fisheries, there is little hope of being able to estimate natural mortality rates through analysis of catch data.

The sub-committee also wishes to stress that the various estimates cited above, and below in the narwhal discussion, are for the most part point-estimates or ranges of point-estimates, they do not incorporate estimates of statistical variability. As such, they are very crude and should be considered as provisional only, pending availability of more extensive data sets that allow more sophisticated statistical treatment.

With respect to maximum sustainable yield, the sub-committee notes that current thinking is that in long-lived, probably K-selected large mammals (having low litter size and extended parental care) such as odontocetes, MSY level is most likely significantly higher than 50% of initial population size; that is, density-dependent responses to changes in population size are non-linear (for example, see Smith, 1979). Given the severely depleted status of the Cumberland Sound, Ungava Bay and eastern Hudson Bay stocks of white whales, and if it be assumed that reproduction increases with decreased density, it is certain that maximum sustainable yields for those stocks are greater than the current replacement yields. This suggests that a programme of provisional complete protection could result in significantly greater harvests in the long term.

3.3 Narwhal

3.3.1 Distribution, migration, identity of stocks and abundance

No new documents were available on distribution or stock identity. There is persuasive evidence for existence of one main stock in the Canadian Arctic, West Greenland and North Greenland (Mitchell and Reeves, 1981). Finley and Brodie reported, however, that there are frequent catches from northwestern Hudson Bay and that wintering animals may be found in eastern Hudson Strait. These two groups may belong to a smaller, separate stock that summers in northern and western Hudson Bay and winters in Hudson Strait as described for white whales (SC/33/SM9).

Kapel and Finley reported that aerial surveys were carried out in March-April 1981 in southern Baffin Bay – northern Davis Strait as well as in the Hudson Strait – southern Hudson Bay area, and that results are expected to be presented at next year's meeting. Narwhals were found widely distributed in cracks and holes in the pack-ice throughout Baffin Bay – Davis Strait.

Reported catches in recent years are presented in Table 4.

3.3.2. Catches

The actual take is probably more than reported. Although Canadian regulations require all landed narwhals, male and female, to be tagged, harvest statistics do not include lost or abandoned carcasses or unreported animals (SC/33/ProgRep Canada). In addition, kills of females are not likely to be reported (tagged), in order to reserve available tag quotas for tusked males (SC/33/SM10).

3.3.3 Hunting loss rates

In 1980 the sub-committee cited an estimate of loss rate of 50% (Mitchell and Reeves, 1981). Additional information presented in SC/33/SM10 indicates that loss rates can be variable, depending on the type of hunt and ice conditions. For example, in 1978 an ice ridge afforded hunters an elevation providing a good firing angle for inflicting fatal injuries (and high losses) at the ice edge hunt for narwhals. In 1979 there was no similar vantage point, and there appeared to be few losses, although many narwhals received superficial wounds. Such circumstances explain the high rate (23–42%) of scarring found on the landed catch of narwhals from northern Baffin Island.

3.3.4 Status

No new information was available concerning status.

3.3.5 Age determination and vital rates

New data on ageing presented by Hay (1980) indicated that based on length-frequency analysis, three layers may be deposited in dentine and mandibular bone in the first two or three years of life. If accumulation rates of corpora albicantia based on annual ovulation rate are correct, adult females may deposit one layer per year. The workshop did not resolve the question of annual deposit of one or two layers (Hay, 1980).

Finley and Miller (SC/33/SM10) found that males were about 390 cm long (with 100 cm tusks) and females about 340 cm long at sexual maturity. Hay (1980) reported similar values, with dentinal-layer counts of 17 for males and approximately 12 for females. Estimates of age at first reproduction will depend on the rate at which dentinal layers are actually accumulated.

Accurate estimates of pregnancy rate, birth rate, calving ratio and natural mortality were not available, and there are very few data on population structure. Seven of 18 mature females examined by Finley and Miller

Table 4

Available catch data for narwhals in Canada and Greenland 1976–80.
(From SC/33/ProgReps Canada, Denmark, SC/32/ProgRep Denmark, SC/30/ProgReps 29, 30, 32 and 33)

	Canada		Greenland		Totals
Year	Western Hudson Bay	N.E. Canadian Arctic	Reported catch	Estimated catch	(Canada and Greenland est.)
1976	8	297	106	110[1]	415
1977	8	200	232	350	558
1978	4	275	503	650	929
1979	30	289	289	350	669
1980	25+	325	185	350	700+
Totals	75+	1,386	1,315	1,810	3,271+

[1] Exclusive of Thule and East Greenland.

(SC/33/SM10) were pregnant, a similar ratio to that found by Hay. In a group of narwhals trapped in a *savssat,* there were 25 calves for 50 adult females (SC/32/ProgRep Canada). The representativeness of the sample is questioned because the group contained few adult males, and the degree to which females and calves segregate or concentrate is unknown. If it is assumed that adult males escaped from the *savssat* and that the original sex ratio was 1:1, then the proportion of calves would have been 19.2% of total.

3.3.5 Net reproductive rate and sustainable yield

As is the case for the white whale (discussed above), there were no data or analyses available to the sub-committee that would allow estimation of natural mortality rate. Therefore estimation of net reproductive rate and replacement and sustainable yields is not possible. The same problems and comments discussed above for the white whale apply here for the narwhal, including the inadvisability of using the 5% figure promulgated by Sergeant (1981) for use for the narwhal (by analogy with the white whale).

As discussed above, the very long history of substantial catches and the present estimates of abundance suggest that the narwhal population is not in a crisis situation such as are the three heavily depleted white whale stocks, and present takes may be smaller than replacement yields. However, in view of the fact that recent data indicate that narwhal takes on the coast of Greenland and those in the Canadian High Arctic are probably from the same stock (IWC, 1980, 1981), research should be continued to more accurately and completely document the take and to collect survey data and comprehensive biological data and specimens that will allow more precise estimation of the size and composition of the population than is possible with existing data. The sub-committee looks forward to the release of the results of the recent aerial survey of the narwhal wintering grounds in the Davis Strait carried out by Canada.

3.4 Killer whale

3.4.1 Review of report of workshop

The sub-committee reviewed and discussed the report of the Workshop on Identity, Structure and Vital Rates of Killer Whale Populations (SC/33/Rep 4). The workshop noted that while killer whales may be found in nearly every area of the world's oceans, concentrations are mainly near coasts and in high latitudes. Morphometrics and colouration may be useful tools in defining some types of geographical or ice-edge/open-water forms, but existing evidence of a high degree of isolation over a few hundred miles for coastal animals in coastal waters of the eastern North Pacific suggests that broader-scale stock areas as used for larger species may be inappropriate for killer whales. Given the extreme stability of local populations and the possibly low reproductive rates evidenced by the available data, any exploitation can be expected to have very long-term impacts on population size and structure.

Among the recommendations for research, the Workshop proposed that (1) reports be solicited from researchers to determine if social and breeding structure is similar to that in the eastern North Pacific; (2) osteological material in public museums and institutions useful for studies of age and of morphological variation be inventoried and their study encouraged and (3) studies be continued of animals in the wild to accurately determine life-history parameters.

3.4.2 The Northeast Atlantic Fishery

There is no new information on stock identification, abundance or migrations. SC/Jn81/KW1 reported year-round occurrence in Norwegian coastal waters, with 3 or 4 areas of particular concentration. Suggestions that the whales move in response to prey movements (Jonsgård and Lyshoel, 1970 and others) require further investigation.

Based on a long catch history, the killer whales in the eastern North Atlantic in 1980 were recommended to be provisionally classified as a Sustained Management Stock pending review this year of information necessary for identification of stocks and assessment of their status (*Rep. int. Whal. Commn* 31). In 1980, Norway voluntarily limited catch to 52 animals.

Christensen stated that mean lengths (SC/Jn81/KW1) have not changed appreciably from those previously reported (Jonsgård and Lyshoel, 1970).

The statement in SC/33/Rep4 that no new data have been received is incorrect (SC/Jn81/KW1). However, the available data are still inadequate for stock assessment.

3.4.3 The Southern Hemisphere fishery

3.4.3.1 Identity and status of stocks

Information available to the sub-committee from the workshop is still inadequate to define stocks for management. Data and analyses are inconclusive with respect to the six to eight longitudinally-defined stocks proposed by Mikhalev *et al.* (1981). There are data on other possible divisions. Description of a 'dwarf' form by Mikhalev *et al.* (1981) indicates that two species or subspecies may exist in the Southern Hemisphere. Ongoing work by Berzin and Vladimirov (SC/Jn81/KW11) may confirm existence of morphologically distinct forms in open waters and at the ice-edge. Colouration studies indicate a similar division (SC/Jn81/KW11). Analysis and stratification of the sample of killer whales taken by the USSR in 1979/80 may help to clarify the situation, but at the present no identification of separate stocks can be made.

3.4.3.2 Abundance

Data from 1978/79 and 1979/80 IDCR cruises were compared with Japanese sightings data by five-degree square, and an estimate of a Southern Hemisphere population of 144,900 killer whales was arrived at (SC/Jn81/KW10). A correction for differences in survey area produced a revised estimate of 254,000 (Appendix 4), but the methods are subject to several critical untested assumptions. Particularly, density within the five-degree-square strata is assumed to be homogeneous. Concern was expressed that effort directed along the ice edge and at minke whale concentrations may be biased towards areas of high killer whale density within some five-degree squares. If so, this could cause an overestimation of density within these strata. The effect of earlier Japanese sighting effort directed at sei whale concentrations before 1970 is unknown.

Hammond plans to re-examine available data on density of killer whales, taking into account 1980/81 IDCR data. The sub-committee requests of the Secretariat that data from the 1980/81, earlier and subsequent IDCR cruises be verified and made available for analysis before next year's meeting.

Lacking a basis for delineating stocks, there is no basis for catch limits. Pending more research of the type done elsewhere on population structure and stock identity, the sub-committee concluded that there should be no catches of killer whales in the Southern Hemisphere.

3.4.3.3 Catches
There were no catches of Antarctic killer whales in the 1980/81 season.

3.4.3.4 Sustainable yields
Sustainable yields cannot be estimated until vital rates are better known, stocks are delimited, and adequate population assessments are conducted.

3.5 Pilot whales

Small catches of long-finned pilot whales were noted for Greenland (SC/33/ProgRep Denmark) and Canada (SC/33/ProgRep Canada). SC/33/O 4 presents an abundance estimate from aerial survey data of populations of pilot whales in the Newfoundland – Labrador Area of 13,167 (± 3,155) whales. The take of 2,773 in the Faroe Islands (provisional issue LXXXVII of the International Whaling Statistics) represented a considerable increase over the 1979 catch of 1,725 (IWC, 1981: 153). The sub-committee is concerned that there is no population estimate for the Faroes and apparently no scientific programme documenting composition of the catches. Accordingly, the sub-committee urges that Denmark be requested to supplement current reports with improved accounting of catch composition.

Takes of short-finned pilot whales off Japan were also higher in 1980 (692—SC/33/ProgRep Japan) than in 1979 (104—IWC, 1981: 153). It was unclear whether the 1980 figure represents an increase in takes or simply a better reporting system. Balcomb reported that annual takes fluctuate but that in the 1975 drive fishery in Taiji alone 500–600 animals were havested. Fifty-three were reported taken that year in Japanese small-type whaling (Issue LXXXV of the International Whaling Statistics). Noting that there is fishing for pilot whales in Japan in small-type whaling and drive fisheries, the sub-committee encourages implementation of a by-village reporting system and a summary of historical fishing effort, abundance and composition of catches.

Short-finned pilot whales are also taken on the West Indian Islands of St Vincent, St Lucia and Dominica. In 1978 there were eight boats equipped to hunt for pilot whales (five in Castries, three in Vieux Fort). Walker reported that information from fishermen at that time indicated that catches were low, probably below 50 animals per year. He also reported that the fishery on St Vincent continues to decline; 1980 catches from two boats were probably around 11 animals.

3.6 Other Small Cetaceans

3.6.1 Bottlenose Dolphin
The reported Japanese take of 3,493 (SC/33/ProgRep Japan) represents a substantial increase over the 1979 take of 666 (IWC, 1981: 153). The sub-committee is concerned over the increased take, particularly since there is no estimate of population size and no data available on composition of the catch.

3.6.2 Striped Dolphin
The sub-committee noted with concern that the reported catch of striped dolphins in the drive-in fisheries in Shizuoka and Wakayama Prefectures, Japan, increased greatly in 1980. The total take for Japan was 16,344 (SC/33/ProgRep Japan); in 1979 it was only 2,193 (IWC, 1981: 153). Kasuya (1976) estimated total population size in 1974 at 186–202,000, less than 50% of the estimated original population of more than 404,000. He estimated MSY at 4,140–6,530 and replacement yield at slightly less. As pointed out in the 1980 report of the sub-committee, Kasuya's estimates were based on assumptions and models that need further examination. No new stock assessment has been carried out as recommended, even though available new estimates of life-history parameters could well strongly affect the outcome of a re-assessment. In any case, the take of over 16,000 is three to four times the estimated sustainable yield.

Ohsumi reported that the drive fisheries do not require a license and that the dolphin populations are not managed. He also reported that responsibility for local fisheries rests with the prefectural governments, not with the national government directly.

The sub-committee is extremely concerned about this severe over-exploitation of the striped dolphin population, which spends only part of the year in Japanese waters. There is a clear need for re-assessment of the populations of this and other species taken in the drive fisheries and for management of the stocks on a scientific basis.

3.6.3 Common Dolphin
Information presented in SC/33/SM11, supplemented by information provided by Duguy, documents a harpoon fishery for dolphins along the Atlantic coast of France which may take over 200 dolphins per year (*Delphinus delphis* and *Stenella coeruleoalba*).

3.6.4 Dall's Porpoise
Ohsumi reported that the figure of 1,000 Dall's porpoise captured incidentally in the salmon drift-net factory ship operation in the North Pacific (see Section 5) (SC/33/ProgRep Japan) is the *reported* catch, which is lower than the actual catch because of a misunderstanding of the reporting requirements by the fishermen. The USA (SC/33/ProgRep USA) estimated that 8,970 Dall's porpoise were taken within the US 200-mile limit off the Aleutian Islands during the summer of 1980. That figure is listed in Appendix 3.

3.6.5 Harbour Porpoise
Previous statements that records of strandings of harbour porpoise on the British Coast have declined (Evans, 1980; Sheldrick, 1976) have been taken to support contentions of population declines. New analysis of the same stranding data presented in SC/33/SM4 do not support those statements of strandings trends, noting instead significant fluctuations in reported strandings between 1936 and 1949.

A new programme has begun to monitor incidental kills of harbour porpoise in Pasamaquoddy Bay, between Maine and New Brunswick (SC/33/ProgRep USA).

4. STATISTICAL REPORTING FOR LIVE-CAPTURE FISHERIES

The sub-committee discussed live-capture fisheries, and members agreed that statistics for these removals from the

populations should be reported to the Scientific Committee as are those for other types of directed take. Live capture of dusky dolphins is reported in SC/33/ProgRep South Africa, but known take by the USA of bottlenose dolphins and by Iceland of killer whales has not been reported to the Scientific Committee. Bryant (1981) listed live captures of 30 killer whales in Iceland during the period 1975–79. The sub-committee urges that members be requested to provide live-capture statistics.

5. INTERACTIONS BETWEEN SMALL CETACEANS AND FISHERIES

5.1 Incidental take

Incidental takes are listed in Appendix 4. Discussion was limited to new developments, summarised below by geographical region.

5.1.1 Europe

The sub-committee notes that incidental takes of small cetaceans have not been reported to the Scientific Committee by the United Kingdom, although contaminant analyses of incidentally-caught harbour porpoise have been reported in an ICES document (see 6 below).

Duguy (SC/33/SM11) reported that small cetaceans are taken incidentally in trawl and gillnet fisheries on the Atlantic coast of France, including long-finned pilot whales, striped dolphins, bottlenose dolphins, common dolphins, Risso's dolphins and harbour porpoises. He also reported that a system exists for mandatory reporting of incidental kills. Noting that France has not included such existing information in the Progress Report, the sub-committee believes that this should be done, for both the Atlantic and the Mediterranean coasts.

5.1.2 North America

The sub-committee reviewed information on progress of the joint US-Japan research programme on the problem of incidental kill of Dall's porpoise in the salmon gillnet fishery near the Aleutian Islands (SC/33/ProgRep USA). The estimated kill in 1980 was 8,970. Abundance has been estimated variously at 840,000 to 2,300,000 but it is thought that these may be overestimates because of several biases. Joint sighting cruises to collect more and better data on distribution and abundance continue. Stomach-contents analyses show that prey items taken by the porpoise are on the average larger and deeper-living than those utilised by salmon.

Balcomb reported that incidental mortality of harbour porpoise occurs in the US gillnet fishery in the Puget Sound area of the state of Washington. He collected 23 dead porpoise assumed to have been killed in gillnets in 1972. The sub-committee notes that the mortality in this fishery has not been reported in the US Progress Report.

A reported 254 dolphins and porpoise were killed in fishing gear on the southeastern coast of Newfoundland (SC/33/PS13: p. 22 and Table 5). Many of the entrapped animals were used as food. This count was extrapolated to an overall estimate for Newfoundland of 23,399. The estimate was based on a telephone poll of 100 fishermen asked to keep records of their incidental catch. It is pointed out in SC/33/PS13 that the estimate may not be accurate because the sample was from one part of the coast of Newfoundland but was used to extrapolate to the entire coast. Hay reported that the large majority of the 254 animals in the reported sample were taken by a few fishermen in one location and that most of the fishermen reported no catch. He stated that in his recollection the telephone survey was retrospective.

This information indicates that significant incidental catches of small cetaceans may be occurring off Newfoundland, and the sub-committee urges that Canada be requested to collect and report accurate and precise statistics.

5.1.3 South America

Perrin reported that he has learned of incidental takes of tucuxi (*Sotalia fluviatilis*) and boutu (*Inia geoffrensis*) in gillnet and seine fisheries for catfish (*Brachyplatostoma* spp.) in the Amazon River. Da Rocha has indicated that statistics for these incidental takes will be included in Brazil's Progress Report next year.

The sub-committee notes that Argentina, Chile and Peru have not reported takes for fisheries in which incidental kill of small cetaceans is known to occur (IWC, 1980).

5.1.4 Asia

Gong reported that small cetaceans of several species are taken incidentally in mackerel purse seines in southern waters of the Republic of Korea. Fishermen will be notified shortly of a new requirement that incidental capture be avoided and that live captured animals be released. Incidental take resulting in death of the animal must be reported to the fisheries agency. Statistics of incidental catch will be included in next year's Progress Report.

5.1.5 South Pacific

The sub-committee notes that SC/33/ProgRep New Zealand for this year includes information and statistics on incidental catch of small cetaceans in fishing gear. The species involved are dusky dolphin, common dolphin, Hector's dolphin and long-finned pilot whale.

5.1.6 Eastern Tropical Pacific

The UK reported incidental catch of spotted, spinner and other small cetaceans by tuna seiners registered in the Cayman Islands.

Hammond reported that several IWC members that are known to operate purse seine vessels fishing for tuna associated with dolphins in the eastern tropical Pacific are not at present participating in the international programme of research conducted by the IATTC on the problem. The programme includes placement of observers aboard purse seiners to collect incidental catch statistics and data and specimens for use in assessing status of the dolphin populations. The non-participating members include the Republic of Korea, Mexico, the Netherlands (Netherlands Antilles), Spain and the UK (Cayman Islands).

Fleischer reported that while Mexico is not participating in the international effort, a programme of research on the problem is being planned, including placement of observers on vessels and preparation of an identification guide for use by Mexican fishermen. It is not planned to collect sightings and effort, but no decision has been reached on collection of biological specimens. A report on the progress of the research programme will be included in next year's Progress Report.

Recent analyses have uncovered several potential biases in life-history data collected from dolphins killed in the fishery (SC/33/SM6), throwing earlier estimates of

life-history parameters into doubt. Perrin reported that research to cope with these biases is underway.

The sub-committee notes that the estimated incidental kills in 1980 of both spotted and spinner dolphins increased about 100% over those in 1979 (SC/33/SM3). Kill of common dolphins decreased about a third. It was pointed out that the large changes in the extrapolated estimates may merely reflect the large variances caused by the small sample size of non-US vessels. The sub-committee wishes to emphasise that it is very important that more IWC members participate in the IATTC programme, so that better estimates can be obtained. The sub-committee also urges that the status of the dolphin stocks be assessed and that results of analyses and assessments be made available to the Scientific Committee.

5.1.7 Eastern Tropical Atlantic

A recent newsletter on West African marine mammal research (Maigret, 1981) contains information on dolphin mortality in tuna seines off West Africa. Seven French seiner captains (23% of those asked) made on the average less than 12 sets on dolphins annually, killing about 14 dolphins per set.

Maigret extrapolated from this sample to arrive at an estimate of 3,300 dolphins killed annually, based on the fleet of about 42 seiners from France, 12 from the USA and 14 from Spain that fished off West Africa in 1977/78. Incidental kill of dolphins in this fishery had not been reported to the Scientific Committee by these IWC members, and the sub-committee believes they should be requested to do so.

Maigret (1981) also reported incidental kill of common dolphins in a surface trawl fishery for sardines, mackerel and '*chinchards*'. In May, 1980, one trawler captured 6 to 22 common dolphins per haul during trawling at night. Twelve vessels from Romania and the USSR were fishing by this method in the area at this time. The sub-committee notes that incidental kill statistics for this fishery have not been reported to the Scientific Committee.

5.2 Direct conflicts

New information was available on interaction between killer whales and a drop-line fishery in waters off Tasmania (SC/33/ProgRep Australia). An initial estimate is that approximately 10% of the catch of blue-eyed trevalla (*Hyperoglyphe porosa*, Centrolophidae) may be lost to killer whales. Further work on the interaction is planned.

The report of the killer whale workshop (SC/33/Rep4) contains information on take of halibut off longlines by killer whales off Iceland.

5.3 Competition

Ohsumi and Kato reported on progress of research on the problem of perceived competition between fishermen and dolphins at Iki Island, Nagasaki Prefecture, Japan. A team of scientists was recently assembled to conduct ecological research. A programme of research lasting at least three years is planned. The research includes analysis of dolphin stomach contents. Research on methods to drive the dolphins away from fishery areas continues.

Ohsumi reported that present plans are to submit a preliminary report on the results of the research to next year's meeting of the Scientific Committee.

6. EFFECTS OF POLLUTION AND INDUSTRIAL DEVELOPMENT

6.1 New information on pollution

The sub-committee reviewed the IWC observer's report on a joint session of the ICES Marine Environmental Quality and Marine Mammals Committees (IWC/33/11A). Two papers related to small cetaceans were presented. Analysis for lead, cadmium, and mercury in 26 harbour porpoise from the northeast coast of Scotland revealed a trend towards increasing residues of mercury and cadmium with increasing body length in some tissues (ICES Paper E.41[1]). However, data points were sufficiently scattered that no statistical relationship could be shown. Concentrations of lead were below detection limit for all samples. Based on these results and the supposed migratory habits of harbour porpoise as they affect results of such studies, the authors suggested that the harbour porpoise may not be acceptable as an index species for monitoring metal concentrations in the marine environment.

In a second report, levels of mercury and organochlorine residues in two white whales from the St Lawrence estuary were compared with those from other areas. An adult female, found dead of an old injury, contained 36.9 ppm mercury in the liver (ICES Paper E.55[1]). High levels of both total DDT and PCB's were found in this whale and in a healthy calf killed by hunters, but the calf had five times as much total DDT and 25 to 35 times as much PCB as the adult. Unfortunately, neither paper reported any anatomical or histological information.

The sub-committee reiterates its support for the view expressed by ICES that studies of pollutants should not only deal with amounts but also with effects, and that anatomical and histological information should be included in reports so that possible confounding effects of infections, etc., may be made clear. The efforts of ICES to standardise assay techniques were noted.

No full reports relating to small cetaceans were available to the sub-committee. Two harbour porpoise were collected for heavy metal and organochloride analysis under Canadian government permit (SC/33/ProgRep Canada). A study of skin ulcerations in marine mammals (SC/33/ProgRep France) and the analysis of samples from stranded specimens for heavy metal and pesticide residues (SC/33/ProgRep New Zealand) were reported. The latter material includes that from a mass stranding of killer whales and from the bottlenose dolphin and common dolphin. Document SC/33/ProgRep Spain refers to a study of organochloride contamination in a Blainville's beaked whale. Duguy added that a study of 34 small cetaceans relating to organochloride residues will be presented at the next ICES meeting.

6.2 New information on industrial development

Document SC/33/ProgRep Canada lists a working paper on the reactions of whales to boat traffic in the area of the confluence of the Saguenay and St Lawrence rivers, an area where small cetaceans are found. Scientists of 2 nations contributed to and participated in a workshop on underwater noise generated by super tankers and its possible effects on marine mammal populations in Arctic waters (SC/33/ProgRep Denmark and ProgRep Canada). The question of noise effects on marine mammals was raised at the sub-committee meeting last year (IWC, 1980).

[1] At authors' requests, these Publications presented to ICES were unavailable for release or complete citation.

The proceedings of the workshop will be submitted for public review. The US reports that environmental impact statements are in preparation relating to the occurrence of marine mammals in or near oil lease sites in the Gulf of Alaska (SC/33/ProgRep United States).

7. OTHER BUSINESS

7.1 Publication of documents

Documents intended for publication in the Report are so indicated in Appendix 2. Authors will obtain reviews by at least 2 peers and send revised versions for publication to the Scientific Editor by 1 October 1981.

7.2 Reproduction Conference

Note was taken of the Conference on Cetacean Reproduction, to be held 28 November to 7 December 1981 in La Jolla, California, USA. The symposium of the conference has a full programme of 52 papers; these and others submitted (for circulation only) before the conference will be considered for publication in a proceedings volume. A workshop that will follow the symposium is fully subscribed. The workshop is designed to bring biologists and quantitative workers together for interchange of ideas on the limits and possibilities of work on reproductive biology of cetaceans.

7.3 Conference on tropical Atlantic cetaceans

The sub-committee recognises and encourages current plans for a conference on the cetaceans of tropical West Africa and suggests that the scope of the meeting be expanded to include cetaceans of the tropical western Atlantic as well. The organiser of the conference is J. Maigret, Editor of GEMMATA (Newsletter of Groupe d'Etude des Mammifères Marins dans l'Atlantique Tropical Africain). Persons interested in the meeting should contact Dr J. Maigret at Centre National de Recherches Océanographiques et de Pêches, BP22, Nouadhibou, R. I. de Mauritanie.

7.4 Grant to IWC by the Netherlands

The Government of the Netherlands had contributed Df. 10,000 to the IWC Research Fund with the suggestion that it be spent 'on such activities as may be recommended by the Scientific Committee with regard to the conservation of small cetaceans'.

After discussion of possible uses of the grant, the sub-committee concluded that in light of problems of stock identification of killer whales in Norwegian waters, Norway should be invited to prepare a research plan for the utilisation of the grant for field studies to identify killer whale stocks on the Norwegian coast. Photographic and acoustic survey would seem to be the most promising methods for this work.

7.5 CITES

The sub-committee noted that the volume 'A World Review of the Cetacea' has been published. The volume was financed by the Nature Conservancy Council of the UK and authored by M. Klinowska. Klinowska and Rudge thanked the members of the sub-committee for their help in preparing the volume. The sub-committee hopes that this useful compilation will be updated by the authors at regular intervals.

7.6 Terminology

The sub-committee noted the recent re-description of the clymene dolphin, *Stenella clymene*, based on examination of extensive materials from widespread tropical Atlantic locations (Perrin *et al.*, 1981). The species is valid and should be added to the IWC list of cetacean names.

8. RECOMMENDATIONS TO THE SCIENTIFIC COMMITTEE

8.1 Northern bottlenose whale

The sub-committee again recommends that the research programme recommended for the northern bottlenose whale in 1977–78 be carried out and that the stock continue to be classified a Protection Stock with a zero catch.

8.2 White whales and narwhals

(1) The sub-committee notes that the status of most small cetaceans in the IWC remains unresolved and that a resolution adopted at the 1980 meeting of the Commission (*Rep. int. Whal. Commn* 31: Appendix 8) established an interim working arrangement for continuation of the work of the sub-committee and provision of scientific advice to the member governments. The resolution also calls for provision of data and analyses to the Scientific Committee by member governments. The sub-committee recognises that advice promulgated under the present working arrangement has resulted in expansion of national research programmes on some species and adoption of voluntary internal catch limits for some stocks. Nonetheless, the sub-committee believes that for scientific reasons the white whale and narwhal should be managed on the same basis as the other Arctic whales. Commonalities affecting scientific management are several, including long migrations, subsistence take of individual animals by indigenous peoples using light craft and harpoons (with various modifications from modern technology), relatively high loss rates that must be measured, and quantifiable fishery effort. For these reasons, most of the members of the sub-committee recommend that the white whale and narwhal be listed in the Schedule (Paragraph 1) and that stock classifications and catch limits be set in accordance with the Commission's management procedures. The two whales should be listed thus:

'white whale' (*Delphinapterus leucas*) means any whale known as white whale, beluga, belukha

'narwhal' (*Monodon monoceros*) means any whale known as narwhal, sea unicorn

Ivashin expressed the opinion that this recommendation is inappropriate in light of last year's resolution of the Commission.

(2) The sub-committee notes the responsive and considerable expansion of studies of populations of white whales and narwhals in Canadian and Greenland waters and recommends that Canada and Denmark be encouraged to continue this very important work, giving particular attention to stock identity (including identification of discrete summering populations), migration, abundance, calf production, collection of complete and accurate catch statistics, and full collection of age and reproductive samples from the catch.

(3) Noting the seriously depleted status of the stocks summering in Cumberland Sound (estimated to be at less than 14% of original size), Ungava Bay (less than 20% of original) and eastern Hudson Bay (less than 10% of

original) and the importance to the species of estuarine calf-rearing grounds, the sub-committee recommends that each of these separate stocks be classified as a Protected Stock with zero catch, and that critical habitat of the stocks be recommended for protection.
(4) Noting that the problems of unknown stock structure, abundance and status identified by this sub-committee in 1979 and 1980 for populations of white whales summering in US and Soviet Arctic waters remain for the most part unresolved, the sub-committee recommends that the US and the USSR be urged to initiate field studies needed for stock identification and assessment. Noting that the USA did not submit white whale catch statistics for 1980, it is recommended that it be asked to do so.

8.3 Killer whales

The sub-committee endorses the detailed recommendations of the Workshop on killer whale populations (SC/33/Rep 4) and includes the most important of them here.

8.3.1 Norway

(1) The Committee last year recommended that because of a long history of catches the killer whales in the northeastern Atlantic be classified provisionally as a Sustained Management Stock, pending review of identity and status of stock(s) at this year's meeting. Data necessary to establish identity and assess status of the stock(s) are still not available. In addition, the catch data and new information on the size and nature of stocks elsewhere indicate that the recent takes on the northern coast of Norway may have come from one or a few localized stocks rather than from an overall northeastern Atlantic stock. For these reasons, the sub-committee recommends that the killer whales on the coast of Norway be designated an Unclassified Stock with zero catch limit, pending identification of stocks and assessment of their status.
(2) Noting that data exist on sex and length of catches since 1938, the sub-committee recommends that catch data be analysed as planned by Norway with consideration of possible biases in capture, to determine whether changes in length frequency or sex composition have occurred.
(3) Because available effort data are inadequate for CPUE analyses, the sub-committee recommends that should the fishery continue, improved reporting of effort be requested from the fishermen. Such reports should include at least: time leaving port, time returning to port and estimated time searching.
(4) Noting that acoustic and photographic enumeration techniques have produced highly successful results in defining killer whale populations in other areas, the sub-committee recommends that such techniques be considered for use in delineating the Norwegian stock(s).
(5) Because of the perceived competition between fishermen and killer whales for herring, the sub-committee recommends that, should the fishery continue and whenever possible, stomach contents be examined by scientists and both species composition and volume determined.
(6) Noting the success of short-term censuses in inland marine waters of British Columbia and Washington, the sub-committee recommends that the planned whale count in coastal waters of Norway be carried out.

8.3.2 Antarctic

(1) Because of the continuing uncertainty over stock identities and consequently the abundance of any Southern Hemisphere stocks, the sub-committee recommends that the stock(s) be classified as an Initial Management Stock with a catch limit of zero.
(2) Noting the large amount of information on stock (or 'community') identity yielded by extended photographic and acoustic surveys in the northeastern Pacific, the sub-committee recommends that these and other methods be considered for use in expanded field studies to delineate Southern Hemisphere populations.
(3) Noting that a large sample (916) of killer whales was taken in 1979/80 by the USSR and has not yet been fully reported on, the sub-committee recommends that the USSR be requested to provide suitable report(s) to next year's meeting of the Scientific Committee. The report(s) should include analysis of reproductive data and specimens collected, analysis of morphometric, meristic and colour-pattern data, exact locations of catches, sightings-and-catch per effort data, and information on hunting strategy and tactics, especially as they may relate to possible sex, age or size bias in the samples from the catch and to possible biases in sighting effort. If possible, samples for morphological analyses should be stratified by age.

8.4 Statistics

As pointed out in previous years, catch statistics provided to the Scientific Committee or to BIWS by member nations are incomplete or inadequately detailed. The sub-committee again recommends that member nations be requested to collect and submit full statistics as detailed in *Rep. int. Whal. Commn* 30: 124. Member nations known to have taken small cetaceans but which did not report the takes or reported them incompletely include Argentina (Incidental), Australia (I), Brazil (I), Canada (Directed and I), Chile (I), France (D, I), Iceland (Live-capture), Republic of Korea (I), Mexico (I), Netherlands (I), Peru (I), Spain (I), UK (I), USA (D, I, L) and USSR (I).

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Appendix 1

AGENDA

1. Participants, agenda and introductory remarks.
2. Documentation.
3. Review of new information on stocks, catches and status.
   - 3.1 Northern bottlenose whale.
   - 3.2 White whale.
     - 3.2.1 Distribution, migration, identity of stocks and abundance.
     - 3.2.2 Catches.
     - 3.2.3 Hunting loss rates.
     - 3.2.4 Status.
     - 3.2.5 Age determination and vital rates.
     - 3.2.6 Net reproductive rates and sustainable yields.
   - 3.3 Narwhal.
     - 3.3.1 Distribution, migration, identity of stocks, and abundance.
     - 3.3.2 Catches.
     - 3.3.3 Hunting loss rates.
     - 3.3.4 Status.
     - 3.3.5 Age determination and vital rates.
     - 3.3.6 Net reproductive rates and sustainable yields.
   - 3.4 Killer whale.
     - 3.4.1 Review of report of workshop.
     - 3.4.2 The Northeast Atlantic fishery.
     - 3.4.3 The Southern Hemisphere fishery.
   - 3.5 Pilot whales.
   - 3.6 Other small cetaceans.
     - 3.6.1 Bottlenose dolphin.
     - 3.6.2 Striped dolphin.
     - 3.6.3 Common dolphin.
     - 3.6.4 Dall's porpoise.
     - 3.6.5 Harbour porpoise.
4. Statistical reporting for live-capture fisheries.
5. Interactions between small cetaceans and fisheries.
   - 5.1 Incidental take.
     - 5.1.1 Europe.
     - 5.1.2 North America.
     - 5.1.3 South America.
     - 5.1.4 Asia.
     - 5.1.5 South Pacific.
     - 5.1.6 Eastern tropical Pacific.
     - 5.1.7 Eastern tropical Atlantic.
   - 5.2 Direct conflicts.
   - 5.3 Competition.
6. Effects of pollution and industrial development.
   - 6.1 New information on pollution.
   - 6.2 New information on industrial development.
7. Other business.
8. Recommendations to the Scientific Committee.
9. Compilation of references for report.
10. Adjournment.

Appendix 2

LIST OF DOCUMENTS SUBMITTED TO THE SMALL CETACEANS SUB-COMMITTEE

SC/33/SM

1 SMITH, T. Changes in size of three dolphin populations (*Stenella spp*) in the eastern tropical Pacific. [Withdrawn.]

2* OGNETOV, G. N. and POTELOV, V. A. The peculiarities of the white whale, *Delphinapterus leucas*, distribution and population dynamics in the White Sea.

3* ALLEN, R. and GOLDSMITH, M. D. Dolphin mortality in the eastern tropical Pacific incidental to purse seining for yellowfin tuna, 1980.

4* EASTON, D., KLINOWSKA, M. and SHELDRICK, M. C. A preliminary analysis of the British strandings records of the Harbour porpoise (*Phocoena phocoena*).

5 ABBOTT, R. M., KLINOWSKA, M. and EVANS, P. G. H. Analysis of the sightings records of the harbour porpoise (*Phocoena phocoena*) in British waters. [Withdrawn.]

6* PERRIN, W. F. and OLIVER, C. W. 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.

7* BRODIE, P. F. Growth and age determination of the beluga *Delphinapterus leucas* based on a captive specimen.

8 Anonymous. Canadian research and management proposals related to narwhal and beluga, 1981.

9 FINLEY, K. J., MILLER, G. W., ALLARD, H., DAVIS, R. A., and EVANS, C. R. The white whales (*Delphinapterus leucas*) of northern Quebec: distribution, abundance, stock, identity and catch history.

10* FINLEY, K. J. and MILLER, G. W. The 1979 hunt for narwhals (*Monodon monoceros*) and an examination of harpoon gun technology near Pond Inlet, Northern Baffin Island.

11* DUGUY, R. and HUSSENOT, E. Occasional captures of delphinids in the N.E. Atlantic.

* Published in this volume.

Appendix 3

REPORTED OR PUBLISHED ESTIMATED CATCHES OF SMALL CETACEANS IN 1981 BY SPECIES AND COUNTRIES

Species		Canada	Japan	Denmark		Norway	USSR	South Africa	(ETP)		Spain	France	New Zealand	Seychelles	Total
				Greenland	Faroes				USA	Non-USA					
rd's beaked whale	D	—	31	—	—	—	—	—	—	—	—	—	—	—	31
rwhal	D	350	—	350[1,2]	—	—	—	—	—	—	—	—	—	—	700
ıite whale	D	768	—	550[1,2]	—	—	236	—	—	—	—	—	—	—	1,554
lo.-Pac. hump-backed dolphin	I	—	—	—	—	—	—	8	—	—	—	—	—	—	8
se killer whale	D	—	356[1]	—	—	—	—	—	—	—	—	—	—	—	356
	I	—	21[1]	—	—	—	—	—	—	—	—	—	—	—	21
ler whale	D	—	2	—	—	52	—	—	—	—	—	—	—	—	54
ng-finned pilot whale	D	—	—	2[1,2]	2,773	—	—	—	—	—	—	—	—	—	2,775
	I	3	—	—	—	—	—	—	—	—	—	—	—	—	3
ort-finned pilot whale	D	—	686[1]	—	—	—	—	—	—	—	—	—	—	—	686
	I	—	6[1]	—	—	—	—	—	—	—	—	—	—	—	6
ısky dolphin	I	—	—	—	—	—	—	—	—	—	—	—	—[4]	—	—[4]
	L	—	—	—	—	—	—	1	—	—	—	—	—	—	2
cific white-sided dolphin	D	—	69[1]	—	—	—	—	—	—	—	—	—	—	—	69
	I	—	4[1]	—	—	—	—	—	—	—	—	—	—	—	4
ttlenose dolphin	D	—	3,480[1]	—	—	—	—	13	—	—	—	—	—	—[5]	3,493
	I	—	13[1]	—	—	—	—	—	—	—	5	3	—	—	21
sso's dolphin	I	—	3[1]	—	—	—	—	—	—	—	—	1	—	—	4
ıntropical] spotted dolphin	D	—	1,440[1]	—	—	—	—	—	—	—	—	—	—	—	1,440
	I	—	20[1]	—	—	—	—	—	10,932[2]	11,637[2]	—	—	—	—	22,589
inner dolphin	I	—	—	—	—	—	—	—	4,334[2]	10,884[2]	—	—	—	—	15,218
·iped dolphin	D	—	16,247[1]	—	—	—	—	—	—	—	—	—	—	—	16,247
	I	—	97[1]	—	—	—	—	—	75[2]	342[2]	—	4	—	—	518
ımmon dolphin	D	—	49[1]	—	—	—	—	—	—	—	—	—	—	—	49
	I	—	75[1]	—	—	—	—	89	400[2]	4,621[2]	—	7	5[4]	—	5,197
ırbour porpoise	D	—	30[1]	850[1,2]	—	—	—	—	—	—	—	—	—	—	880
	I	—	10[1]	—	—	—	—	—	—	—	—	1	—	—	11
ıll's porpoise	D	—	6,718[1]	—	—	—	—	—	—	—	—	—	—	—	6,718
	I	—	9,158[7]	—	—	—	—	—	—	—	—	—	—	—	9,158
nless porpoise	D	—	153[1]	—	—	—	—	—	—	—	—	—	—	—	153
eaviside's dolphin	I	—	—	—	—	—	—	1	—	—	—	—	—	—	1
ector's dolphin	I	—	—	—	—	—	—	—	—	—	—	—	1[4]	—	1
nidentified or mixed	I	23,399[6]	9[1]	6[1]	—	—	—	61	314[2]	—	—	—	150[1,2,4]	≤ 100	24,039
otal		24,520	38,677	1,758	2,773	52	236	174	16,055	27,484	5	16	156	≤ 100	112,006

Legend: D = Direct
I = Incidental
L = Live capture

1 = Provisional.
2 = Estimated total.
3 = Non-USA kill in ETP.
4 = 1980/81—Catch listed under 'other' composed of dusky, common, and Hector's dolphins, unspecified proportions.
5 = Most of the estimated ≤100 reported are bottlenose dolphins.
6 = Actual takes of 254 animals, of mixed-species composition with unreported proportions, extrapolated to numbers of nets fishing off Newfoundland (SC/33/PS13). As noted in the text, the estimate is of questionable value, because data from a small sample of fishermen (100) in one area were extrapolated to the entire Newfoundland coast and because most of the fishermen queried reported no take (nearly all of the 254 reported were taken by a few fishermen in one location).
7 = Estimated by US (SC/33/ProgRep USA).

Appendix 4

ABUNDANCE ESTIMATES FOR KILLER WHALES IN THE ANTARCTIC

P. S. Hammond

Ohsumi (SC/Jn81/KW10) has calculated population estimates of killer whales in areas I–VI of the Antarctic. He used indices of abundance from Japanese scouting boat data collected from 1965–1980 calibrated to a population estimate made by Allen (*Rep. int. Whal. Commn* 31: 151–152) who employed line-transect methodology on data collected during the IWC/IDCR minke whale cruises in 1978/79 and 1979/80. The calibration involved calculating the ratio of the IDCR population estimate to the scouting boat index of abundance for data collected in Areas III and IV, zone B, in January in both cases. Population estimates for all areas were then calculated by multiplying the indices of abundance from the scouting boat data by this ratio.

One of the assumptions of this method is that the survey areas for the two data sets upon which the ratio depends are equal. This was not the case. The scouting boat index of abundance was calculated assuming a survey area of 1,560,000 sq. nm and the IDCR population estimate was calculated assuming a survey area of 960,500 sq. nm.

The sighting rates (number of whales seen/length of search track in nm) from the two data sets turn out to be very similar in the calibration area; 0.030 for the scouting boat data and 0.028 for the IDCR data. This indicates that given similar sighting conditions the two surveys were sampling the same population density. If it is assumed that sighting conditions were the same, an estimate of density of whales from the scouting boat sighting rate can be obtained by multiplying by the factor which converts sighting rate to density using the IDCR data. The number of whales in the area surveyed by the scouting boats can then be obtained by multiplying scouting boat density by the survey area. Since sighting rate can be obtained for the scouting boat data by dividing the index of abundance by the survey area, and the population estimate is obtained by multiplying by the survey area, the only calculation necessary to get from the scouting boat index of abundance to a population estimate is to multiply by the sighting rate: density estimate conversion factor from the IDCR data. This is given by

$$\frac{\text{Density of whales from IDCR cruises}}{\text{Sighting rate of whales from IDCR cruises}} = \frac{0.0637}{0.0278} = 2.29$$

This conversion factor can then be applied to the indices of abundance for Areas I–VI given in Table 4 in SC/Jn81/KW10 to produce revised population estimates. These are given at the foot of the page.

For these population estimates to be viewed as absolute numbers of whales, several assumptions need to be made: firstly, that the population estimate made by Allen is correct: secondly, that sighting conditions were the same for all surveys in all areas: thirdly, that any non-random searching with respect to killer whale density has been accounted for by the stratification schemes.

There is clear evidence that the density of minke whales in the Antarctic decreases very sharply from the ice edge to the north within 5° of the ice edge (*Rep. int. Whal. Commn* 30: 257–283; SC/Jn81/MiS15; SC/Jn81/MiS16). If killer whales are distributed similarly to minke whales, killer whale density will not be homogeneous within the 5° squares next to the ice edge. If searching effort has been directed towards regions of high minke whale density, estimates of sighting rates and densities of killer whales may be biased upwards.

Prior to 1970, the primary target of the Japanese scouting boats was the sei whale. Since 1970, the primary target has been the minke whale.

	Area						
	I	II	III	IV	V	VI	Total
Index of Abundance	11,565	17,082	37,290	30,921	6,953	7,503	111,314
Population estimate	26,500	39,141	85,445	70,851	15,932	17,192	255,061

Annex I

Meeting Procedures (see Agenda Item 4.1)

Item 26.2(d) of the Commission's 32nd Meeting Report (*Rep. int. Whal. Commn* 31: 27) endorses the Finance and Administration Committee's recommendation that:

> 'The Scientific Committee consider methods of reducing its work load, including, for example, a critical examination of only one third of the whale stocks each year with an overview of all stocks to ensure detection of unexpected changes in population estimate.'

The Committee believes that the framework for handling the problem of its excessive workload already exists, given the present system of sub-committees and special meetings. In addition the relatively small number of stocks currently exploited already results in a fairly high proportion of stocks only being 'overviewed' each year.

Given the above, however, the Committee recognises the need for clarification of the priorites to be given to particular stocks in its programme of work each year. It believes that priorities should be assigned as follows:

Priority 1. Those stocks exploited currently as primary targets of a fishery:
Detailed examination, and where necessary, assessment, should be conducted at least every other year;

Priority 2. All other exploited, or currently protected stocks:
Detailed examination should be undertaken every three to four years.

Additional points are:

(i) As a general rule major new assessments should not be undertaken during annual meetings, although 'reruns' may be possible using validated models, or revised parameter values, or new data sets, particularly where these have been developed by national groups between meetings and are available in checked form on the IWC system at the start of the meeting. Major reassessments involving validation of new models and/or refinement of new data sets should be reserved for Special Meetings or Workshops, although validation itself could be undertaken at annual meetings.

(ii) Major runs of programs not already 'up and running' on the computer, or that require major manipulation of data banks, should not be considered during the annual meeting.

(iii) During the annual meeting, sub-committees should identify priority stocks, and priorities for work to be done in relation to them during the following year. Such work should include assessments, using established programs and data banks, by the IWC computer centre as well as the accession of major quantities of data into the data bank.

RECOMMENDATION

In response to the Commission's request contained in their 26.2(d) of the 32nd Meeting Report the Committee recommends endorsement of the above by the Commission.

Annex J

Whale Marking—Progress Report 1981

S. G. Brown

Information on the progress of whale marking is available in the following Progress Reports: Denmark, Iceland, Japan, New Zealand, Norway, Peru, South Africa, USA, USSR. Recent marking is also referred to in SC/Jn81/KW1 SC/33/Ba6; Mi1, Mi5; PS1 and SC/Jn81/MiS10, 19, 21, 23, 28, 31 and 33. SC/Jn81/MiS19 is a report on the third IDCR Minke Whale Assessment Cruise 1980/81.

At the June 1980 meeting of the Scientific Committee, six proposed marking programmes were approved (*Rep. int. Whal. Commn* 31: 155) for the Antarctic season 1980/81 and for 1981. Marks and marking guns as required were to be supplied by the International Marking Scheme. The IDCR Minke Whale Assessment Programme and the Bryde's whale marking in the South Pacific were carried out in the 1980/81 season.

Details of the numbers of whales marked in the 1980/81 season programme and of marking in 1980 and early 1981, are given in Table 1. The total of 753 large whales marked in the Southern Hemisphere comprises 1 blue, 5 sei, 20 Bryde's, 608 minke and 119 sperm whales.

In the North Atlantic 57 whales were marked in 1980; 18 fin, 33 sei, 4 humpback, 1 minke and 1 sperm whale. In the North Pacific 194 whales were marked in 1980; 2 blue, 1 fin, 3 sei, 55 Bryde's, 29 bowhead, 88 gray and 16 sperm whales.

In addition to the above large whales, 6 killer whales were marked in the North Atlantic in 1980 and 1981 by Norway, and 2 killer whales in 1980 by Iceland. A single killer whale was marked in the North Pacific (Bering Sea) by USSR in 1980.

A fin whale was successfully tagged with a radio tag on the Icelandic whaling grounds in 1980 and tracked for approximately 1,500 km across Denmark Strait to the coast of East Greenland. The USA is conducting experiments in radio tagging bowhead whales, and is developing a tag for use with a Nimbus satellite in tracking dolphin movements. A technique for 'freeze-branding' bottlenose dolphins has also been developed.

One Southern right whale was marked with an experimental streamer mark of New Zealand design off the Auckland Islands in November 1980.

Recoveries of marks in 1980 are reported from 3 fin, 1 sei and 4 minke whales in the North Atlantic and 2 Bryde's whales in the North Pacific. In the Southern Hemisphere marks were returned from 13 minke whales in the 1980/81 whaling season, and from 1 Bryde's whale off Peru in 1981.

Proposed Marking Programmes

Marking programmes proposed for 1981/82 and 1982, including continuing programmes from earlier seasons are listed in Table 2, with estimated requirements of marks, guns, and estimated costs at current and 1982 prices of marks. Rough estimates of shipping costs are included.

Table 1

Large whales marked with Discovery-type marks during 1980 and 1981, and in the Antarctic Season 1980/81

	Blue	Fin	Sei	Bryde's	Humpback	Minke	Bowhead	Gray	Sperm	Total
Southern Hemisphere										
IDCR Minke Whale Cruise 1980/81	—	—	—	—	—	474	—	—	12	486
Japan (Scouting Boat 1980/81)	—	—	5	20	—	134	—	—	91	250
USSR Scheme 1980/81	1	—	—	—	—	—	—	—	8	9
Peru (March 1981)	—	—	—	—	—	—	—	—	8	8
Total	1	—	5	20	—	608	—	—	119	753
Northern Hemisphere—North Atlantic										
Denmark – Norway Joint Cruise 1980	—	8	—	—	4	1	—	—	—	13
Iceland 1980	—	10	33	—	—	—	—	—	1	44
Total	—	18	33	—	4	1	—	—	1	57
Northern Hemisphere—North Pacific										
Japan 1980	2	1	3	55	—	—	—	—	16	77
USSR 1980	—	—	—	—	—	—	29	88	—	117
Total	2	1	3	55	—	—	29	88	16	194