# Annex H

# Report of the Sub-Committee on Small Cetaceans

## 1. PARTICIPANTS, AGENDA AND INTRODUCTORY REMARKS

Members (M) of the Scientific Committee of the IWC, invited experts (E), observers (O) and interpreters (I) attending the meeting were:

Aguilar (M), Alverson (M), van Beek (M), Borodin (M), Braham (M), Brodie (M, O) Brown (M), Brownell (M), Caldwell (O), Cawthorn (M), Choi (M), Christensen (M), Collet (E), Dronenburg (M), Fortom-Gouin (M), Fraker (E), Gama (M), Glover (O), Gong (M), Gordon-Clark (O), Hammond (E), Holt (M), Ikeda (M), Jarrell (M), Kapel (M), Kasuya (E), Kato (M), Klinowska (M), Leatherwood (E), Misaki (I), Miyahara (M), Miyashita (M), Miyazaki (E), Nakamura (I), Ohsumi (M), Øritsland (M), Perrin (M), Pinta Gama (M), Riyazantsev (I), Rudge (M), Sanpera (M), Sigurjónsson (M), Skeat (M), Smith (E), Wada (M), Zemsky (M).

Many participants did not attend all sessions of the meeting.

Perrin chaired the meeting and edited the report. Alverson, Braham, Collet, Hammond, Kasuya, Klinowska, Leatherwood, Øritsland and Smith acted as rapporteurs.

The draft agenda was adopted with minor changes (Appendix 1). In the report, some rubrics have been modified from the agenda to accord with the course of the discussions.

## 2. DOCUMENTATION

Small-cetacean documents (SC/34/SM series) submitted to the Scientific Committee are listed in Apendix 2. Also containing information on small cetaceans and available to the sub-committee were SC/34/ProgReps Australia, Brazil, Canada, Denmark (Greenland), France, Iceland, Japan, Korea, New Zealand, Norway, South Africa, Spain, UK, USA and USSR; SC/34/Reps 1 (with Annex) and 3; SC/34/O 1, 3, 5, 13, 14, 21, 24, 25; SC/34/Sp9 and issues LXXXVII and LXXXVIII (bound together) of the International Whaling Statistics.

## 3. REVIEW OF STOCK ASSESSMENTS FOR SOME EXPLOITED POPULATIONS OF PELAGIC DOLPHINS (*DELPHINUS* AND *STENELLA* SPP.)

The sub-committee in 1981 agreed to focus this year on review of stock assessments for major exploited populations of pelagic dolphins. During the meeting, it was agreed to consider *Phocoena phocoena* and *Tursiops truncatus* as well as *Delphinus delphis* in the Black Sea fisheries.

### 3.1 Small-cetacean fishery in the Black Sea

*3.1.1 Background*

A fishery for three species, the common dolphin *Delphinus delphis*, the harbour porpoise *Phocoena phocoena*, and the bottlenose dolphin *Tursiops truncatus*, has existed in the Black Sea and the Azov Sea since 1870, as described in FAO (1978), Zemsky and Yablokov (1974) and Smith (1982). Four countries have been involved (Turkey, Rumania, Bulgaria and the USSR), with all but Turkey halting the fishery in 1966 following a collapse of the populations. The collapse was reportedly indicated by changes in the age, sex, species composition and size of the catch in 1964–65 (Zemsky and Yablokov, 1974).

The fishery by Turkey is not well documented. Danilevskiy and Tyutyunnikov (1968) in a discussion of the failure of the catch rates to increase to 1930s levels following the Second World War, note the existence of 'unceasing hunting of the dolphin with weapons in Turkish waters during the war and post-war years which destroyed the breeding stock and the young during the breeding season'. The same authors report 1951–56 catches of 85,000 to 100,000 centners (presumed hundreds of kilograms) by Turkey. The catches have been reportedly made from small boats using either high powered rifles or high calibre shotguns with large shot. Zemsky and Yablokov (1974) note that the loss rate of shot animals is very high. Zemsky reported that it may exceed 40 to 50%. A large number of dead harbour porpoise have been reported floating in parts of the Black Sea (see below).

*3.1.2 Catch data*

The recent data on the catches have been reported in several documents (Table 1). These data differ substantially among sources; some variability may be due to part-year or regional values being used.

The USSR catch prior to 1964 was 80 to 90% *D. delphis; P. phocoena* came to dominate in 1964 to 1966 (Danilevskiy and Tyutyunnikov, 1968). It is unclear if these percentages refer to numbers or weight of animals. The species composition of the Turkish catch is reported in Thornton (1982) as 80% harbour porpoise, 15–16% common dolphins, and 2–3% bottlenose dolphins. Common dolphins were still the preferred catch.

Zemsky and Yablokov (1974) estimated numbers of dolphins killed in the Turkish fishery by assuming an average weight of dolphins in the catch of 54 kg, but do not give the source of this value. Berkes (1977) uses a value of 50 kg. The mean weights of adult *D. delphis, P. phocoena* and *T. truncatus* are reported as 43 to 60 kg, 30 kg and 175 kg, respectively (Tomilin, 1957).

Thornton's percentages do not total 100; using the midpoint of the intervals given, and rescaling to 100%

yields species composition of 82, 16 and 2%. The percentages are assumed to refer to individuals and not to weight. Thus the average weight of the cetaceans would be

$$0.82 \times 30 + 0.16 \times 52 + 0.02 \times 175 = 36 \text{ kg}.$$

*3.1.3 Population size data*

Aerial surveys of dolphins have been conducted by the USSR since 1967. The numbers of schools of dolphins sighted by species and school size have been reported variously and have been used to estimate total dolphin population sizes by Zemsky and Yablokov (1974). They note that there are many uncertainties, and that the *D. delphis* estimates are more reliable than those for the other species because assumptions about spatial distribution were more likely met.

These estimates are also given by Smith (in press), where several of the assumptions made by Zemsky and Yablokov (1974) are examined. The estimates of the population size of *D. delphis* varied between 28,000 and 285,000 from 1967 to 1973, with no obvious trend. Similarly, the estimates of the population size of *P. phocoena* varied between 12,000 and 33,000 over the same period. Several of the assumptions in these estimates are not tested, and the effect of sea state on strip transect methods has not been accounted for.

More recent aerial sighting data were available to the sub-committee showing the numbers of schools sighted in the USSR from 1978 to 1980, by species and school size (Table 2). The number of schools sighted varied widely among years; the percentage of schools of each species varied less. Mean school sizes were relatively constant, with overall means of 10.4, 9.5, and 13.2 for *D. delphis*, *T. truncatus* and *P. phocoena*, respectively.

Table 1

Reported catches of dolphins by Turkey, in units as originally reported, for all years where data are available since 1965. Values are given by source because considerable uncertainty exists about these data and they have been quoted variously in different units, using various conversion factors

| Year | Danilevskiy and Tyutyunnikov (1968)[1] | Zemsky and Yablokov (1974)[2] | Berkes (1977)[3] | FAO (1979)[4] | Thornton (1982)[5] |
|---|---|---|---|---|---|
| 1964 | — | — | — | — | 429 |
| 1965 | — | — | 1,300 | — | — |
| 1966 | 2,000 | — | 5,900 | — | — |
| 1967 | 540 | 2,100 | 200 | — | 5,900 |
| 1968 | — | 20,200 | 2,200 | — | 2,200 |
| 1969 | — | — | 8,300 | — | 8,346 |
| 1970 | — | — | 3,400 | 4,900 | 7,055 |
| 1971 | — | — | 4,400 | 4,400 | — |
| 1972 | — | 19,000 | 4,400 | 3,200 | 4,400 |
| 1973 | — | 70,000 | 4,400 | 2,600 | 2,200 |
| 1974 | — | — | — | 2,250 | — |
| 1975 | — | — | — | 2,080 | 1,404 |
| 1976 | — | — | — | 1,907 | 1,590.3 |
| 1977 | — | — | — | 1,907 | 2,608.3 |
| 1978 | — | — | — | 1,907 | 1,907.8 |
| 1979 | — | — | — | 1,907 | 1,827.9 |
| 1980 | — | — | — | — | 2,721 |
| 1981 | — | — | — | — | 325 |

[1] In centners; 1966 and 1967 values are approximate amount sold to the fat/meal factories in Trabzon; 1967 value is for first half of year. Data reported to be from monthly surveys of fisheries in Turkish magazine *Balik ve Balikcilik*.

[2] In centners; 1967 value reported to be from *Balik ve Balikcilik*, 1966, but may have been taken incorrectly from Danilevskiy and Tuytyunnikov (1968); 1968 and 1972 values from *Balik ve Balikcilik* in 1969 and 1973, respectively.

[3] In tonnes; 1972 and 1973 values estimated, basis unknown.

[4] In tonnes; 1977 to 1979 values estimated, basis unknown.

[5] In tonnes; source given as: 1964, 1967–71, 1972–74, 1975 values from Berkes (1977), and Turkish State Institute of Statistics, Su Urunleri Anket Sunuclari, 1971 and 1974; 1975–81 values from Turkish State Institute of Statistics, Su Urunleri Anket Sunuclari, Fisheries Statistics, 1972–75, 1976–79, 1980, and personal communication with H. H. Hatipuglu, Manager, + ve Balik Kurumu, Trabzon, the processing station for fish and dolphins.

Table 2

Number of dolphin schools sighted during approximately 8,000 km tracks of aerial sighting surveys by the USSR in the Black Sea area during 1978, 1979 and 1980, for each species classified by estimated school size. The surveys reportedly followed the same tracks in each year.

| | Estimated school size (midpoint of intervals) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | 5 | 15 | 25 | 50 | 75 | 100 | 150 | 200 | 300 | 500 | Total |
| **1978** | | | | | | | | | | | |
| *D. delphis* | 82 | 21 | 5 | | | | | | | | 108 |
| *T. truncatus* | 22 | 17 | 1 | 2 | | 1 | | | | | 43 |
| *P. phocoena* | 5 | 3 | 1 | | | | | | | | 9 |
| **1979** | | | | | | | | | | | |
| *D. delphis* | 380 | 83 | 22 | 7 | | 3 | | 1 | | 1 | 497 |
| *T. truncatus* | 103 | 31 | 1 | 1 | | 1 | | | | | 137 |
| *P. phocoena* | 19 | 3 | | | | | | | | | 22 |
| **1980** | | | | | | | | | | | |
| *D. delphis* | 112 | 41 | 12 | 2 | 1 | 1 | | 2 | | | 177 |
| *T. truncatus* | 57 | 22 | 1 | 3 | 1 | | | | | | 84 |
| *P. phocoena* | 8 | 8 | | | | | | | | | 16 |

Maps of the location of sighted schools showed *D. delphis* and *T. truncatus* distributed widely in all areas surveyed, but variably among years, and *P. phocoena* distributed exclusively in the eastern half of the sea, primarily but not exclusively nearer shore.

Smith reported that additional dolphin sighting data were collected during a joint USSR–US research cruise in the southeastern Black Sea in June 1981. Although limited to four days and approximately 900 km of trackline, the survey results provide some information on sighting rates and school sizes by species, and on ranges in the area 39 to 41°E longtitude and 41 to 43°N latitude. Only three *T. truncatus* schools were seen, all near the coast. Twenty four schools of *D. delphis* and 35 schools of *P. phocoena* were seen in both coastal and open waters, with average school sizes of 36.3 and 4.4, respectively. Thus the rates of encounter of individual dolphins were 0.99 and 0.17 per km searched, for *D. delphis* and *P. phocoena*, respectively. Also during this survey, 17 dead *P. phocoena* were sighted, floating. They were encountered at decreasing rates per km of 0.036, 0.017, 0.011, and 0.010 on successive days as the ship surveyed increasingly more northerly east-west tracks, moving farther away from Turkey.

*3.1.4 Reproductive rate data*

Few data are available on reproductive rates for dolphins in the Black Sea, and none are available from recent years. The proportion of all *D. delphis* females in the catches in 1931–32 which were pregnant and which were lactating are shown in Table 3, along with comparable figures from eastern tropical Pacific populations. The percentage pregnant for the more exploited Black Sea populations

Table 3

Reproductive indices for *Delphinus delphis* in the Black Sea and in the eastern tropical Pacific

| Population | Year(s) | N | % of all females pregnant[1] | % of all females lactating[2] |
|---|---|---|---|---|
| **Black Sea** | | | | |
| (a) Danilevskiy and Tyutyunnikov (1968) | 1931 | 158 | 22.0± 6.6* (15.4–28.6) | 13.0± 5.4 ( 7.6–18.4) |
| (b) Klumov (1954) | 1931 | 932 | 11.9± 2.1 ( 9.8–14.0) | 21.1± 2.7 (18.4–23.8) |
| | 1934 | 3,320 | 11.5± 1.1 (10.4–12.6) | 29.9± 1.6 (28.3–31.5) |
| | 1939 | 680 | 12.2± 2.5** ( 9.7–14.7) | 15.9± 2.8 (13.1–18.7) |
| **Eastern tropical Pacific** (Henderson *et al.*, 1980; Perrin and Oliver 1982; SC/34/SM5) | | | | |
| Northern | 1973–81 | 124 | 28.3± 8.1 (20.2–36.4) | 39.1± 8.8 (30.3–47.9) |
| Central | 1973–81 | 722 | 17.2± 2.6 (14.4–20.0) | 30.9± 3.4 (27.5–34.3) |

[1] % pregnant: 3 of 4 lowest estimates are for Black Sea; highest estimate is for ETP little-exploited population.
[2] % lactating: great variation, but 2 of 3 high estimates are for ETP.
* Approx. 95% confidence interval = ± 2 S.E. estimated as $2\sqrt{p(1-p)/n}$.
** All with corpora lutea assumed pregnant.

(see SC/34/SM6 for status of the Pacific populations) might be expected to be higher, but no consistent differences are apparent. Percent lactating was lower in the Black Sea, as might be expected. No recent estimates of natural mortality rates and gross or net reproductive rates are available.

*3.1.5 Population status*

The catch data in Table 1 are unsatisfactory because numbers and species of dolphins killed are not indicated. Thus assessments by species are not feasible. Assuming average body weights of 36 kg, the reported catches, which range from 2,000 to 8,000 tonnes per year since 1967, suggest varying kill levels of 56,000 to 222,000 animals of the three combined species, per year. The total number of cetaceans harvested from 1967 to 1981, making the same assumptions, was approximately 1,300,000 animals.

The population size estimates and sighting data are unsatisfactory because many untested assumptions must be made to obtain the total abundance estimates. Additionally, the results of the aerial sighting surveys are highly variable among years, suggesting that some factors affecting sighting rates have not been accounted for. The recent shipboard sighting survey data are too limited to allow population size estimates. If, however, one takes the average of the population size estimates given by Zemsky and Yablokov (1974) as reasonable, then the total number of animals of even all three species (264,000) would appear to be too small to have supported the above-discussed possible levels of harvest. Even the maximum population size estimates for the three species combined given by Zemsky and Yablokov (1974) was only 432,000, less than one third of the possible number of dolphins killed from 1967 to 1981.

Zemsky offered the opinion that although his population size estimates are quite uncertain, the Black Sea is neither large enough nor productive enough to have ever supported more than 600–700,000 animals, even in the absence of a fishery. This opinion, coupled with the fact that the Soviet fishery was stopped due to decline of catches, suggests that either the Turkish fishery is having a very serious impact on the population, or there are some substantial errors in some of the data.

The dead *P. phocoena*, at apparently decreasing densities based on the declining sighting rates with distance from the Turkish coast, suggest that the fishery may be rather wasteful, as is generally known to occur in rifle fisheries.

The Turkish catches for 1981 were reported to be much lower than in recent years, due to restrictions on the export market to the European Economic Community. The Turkish markets for dolphin products are not known, and the long-term impacts of the EEC restrictions are not predictable.

Turkey has not yet ratified the Council of Europe (Berne) Convention; ratification may be done with exeption. If Turkey comes under the complete provisions of this Convention, then these animals will become protected species in Turkey from June 1982.

The catches of anchovy are reported to be increasing rapidly in the eastern Black Sea; because the cetaceans in this area are thought to feed on anchovy, the sub-committee noted with concern the reported recent increases in the Black Sea anchovy fisheries by both Turkey and the USSR. There is insufficient information available to assess the likely impacts of the anchovy catches on the cetacean populations.

*3.1.6 Recommendations*

The sub-committee prepared a set of recommendations for improvement of harvest statistics, analysis of existing aerial survey data, invitation to the Scientific Committee meeting of individuals in Turkey knowledgeable of the fishery, study of dolphin/anchovy fishery relationships, and sampling of the catch for data on sex, length and age composition and reproductive condition (see Agenda Item 10 of this report).

### 3.2 *Stenella* spp. in the eastern tropical Pacific

*3.2.1 Background*

In the eastern tropical Pacific, dolphins of several species and stocks are killed incidentally in the purse-seine fishery for tunas. Fishermen take advantage of the occurrence of mixed-species aggregations of tuna, dolphins and birds in this region, using it to locate and capture tuna. The purse-seine net is set around schools of dolphins and the tuna swimming beneath them, and although effort is made to ensure the release of the dolphins unharmed, some are killed during the fishing operation. The fishing vessels of thirteen nations (1981 figure) use this method of catching tuna in the eastern tropical Pacific (SC/34/SM2) in a large area comprised of international waters and the coastal waters of Central and South American nations (SC/34/SM1).

The major stocks of dolphins that have been involved incidentally in this fishery are the northern offshore stock of the spotted dolphin (*Stenella attenuata*) and the eastern and northern whitebelly stocks of the spinner dolphin (*S. longirostris*). Approximate ranges of these stocks are given in SC/34/SM1. Major exploitation is thought to have begun in 1959 following technological changes in purse-seine fishing gear. Available data suggest that incidental

Table 4

Estimated number of dolphins (thousands) killed incidental to the tuna purse seine fishery in the eastern tropical Pacific, from 1959 to 1981. Estimates are given by population of dolphins of the genera *Stenella* and *Delphinus*, and of other unidentified species combined for the fleets of all nations. Data for all species for 1979–81 from SC/34/SM2, Table 4. Estimates from 1959 to 1972 are based on the mean numbers of dolphins killed per set from 400 sets observed on 21 fishing trips from 1964 to 1972, pooled for all years. Estimates from 1973 to 1978 based on the mean number of dolphins killed per set for each year, assuming US and non-US mean kill rates were different. Estimates from 1979 to 1981 based on the mean number of dolphins killed per set, stratified by US and non-US vessels. Estimates of the non-US kill levels have large sampling errors and are different from estimates based on the ratio of numbers of dolphins killed and numbers of tons of tuna caught

| Year | *S. attenuata*[1] offshore spotted | *Stenella longirostris*[1] Eastern spinner | *Stenella longirostris*[1] Whitebelly spinner | *S. coeruleoalba*[2] striped | *D. delphis*[2] common | Other[2] and unidentified | Total |
|---|---|---|---|---|---|---|---|
| 1959 | 68 | 26 | 0 | 0 | 4 | 0 | 98 |
| 1960 | 341 | 127 | 0 | 0 | 20 | 0 | 488 |
| 1961 | 384 | 143 | 0 | 0 | 22 | 0 | 549 |
| 1962 | 159 | 59 | 0 | 0 | 9 | 0 | 227 |
| 1963 | 175 | 66 | 0 | 0 | 10 | 0 | 251 |
| 1964 | 292 | 110 | 0 | 0 | 16 | 0 | 418 |
| 1965 | 322 | 120 | 0 | 0 | 18 | 0 | 460 |
| 1966 | 292 | 110 | 0 | 0 | 33 | 0 | 435 |
| 1967 | 197 | 73 | 0 | 0 | 11 | 0 | 281 |
| 1968 | 170 | 64 | 0 | 0 | 9 | 0 | 243 |
| 1969 | 348 | 116 | 14 | 0 | 19 | 0 | 497 |
| 1970 | 339 | 113 | 13 | 0 | 18 | 0 | 483 |
| 1971 | 168 | 56 | 7 | 0 | 9 | 0 | 240 |
| 1972 | 275 | 92 | 11 | 0 | 15 | 0 | 393 |
| 1973 | 125 | 31 | 31 | 0 | 28 | 0 | 164 |
| 1974 | 91 | 25 | 45 | 0 | 5 | 0 | 166 |
| 1975 | 100 | 43 | 32 | 1 | 3 | 0 | 149 |
| 1976 | 45 | 9 | 19 | 3 | 7 | 1 | 80 |
| 1977 | 21 | 5 | 5 | 0 | 18 | 0 | 49 |
| 1978 | 18 | 2 | 4 | 1 | 3 | 0 | 28 |
| 1979 | 12 | 1 | 2 | 1 | 7 | 1 | 23 |
| 1980 | 22 | 2 | 11 | 1 | 7 | 0 | 43 |
| 1981 | 33 | 2 | 7 | 0 | 1 | 3 | 47 |

[1] Data for *Stenella attenuata* and *S. longirostris* for 1959–78 from SC/34/SM6, Table 4—numbers divided by 1.048 to remove injured animals.
[2] Data for other species for 1959–78 from Smith (1979) Table 15—numbers divided by 1.017 to remove injured animals.

mortality increased rapidly from the early 1960s to levels estimated at several hundred thousand animals per year during the mid-1960s and early 1970s (Table 4). Mortality declined rapidly through the 1970s, and present levels are estimated to be of the order of tens of thousands per year. Although the offshore spotted and eastern spinner have been exploited since 1959, the whitebelly spinner was not exploited until approximately 1969, following an offshore expansion of the tuna fishery (Table 4).

The non-US registered vessels are thought to have been responsible for a small proportion, increasing over time, of the dolphins killed from 1959 to 1972. From 1973 to 1978 the proportion of the estimated dolphins killed which are thought to be due to non-US vessels varied from 0.15 to 0.51, and again increasing generally over time. Estimates of the proportion of the kill due to non-US vessels from 1979 to 1981 are given in Table 5, varying from 0.20 to 0.62 over years and for two different methods of estimating the total kill. The sample variances of the total kill estimates for the non-US fleet are large, but it is clear that the proportion of the kill due to the non-US fleet is increasing.

Research on levels of mortality, abundance and biological parameters of these dolphins has been pioneered by the United States. Some preliminary work was done in the 1960s, but in the early 1970s the US began to place observers on purse-seiners of the US fleet to collect data and life-history samples. A similar programme was initiated by the Inter-American Tropical Tuna Commission (IATTC) in 1979 to sample fishing vessels of the international fleet. Both these programmes are continuing. In addition, since the early 1970s the US has had an extensive research programme utilising research vessels and aircraft to collect data for stock assessment.

*3.2.2 Most recent stock assessments*

In 1976, the US convened a workshop in La Jolla, California to assess the status of the stocks of these exploited dolphin populations. The major result of this assessment was that the eastern spinner was declared a protected stock by the US, so that vessels of the US fleet were forbidden to set their nets around schools containing eastern spinners.

Table 5

Estimated number of dolphins (thousands) killed incidental to the tuna purse seine fishery in the eastern tropical Pacific, from 1979 to 1981, for vessels registered in the United States (US) and not registered in the US (non-US). Estimates are given for all species (with standard deviations in parentheses), based on the mean number of dolphins killed per set (KPS), and, alternatively, on the ratio of numbers of dolphins killed per ton and the tons of tuna caught per set (KPT)

| | KPS | | KPT | |
|---|---|---|---|---|
| Year | US | Non-US | US | Non-US |
| 1979 | 16.4 | 6.5 | 16.4 | 4.0 |
| | (1.6) | (2.2) | (1.6) | (2.1) |
| 1980 | 17.0 | 26.3 | 18.6 | 31.0 |
| | (1.7) | (6.7) | (1.6) | (6.8) |
| 1981 | 17.9 | 28.7 | 18.5 | 16.5 |
| | (1.5) | (20.5) | (1.9) | (9.8) |

Note: Estimates of the non-US kills of dolphins have large sample variances due to very limited or lacking data from several countries, including Bermuda, British Grand Cayman Islands, Ecuador, Republic of Korea, Mexico, Netherlands Antilles, Portugal, El Salvador, Senegal, Spain and Venezuela. The proportion of the kill which is due to some of these countries is thought to be quite large, and lack of data will make obtaining precise estimates impossible.

In 1979, a similar workshop was convened which estimated current and initial levels of abundance of the exploited stocks and the most likely level of maximum net productivity for those populations. A summary of this assessment is given in SC/34/SM6, which describes a simple model to back-calculate initial abundance from estimates of current abundance using primarily research vessel and aircraft data, from estimates of annual mortality (using data collected from fishing vessels) and from estimates of net reproduction. The eastern spinner population was estimated to be at approximately 20% of its initial size, the northern offshore spotted to be at approximately 40–50% and the northern whitebelly spinner to be at approximately 70–80% of initial size. The sub-committee noted that Table 4 in SC/34/SM6 is not in the source document referenced.

Following this workshop, there were legally-required hearings in the US centring on the issuance of a permit to the tuna fleet allowing US vessels to set their nets around schools of dolphins. Some additional data and the results of some new analyses were presented during these hearings, which culminated in an Administrative Law Judge's decision, which in turn led to some administrative adjustment to the conclusions of the workshop. The eastern spinner remained a protected stock whilst the offshore spotted and the whitebelly spinner remained unprotected, with mortality quotas for the following five years.

Document SC/34/SM1 describes an analysis of sightings data collected by observers aboard tuna purse-seiners. Estimates of abundance have been presented for 1977–81 in order to investigate possible trends. Potential biases in the estimates and the size of their standard deviations dictate that little information can be obtained from the results. However, there were definite decreasing trends in estimates of mean school size for offshore spotted and the eastern and whitebelly spinner dolphins.

Discussion of the current status of the stocks of these dolphins centred on the problems in estimation of current abundance levels and how the proportion of current to initial population size might change with different levels of current abundance. Members of the sub-committee expressed concern over several aspects of this estimation procedure, mostly involving suitable ways of stratifying the data; for example, by area and by searching effort under different sighting conditions. Correction factors were mentioned for these and other factors of the analyses such as estimated mean school size, which is different when calculated using data collected in fishing vessels, research vessels and aircraft.

The sub-committee decided to calculate proportions of current to initial abundance for the estimated 95% confidence limits of the current population estimates given in SC/34/SM6 in order to investigate the range of proportions likely when using interval estimates of current abundance. This was done by assuming net reproduction to have been zero, thus allowing initial population size to be calculated by simple addition of the total estimated number of animals killed during the period of exploitation to the current population size. It was recognised that the inclusion of net reproduction would alter the results in a manner which could be assessed from SC/34/SM6. Table 6 shows these proportions together with those from SC/34/SM6 for the point estimates of current population size.

The sub-committee recognised that there was little that could be said concerning the status of these stocks based on the variation in the estimates of proportions of current to initial population size (Table 5). Members noted that the US is planning a major assessment in 1984 and voiced their support for this action. By then, a considerable amount of new information should be available, and some of the uncertainties and variation in the estimation procedures should be reduced.

*3.2.3 Other relevant information*

The sub-committee noted that several documents (SC/34/SM2,5,6) contained information relating to estimates of mortality and one (SC/34/SM3) contained information on efforts being made to reduce mortality by means of improvements and new technology in fishing methods.

Members were concerned, as in the sub-committee meetings of the last two years, that estimates of mortality for the non-US fishing fleet (comprising vessels from some dozen nations) were far more imprecise than estimates for the US fleet (SC/34/SM2). Furthermore the very small sample of non-US vessels and its lack of representation of the non-US fleet dictated that it could not be determined whether or not US and non-US rates were different. The sub-committee noted that several member nations of the IWC (Mexico, the Netherlands, Spain and the UK) had vessels that fished for tuna associated with dolphins in 1981 but did not participate in the observer programme of the IATTC which collects the mortality data for the non-US fleet. However, it was pointed out that the UK is participating in 1982. At last year's meeting, the sub-committee was informed that Mexico was initiating a programme of data collection and that this would be reported on this year. Unfortunately, no report has been received by the sub-committee. In view of the fact that the non-US tuna fleet in the eastern tropical Pacific is increasing in size (especially the Mexican fleet; Anon, 1982) relative to the dominant US fleet, the sub-committee

Table 6

Proportions of current to initial population size of *Stenella* spp. assuming zero net reproduction based on 95% confidence limits of the current population sizes estimated in SC/34/SM6, using research data only (R) and fishing vessel plus research data (F + R)

| | Estimated 95% confidence limits of the estimates of current population, in thousands | | Estimates of proportions of current to initial population size | |
|---|---|---|---|---|
| | F + R | R | F + R | R |
| Offshore spotted | 1,250–4,300 | 740–2,630 | 0.23 (0.40) 0.51 | 0.15 (0.29) 0.39 |
| Eastern spinner | 164–422 | 151–435 | 0.10 (0.17) 0.23 | 0.10 (0.17) 0.23 |
| Whitebelly spinner | 110–650 | 81–350 | 0.37 (0.66) 0.77 | 0.30 (0.53) 0.65 |

Note: figs in parentheses represent the mean values.

felt that members of the IWC whose vessels fish for tuna associated with dolphins should be strongly encouraged to participate in the IATTC programme of data collection.

*3.2.4 Conclusions and recommendations*

The sub-committee concluded that further analyses are necessary before any reliable statements can be made about the status of the offshore spotted and eastern and whitebelly spinner stocks in the eastern tropical Pacific. Several recommendations are suggested concerning participation in the IATTC programme, mortality reduction, re-assessment of the stocks, and reporting of statistics (see Agenda Item 10.2).

### 3.3 *Stenella coeruleoalba* in the western North Pacific

*3.3.1 Background*

A large catch by Japan in 1980 (approximately 16,000, *Rep. int. Whal. Commn* 32: 179–83) considered in relation to estimated MSY of 5–6,000 led the sub-committee to place this item on its agenda for 1982. The sub-committee notes that in 1981 the fishermen voluntarily held the catch to 4,710 under advice offered by the Japanese Fisheries Agency (SC/34/SM10).

The sub-committee had available to it two relevant documents: SC/34/SM10 on the history, catches and the nature of the fishery, and SC/34/SM12 on historical changes in reproductive parameters.

The fishery is known to have existed since at least 1888 (the Meiji period), but dolphins of unidentified species were taken in drive fisheries at least as long ago as in the Genroku Ages (1688–1703). At present, about 97% of the catch is taken at Kawana and Futo on the Izu Peninsula and Taiji on the Kii Peninsula in southeastern Honshu. Annual total catches have fluctuated greatly from near zero levels in some years to more than 20,000 in others.

*3.3.2 Status of the stock*

The most recent stock assessment was carried out in 1975 by Kasuya and Miyazaki (1982), based almost entirely on history of catch and analysis of life-history specimens and data collected in the fishery. They estimated MSY level on the basis of a deduced relationship between stock size and recruitment, incorporating consideration of age-specific vital rates and inferred density-dependent changes in rates. They estimated initial population size at 320,000–340,000 and MSY level at 161,000–170,000. MSY was estimated at 4–6,000, near the RY in 1974. Kasuya reported at this meeting, however, that more recent life-history and population studies led him to believe that these estimates are unreliable, for reasons discussed below.

The record of catches is not complete, but complete statistics from 1962 onwards (Fig. 2 in SC/34/SM10) indicate a statistically significant downward trend in total catches on the Izu Peninsula over the period 1962 to present. The full statistics for earlier years are not available, but some annual catches are known to have exceeded 20,000 dolphins, a level not reached during the 1962 to 1981 period. Factors contributing to the very wide fluctuation in catches are known to include market demand, starting and stopping of fisheries at various villages, competition or cooperation between villages, changes in numbers of teams per village, changes in speed of scouting vessels, long- and short-term oceanographic variation, fluctuations in mean school size and in timing of seasons and, most recently, advice by the Japanese Government that catches be reduced. Large volumes of data are reported in SC/34/SM10 and in numerous other reports, published mainly in *Sci. Rep. Whales Res. Inst., Tokyo*, but the above listed factors are confounded, making adequate analysis of the presented data difficult if not impossible. Two serious problems with the effort data are that while periods of scouting last only hours, effort is reported in days, and CPUE on one day influences effort on the following and successive days. Clearly, the effects of the many factors must be isolated before CPUE can be evaluated with any confidence.

SC/34/SM12 reported findings that indicate that some reproductive parameters changed over the period of the 1950s to the 1970s: average age at attainment of sexual maturity in females (from 9.7 years in the 1956 cohort to 7.2 years in the 1970 cohort), minimum age at attainment of sexual maturity (in parallel with average age), and average length of reproductive cycle (from 4.0 years in 1955 to 2.8 years in 1977, mainly through shortening of the lactation period). Kasuya cautioned, however, that these last findings may not be completely reliable for two reasons: (1) age and sex segregation is pronounced in the population, yielding several types of schools, but only 37 'schools' were sampled over the period of the study, 1967–80, and half of them were small schools; and (2) schools examined before 1967 were sampled by different workers than were the later, majority of schools. The results are important, however, in that they are consistent with a hypothesis of increased reproductive rate as a density-dependent response to exploitation.

*3.3.3 Conclusions and recommendations*

The sub-committee was able to agree that:

1. Total catches have declined over a long period on the Izu Peninsula.
2. There is no clear trend in CPUE as reported.
3. Some reproductive parameters have probably changed in a way consistent with density-dependent response.
4. It is very difficult to assess a migratory population at one point along its migration route, as is the case here.
5. There are considerable uncertainties and problems involved in analysis of the CPUE and more detailed data and renanalyses are needed.

The sub-committee drafted a recommendation to address the problems of the CPUE analyses (see Agenda Item 10.3).

## 4. REVIEW OF BOTTLENOSE WHALE POPULATIONS AND FISHERIES

### 4.1 Northern bottlenose whale, *Hyperoodon ampullatus*

Sightings were reported in SC/34/O 5 and O 6. There were no takes of this whale in 1981. The status of this stock remains unknown, and its continued protection is recommended (see Item 10.4).

### 4.2 Southern bottlenose whale, *Hyperoodon planifrons*

There was no new information available on this species.

### 4.3 Baird's beaked whale, *Berardius bairdii*

(also referred to as 'northern giant bottlenose whale').

The sub-committee reviewed and discussed the two submitted documents on Baird's beaked whale in the western North Pacific (SC/34/SM8 and 11).

*4.3.1 Distribution, stock identity and migrations*

Sightings by Japanese scouting boats from 1965 to 1980 show that the Baird's beaked whale is widely distributed

across mid-latitudinal waters of the North Pacific from about 30°N northwards into the southern Bering Sea (SC/34/SM11).

Recorded southern sightings down to about 25°N in the Western and Central Pacific and south of 40°N in the Eastern Pacific (SC/34/SM11) are subject to some doubt because surveys by other investigators, as reported by Leatherwood, indicate that very few Baird's beaked whales occur at water temperatures above 18°C in the Eastern Pacific, north of those lower latitudes where they were reported by the Japanese scouting boats. However, Kasuya reported that Baird's beaked whales have been hunted from Chiba during the presence of the warm Kuroshio current. Misidentification of *Berardius* cannot be excluded as an explanation of the southern distribution of scouting boat sightings, particularly in the warm waters near Hawaii. Leatherwood reported the occurrence of an unidentified or undescribed species of large beaked whale in the central tropical Pacific (Leatherwood *et al.*, 1982). Kasuya noted that other beaked whales, e.g. *Ziphius*, may be included in the scouting boat data. This potential problem merits further investigation.

The absence of sightings in areas off the east coast of Japan (Fig. 4, in SC/34/SM11) suggests a discontinuity in distribution and hence a discrete stock in Japanese waters. However, low sighting effort in these areas may account for the apparent separation. Marking studies have not been conducted, and no other information is available that would indicate stock structure. A pan-Pacific stock of Baird's beaked whales cannot therefore be ruled out with the present state of knowledge. Analysis of sightings relative to sighting effort by area (smaller strata, if possible) might throw some light on this problem.

Although catches are taken in discrete local areas (Omura *et.al.*, 1955; SC/34/SM11), aerial sightings show a continuous distribution of Baird's beaked whales along the eastern coasts of Japan (Kasuya, 1971).

Seasonal changes in abundance do not give definite indications of migrations but suggest some northward movement along the eastern coast of Japan (Honshu and Hokkaido) from July–August to October–November.

*4.3.2 Catches*

Soviet catches of Baird's beaked whales at Kamchatka and the Kuril Islands from 1934 to 1964 add up to 143, while a total of 35 was taken off the coast of British Columbia between 1950 and 1966, and 14 were landed by a Californian fishery from 1959 to 1966 (Mitchell, 1975a). After the sub-committee had completed its deliberations, it was informed by Tillman that the Soviet NP forms contain data on pelagic take of *Berardius* in the North Pacific. The sub-committee did not have time to pursue this lead. No further catches have been reported for these fisheries. However, catches by land-based small-type whaling operations continue in Japanese coastal waters, where whaling for the *tsuchimbo* can be documented back to the early part of the 17th century in the Chiba prefecture (SC/34/SM11).

Catches by one Chiba company from 1815 to 1869 fluctuated widely, with an annual average of 9 whales. Catches virtually stopped after 1870, but some whales apparently were taken during the 1890s and later, particularly after the introduction of the first modern whaling vessel in 1907. Catches were small up to World War II (Omura *et al.*, 1955), and an average of 15 per year was recorded for 1941–43. The total catch through the period 1907–47 is estimated at about 600 on the basis of an assumed catch of about 15 per year (SC/34/SM11).

Small-type whaling expanded rapidly after World War II on the Japanese coasts. A licensing system was introduced in 1947, and the number of licensed small-type vessels hunting minke, Baird's beaked, short-finned pilot, killer and other medium or small-sized whales reached a maximum of 80 in 1950, and then decreased to an average of eight during the last ten years.

Japanese catches of Baird's beaked whales peaked at a total of 485 in 1952 and fell off to less than one tenth of this number in recent years. Average total catches per year through the post-war years are given for ten-year periods in Table 7, and available data on catch and effort in the coastal Japanese small-type whaling operations, with specified information on the exclusive fishery for Baird's beaked whale in the Chiba Prefecture, are given in Table 8.

Table 7

Average total annual landings of Baird's beaked whale by Japanese small-type coastal whalers, 1948–81 (SC/34/SM11)

| Years | No. of whales |
|---|---|
| 1948–57 | 217 |
| 1958–67 | 164 |
| 1968–77 | 71 |
| 1978–81 | 34 |
| Average per 10 year period 1948–81 | 137 |

Table 8

Landings of Baird's beaked whales and other species by Japanese small-type coastal whalers, 1972–81 (SC/34/SM11; additional information supplied by Ohsumi)

| | Total—coastal whaling | | | Chiba fishery | |
|---|---|---|---|---|---|
| | | No. of whales | | | |
| Year | No. of vessels | Baird's beaked | Other species | No. of operating boats | No. of Baird's beaked |
| 1972 | 9 | 86 | 452 | 3 | 86 |
| 1973 | 8[1] | 32 | 620 | 2 | 30 |
| 1974 | 8[1] | 32 | 437 | 2 | 32 |
| 1975 | 8[1] | 46 | 431 | 3 | 39 |
| 1976 | 7 | 13 | 375 | 2 | 11 |
| 1977 | 7 | 44 | 256 | 2 | 28 |
| 1978 | 7 | 36 | 411 | 2 | 33 |
| 1979 | 9 | 28 | 410 | 3 | 24 |
| 1980 | 8 | 31 | 379 | 3 | 23 |
| 1981 | 8 | 39 | 374 | — | — |

[1] Included catches by one 200-ton experimental vessel:
1973 1 Baird's, 118 minke
1974 0 Baird's, 81 minke
1975 5 Baird's, 80 minke

The fishery is now mainly directed at minke whales, which constituted 83.6% of the total landings during the past ten years. Baird's beaked whales amount to 8.5%, and other species, mainly short-finned pilot whales but also a few killer whales and others, make up the remaining 7.8% of the total catches in 1972–81.

The recent decline of coastal catches in Japan up to 1973 when they levelled off (SC/34/SM11), is believed to have been caused by a reduction in the number of licensed small-type whaling vessels from 18 in 1966 to half this

number in 1972, and a simultaneous shift of effort towards minke whales. The statistics show a nearly compensatory increase in catches of minke whales (SC/34/SM11).

Catches of beaked whales actually stopped in the previous area of highest catches at Tohoku Region on the Pacific coast of Honshu, while catches in the waters around Hokkaido were reduced to a very low level. These are now major fishing grounds for minke whales. At Chiba, however, the traditional fishery for beaked whales continued, although on a relatively low level with only 2–3 boats operating through the last decade (Table 8).

*4.3.3 Life history and vital parameters*

In a previous study, Omura *et al.* (1955) reported sexual maturity of males at body lengths of 9.7–10.2 m in males and 10.0–10.5 m in females. More recent estimates are 8.9–10.0 m in males and 9.9–10.4 m in females, and the length at 50% maturity now is estimated at 9.5 m and 9.9 m for males and females respectively (SC/34/SM11). Age at sexual maturity has been estimated at 9.0 years (Ohsumi, in press; Kasuya, 1977).

Data from a small sample of 11 females suggest an apparent pregnancy rate of about 50%, but the actual pregnancy rate is probably lower (SC/34/SM11), possibly about 25% (Ohsumi, in press). There may be bias due to selectivity in the catch.

The gestation period was found to be 17 months by Kasuya (1977) and has since been calculated to be 16.7 months (Ohsumi, in press). Body length at birth is estimated at 4.4 m, length at one year at 5.6 m and length at weaning at 8.6 m. It is therefore assumed that lactation lasts for more than one year.

Natural mortality has provisionally been deduced at 0.083 based on a comparative study (Ohsumi, 1979).

Some sexual segregation is indicated by the high proportion of males (about 80%) in catches in Japanese coastal waters (SC/34/SM11).

*4.3.4 Status*

No estimate of stock size is available for the total oceanic stock in the North Pacific, nor for the hypothetical stock of Baird's beaked whales in Japanese waters.

Total CPUE estimates for all operating licensed vessels for the past decade have been stable (Table 1, SC/34/SM11). However, the 'density distribution' of Baird's beaked whales, calculated as the number of whales sighted per hour of operation as reported by the whalers since 1977, indicate a definite increase through the last five years for both the Pacific Coast of Hokkaido and the Chiba area (SC/34/SM11). Ohsumi noted that operation time was recorded by each vessel at the time from the start of the search at sunrise until all work closed for the day, and included searching, waiting for whales to reappear after dives, chasing time and handling time. He also noted that sonar is not used in the Baird's beaked whale fishery.

It was pointed out that estimates of variance in the sighting data are needed before the short series of 'density distributions' can be used as indices of abundance. It was also noted that the rates of increase were too high to be simply due to an increase in stock abundance.

The change in sighting frequencies might also reflect a change in distributional behaviour. Ohsumi and Kasuya noted that the distribution of small cetaceans in Japanese coastal waters is related to oceanographic conditions. It is likely, therefore, that variations in sightings among years may have been caused by changes in the physical and related biological factors in the sea.

The sub-committee agreed that further studies were needed to establish any evidence for a sustained oceanographic change. It was also agreed that comparative analyses of previous CPUE data should be undertaken and that the history of the catch should be further documented.

An analysis of published catch-per-boat data was presented in SC/34/SM8. Assuming that boat efficiency increases faster than tonnage, this analysis asserts a decreasing abundance of Baird's beaked whales when boat efficiency is corrected by the cube of boat-tonnage.

Another underlying assumption is that the abundance of minke whales which are most extensively hunted in an allegedly mixed fishery, has remained constant. Ohsumi and Miyazaki, supported by evidence presented in SC/34/SM11 and SC/34/Mi16, pointed out the seasonal separation of operations in whaling for minke and Baird's beaked whales and noted that boat size did not affect efficiency in the fishery for beaked whales.

The sub-committee agreed that the analysis in SC/34/SM8 is based on faulty assumptions and should not be used in assessment of the stock. Fortom-Gouin noted that daily catch and effort records for the fishery are not available from IWS or in the Japanese Progress Reports.

*4.3.5 Conclusions*

The members of the sub-committee agreed on the following:

1. The limits of distribution of the population exploited by Japan are unknown. Although Baird's beaked whale occurs across the North Pacific, it is possible that the whales exploited by Japan comprise a discrete stock.
2. The original size of the population, its present size, and its level relative to initial size and MSY level are not known.
3. An average annual catch of about nine whales was taken over a period of 55 years in the 19th century (range 0–26).
4. Average annual catches in the 1950s of about 250 whales (average 242; range 186–322) were followed by a decline in catches during the 1960s and early 1970s to present levels of about 30 per year (average 33; range 13–46 over period 1973–81).
5. In one area off Chiba (Area D in SC/34/SM11, p. 17), the nominal catch per boat increased over the period 1947 to about 1974, and possibly declined from about 1975 onwards (SC/34/SM11, p. 23). The number of whales sighted per hour of operation in Areas D and B (off Southern Hokkaido) may have increased over the period 1977–81.
6. The sub-committee is uncertain about the validity of the measures of effort employed in SC/34/SM11, for several reasons: fluctuations in the number of vessels hunting Baird's beaked whales, changes in vessel-tonnage composition of the fleet, the operational nature of searching effort (involves waiting at the surface for long periods while whales are submerged), aggregating behaviour of the whales, a sharp change in sex ratio in the catch (SC/34/SM11, p. 24) and the high apparent rates of increase in CPUE measures (SC/34/SM11, p. 23).
7. The sub-committee is unable to recommend a classification for the stock. If the Commission should wish to establish a catch limit on the basis of recent catches, the catches in the last ten years are listed in

Table 8 (the annual average for 1972–81 is 39 whales). The sub-committee believes that such catches over a short period would not seriously affect the stock, but that research should proceed to obtain the information necessary to assess the status of the stock (see Agenda Item 10).

Ohsumi noted that the studies proposed (Item 10) would require considerable time as well as funds. In order to justify such dual investment it would be necessary to go through the formal research proposal procedures stipulated by the Government of Japan. In addition, industry's financial committment is also indispensable. At this point it seems highly unlikely that the Government and industry would approve such committment without tacit assurance of the preservation of the whaling industry for a considerable period. Lastly, it should be pointed out that the efficiency of this type of study is very precarious unless a substantial whale catch is guaranteed.

### 4.5 Arnoux' beaked whale, *Berardius arnouxii*

No new information was available on this species.

## 5. REVIEW OF NEW INFORMATION ON OTHER EXPLOITED SMALL CETACEANS

Because of shortage of time due to major concentration on the pelagic dolphins and the beaked whales, the sub-committee only very briefly reviewed new information on other small cetaceans.

### 5.1 White whales

*5.1.1 Distribution and abundance*

Based on aerial surveys conducted in 1980–82, populations in the Okhotsk Sea in summer were estimated at 8,000 to 9,000, distributed at Sakhalin Bay and in the Amur River Estuary (6,000–7,000) and in Shelikov Bay (2,000) (SC/34/SM13). Methods used to calculate these population estimates were not described in sufficient detail to permit assessment of their reliability by the sub-committee. Results of aerial surveys in winter tentatively support earlier speculations (Kleinenberg *et al.*, 1964) that individuals in this stock winter in ice-covered areas of the Okhotsk Sea and respond in their local movements to ice edge shifts (SC/34/SM13).

Sightings data for Baffin Bay and Davis Strait were reported in SC/34/ProgRep Denmark. Kapel reported that papers analysing the data do exist, but they were not available to the sub-committee.

The isolated stock in the Gulf of St. Lawrence is now estimated to contain about 300 animals (SC/34/ProgRep Canada).

*5.1.2 Catches**

The recent catches of white whales by Canada, Denmark (Greenland), the USA and the USSR are summarised in Appendix 2. Details of takes by region or village are shown for Canada in Table 9 and the USA in SC/34/PS9 and Table 10. Brodie reported that the catch statistics for northern Quebec are incomplete. The sub-committee reviewed the partial record of takes in 1981 in waters of the USA and noted the existence at Point Lay (Icy Cape), Alaska, of an occasional drive fishery in which one to several hundred animals might be driven ashore and killed on a given drive. Fraker reported that other such drive fisheries likely exist in Alaska. Brodie reported that some of the US take may be from populations previously thought to be exploited mainly by Canadian Inuit. The sub-committee expressed concern about the minimum levels of these previously unreported takes in waters of the USA (reported catch is now greater than for Canada) and agreed that more information is required.

Table 9

Details of takes of white whales and narwhals in Canada in 1981 (partial list prepared by J. S. Loch, 20 May 1982 [SC/34/ProgRep Canada] updated by Brodie and Fraker). Does not include takes from northern Quebec (Ungava Bay)

| Subdistrict | White whale | Narwhal |
|---|---|---|
| **Baffin (villages)** | | |
| Arctic Bay | 0 | 100 |
| Broughton Island | 0 | 50 |
| Cape Dorset | 1 | 0 |
| Clyde River | 0 | 37 |
| Frobisher Bay | 44 | 0 |
| Grise Fiord | 47 | 0 |
| Hall Beach | 5 | 17 |
| Igloolik | 60–80 | 36 |
| Lake Harbour | 16 | 0 |
| Pangnirtung (Cumberland Sound) | 45 | 44 |
| Pond Inlet | 0 | 82 |
| Resolute Bay | 8 | 0 |
| Sanikiluaq | 6 | 0 |
| Subtotal | 232–252 | 366 |
| **Keewatin** | | |
| Chesterfield Inlet | 11 | 0 |
| Churchill | 1 | — |
| Repulse Bay | 52–56 | 29 |
| Coral Harbour | 8 | 6 |
| Rankin Inlet | 61 | 5 |
| Eskimo Point | 52 | 0 |
| Whale Cove | 22 | 0 |
| Subtotal | 207–211 | 40 |
| **Central** | | |
| Bathurst | — | — |
| Cambridge Bay | — | — |
| Pelly Bay | — | — |
| Spence Bay | 28 | — |
| Gjoa Haven | — | — |
| Coppermine | — | [c] |
| Holman Island | — | [c] |
| Subtotal | 28 | — |
| **Inuvik** | | |
| Aklavik | 35[a]–45[b] | [c] |
| Inuvik | 52[a]–62[b] | [c] |
| Tuktoyaktuk | 62[a]–105[b] | [c] |
| Subtotal | 149[a]–212[b] | [c] |
| Grand total | 616–703 | 406 |

[a] Number landed. [b] Total number killed (includes estimates of sinking loss). [c] Does not inhabit this area, according to Fraker.

* Editor's note. The US National Marine Fisheries Service has informed us that a detailed review of the 1981 Alaska white whale fishery presented to it by the Alaska Department of Fish and Game in September 1982, revealed an estimated take of 182–237 animals, not the 614–649 value originally presented to the sub-committee. The revised catch figures by region or village are shown in square brackets in Table 10, after the values which were available to the sub-committee. The summary values in Appendix 2 have been similarly amended.

Table 10

Details of preliminary catch data available for white whales in United States waters in 1981. [As indicated in the footnote to section 5.1.2 new information has been supplied by the US Marine Fisheries Service. The revised estimated takes are shown in square brackets and are also cited in Braham (in press).]

| Region | Village | Reported catch | |
|---|---|---|---|
| North Coast | Barter Island | 0[a] | [0] |
| Northwest Coast | Barrow | 5[b] | [5] |
| | Wainwright | 0[b] | [0] |
| | Point Lay | 75–100[b] | [29–38] |
| | Point Hope | 4–7[a] | [4–7] |
| | Kotzebue Sound | 249[c] | [4] |
| | Escholtz Bay | | [39] |
| Norton Sound | Yukon River | 25–28[a] | —[e] |
| | St. Michael | 11[a] | [11] |
| | Stebbins | 10–20[a] | [10–20] |
| | Shaktoolik | 7–15[a] | [7–15] |
| | Koyuk | 21–25[a] | [21–25] |
| | Elim | 3[a] | [3] |
| | Nome | 1[a] | [1] |
| Kuskokwim | | <100?[d] | —[e] |
| Bristol Bay | | 35–45[c] | [10–20] |
| Cook Inlet | | ? | [3–6] |
| | Estimated total: | <546–<609 | [182–237] |

[a] Table 2 in SC/34/PS9.
[b] Provided by Dronenburg.
[c] J. J. Burns, Alaska Department of Fish and Game, Fairbanks, Alaska.
[d] Reported by Leatherwood.
[e] The revised data give an estimated take of 25–28 for the 'Yukon–Kuskokwim deltas'.

*5.1.3 Status*

No new data were presented on the status of high Arctic stocks of white whales. The isolated stock in the Gulf of St. Lawrence is believed to be declining, for reasons poorly understood (SC/34/ProgRep Canada). SC/34/SM13 states that the Sea of Okhotsk stock(s) could sustain an annual take of about 1,000 individuals, 11.1 to 12.5% of the estimated total population. The sub-committee noted a view expressed that takes of 100 per year would be more appropriate. The population is not currently being exploited. The sub-committee noted that the latter level of take would be more in line with previous recommendations.

The sub-committee recalled its previous reviews of the Cumberland Sound stock, resulting in repeated recommendations that the stock be classified as a Protection Stock with a catch limit of 0 (*Rep. int. Whal. Commn* 30: 123–4; *Ibid.* 31: 150; *Ibid.* 32: 121–2), and noted with concern a quota of 40 and a take of 45 for that area in 1981 (SC/34/ProgRep Canada).

*5.1.4 Recommendations*

The sub-committee noted that research recommendations made in previous years have been acted on by the USSR and Canada. The research (reported in ProgReps and the SM series) includes studies of population size, productivity and exploitation in waters of the USSR and population size, discreteness, exploitation history and loss rates in Quebec, Hudson Strait, Northeast Hudson Bay, the Canadian High Arctic and West Greenland. The sub-committee noted, however, that takes in 1981 in Cumberland Sound, Eastern Hudson Bay and Ungava Bay (SC/34/ProgRep Canada) were high relative to the population size (*Rep. int. Whal. Commn* 32: 114) and therefore repeats the recommendation of last year for complete protection of these stocks (see Agenda Item 10.5). The sub-committee feels strongly that catch statistics should be collected by the USA and more complete statistics collected by Canada and reported to the IWC and that the USA should be urged to carry out assessment research (see Agenda Item 10.5).

Noting that studies of white whale and narwhal distribution in Baffin Bay and Davis Strait have been carried out by the consulting company LGL Ltd for the Arctic Pilot Project (Petro Canada) following recommendations by a Danish-Canadian working group, the sub-committee feels that the governmental representatives of the said working group should attempt to make reports of such studies available to future meetings of the Scientific Committee.

**5.2 Narwhals**

Information on sightings was reported in SC/34/ProgRep Denmark (Greenland) and by Leatherwood for Alaskan waters.

Recent catches of narwhals by Canada and Denmark (Greenland) are summarised in Appendix 2. Canadian takes by village or region are presented in Table 9.

No new information was available concerning loss rates or status of populations.

**5.3 Killer whales**

*5.3.1 Distribution and abundance*

A total of 9,000 killer whales was sighted from Soviet whaling ships in 1980 in the area from latitude 63° to the ice edge between longitudes 60°E and 141°40'E (SC/34/SM15). Zemsky reported that the statement in SC/34/SM15 that the 9,000 figure represented the size of the stock was a mistake of translation. The size of the stock was not estimated.

In 1981, Norway acted on the Committee's recommendation of last year that the killer whales along the Norwegian coast be censused. Based on reports of fishermen completing questionnaires (332 of 5,000 distributed) the minimum population of killer whales in Norwegian waters was estimated at 1,115 individuals (SC/34/SM4). Concentrations were noted in areas previously indicated to be important (Jonsgård and Lyshoel, 1970; Christensen, 1982).

Additional information on sightings is presented in SC/34/O 3, SC/34/O 24 (Andaman Sea), SC/34/ProgRep Brazil (N. Atlantic), SC/34/ProgRep Japan (S. Hemisphere) and SC/34/ProgRep New Zealand (N.Z. waters) and Spain.

*5.3.2 Catches*

The 1981 voluntary Norwegian national quota of 52 animals was assigned with no time limit. Thirteen animals were taken in 1981 including eight off Vestfjorden in January.

Live captures off Iceland from 1975 until 1981 are summarised under Agenda Item 6.

*5.3.3 Vital rates*

The sub-committee reviewed a report providing considerable detail on the composition of the catch of 906 whales by the USSR in the Antarctic in 1980 (SC/34/SM15). This was in response to a request by the Scientific Committee in 1981. Pregnancy rates indicated by the sample (41.76% of all taken) are consistent with those reported for killer whales taken in the Norwegian coastal

fishery (Christensen, 1982). The sub-committee expressed concern, however, that both sets of figures were significantly higher than rates of production in population(s) monitored for many years by direct observation (Bigg, 1982; Balcomb *et al.*, 1982). Christensen noted, however, that the proportion of females pregnant in the catches is consistent with his observations of numbers of calves accompanying females (Christensen, 1982).

Zemsky reported that harpooners do select larger animals. Christensen noted that it is very difficult to harpoon killer whales because of their speed and evasive behaviour. This leaves open the possibility that slower animals may be harpooned selectively. Most members of the sub-committee felt there is uncertainty about the representativeness of the sample and agreed that the data presented would be difficult to interpret without information on possible bias from hunting practices and killer whale behaviour.

The sub-committee notes that SC/34/SM15 did not contain age data for the sample of 906 animals. Because of the importance of age-specific reproductive rates in modeling population dynamics and assessing status, the USSR is urged to age the sample and analyse the data.

### 5.4 Pilot whales

*5.4.1 Distribution and abundance*

Sightings of pilot whales were reported for the 1981/82 IDCR Cruise (SC/34/ProgRep Brazil); in SC/34/ProgReps New Zealand and Spain, and SC/34/O 3, O 5, and SC/34/Sp9.

*5.4.2 Catches*

Catches of pilot whales by Denmark and Japan are presented in Appendix 2. Takes known to have occurred in a US live-capture fishery were unreported. Records of takes by the Faroe Islands (Denmark) are reported by village in Appendix 5.

The sub-committee reviewed evidence of a presumably now defunct fishery that took short-finned pilot whales for bait in a shark fishery in the Gulf of Mexico, off the USA, prior to 1972 (Mundus and Wisner, 1971). The total size of the catches is unknown.

*5.4.3 Vital rates*

Information in SC/34/ProgRep Australia partly summarises research on *Globicephala macrorhynchus* off Japan. Two reports by Marsh and Kasuya will appear in *Rep. int. Whal. Commn* (special issue 6), the proceedings volume of the recent conference on cetacean reproduction (see SC/34/Rep 1 and its Annex).

### 5.5 Dall's porpoise

*5.5.1 Abundance and identity of stocks*

Based on sightings from Japanese salmon research vessels and US platforms-of-opportunity vessels, Dall's porpoise in the North Pacific is estimated to number 1.2 million to 1.7 million (these are point estimates—no measures of confidence are reported) (SC/34/ProgRep USA). Composition of the population(s) in the US Fishery Conservation Zone, as represented by the specimens examined from the catch, are 725 individuals of the *Phocoenoides dalli-dalli* type and 2 of the *P. dalli-truei* type (SC/34/ProgRep USA). Recently Japanese takes in coastal fisheries have been mostly of the *truei* type (SC/34/SM10).

*5.5.2 Catches*

Reported takes by Japan and the US are presented in Appendix 2. However, some members of the sub-committee noted that these figures represent only partial accounting. Incidental kills associated with Japanese salmon fishing in the Fishery Conservation Zone of the USA occurred at a rate of 0.18 porpoises per set observed, or an estimated 1,850 animals (95% confidence limits 1,493–2,206) (SC/34/ProgRep USA). Kills in other areas are not reported, and no estimate of incidental takes in this fishery is included in SC/34ProgRep Japan. The sub-committee urges that Japan and the USA report completely the takes of this species by all methods in all areas. Miyazaki reported that fuller statistics are available in the 1981 INPC Report.

### 5.6 Harbour Porpoise

The recent catches of harbour porpoises by Denmark (SC/34/ProgRep Denmark) and Japan (SC/34/ProgRep Japan; ProgRep USA; SC/34/SM10) are summarised in Appendix 2. Details of Greenlandic catches by district are presented in Appendix 6. Estimated takes by Turkey in the Black Sea fishery are discussed in Agenda Item 3.1. Known incidental takes along the US coasts were not reported in SC/34/ProgRep USA.

## 6. LIVE-CAPTURE FISHERIES

Data on live-capture fisheries for 1981 are fragmentary, and no document dealing with the subject was submitted to the meeting, nor did any of the ProgReps contain information.

Between 1975–81, the government of Iceland issued 14 permits for the taking of 56 killer whales. A total of 37 animals were captured. A total of 34 were taken in the 1975–80 period; 26 were exported, 6 released and 2 died (summarised below). Data were provided by Sigurjónsson (first two columns), Klinowska (1981 data) and M. Dahlheim, National Marine Laboratory, Seattle, Washington.

| Year | No. of permits issued | Quota | Number captured | Exported | Released | Died |
|---|---|---|---|---|---|---|
| 1975 | 1 | 2 | 1 | – | – | 1 |
| 1976 | 2 | 6 | 5 | 3 | 2 | – |
| 1977 | 2 | 10 | 6 | 6 | – | – |
| 1978 | 4 | 14 | 11 | 6 | 3 | 2 |
| 1979 | 2 | 8 | 6 | 6 | – | – |
| 1980 | 1 | 8 | 5 | 5 | – | – |
| 1981 | 2 | 8 | 3 | 3 | – | 1 |
| | — | — | — | — | — | — |
| | 14 | 56 | 37 | 29 | 5 | 4 |

Appendix 5 in Hoyt (1981) is entitled 'Live Capture Statistics for Killer Whales' and contains detailed records of the live-capture fishery in California and Washington,

USA; British Columbia, Canada; Iceland; and Japan for the years 1961–80; the data are summarised below.

| Area | No. captured | No. died[1] | No. kept[1] | No. escaped or released |
|---|---|---|---|---|
| California | 1 | 0 | 1 | 0 |
| Washington | 223+ | 10 | 31 | 182+ |
| British Columbia | 52 | 1 | 25 | 26 |
| Iceland | 34+ | — | 28 | 6+ |
| Japan | 5+ | — | 5 | — |
| Total | 315+ | 11+ | 90 | 214+ |

[1] Incomplete.

## 7. NEW INFORMATION ON INTERACTIONS BETWEEN SMALL CETACEANS AND FISHERIES

### 7.1 Incidental take

Incidental takes are listed in Appendix 2. New information on incidental catch was reported from British waters, Spain and the North Pacific.

The sub-committee drew attention in 1981 to the incidental take of harbour porpoise in British waters. Brown reported that arrangements were recently made for District Fishery Inspectors to include reports of incidental catches of cetaceans in their monthly reports to the Inspector of Fisheries. Any reports received will be passed to SMRU for transmission to the IWC Scientific Committee.

Van Beek reported that the number of bottlenose dolphins incidentally taken west of the British Isles by Dutch trawlers was estimated at about 15 per year. This figure was based on a small inquiry in the fishery carried out by the Research Institute for Fisheries at Yjmuiden.

In Spain a minimum of 14 bottlenose dolphins was captured, mainly off the Mediterranean coast (SC/34/ProgRep Spain). No information was available on the type of fishery and gear used.

Miyazaki (SC/34/SM10) reported the number of dolphins caught incidentally by Japanese seine net, gill net, set net and long line fisheries in coastal waters and brought to ports for human consumption. The number was 2,340 animals, of 10 species, in the six years from 1976 to 1981. These catches are not separated from directed catches in SC/34/ProgRep Japan.

Leatherwood noted that the US government for several years has issued permits to the Republic of Korea, USSR, the Federal Republic of Germany and perhaps other countries to take marine mammals incidentally while fishing in the southern Bering Sea and northern North Pacific. The permits have authorized incidental takes of Dall's porpoise and harbour porpoise, but the takes under those permits have not been reported by the USA.

Kasuya and Brownell reported that incidental take of small cetaceans by the Japanese gill-net fishery for red squid in the northeastern North Pacific is known to have occurred but has not yet been reported in SC/34/ProgRep Japan.

Incidental take of harbour porpoise along the Alaskan and Californian coast was reported in the Report of the IUCN Workshop on Marine Mammal/Fishery Interactions (IUCN, 1981) but has not been included in the USA progress reports.

### 7.2 Direct conflicts

As reported previously bottlenose dolphins are reported to take hooked fish in a hand-line fishery in Hawaiian waters; in addition there are unverified reports of rough-toothed dolphins taking bait in a Hawaiian longline fishery (IUCN, 1981).

Collet (Appendix 3) reported new information on the conflict between dolphins and the French tuna troll fishery in the eastern North Atlantic. Dolphins are killed with hand harpoons to scare away other dolphins from the fishing area. Separate estimates of these kills were not available. She also reported that dolphins have been entirely protected by law in France since 1970, and a recent request from fishermen in Corsica for permission to use sound emitters to scare dolphins in net fisheries was rejected in 1982 by the Government.

### 7.3 Competition

The Japanese Government in 1981 launched a new five-year research project to study dolphin populations which interact with local fisheries in the Iki Island area. Results of the previous three-year investigations of methods to scare the dolphins away from the fishing area were published in 1981 in Japanese but not available to the sub-committee.

## 8. NEW INFORMATION ON EFFECTS OF POLLUTION AND INDUSTRIAL DEVELOPMENT

Decisions made last year on new formats for progress reports, cooperation with other bodies and the Resolution passed by the Commission have resulted in an increase in available information this year. The progress reports of Australia, Canada, Denmark, France, Spain and USA all contained material on small cetaceans. Clearly much work is underway, and the results of the new studies will help to clarify the situation of cetaceans in these matters. Unfortunately, many planned and reported studies still take no account of the effects of pollutants, and without this information it is impossible to assess the significance of reported levels. A further problem which needs attention in planning studies is selection of tissues for analysis. Comparison of different studies would be greatly facilitated if an agreed minimum list of required samples could be drawn up, with, for example, suggested locations on the animal for collection of samples. In this context, the initiatives of ICES and IOC in setting up special study groups are most welcome (IWC/34/28, IWC/34/11).

### 8.1 Pollution

SC/34/ProgRep France notes a study of skin necroses. Collet explained that most stranded common dolphins in France show numerous, small skin necroses, and this study is designed to investigate the matter. She also said that over the past two years stranded animals have been found with oil in the gastro-intestinal tract. Bottlenose and common dolphins are involved. For some years past similar oil residues have been found in the gastro-intestinal tract of stranded seals. This matter is also under investigation.

SC/34/O 14 discussed the possible implications of findings by Japanese workers (Fukushima and Kawi, 1981; Tanabe *et al.*, 1981) of significant transfer of PCBs from lactating striped dolphins to their calves. The first-born calf receives a larger part of the load of PCBs accumulated over the life of the mother through lactation. The sub-

committee did not have time to discuss this work substantively.

SC/34/ProgRep Canada gives references to review papers on heavy metal and organochlorine concentrations in marine mammals in northern waters which were presented at recent meetings (Wagemann and Muir, 1981; Wagemann, Snow and Lutz, 1981) but the reports were not available to this meeting. Australia, Canada, France and Spain report continuing sampling programmes, much of the material from stranded animals, although harvested animals are also included.

It seems to be particularly important that monitoring is not confined to stranded animals, in view of the report that PCB levels in seals found dead were significantly higher and more variable than those in animals caught in nets or shot (IWC/34/11). It is also important that wherever possible anatomical investigations are made of sampled animals, where PCBs are concerned at least the reproductive tract should be examined. In seals and other mammals this structure appears to suffer damage from PCBs, although the exact relationship between observed abnormalities and PCB levels is not clear (IWC/34/11).

### 8.2 Industrial development

SC/34/ProgRep Denmark mentions investigations in connection with the Arctic Pilot Project (APP)[1]. Kapel added that in the early phase of the negotiations with the proponents (Petro Canada and others) the Danish representatives stressed that the general knowledge of marine mammals in Baffin Bay and Davis Strait was so poor that the possible adverse effects of the project could not be adequately assessed. In the past two or three years some studies have been carried out to address these problems, partly funded by APP, but the extent of these studies are far from sufficient in the opinion of the Danish representatives.

One particular issue is the question of the impact of noise emitted from the ice-breaking carriers. These problems were treated only superficially in the environmental impact statement originally submitted by the proponents, but was raised by Danish scientists in the Working Group established to look into environmental and technical problems relating to the suggested routes with passage through Greenland waters.

APP reacted by calling a workshop to discuss questions of noise and have initiated some studies (Anon, 1981). The results of these studies are, however, not sufficiently convincing to remove Danish doubts. Indeed, studies carried out by Danish consultants appear to support the opinion that noise could have an effect over large areas.

Fraker reported on the 1981 White Whale Monitoring Program in the Mackenzie Estuary (Fraker and Fraker, 1982). This is the tenth such annual study and besides reporting on the industrial activity, which appears to have had rather little major effect in general, this work has provided much information about the animals themselves and the hunting. A few short-term effects of activity are noted: noisy and/or moving vehicles, high numbers of vessel movements and long duration of stimuli do disturb animals, particularly where there is less space for escape, as in narrow ice leads.

[1] Transport of Liquid Natural Gas (LNG) from the Canadian High Arctic through Baffin Bay and Davis Strait in very large ice-breaking tankers.

## 9. OTHER BUSINESS

### 9.1 Research proposals

The sub-committee reviewed SC/34/RP 1–7. The research proposed in SC/34/RP1 has already been started by the US National Marine Fisheries Service. SC/34/RP4 was deemed to more directly concern the sub-committee on protected species, but the sub-committee does note that if data on struck-and-loss rates, or local catches for white whales and narwhals, are uncovered in the proposed study they would be of use in future meetings.

SC/34/RP5 was tendered in response to a request originating in last year's special meeting on killer whale populations and meeting of the sub-committee (SC/33/Rep 4). The sub-committee considered what would be the best use of DFL 12,000 donated to the IWC by the Nethelands for research on small cetaceans and decided, based on the conclusions of the killer whale meeting, that highest priority should be given to research on stock identity of killer whales. The sub-committee therefore strongly supports the proposal in principle. As submitted however, the proposal is not sufficiently detailed and should be returned for revision, along guidelines supplied by the Secretariat. The sub-committee notes that the proposal is for a one-month pilot study and that should the initial study prove successful, funding from some source would be required for continuation of the research.

The sub-committee does not support the remaining proposals (SC/34/RP2, 3, 6, and 7).

### 9.2 The 1983 meeting of the sub-committee

The group proposes to focus next year on status of populations of phocoenids, including those taken incidentally; on *Cephalorhynchus spp*; and on populations of small cetaceans involved in live-capture fisheries.

### 9.3 Publication of documents

The following documents were recommended for publication: SC/34/SM1, 2, 3, 5, 9, 10 (with revision), 11 (with revision), 14 (with revision) and 15 (with revision).

### 9.4 Sightings data from Oman

The Secretary is in receipt of a letter from the Director of Fisheries Research (and Commissioner for the IWC) of Oman with enclosures detailing small cetacean sightings by Oman Navy vessels from September 1981 to March 1982. These data may be obtained from the Secretary.

### 9.5 Errors in IWS

Members of the sub-committee found extensive errors in IWS LXXVIII (see Appendix 4).

## 10. RECOMMENDATIONS TO THE SCIENTIFIC COMMITTEE

### 10.1 The Black Sea

Because very large catches of dolphins and porpoise have been taken in proportion to estimated population sizes, because the populations are of unknown status but likely to be depleted, and because catches continue, the sub-committee urges the following actions:

(1) Improvement in harvest statistics is needed, in defined units, both to determine if the assumed value of centners as 100 kg is correct, if the levels reported correctly represent the fishery, and to determine species composition; we recommend that the IWC request Turkey's and FAO's

assistance in obtaining original Turkish documents reporting catch levels, with translations, for the Scientific Committee's use.
(2) The series of aerial sighting surveys from 1967 to the present provides a possible basis for population size monitoring, and it is recommended that the data resulting from these surveys by the Soviet Union be presented to the Committee for analysis.
(3) Because the fishery is not well understood, and because little improvement in understanding of the fishery has occurred in the last several years, despite discussions in several forums (FAO, 1979; *FAO Fish Ser. No 5 [Mammals in the Sea]*; recent IWC reports), we recommend that individuals in Turkey knowledgeable of the fishery and of the fishery statistics be invited to participate in the next Committee meeting.
(4) Because the dolphins feed on anchovies, the history and present status of the anchovy fisheries throughout the Black Sea should be described for Committee use. Additionally, the present catch of cetaceans in the Black Sea should be sampled for stomach contents; the available literature on the Black Sea dolphins should be reviewed on this point.
(5) Because the available biological studies on these cetaceans are quite old, the Turkish catch should be sampled in order to determine sex composition and the reproductive condition and length of the animals. The sub-committee urges that Turkey and FAO be approached on this matter.

**10.2 Dolphin populations in the eastern tropical Pacific**

Noting that the continuing incidental kill of dolphins in the purse-seine tuna fishery of the eastern tropical Pacific is a problem of international scope, the sub-committee makes the following recommendations:
(1) Member nations of the IWC should be urged to participate in the data collection programme of the Inter-American Tropical Tuna Commission. Members fishing on dolphins but not currently participating are Mexico, the Netherlands and Spain.
(2) Research into ways of reducing incidental mortality should continue, and crews of vessels of member nations of the IWC should be encouraged by member governments to participate in the seminars held by the IATTC.
(3) Since there is uncertainty about the assessments which have been made and consequently about the status of the stocks, the US should be urged to continue with plans for reassessment.
(4) Incidental catch statistics should be included in Progress Reports to the IWC as required by the Schedule. Mexico, especially, has a large and growing fleet and should be approached directly by the Secretary and urged to participate.

**10.3 Striped dolphins in Japan**

Noting that catches of striped dolphins have declined over a long period on the Izu Peninsula, that reproductive parameters have possibly changed in response to exploitation, but that available analyses of CPUE are not adequate to allow determination of the status of the stock, the sub-committee recommends that more detailed effort data and relevant information be retrieved, or collected, and analysed. The data should include if possible:

(a) effort in hours and days, by vessel, area, season and year;
(b) detailed oceanographic data;
(c) data on other major fisheries, in the area, especially that for squid;
(d) information on shifting of seasonal abundance (as well as effort and catch) year to year.

**10.4 Bottlenose whales**

*10.4.1 North Atlantic*

The status of research to obtain knowledge needed to assess the population of the northern bottlenose whale has not changed from the previous year, and the sub-committee recommends that the classification of the stock as a provisional Protection Stock should be continued.

*10.4.2 North Pacific*

The sub-committee recommends that if exploitation of Baird's beaked whales in the western North Pacific continues, an expanded programme of research be initiated to obtain the information necessary for determining the status of the stock. The programme should include, but not necessarily be limited to:
1. Refinement and re-analysis of CPUE data, including segregation of beaked whale and minke whale effort, inclusion of confidence intervals about the estimates, description of the searching and catching operations, and re-analysis of vessel tonnage effects. Other technological factors possibly relevant should be examined; these include acoustic equipment (type, when installed, and how used), speed, size and age of vessel, crew size and gun equipment.
2. Re-analysis of scouting vessel data to delineate range and estimate population density, including evaluation of sample size and seasonal effects, elimination of records likely to have been based on erroneous identifications, and presentation of data on miles of effort and actual sightings (including school sizes), by 5° block or smaller stratum if possible.
3. Additional research to determine the identity and range of the stock(s). Potential methods include tagging (on the grounds and in adjacent pelagic areas to the east and north—the latter by scouting vessels) and aerial survey.
4. Investigation of population dynamics based on analysis of samples and data from the fishery, on field observations (including analysis of aerial photographs) of age and sex structures of schools and the population, and on comparative studies of other, related and ecologically similar species.

Japan should be urged to provide the results of items 1 and 2 to the next meeting of the Scientific Committee.

**10.5 White whales and narwhals**

(1) Noting that for waters of the USA there continue to be very few data on population size, discreteness and vital rates and incomplete data on takes and total removals, the sub-committee recommends that the government of the USA be encouraged to initiate appropriate field studies, submit more complete white whale statistics, and summarise available survey data on these whales.
(2) Noting the quota of 40 set for the Cumberland Sound population of white whales and the landed take of 45 in 1981, the sub-committee again this year recommends that Canada be urged to afford complete protection to this severely depleted population. The same applies to the Eastern Hudson Bay and Ungava Bay stocks.

### 10.6 Statistics

The sub-committee repeats its recommendation of previous years that members be urged to collect and submit full statistics as detailed in 1980 (*Rep. int. Whal. Commn* 30: 124), including statistics for incidental catch and live captures. As statistics for considerable catches of white whales in Alaska have not been completely collected and reported by the USA, the Secretary should contact the USA and urge that such be done.

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