Annex H

Report of the Sub-Committee on Other Southern Hemisphere Whale Stocks

Members: Childerhouse (Chair), Baba, Baker, Bando, Bannister, Best, Black-Layne, Branch, Brandao, Bravington, Brownell, Burt, Butterworth, Carlson, Clapham, Clark, Cooke, Dinter, Donovan, Engel, Fortuna, Fujise, Funahashi, Gales, Goto, Greco, Groch, Gunnlaugsson, Hakamada, Hammond, Hatanaka, Hedley, Hester, Hildebrand, Holloway, Iniguez, Jean-Benoit, Kato, Kell, Kishiro, Kock, Last, Lauriano, Lawrence, Lima, Lyrholm, Mae, Martin, Matsuoka, Mattila, Mikhalev, Miyashita, Morishita, Murase, Nakatsuka, Nishiwaki, Ohsumi, Øien, Okamura, Olafsdottir, Oothuizen, Palazzo, Palka, Palsboll, Panigada, Panigada, Pastene, Pike, Polacheck, Pomilla, Punt, Rademeyer, Robbins, Rose, Rosenbaum, Schweder, Secchi, Shimada, Simmonds, Smith, Thiele, Tomita, Urbán, Van Waerebeek, Víkingsson, Wada, Walløe, Walters, Williams, Yamakage, Yoshida, Zerbini.

1. CONVENER'S OPENING REMARKS

Childerhouse welcomed the participants, and noted that the sub-committee would have six sessions in which to complete its work.

2. ELECTION OF CHAIR AND APPOINTMENT OF RAPPORTEURS

Childerhouse was elected Chair. Clapham undertook the duties of rapporteur.

3. ADOPTION OF AGENDA

The adopted agenda is given in Appendix 1.

4. REVIEW OF DOCUMENTS

Documents relevant to the sub-committee included: SC/56/SH1-4, SC/56/6-22, SC/56/BC3, SC/56/E12, SC/56/E24, SC/56/E26, SC/56/IA12-13, SC/56/O12

5. SOUTHERN HEMISPHERE HUMPBACK WHALES

5.1 Report of intersessional group

Bannister reported on the work of an intersessional group to summarize work required to complete a Comprehensive Assessment of Southern Hemisphere humpback whales. This body continued work begun by a similar group convened after the 2002 meeting to summarize current knowledge by population or management area, identify major gaps in knowledge and establish research priorities to fill these gaps (see JCRM 6, Supplement, Annex H, Appendix 7 (pp259-267); the Arabian Sea was added to the group's review. Bannister noted that the principal new information considered by the group was being made available to the Sub-Committee in the form of papers submitted to the meeting. Information on the current state of knowledge regarding the Arabian Sea humpback whale population (breeding area X) was supplied by G. Minton and is shown in Appendix 2.

The Sub-committee thanked Bannister and his group for their work, and **recommended** that an updated version of a table summarizing current knowledge for Southern Hemisphere humpbacks be placed on the IWC website www.iwc.org.

5.2 New estimates of abundance and rate of increase, and new stock structure information

The Sub-committee noted that the existing IWC management areas and boundaries for Southern Hemisphere humpback whales may not be consistent with the present understanding of SH humpbacks and **agrees** that this matter requires further consideration. Fig 1 shows hypothetical stock boundaries for SH humpbacks for illustrative and discussion purposes only. The areas and sub areas identified reflect approximate, rather than necessarily exact, boundaries.

5.2.1 Africa

SC/56/SH2 used aerial survey data to provide initial estimates of abundance and information on distribution of humpback whales in the coastal waters of Gabon. The aerial survey was conducted in 2002, with transects run up to 50 nm off the coast (corresponding to the 1000 m isobath), from the border of Equatorial Guinea to a point south of Mayumba near the Congo border. A total of 1488 nm of survey effort was flown. Seventy-four different groups of humpback whales were observed throughout the survey area. Relatively large numbers of whales were encountered throughout the southern stratum (Cap Lopez to Gamba); densities and sightings were considerably lower in the northern stratum (Equatorial Guinea to Cap Lopez). From the on-effort surveys covering 1488 nm, the initial abundance estimate from a line transect distance sampling analysis was 1,259 whales (95% CI 710-2333). The rapid development of oil and gas exploration in the region is a cause for concern in light of the likelihood that these waters represent critical habitat for humpback whales; these industrial activities (including seismic surveys) are ongoing down much of the western coast of Africa from Gabon and Angola into South Africa.

In discussion, it was suggested that the abundance estimates might be conservative when g(0) was assumed to be 1, and that efforts should be made to calculate this during the time that future surveys are conducted. An additional point was made regarding the need to better examine catch data from this region in order to set a baseline to judge the extent to which this population is recovering.

SC/56/SH3 examined population structure and mtDNA diversity in humpback whales from wintering areas in the Indian and South Atlantic Oceans (regions A, B, C and X, the western and eastern South Atlantic, southwestern Indian Ocean, and Arabian Sea, respectively). A total of 1,416 individual whales representing eleven sampling sites within the four wintering areas were sequenced for a portion of the mtDNA control region. A hierarchical analysis of molecular variance using M_{ST} and F_{ST} supported the division of the wintering regions based upon IWC designated boundaries of A, B, C and X. Pairwise comparisons further confirmed the A, B and C divisions, although varying degrees of heterogeneity were detected for proposed sub-divisions within Regions B and C. Although this analysis generally supports IWC population divisions, additional analyses are required to better evaluate population structure in a management context. Although the Arabian Sea samples shared some haplotypes with the southern Indian Ocean, they were significantly different from all other regions. This further supports the idea that this population is non-migratory and reproductively isolated from southern Indian Ocean humpback whales (Mikhalev 1997). The relatively low genetic diversity in the Arabian Sea may reflect the recent Soviet whaling on this population, although it is also possible that this may always have been a small population with low diversity. Little is known regarding pre-modern whaling on this population; genetic analysis of historical specimens, if available, is required to establish a baseline for pre-whaling genetic diversity.

SC/56/SH4 used microsatellite DNA to examine population structure in Southern Hemisphere humpback whales from wintering regions A and B (western and eastern South Atlantic) and region C (southwestern Indian Ocean). A total of 1,342 whales representing nine sampling sites were genotyped at 11 microsatellite loci. A global test for population differentiation based on allele frequencies showed overall significant heterogeneity. However, a Bayesian clustering procedure was unable to partition the samples into different groups and suggest high levels of mixing for all samples. A hierarchical analysis of molecular variance using F_{ST} supported the division of wintering regions based on the current IWC boundaries of A, B and C, while R_{ST} values marginally approached significance. However, values for both statistics were small and most of the variation was due to within-site differences. Less support was encountered for further sub-divisions within regions B and C: results were not consistent with proposed sub-division of Region B into sub-regions B1 and B2, while the division of Region C into C1, C2 and C3 was partially supported. Individual humpback whales may disperse to different breeding grounds within wintering regions or may mate while migrating, either of which would affect genetic analyses of population structure. The use of the program STRUCTURE conflicted with the analyses of molecular variance, and concerns regarding the way in which this software works warrant caution in its use.

SC/56/SH8 summarized preliminary photographic comparisons of individually identified humpback whales from two South Atlantic wintering grounds off Brazil and Gabon. Analysis of the structure of songs recorded in both regions has previously suggested some degree of contact between them. The sample set for comparison consisted of 1,626 individuals photographed over 14 years off Brazil, and 419 individuals photographed over three years off Gabon. No matches were found. The lack of evidence for the movement of individuals between these two regions is consistent with the gene flow analyses presented in SC/56/SH3 and SC/56/SH4. Similarity in song structure between Brazil and Gabon might be explained by exchange on a common feeding ground or during migration to high latitudes (see Clapham and Mattila (1990), Clark and Clapham (2004)). It was noted that the results provide further reason to question the value of similarities in song structure as evidence of population mixing.

SC/56/SH12 summarized the results of a line transect survey off the coast of Mozambique in 2003. The majority (98.1%) of the 951.8 nm of search effort was conducted in passing mode due to the high densities of whales

encountered. A total of 691 sightings were made of approximately 1,130 humpback whales. The distribution of humpback whales was not random over the survey area, and the high densities in the northern portion of the survey area strongly suggested that the northern boundary of the habitat was not reached by the survey. No correlations could be found between distribution and any environmental parameter. Groups containing a calf were found throughout the survey area. A preliminary analysis of unstratified data gave an abundance estimate of 5,729 (CV=0.12) humpback and unidentified large whales (which were probably also humpbacks) in the 14,029.5 nm^2 area surveyed. Pooling of estimates over the four surveyed strata gave a total abundance of 5,811 whales (CV=0.15). Comparison of abundance estimates over comparable survey areas in 1991(1,954, CV=0.38) and 2003 (5,039, CV=0.38) suggests an increase of 7.9% per annum. However, this figure must be regarded with caution as both surveys assumed g(0) to be 1, and sighting probabilities on the track-line may have been higher during the 2003 survey because of platform design and observer team size. A boat-based survey was conducted in September 2003 between Beira and Maputo, during which at least 118 individuals were photographically identified and 70 skin samples were obtained.

The Sub-committee welcomed all of the results reported by groups working in Africa, and expressed the hope that this research would continue in future years.

5.2.2 South America

SC/56/SH1 used satellite telemetry to address the long-standing question of where whales wintering off the Brazilian coast feed. In October 2003, 11 humpback whales were satellite tagged off Brazil (*ca.* 18°30S, 39°30W) to investigate movements on the wintering grounds, migration routes and migratory destinations. Mean tracking time for the 11 whales was 35 days (mean = 5-156 days) and mean distance travelled was 1,641 km/whale (range = 83-6,626 km). Departure dates from the Brazilian coast ranged from late October to late December, indicating that some whales still occupy the wintering grounds in the beginning of the austral summer. Whales migrated south at an average heading of 160 from their tagging position. Two whales reached feeding grounds offshore from South Georgia and the South Sandwich Islands after a 45- to 60-day migration. This study provided the first evidence that Brazilian humpback whales migrate to these feeding areas, and also confirmed that whales migrate in a relatively direct, linear path. The authors noted that, while this was a small sample size, the results suggested that these humpback whales do not migrate further south and may therefore not be available to IDCR surveys. The Sub-Committee noted its appreciation for the work reported and encouraged the further development of this project.

In discussion, it was noted that the population of humpback whales that fed in the coastal waters of South Georgia (rather than somewhat offshore) was virtually extirpated by whaling and humpbacks are uncommon today in coastal waters (though more were found offshore in 1998). Best considered that the location of then historical whaling grounds near South Georgia needed further investigation.

Further discussion of this issue focused on an examination by Zerbini and Clapham of catch records of humpback whales from a shore whaling station at Costinha, Brazil (approximately 7^o S), which began taking humpbacks in 1911 (Williamson 1975). Recorded catches for the years 1911 to 1914 were: 102 (1911), 342 (1912), 352 (1913) and 317 (1914). The whaling station was closed from 1915 to 1923, after which catches resumed at a much lower level (between 47 and 62 humpbacks annually from 1924 to 1928, average 45 per year). It is not known whether the closure of the whaling station at Costinha after 1914 was due to the Great War, or because humpback whales were no longer available in sufficient numbers to make whaling worthwhile. If it was for the latter reason, the crash of the humpback population off Brazil would coincide exactly with a similar crash at South Georgia. The Bureau of International Whaling Statistics reports a total of 18,557 humpbacks taken at South Georgia between 1909 and 1915, at which point humpbacks were effectively commercially extinct in the area. Although approximately 2,500 additional humpbacks were caught at South Georgia in subsequent years until 1955, these catches primarily occurred later in this period. In addition, another land station operating at Cabo Frio, Brazil (approximately 23^o S), from 1960 to 1963, caught only ten humpbacks during this period, indicating the continued depletion of this population (Williamson 1975).

It was suggested that the catch data from Brazil and South Georgia, and the apparent coincident collapse of the fishery in both places around 1915, provided tentative support for the idea that humpback whales wintering off the Brazilian coast were migrating to South Georgia and using this region as a primary feeding area. However, additional work needs to be conducted to establish whether the Great War influenced the closure of the Costinha station, and whether additional catch records exist for the Brazilian coast. Furthermore, a similar assumption was once made from patterns of whaling catches about a connection between West Africa and South Georgia, which has not been established and requires further investigation. That humpback whales have been plentiful off Brazil for some years, but not in the coastal waters off South Georgia where whaling primarily occurred, might indicate the existence of a second (less depleted) feeding destination for the Brazilian whales. In this regard, it is noteworthy that the tagged animal from Brazil migrated to a location offshore of South Georgia, and not to the

old inshore whaling ground, where humpbacks remain rare. The historical and current connections between these two habitats is unknown. It is also possible that a distribution shift between the two areas has occurred which is related to environmental conditions, although this appears unlikely given the relatively high abundance of euphausiids reported by British Antarctic Survey cruises off South Georgia in recent years.

SC/56/SH6 reported the results of three years of aerial surveys in the peak of the humpback whale breeding season at Abrolhos Bank off Brazil. Seventy-seven transects covered the continental shelf from the coast to the 500 m isobath between 12 10 S and 20 42 S, and line transect distance sampling protocols were used. A total of 547 humpback whales were recorded over the 3-year period. The survey confirmed that Abrolhos Bank represents the major breeding ground for humpback whales in the region, although the distribution of whales changes from year to year, with more whales in inshore waters in 2001 and 2003. Distribution may be affected by human activities in the region, including seismic surveys from oil and gas development in the southern portion of the study area.

SC/56/SH10 discussed possible routing options for barge traffic travelling across Abrolhos Bank in order to mitigate disturbance and collision risk to humpback whales wintering there. Humpback whale distribution in the area of two proposed routes was monitored by surveys using platforms of opportunity; preliminary results of this work and relate aerial surveys that the second (more inshore) route ran through lower densities of whales and may thus be preferable.

SC/56/SH16 presented an update of comparisons of photographically identified individual humpback whales from the Antarctic Peninsula (n = 395 whales) and the Brazilian breeding grounds (Abrolhos Bank, n = 983). No matches were found, further suggesting that the Peninsula (notably Gerlache and Bransfield Straits) is not a feeding ground for Brazilian whales. Given the established migratory connection between the western side of the Peninsula and the west coast of South America (e.g. Colombia and Costa Rica), the lack of matches with Brazil is perhaps not surprising; the sample size from Weddell Sea in the present comparison was too small to allow firm conclusions to be drawn about the migratory destinations of these animals. Ten new resightings of humpbacks were made from the Antarctic Peninsula, including an individual photographed in the Weddell Sea in two consecutive feeding seasons. It was noted that British Antarctic Survey and a German research program would be conducting studies in the Weddell and Scotia Seas over the next five years, providing opportunities to gather additional information on humpback whales there. The Sub-Committee **recommended** that collaboration between IWC and the institutions conducting these studies be encouraged; it was noted that data collected by past cruises from these programs are held by the IWC Secretariat.

SC/56/O7 presented results from four coastal (non-systematic) surveys in Magellan Strait during the austral summer of 2003/2004, conducted by the Marine Biology Group of CEQUA. Between 26 December 2003 and 12 March 2004, there were 94 sightings of 152 humpback whales; these figures include animals sighted on multiple occasions. During the surveys, photo-id, biopsy and underwater videotaping sampling was undertaken. Photographic identification of 35 individual humpback whales indicated that some animals remained within the study area during the entire summer; eight animals photographed in previous summers were resighted during the 2003/04 surveys, suggesting some degree of site fidelity. Feeding behaviour, including that involving bubble structures (usually in a line), was recorded; this may be the first record of bubble feeding from this ocean.

SC/56/SH22 reported comparisons of photo-id data from humpback whales in Magellan Strait to photographs from the Antarctic Humpback Whale Catalogue. Four inter-year matches were made within the Magellan Strait study area, and four others were made with other areas: one each from Ecuador, Colombia, Panama and Costa Rica. These data present the first evidence for the migratory destination of humpbacks from the Patagonian Channels, and suggest the possibility of genetic exchange between the two hemispheres. Specifically, it is conceivable that Southern and Northern Hemisphere humpbacks could overlap spatially and temporally off Central America if late-migrating whales from the Southern Hemisphere mixed with early migrants from the Northern Hemisphere, or vice versa.

SC/56/SH19 conducted genetic analysis on skin biopsies obtained from 25 humpback whales (12 males, 13 females) in the Straits of Magellan, Chile. MtDNA control region sequences from these samples were compared with other published sequences from humpback whales in the Southern Hemisphere (n = 279, representing 94 haplotypes). Four haplotypes were present in the 25 Chilean animals, which represents low diversity relative to other studied areas of the Southern Hemisphere. The dominant haplotype (found in 16 animals) corresponded to the most common haplotype from both the Colombian breeding ground and the Antarctic Peninsula feeding area; the second most common Chilean haplotype has been previously found exclusively in these two locations. One previously undocumented haplotype was present. However, an analysis of molecular variance indicated significant differences between the Strait of Magellan whales and those from Colombia, the Peninsula and other areas of the Southern Hemisphere. Seven individuals represented by three haplotypes were phylogenetically closely related to haplotypes from the North Pacific. Overall, the results support the idea that the Strait of

Magellan might represent a discrete feeding ground (i.e. segregated in terms of mtDNA lineages from other feeding grounds) connected to the Colombian breeding grounds or to breeding areas along the coast of Central America. The presence of haplotypes characteristic of the North Pacific suggests historical maternal gene flow or low levels of gene flow between the hemispheres. The possibility of such inter-hemispheric movement is also indicated by recent photo-id data (Stevick *et al.* JCRM in press).

The Sub-committee welcomed all of the results reported by groups working in South America, and expressed the hope that this research would continue in future years.

5.2.3 Oceania

SC/56/SH7 was the annual report of the South Pacific Whale Research Consortium, which met in March 2004 for its fifth annual meeting in Byron Bay, New South Wales, Australia. Research groups active in French Polynesia, the Cook Islands, Tonga, Fiji, Samoa, New Caledonia, Vanuatu, New Zealand, Norfolk Island and eastern Australia were represented and presented updates on work on humpback whales and other cetacean species. Regional catalogues of humpback whale fluke photographs (representing more than 1,200 individuals from Oceania alone) were compared to describe regional return and interchange. A limited degree of migratory interchange has been established between adjacent wintering grounds of Oceania (the presumed wintering grounds of IWC management Area V and Area VI humpbacks) but not between regions separated by intervening regions (e.g, limited interchange between Tonga and Cook Islands but not between Tonga and French Polynesia). Non-systematic vessel surveys and unpublished capture-recapture estimates based on photo-identification indicate that the density of whales remains low throughout the wintering grounds of Oceania. Systematic shore-based surveys of Fiji show very low density in an area of former abundance. Analysis of mitochondrial (mt) DNA diversity based on nearly 1,000 genetic samples shows significant differentiation among surveyed wintering grounds of New Caledonia, Tonga, Cook Islands and French Polynesia, as well as for Western Australia (Group IV) and the Pacific coast of Colombia (Group I). Consortium members initiated a checklist of 24 cetacean species documented by members in one or more island groups in the region by sightings, photographs or genetic samples.

SC/56/SH18 presented the results of the first marine mammal survey of Vanuata in the South Pacific. Humpback whales were observed in the southern islands: Futuna and Tanna, Aneityum. Singing and mother/calf pairs were recorded, suggesting that the region is of some importance as a breeding/calving ground. Comparisons of photo-id data between Vanuatu and the South Pacific Whale Research Consortium collection found two matches, one each with New Caledonia and Tonga.

Childerhouse reported on a humpback whale survey at Tory Channel, Cook Strait, New Zealand, conducted from 10 to 27 June 2004. The New Zealand population has been of considerable concern given its apparent lack of recovery from whaling. With the exception of use of a higher sighting location, the survey replicated the spotting methods of the Tory Channel whaling station, and the sighting team included four men who had worked on this station. In 17 days, a total of 33 humpback whales were observed (all moving north). Eleven animals were photo-identified and 13 were biopsied; no individuals were resighted. Comparison of the results from this preliminary survey showed densities that were broadly consistent with those observed at the same time of year in a ten-year period of operation of the Tory Channel whaling station (1946-55). The Sub-committee endorsed this work and urged that future surveys be undertaken, as the New Zealand migratory population is often cited as an example of extirpation.

The Sub-committee welcomed all of the results reported by groups working in Oceania and New Zealand, and expressed the hope that this research would continue in future years.

5.2.4 Antarctica

SC/56/SH9 summarized catches of humpback whales by two Soviet whaling fleets, the *Slava* (SL) and *Sovetskaya Ukraina* (SU) in the 1960/61 Antarctic season. A total of 12,529 humpbacks were taken from Area IV, Area V and western Area VI (only 302 were reported to IWC). Of these, 4,046 were taken by the *Slava*, and 5,582 by the *Sovetskaya Ukraina,* and a further 2,911 by a third factory ship, the *Yuri Dolgorukiy*. Following the 1959/60 whaling season's large catches of humpbacks in Area V, the Soviet fleets found fewer animals in this area in the 1960/61 season and therefore expanded their search effort into other regions, notably to the east. Intensive whaling for humpbacks began in December 1960, beginning south of western Australia between 57 and 59 S. The average length of females and males was 12.0 m and 11.0 m, respectively.

The fleets then moved further east to an area south of eastern Australia. The average lengths for females and males taken by both fleets were 11.8m and 11.7m, respectively. The author noted that whale length was sometimes overestimated because there a penalty was levied for undersized animals since the industrial plan for the factory ships depended upon volume of the product (in contrast, a monetary reward was given for particularly large whales).

The majority of humpback whales taken during the 1960/61 season came from a location south and southeast of New Zealand. Additional catches were made south of Oceania in the region of longitude 160-135 W.

The Sub-committee thanked Mikhalev and noted that the information presented in SH9 was of great value to the assessment of Southern Hemisphere humpback whales. The Sub-committee **recommended** that the data presented in SH9 be provided to the Secretariat for validation and inclusion in the official IWC catch database.

SC/56/SH11 provided estimates of abundance and rates of increase for humpback whales in Antarctic Areas III-E, IV, V and VI-W, based upon sighting data obtained by JARPA between the 1989/90 and 2002/03 austral summer seasons. The distribution pattern observed between the first half of surveys (1989/90-1996/97) and later in those surveys (1997/98-2002/03), concentrations of humpback whales increased in the southern strata each year between 90E^{o} and 120^{o}E. In Area V, they were widely dispersed on the Pacific Antarctic Ridge except the Ross Sea. Abundance estimates of humpbacks in Areas III-E, IV, V and VI-W were 4,426 (CV=0.20); 32,519 (CV=0.11); 2,759 (CV=0.16); and 1,551 (CV=0.24), respectively. Because data in Areas IIIE and VIW were not obtained in the peak migration period, results in these Areas are underestimated. The combined rates for Areas IV and V between 1989/90 and 2002/03 was 13.7% (CV=0.29, 10.5% - 25.0%). The estimate for the total research area in the 2001/02 and 2002/03 seasons was 41,255 (CV=0.10). The following conditions and assumptions were applied to these analyses: 1) distance and angle were corrected by using the results of the distance and angle estimation experiments, 2) truncation distance was 2.4 n.miles, 3) effective search half width was obtained by fitting a hazard rate model, 4) smearing parameter was obtained by the Buckland and Anganuzzi method II, 5) g (0) was assumed to be 1, and 6) sighting data were pooled by each season for estimations of the effective search half-width (*ws*) and the mean school size (E(s)). Instantaneous rates of increase for humpback whales were estimated at 18.1% (CV=0.21) and 12.2% (CV=0.21) in Areas IV and V, respectively.

It was not clear why abundance estimates should have increased by so much over the period of the surveys. Clearly the increase rates in Area IV (18.1%: 10.5-25.6%) are far greater than could be possible given the biology of humpback whales, although the increase rates for Area V (12.2%: 7.1-17.3%) and for the combined Area IV+V (13.7%: 6.2-21.1%) are at or just above the maximum plausible rate (12.6%) in Clapham *et al*. 2001. Three hypotheses were considered for the high rates of increase: a southward (and longitudinal) expansion in humpbacks, minor changes in survey methodology (e.g. changes in numbers of vessels) or inter-annual variability related to oceanography; an outline of possible changes in the surveys would be a useful guide in deciding which of these hypotheses is most likely.

Matsuoka stated that geographic expansion (notably movements from Area V to Area IV) was the most likely explanation, and that it is also possible that some humpbacks may not migrate to the breeding grounds. Some members disagreed with the latter idea, and noted that a large proportion (perhaps as much as two-thirds) of the population would have to be missing from the breeding grounds for this to explain the observed differences in estimates in some cases. The authors of SH11 responded that direct comparisons between breeding and feeding grounds were difficult. For example, not all of the breeding grounds were surveyed in Australia or South Africa. However, they advised that they would study this issue further in the future. Best considered that analysis of photo-identification data from the wintering grounds might provide independent estimates of population size that would be useful in this regard.

The abundance estimates themselves, for Area IV and V combined, were similar to estimates from the breeding grounds (total 20,000) except in 2001/02-2002/03 but there was a higher ratio of humpbacks in Area IV: Area V than would have been expected from the 12,000: 8,000 ratio in the breeding grounds, although as noted there may be movement between the Areas.

A number of recommendations were made to improve the estimates, and the comparability of the estimates, between years. At present, despite high numbers of sightings in many individual strata, all strata are pooled to estimate school size and search half-width estimation, despite high numbers of sightings in many individual strata. It was **recommended** that estimating these parameters separately for each stratum when the number of sightings is greater than a certain number, for example 15 was used in Branch & Butterworth (2001a). It was suggested that models other than the hazard rate function could have been fitted to the detection function, although the methods used were the same as in the IDCR-SOWER humpback estimates (Branch & Butterworth 2001b). It was also noted that the effective search half-width and estimated school size were variable.

Of concern was that the region with highest sightings density, the northern area between 100ºE and 130ºE had poor survey coverage in 1989/90, thus estimates for Area IV in that year may be biased low. In other years, survey coverage in Areas IV and V was comparable. However, in the E part of Area III, the survey strata were extended northwards in 1999/2000 and 2001/02 compared to previous surveys. In addition, in the northern stratum of the west part of Area VI in 1998/99 there was no survey effort, and thus this stratum should be excluded from the analyses in that year.

SC/56/SH15 reported on the movements of two satellite-tagged humpback whales from the Antarctic Peninsula. One of three deployed tags failed to work, while the other two operated for 72 and 59 days, respectively. A total of 612 and 306 positions were obtained, and the two whales showed marked differences in movements: one remained in or near the Gerlache Strait area during the entire time, while the other moved north into Bransfield Strait, then south and southwest, reaching its southernmost position at 71.51 S, 81.98 W; its final tracking position ws near the Margeurite Bay area.

SC/56/O12 reported the sightings of humpback whale in 2003/04 JARPA cruise. Total primary sightings of humpback whales were 1690 schools and 3134 individuals. Total sighting numbers of humpback whales were the largest in JARPA history. They distributed widely off the Area IIIE and 90E to 110E in Area IV. They were highly abundant even near the ice edge of Area IV except around the Davis Sea and Prydz Bay. The distribution of humpback whales expanded not only offshore but also near the edge in recent cruises. Distribution of humpback whales was rarely overlaps with those of Antarctic minke whales near the ice edge. The results suggested the two species could use difficult habit along the ice edge. However, in discussion it was noted that there was not confirmed direct competition between the species. Abundance of Antarctic minke whales in Area IV using JARPA data was stable even though abundance of humpback whales was significantly increased. Current abundance trend of both species indicated there was no identification of inter-specific competition between them. In discussion it was noted that there was no direct evidence for this and therefore that this must be regarded as speculation; the authors agreed and noted that when humpback whales were sighted it had no apparent effect on the local abundance of minkes.

SC/56/IA13 presented the report of the SOWER 2003/04 circumpolar survey. The 81-day cruise departed Hobart, Australia on 19 December 2003 and returned to Hobart on 8 March 2004. The research area was surveyed in three contiguous strata. The Northern Stratum 170°E to 170°W was surveyed first, followed by two strata in the Ross Sea (the Intermediate and Southern Strata). A total 126 groups of 247 individuals of humpback whales were observed during entire survey. A total of 54 groups of 96 individuals were sighted in the Northern strata, a total of 68 groups of 144 individuals were sighted in the intermediate stratum, and there were no humpback whales sightings in the Ross Sea. Two biopsy samples were collected from two individuals and 11 photo-id images were taken from 11 humpback whales.

SC/56/E24 summarized four cruise reports for the Southern Ocean IWC-GLOBEC/CCAMLR collaboration; the cruises were conducted between January and March 2004. One cruise was in the Ross Sea, another in the Weddell Sea, one in E Antarctica, and one off the western Antarctic Peninsula; the latter two cruises were primarily intended to retrieve passive acoustic monitoring devices. There were relatively few humpback whales sightings on these cruises.

SC/56/E26 investigated the seasonal presence of humpback whales in the western Antarctic Peninsula during the austrral autumn and winter through passive acoustic data, as well as visual and sea ice data. The objectives of the study were to determine whether humpbacks were acoustically active during the period, to assess whether there were correlations between acoustic and sighting data, and to assess the effect of sea ice on humpback whale distribution. Between March 2001 and February 2003, eight acoustic recording dev ices were deployed off the western Antarctic Peninsula. Humpback calls were detected between April and mid-July 2001 and from April to early June 2002. Only 37 days of calling were detected in 2001 (at two sites) and 61 days over six months in 2002 (at four sites). The calling pattern was not consistent or predictable, and it is possible that there is a strong social- or feeding-related basis to the timing and nature of calls which was not yet understood. Sighting survey detections of humpbacks were made during February/March through late May in both 2001 and 2002 and in February/March 2003 (371 sightings of 850 individuals). Humpback numbers for late summer/autumn were 75 groups of 152 whales in 2001, 178 groups of 410 whales in 2002, and 118 groups of 288 groups in 2003. One winter sighting of two whales was made in August 2002 near Anvers Island. The primary habitat used by the whales during all years were the fjords and coastal areas, whether ice was present or not; however numbers increased in the study area when sea ice was present in Marguerite Bay, a fact which may reflect the availability of krill in these areas. It appears that the whales use the ice edge and diffuse outer margins as additional (but not primary) feeding habitat.

In discussion, it was noted that E26 provided another demonstration of the value and cost-effectiveness of passive acoustic monitoring to determine occurrence of whales in locations which would otherwise be difficult or impossible to continuously monitor because of logistics, weather and other factors. Examination of the calls to determine whether they were of humpback whale song would be useful to ongoing studies of humpback whale song and the mating system. The question was raised whether the recorded calls were of males or females; the response was that, if this was humpback song, then it would be (probably mature) males. However, the occurrence of song during summer and autumn does not necessarily indicate non-migrating whales, since humpback song has been recorded elsewhere in the world on feeding grounds at this time and in spring.

5.3 Further population dynamics modelling

SC/56/SH17 presented a Bayesian population assessment of the Southern Hemisphere humpback whale breeding stock A off the eastern coast of South America. A deterministic age-aggregated population dynamics model was fitted to modern whaling catch data, one absolute abundance estimate, and two indices of relative abundance with the goal of estimating the pre-exploitation population size (K), the maximum net recruitment rate (r_{max}), the maximum depletion level (N_{1968}/K), and other status indices. A Bayesian statistical model was used to calculate probability distributions for the model parameters and other quantities of interest. Prior distributions were set on r_{max} (uninformative = U[0, 12.6%] and informative = N[6.7%, $4\%^2$]) and N_{2002} (U[ln(350); ln(15000)]). Sensitivity of model outputs to various catch allocation scenarios, to the utilisation of different input data and to the specification of different prior distributions were investigated. Results indicate that the posterior probability distribution for r_{max} is relatively robust across all scenarios, but uncertainty around this estimate is large. Estimates of K are more sensitive to different catch allocation hypotheses. Posterior probability distributions of quantities of interest for the base case scenario are: K = 21,526 (95% CI = 19,990-26,106), N_{1968}/K = 1.3% (95% CI = 0.4%-8.8%), N_{2004}/K = 24.2% (95% CI = 13.3%-42.2%), and N_{2020}/K = 72.6% (95% CI = 23.1%-96.6%). The author noted that despite apparent recovery in recent decades, the western South Atlantic humpback whale population is still low relative to its pre-exploitation size and requires continued conservation efforts. He also noted that existing allocation of catches to breeding stocks may require revision in light of more recent knowledge regarding migratory connections, since such allocations influence assessments of current population status. In discussion, it was noted that it was difficult to reliably calculate trend from the data presented. It was also noted that the low catches of humpback whales at Cabo Frio, Brazil (only 10 animals taken from 1960 to 1963) was consistent with the model results showing a very low depletion level at this time.

SC/56/SH20 provided updated age-aggregated production modelling assessments of the Southern Hemisphere humpback whale breeding stocks A (off Brazil) and C (western Indian Ocean). The computations were based upon new assessments of abundance and trends. Results for stock A were broadly consistent with the analysis of SH17, and suggest current abundance is in the vicinity of 30% of the pre-exploitation level. Stock C is estimated to be close to carrying capacity (K), though a more comprehensive error analysis is warranted before definitive conclusions are drawn. In discussion, the use of rates of increase from Australia for Stock A was questioned; it was suggested that use of rate of increase information now available for this stock was to be preferred. The authors of SH20 suggested that use of the results of SH17 would likely provide a more accurate estimate of the status of breeding stock A.

Discussion on SC/56/SH20 ensued pertaining to the inputs used for the model in this paper for Stock C. Significant progress had been made in reducing the range of possible model inputs, especially due to data presented in SC/56/SH12. However, a number of reservations from SC/52 still remain, as the authors of SC/56/SH20 and the sub-committee acknowledge. The central issue is possible "double counting" in the estimates presented for the C sub-stocks in SC/56/SH12 and Best et al. (1996) and in the allocation of Antarctic Area III catches to Wintering Region C stocks.

The interpretation of information to differentiate sub-stocks within Region C and relevance to model inputs varied among members of the Sub-Committee. Some felt that results from SC/56/SH3 and from SC/56/SH4 indicate varying degrees of sub-structure, which raises concerns as to the degree to which estimates for individual sub-stocks (i.e. C1, C2, or C3) include animals from some proportion of more than one sub-stock. This could potentially overestimate abundance for the entire C stock if there is "double counting". Others felt that this would not impact the estimate of abundance of the C stock, because the line-transect methodology (which estimates whale density irrespective of stock identity) and the expectation that the sub-stock components are on separate migratory streams that do not have significant overlap (the surveys to derive estimates of abundance for Mozambique in SC/56/SH12 and for southern Madagascar in Best et al. (1996) occurred at a similar within-year timeframe but took place in different years). A more in-depth analysis of results of samples obtained by Findlay et al. (1994), Best et al. (1996), SC/56/SH12 as well as other sites within Region C is recommended and may provide needed resolution on stock identity.

It was noted that animals on other low-latitude breeding areas (i.e. Madagascar/Antongil Bay (C3) SC/52/IA10) were not included in these abundance estimates used in SC/56/SH20 so that these could reflect a bias towards underestimating stock size. Rosenbaum indicated that more precise estimates of stock-structure and abundance estimates based on 10 years of data for C3 could be presented in upcoming SC meetings so that the most comprehensive set of estimates and associated expectations could be included in the modelling procedure.

While SC/56/SH20 suggests the population is approaching carrying capacity, there are no independent data to suggest this is actually occurring. Some discussion therefore ensued pertaining to whether it would be possible to better monitor population characteristics (e.g. trends in pregnancy rates) from these breeding grounds in order to evaluate whether the population is approaching carrying capacity. The sub-committee thought this would be

difficult given low-resighting rates on humpback whale wintering grounds and the only place this would likely occur in the near future would be in C3 (Antongil Bay, Madagascar).

Butterworth pointed out that the catch from high-latitude Area III feeding areas could not be further apportioned to Wintering Region C sub-stocks. This is the other major area where uncertainty remains that will effect model output. Rosenbaum indicated that genetic analyses comparing Area III Antarctic and C1, C2, and C3 will be presented to the sub-committee shortly, but also indicated that similar problems may occur with analysis of genetic data at the sub-stock level.

The sub-committee recognized that for the immediate future, assessments at the sub-stock level would require additional information and recommended that assessments at the stock level continue.

As discussed by the Scientific Committee with respect to concern and clarification for use of the term "recovery", the sub-committee agreed that the Wintering Region C is showing rates of increase within the range of biologically plausible values for this species. However, this rate of increase is not fully consistent with the outputs of the population model in SC/56/SH20. If breeding stock C is indeed close to carrying capacity, one might expect to see changes in certain biological parameters such as changes in age at first reproduction. However, while such parameters have been monitored over long periods in other places (e.g. the Gulf of Maine), it would be logistically difficult to achieve sufficient effort in the feeding or breeding areas concerned. Revised analyses with new abundance estimates, examination of low-latitude Soviet catch data, and consideration of biological parameters, particularly gene flow and sub-structure, are recommended in order to more effectively evaluate how close this stock is to its pre-exploitation size.

The large variance associated with the estimate of increase rate also provide strong motivation for a resumption of the shore-based surveys at Cape Vidal that ceased in 1992, so that this rate can be estimated with greater precision and it is **recommended** that more precise definitions of sub-stocks be clarified (potentially to be provided by the Stock Definition Sub-Committee) so that 'within-region' genetic analyses can help evaluate population structure and increase within this management context.

Overall, the Sub-committee agreed that reallocation of catch data where appropriate was important and that discussions of the status of populations should be continued pending these revisions.

Sub-committee members involved in modelling agreed to continually review the results of recent and future studies that were relevant to assessment, as such data become available, and also to communicate with paper authors as appropriate to ensure that caveats and other considerations are identified. The Table produced by Bannister's intersessional working group summarizing current knowledge on Southern Hemisphere humpback whale populations *(reference)* will be updated as better information becomes available.

5.4 Antarctic Humpback Whale Catalogue

SC/56/SH14 presented updated information on the Antarctic Humpback Whale Catalogue (AHWC), which has collected identification photographs since 1987. The collection contains photographs from 170 researchers and opportunistic sources. During the period of the most recent IWC contract, the AHWC catalogued 686 photographs representing 319 individuals from Antarctic and Southern Hemisphere waters. The total number of individuals in the AHWC currently stands at 1,979. From the latest submissions, sixteen individuals were resightings from the same area, and 14 were matched between two areas. The latter including matches between the Antarctic Peninsula to Colombia (4), Ecuador (1) and Costa Rica (1). Within-area matches included animals seen off the Peninsula (7), Chile (5), Colombia (2), Gabon (1) and Western Australia (1). The longest interval between resightings was 18 years. All catalogue photographs have been digitised, and associated data are stored in a relational database. The AHWC is available online at http://www.coa.edu/antarctic, although not all images are publicly available. The connection between the Antarctic Peninsula and western South America (43 matches), and the lack of matches between the former area and Brazil, is consistent with matching results reported by Stevick *et al.* (JCRM in press).

5.5 Other

SC/56/E12 reports preliminary data of an evaluation of the risk of chronic exposure to oil-born aromatic hydrocarbons (PAHs) for the humpback whale population wintering off the coast of Gabon, an area of intensive oil exploration. Very low biomarker CYP1A1 expression was detected in skin biopsies compared with studies in other areas, the paper provides some plausible hypotheses that may account for this low level. Expression in other resident cetaceans (e.g. Atlantic humpback dolphins) that feed in Gabon waters will be evaluated. Due to increasing oil-exploration activities world wide, similar studies are becoming more important to monitor critical habitats for which concerns may arise.

SC/56/SH13 summarized preliminary results from a space-time imaging system to detect and track humpback whales from a land-based observation platform. Shore-based counts of northward-migrating humpback whales

were made between 1988 and 1991, and again in 2002, from Cape Vidal, northern KwaZulu Natal, South Africa. Methods used for abundance estimation require that the offshore distribution, and migration speeds and headings of each group be determined. Between 1988 and 1991 whale groups were tracked by survey theodolite, although increases in densities of animals recorded in 2002 necessitated that alternate tracking methods be investigated. A five-day survey was carried out from two platforms at Cape Vidal during July 2003, to assess the feasibility of utilising video space-time imagery to track humpback whales from the shore. Initial results suggest that the method is feasible, with immediate computation of migration speeds and headings, and distance offshore. The system offered considerable savings in effort over theodolite tracking, allowing observers to concentrate effort on searching, and may be developed to include detection applications in the future.

The Sub-committee welcomed this paper and recognized the value of the technique. The Sub-committee also **recommended** that additional work be conducted in the Cape Vidal area to provide updated information on rates of increase.

5.6 Work required to complete assessment

It was noted that substantial progress had been made in recent years in improving the understanding of humpback whales in the Southern Hemisphere and Arabian Sea. The summary table of the current state of knowledge for Southern Hemisphere (provided on the IWC website at www.iwc.org) provides a very useful summary and also identifies areas for further consideration. Future research should be aimed at addressing these outstanding issues. Until these issues have been adequately addressed it is difficult to set a deadline for the completion of the Comprehensive Assessment.

5.7 Work Plan

This item was considered under Item 7.

6. OTHER ITEMS

6.1 Fin whales

SC/56/SH11 presented estimates of abundance for fin whales in Antarctic Areas III-E, IV, V and VI-W, based upon sighting data obtained by JARPA between the 1989/90 and 2002/03 austral summer seasons. Abundance estimates of fin whales in Areas III-E, IV, V and VI-W were 3,382 (CV=0.52), 7,642 (CV-0.26), 3,031 (CV=0.33) and 474 (CV=0.32), respectively. For the research area the total estimate was 14,259 (CV=0.20) in 2001/02 + 2002/03 seasons. In Area IIIE, abundance estimates of 3,113 (CV=0.24) in 1995/96, 78 (CV=0.58) in 1997/98, 3,315 (CV=0.28) in 1999/2000 and 3,382 (CV=0.52) in 2001/02 seasons. In Area IV, present abundance estimates of 63 (CV=0.97) in 1989/90, 129 (CV=0.64) in 1991/92, 189 (CV=0.45) in 1993/94, 1,191 (CV=0.32) in 1995/96, 637 (CV=0.34) in 1997/98, 1,162 (CV=0.32) in 1999/2000 and 7,642 (CV=0.26) in 2001/02 seasons. In Area V, present abundance estimates of 726 (CV=0.31) in 1990/91, 1,397 (CV=0.38) in 1992/93, 6,334 (CV=0.37) in 1994/95, 1,294 (CV=0.32) in 1996/97, 4,655 (CV=0.37) in 1998/99, 4,802 (CV=0.25) in 2000/2001, 3,031 (CV=0.33) in 2002/03 seasons. In Area VIW abundance estimates were obtained of 420 (CV=0.26) in 1996/97, 1,789 (CV=0.75) in 1998/99, 1,074 (CV=0.30) in 2000/2001 and 474 (CV=0.32) in 2002/03 seasons. Because data in Areas IIIE and VIW were not obtained in the peak migration period, results in these Areas are underestimated. Fin whales tended to be distributed in Area V rather than Area IV. They were widely dispersed and also rarely found within the Prydz Bay and the Ross Sea. Compare to distribution pattern between the first half of surveys (1989/90-1995/96) and late of surveys (1996/97-2002/03), fin whales appeared in the western part of Area IV in recent years. Instantaneous increase rates for fin whales were 29.8% (CV=0.10) and 12.9% (CV=0.25) in Areas IV and V, respectively. A preliminary estimate of this species south of 30 S between 35 E and 145 W, based on JARPA data and JSV data was 68,000 (CV=0.21).

In discussion, the same concerns and responses were exchanged regarding these estimates of abundance and rates of increase as occurred with regard to the humpback whale portions of SH11 (see 5.2.4). It was also noted that the 8-fold increase observed in abundance of fin whales in Area IV, which could not be explained by a biological rate of increase and might indicate either immigration into the area or unreliable survey data. Furthermore, it was noted that if trends were calculated for Area V beginning in 1994/95, the data would actually show a decrease in the population through the most recent abundance estimate (for 2002/03). Whether the coincident increase in Area IV with the decrease in Area V over this time period indicated movement between these areas is not clear. It was also not clear how the authors had estimated abundance from such a small number of sightings in Area IV in 1989/90. Combining data from some years might allow for better estimates. In addition, it was noted that estimates of abundance based upon extrapolations from JSV data are controversial within SC. Lastly, it is likely that a significant portion of the fin whale population feeds north of 60 S, and this should be taken into account in interpreting the presented estimates. Kato stated his belief that current

abundance estimates are negatively biased, because JARPA surveys did not conducted in their high density area, north of 60 S.

6.2 Blue whales

SC/56/SH21 presented recent records of blue whales in the northwestern region of Chiloe island, Chile (the site of a former whaling ground). A total of six sightings of 15 blue whales were made from a survey conducted between February 16 and March 17 2004. The presence of blue whales and observations of defecation off Chiloe island suggests that the feeding and nursing ground identified by Hucke-Gaete *et al.* (2003) could at least extend as far north as 41 45 S. The authors suggested that protection of this area should be a high priority.

Branch updated the Sub-committee on evidence for increases in Southern Hemisphere blue whale populations, derived from IDCR/SOWER, JSV and JARPA data and incorporating comments made on an earlier analysis presented at SC last year. The paper (Branch *et al.* in press) noted that blue whales were hunted to near-extinction last century, and further that estimated whaling mortality was unsustainable from 1928–72 (except during 1942-44), depleting them from 239,000 (95% interval 202,000–311,000) to a low of 360 (150–840) in 1973. The authors noted that obtaining statistical evidence for subsequent increases has proved difficult due to their scarcity. The study fitted Bayesian models to three sighting series (1968–2001), constraining maximum rates of increase to 12% per annum. These models indicated that Antarctic blue whales are increasing at a mean rate of 7.3% per annum (1.4–11.6%). Informative priors based on blue whale biology (4.3%, SD = 1.9%) and a Bayesian hierarchical meta-analysis of increase rates in other blue whale populations (-0.3%, SD = 11.6%), suggest plausible increase rates are lower (although the latter has wide intervals), but a meta-analysis of other mysticetes obtains similar rates of increase (6.7%, SD = 4.0%).

Branch explained changes that had been made to this paper in response to comments made last year. These included: 1) The catch series was updated, paying particular attention to trying to exclude any possible pygmy blue whales. The final catch series included 329,623 Antarctic blue whales, and excluded 12,618 pygmy blue whales. In addition, 20,638 catches of blue whales (unspecified) caught in the South Atlantic, South Pacific and Indian Ocean, were not included. 2) A section was included describing the separation between pygmy and Antarctic blue whales, and note that our abundance estimates and catch series may still include a small proportion of pygmy blue whales, no more than 7%. 3) The maximum likelihood point estimate of pre-exploitation abundance was replaced with a Bayesian posterior. 4) An error in the meta-analyses of other blue whales, and of other whale populations, was corrected. These estimates now have considerably wider probability intervals, and when used as informative priors on the rate of increase, they do not have much effect on the posterior for the rate of increase (see p. 31). 5) The meta-analysis estimate for rates of increase in large cetacean populations was revised to 6.7% (SD = 4.0%). The estimate used only published rates of increase. This estimate was the one that was used as an informative prior for rates of increase in SC/56/SH17. In addition, considerable text was added incorporating much of the discussion and appendices from last year's SH report was incorporated into Branch et al (*in press*), better explaining the various methods used in obtaining the results in this paper, and addressing alternative hypotheses for the rates of increase in the discussion. Finally, Branch noted the paper's conclusion that although Antarctic blue whales appear to have been increasing since Soviet illegal whaling ended in 1972, they still need to be protected, since their estimated 1996 population size, 1700 (860–2900), was just 0.7% (0.3–1.3%) of the estimated pre-exploitation level.

The Sub-committee welcomed this work and thanked Branch for addressing many of the issues identified last year. The Sub-committee **agreed** that this research represents a considerable advance on previous work and supports the conclusions that, (a) on average, the Antarctic blue whale population is increasing at a mean rate of 7.3% per annum (1.4–11.6%); (b) had an estimated circumpolar population size of 1700 (860–2900) in 1996; and (c) that this population is still severely depleted with the 1996 population estimate estimated to be at 0.7% (0.3–1.3%) of the estimated pre-exploitation level.

The Sub-committee next considered the work required to complete an assessment of Southern Hemisphere blue whales, as summarized by a working group convened by Bannister. It was noted by the group that the state of knowledge for Southern Hemisphere blue whales is considerable less advanced than for humpback whales, both in relation to population differentiation and estimates of numbers. However it was pointed out that recent work by Branch *et al.* (*in press*) has provided a considerable advance on previous work. A summary of present studies and reports was provided by the working group. Bannister agreed to continue the existing inter-sessional group on blue whales, and said that any new information would be considered as it became available.

The Sub-committee agreed to request an update on the status of acoustic and genetic data on blue whales from the SOWER cruises with a view to potentially integrating new information into efforts to assess Southern Hemisphere blue whales.

6.3 Other

SC/56/BC3 presented information on phylogenetic relationships among sei whales as determined by genetic analysis of mtDNA sequences, including those available in the SWFC archive in the USA. The analysis suggested strong differentiation of the North Atlantic samples, and a closer relationship between the North Pacific and the Southern Hemisphere sei whales. In discussion, the possibility of examining additional sei whale material stored in formalin (such as ear plugs and foetuses, etc) for genetic analysis was raised; extraction of DNA from formalin-preserved samples was thought to be of variable success. The value of a global investigation of the population structure of sei whales was recognized and the Sub-committee **recommended** that the availability and practicality of using such material be investigated. It was agreed to pursue this by assembling a table of potential sources of samples.

7. DRAFT WORK PLAN

The sub-committee agreed that considerable progress had been made in some areas of the work plan from last year; however many items still required further investigation. In particular, the sub-committee again **recommended** that the assessment of blue whales start in 2006, and to ensure that the necessary materials are available for the review, the sub-committee re-iterated the items identified at last years meeting (IWC 2004; Section 6.6, p 249) as important tasks to be addressed before 2006. In addition, the sub-committee proposed the following new work related to completing the Comprehensive Assessment of humpback whales:

(1) Investigate the distribution and allocation of historic catches to (a) proposed sub areas of breeding grounds and (b) from the Antarctic Peninsula to Stocks A and G

(2) Update the tables summarising the present state of knowledge and work required to complete a Comprehensive Assessment of Southern Hemisphere humpback and blue whales (e.g. two intersessional working groups both chaired by Bannister)

(3) Further investigation and clarification of proposed sub areas for stocks on the breeding grounds

The only item with budgetary implications is the Antarctic Humpback Whale Catalogue with a budget of £5,200.

8. ADOPTION OF REPORT

The report was adopted at 6 July 2004 19:12. On behalf of the Sub-committee, Childerhouse thanked Clapham for his excellent job as rapporteur, and the members of the Sub-committee expressed their appreciation to Childerhouse for his fine leadership.

9. REFERENCES

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Branch *et al.* (in press)

Branch & Butterworth (2001a)

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Clapham and Mattila (1990)

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Clark and Clapham (2004)

Findlay et al. (1994)

Hucke-Gaete *et al.* (2003)

Mikhalev (1997)

Stevick *et al.* JCRM (in press)

Williamson (1975)

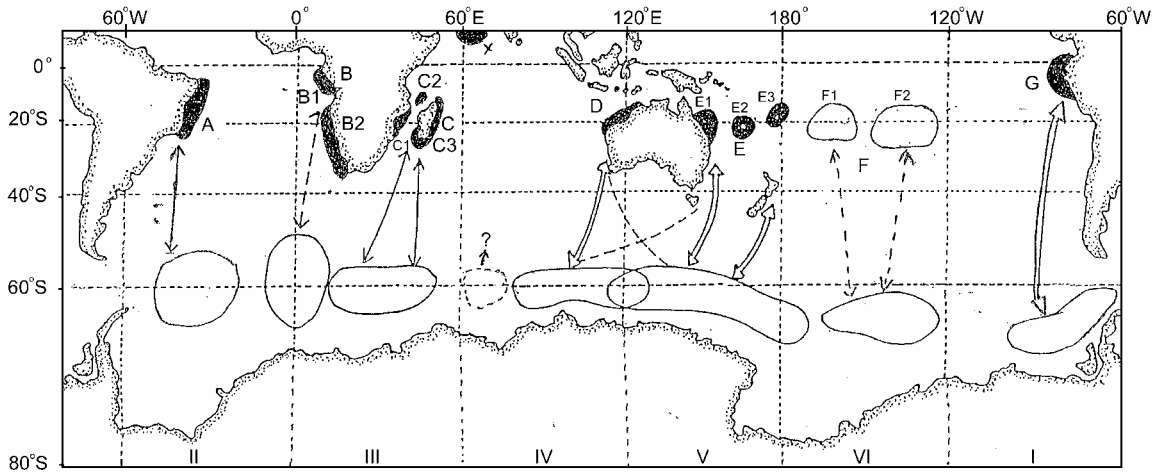

Fig. 1. New hypothetical Stock Structure for Southern Hemisphere humpback whales. This is for illustrative and discussion purposes only. The areas and sub areas identified reflect approximate, rather than necessarily exact, boundaries. A dotted line represents hypothetical connection, thin lines represent a small number of documented connections between areas from resights using Discovery tags, photo-identification or genetics, or satellite tracked whales, and thick lines represent a large number of documented connections between areas from resights using Discovery tags, photo-identification or genetics, or satellite tracked whales.

Appendix 1

AGENDA

1. Convenor's opening remarks
2. Election of Chair and appointment of rapporteurs
3. Adoption of agenda
4. Review of documents
5. Southern Hemisphere humpback whales – review progress on in depth assessment
    - 5.1. Report from intersessional group
    - 5.2. New estimates of abundance and rate of increase, stock structure information
        - 5.2.1. Africa
        - 5.2.2. South America
        - 5.2.3. Oceania
        - 5.2.4. Antarctica
    - 5.3. Further population dynamics modelling
    - 5.4. Antarctic humpback whale catalogue
    - 5.5. Other
    - 5.6. Work required to complete assessment
    - 5.7. Work plan
6. Other items
    - 6.1. Fin whales
    - 6.2. Blue whales
    - 6.3. Other
7. Work plan
8. Adoption of report

Appendix 2

SUMMARY OF INFORMATION ON ARABIAN SEA HUMPBACK WHALES (STOCK X)

At the 2002 meeting an intersessional group (Chair - Bannister) was established to review the current state of knowledge of Southern Hemisphere humpbacks, with the following terms of reference (IWC 54, SC Report Item 10.4.4): (a) summarise current knowledge by population or management area; (b) identify major gaps in knowledge; and (c) establish research priorities to fill the gaps. The group continued its work intersessionally, in particular to include information of the Arabian Sea population. Information on the Arabian Sea Breeding Group ('X') was provided direct by Minton on behalf of the Oman Whale and Dolphin Research Group. As it is not contained in a separate document to this meeting, it is reproduced in Table 1. The updated and revised table with information about all Southern Hemisphere humpback whale stocks is available on the IWC website at www.iwc.org.

Table on next page.

Table 1. Summary information for Breeding Stock 'X'

(1) BS Breeding Stock	(2) Feeding grounds	(3) Migration routes	(4) Breeding Grounds	(5) Commercial catches	(6) Subsistence/ Incidental catches	(7) Pop Abundance	(8) Pop Trend	(9) Age at Sex Matur	(10) Juv Survival	(11) Adult Survival	(12) Environ. Concerns	(13) Assessment Models
"X" Arabian Sea	Arabian Sea [1-5] Coasts of Oman, Pakistan and India	Within Arabian Sea? Mounting evidence that discrete from SH IO populations [4-7]	Arabian Sea (Song recorded off Oman and Sri Lanka betw. Jan and March and small calves off Oman Dec-Apr)[5,8]	242 (1965-66)[1,2]	3 (beach cast specimens) also 8 live entanglements betw. 1990 and 2000. [9]	Mark-Recapture: *Chapman corrected Petersen for Oman study areas*[4,6] (2000-2003) between year re-sights: 56 (95% CI = 35-255) between study area re-sights: 45 (95% CI = 46-154)	?	?	?	?	? (unknown how global warming will affect Arabian Sea)	None
Score (0-3, unknown to well-known)	1	0	2 (limited knowledge in Oman only)	3	1	2 (based on limited work off the coast of Oman only)	0	0	0	0	0	0

References

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4. Minton, G., Collins,T.J.Q. and Findlay, K.P, 2003.. A note on re-sights of individually identified humpback whales (*Megaptera novaeangliae*) off the coast of Oman. SC/55/O10, 1-7. Document presented to the 55th meeting of the International Whaling Commission.

5. Minton, G. *et al.* 2002. Preliminary investigations of humpback whale (Megaptera novaeangliae) distribution and habitat use off the coast of Oman. SC/54/H3, 1-19.. Document presented to the 54th meeting of the International Whaling Commission.

6. Minton, G. Ecology and Conservation of Cetaceans in Oman, with particular reference to humpback whales (*Megaptera novaeangliae*). Thesis in prep. for University of London, University Marine Biological Station, Millport.

7. Rosenbaum, H.C. *et al.* 2002. Preliminary analysis of MtDNA variation among humpback whales off the coast of Oman and their relationships to whales from wintering grounds in the southwestern Indian Ocean. SC/54/H4, 1-10. Document presented to the 54th meeting of the International Whaling Commission.

8. Whitehead, H. 1985. Humpback whale songs from the North Indian Ocean. *Investigations on Cetacea* 17, 157-162).

9. Oman Whale and Dolphin Research Group 2004.. Oman Cetacean Database (OMCD).

With reference to TOR 3, the Oman Whale and Dolphin Research Group defines the following as research priorities related to stock assessment for the Arabian Sea:

1) Continued photo-ID, biopsy and acoustic recording off the coast of Oman, with more extensive seasonal and geographical coverage.

2) Line-transect surveys off the coast of Oman for more accurate population abundance estimates.

3) Exploratory small-boat or line-transect survey work in the Gulf of Aden, and on the Arabian Sea coasts of Sri Lanka, India and Pakistan to search for possible additional feeding and/or breeding grounds –coupled with the capacity to conduct photo-ID, biopsy and acoustic work if additional grounds found.