

RELATIVE ABUNDANCE OF LARGE WHALES AROUND SOUTH GEORGIA (1979–1998)¹

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ABSTRACT

To assess large-whale stocks following the cessation of land-based South Georgia whaling in 1965, we report three independent sighting databases: a

¹ A tribute to Ken Norris by Roger Payne. Anticipating that many others will use this opportunity to reaffirm Ken Norris's secure place in the history of cetacean biology I will use the chance to talk about Ken as a person. With his wife Philly he raised a wonderful family, built an unexcelled house among the redwoods (with 'puk puks' in the living room), and gave

cruise in 1997, observations from Bird Island (NW of South Georgia) between 1979 and 1998, and mariner sightings between 1992 and 1997. All species were rare, with sightings of southern right whales being the most common event. Two right whales photographed off South Georgia matched animals known from Peninsula Valdés, Argentina, a population known to be growing at 7% *per annum*. In contrast, blue and fin whales appeared to be less abundant. A single blue whale mother-calf pair was observed off the Shag Rocks in February 1997. Extirpation of animals from this particular feeding ground is the most likely reason for ongoing low numbers of all species. Other factors may include competition for krill by traditional predators such as penguins and seals and more recently by humans, an unusually high rate of natural mortality, habitat change such as alteration in sea ice coverage, and/or the impact of ongoing whaling. The history of this critical area of large-whale habitat and this report demonstrate the need for improved, consistent long-term monitoring of population trends for these depleted stocks.

Key words: South Georgia, survey, whale, right whale, Antarctic, whaling.

"I see them in hundreds and thousands." So said the Norwegian, C. A. Larsen, of large whales in South Georgia waters in 1903 (Bogen 1954). In the following year he opened the first whaling station in South Georgia. Between 1904 and 1965, 175,250 whales were processed at various combinations of six whaling stations and a variety of immobile processor ships in South Georgia (Fig. 1). The low catch of right whales reflects their earlier heavy exploitation by the end of the 19th century (Matthews 1938). The early 20th-century catches were taxed to fund the Discovery Investigations, where "preservation of the whaling industry" was the overall goal (Anon. 1920). This very substantial research effort included studies on hydrography, nutrients, krill, and whale distribution in the area (Hinton 1925, Kemp and Bennett 1932, Hardy and Gunther 1935, Matthews 1938). In spite of this knowledge base, the local stocks were severely depleted (Fig. 2), and with each successive decade the distance traveled by the catcher fleet increased² as pelagic whaling in the southern ocean became increasingly circumpolar. Thus, the development of pelagic factories and a lack of controls on local whaling led to commercial extinction of both the whales and the shore-based whaling industry by 1965.

Although shore-based activity ceased in 1965 at South Georgia, cruise ship

scores of students both the scientific wallop and the confidence to protect the environment. In addition to all that he created the Marine Mammal Society—no small feat given the fairly high PIP (*primus inter pares*) coefficient of some of our colleagues. As with the most distinguished members of any field there was no pettiness in Ken. He used his time and talent getting people to pull in the same direction. This was an aptitude the government recognized—it called on him again and again to oversee committees dealing with thorny, divisive issues. I sat on several, watching with admiration as Ken plied his trade at the head of the table, bringing us always to amiable conclusions. It was always a pleasure to see him, and hear his wonderful accounts of what he'd been up to. And it always made me glum to have to say goodbye. This time it's harder than ever.

² John Bannister, % W. Australia Museum, Francis St, Perth, W. Australia 6000, Australia 9/98 (Whaling Inspector, Grytviken 1961).

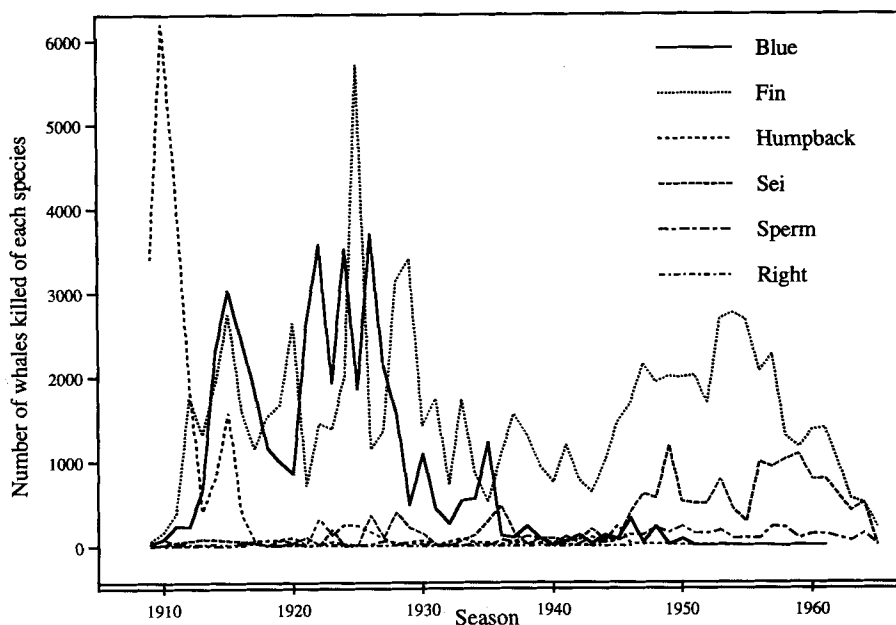


Figure 1. Annual catch for shore stations and shore-based floating factories in South Georgia, 1910–1965. Data do not include pelagic operations in area, which were not ever substantial, as vessels usually operated farther south near the ice edge. (Anon. 1931, 1952, 1966).

naturalists³ and other mariners⁴ in the area have suggested a general low abundance of large whales around both South Georgia and the Antarctic Peninsula. Around the Antarctic Peninsula the most abundant species appears to be the humpback whale. In 25 yr in the area aboard a yacht, Jerome Poncet saw and reported one blue whale. Other published reports of large whales around South Georgia (Lockyer 1977, Goodall and Galeazzi 1986, Gil de Sola 1989, Best *et al.* 1993, Ashford *et al.* 1996) are sparse. Right-whale sightings were reported during the 1958–1959 sei-whaling season (Bonner 1987); sightings began at the end of January and peaked in March. Since the cessation of land-based whaling there has been no systematic report of large-whale population status in this area.

This paper summarizes three independent data sets for whale sightings on and around these whaling grounds: sightings data from a survey cruise January/February 1997, a continuous data series from land-based observations by British Antarctic Survey personnel from Bird Island, South Georgia, between 1979 and 1998, and observations reported by regional mariners over the period

³ Kim Robertson, New Island, Falkland Islands and Megan McCosker, Bar Harbor, ME USA 12/97 (Cruise ship naturalists).

⁴ Salley and Jerome Poncet, Beaver Islands, Falkland Islands (Naturalists) and Skip Novak, 92 Satchell Lane, Hamble Hants, UK (Charter skipper) 2/97.

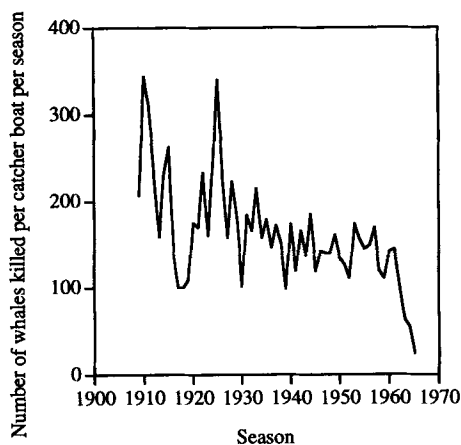


Figure 2. Number of whales killed per catcher boat per year for South Georgia shore stations and shore-based floating factories. Catcher fleet averaged 18 vessels (SD = 7). (Anon. 1931, 1952, 1966).

1992–1997. Lack of controlled effort data precludes any population estimates, but we do establish the relative abundance of the species observed in the area.

METHODS

1997 ship survey—Between 22 Jan and 17 Feb 1997, the R/V *ABEL-J* cruised from Stanley, Falkland Islands, to the Shag Rocks and the waters north of South Georgia (Fig. 3). A watch was maintained for the entire cruise during adequate daylight and visibility. (Two observers were stationed at the highest practical position. The observer team consisted of MJM, PKH, RS, and BAJ.) Three vantage points were used. In relatively calm seas, the foremast observation platform at an eye height 13.8 m above sea level was used. In rougher seas, the wheel house roof was used at an eye height 9.0 m above sea level. In conditions of major precipitation and/or high wind chill, observations were

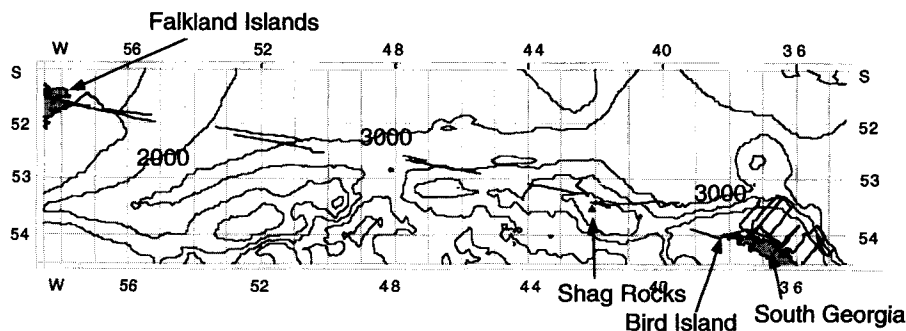


Figure 3. Cruise track by R/V *ABEL-J*, 24 January 1997 through 17 February 1997. Solid lines represent time spent surveying for cetaceans. Depth in meters.

made from within the wheelhouse at an eye height of 6.7 m. Observations were suspended in less than 500-m visibility. Each observer recorded sightings from amidships to the bow, one looking to port and the other to starboard. Data were recorded on a standard form every 30 min, at any course change, and at each sighting. Data included date, time, latitude, longitude, depth, water temperature, vessel heading, and subjective estimates of visibility, cloud cover, Beaufort wind strength, and sea state (1–4). When sightings were made, the survey track was suspended and the animals approached if necessary for species confirmation, a count of the individuals present, and photography for individual identification. A 5.5-m inflatable boat was launched for this purpose if conditions allowed. Inclement weather and high mean sea state precluded a numerical census analysis. Individual whales were photographed using focal lens lengths of 70–300 mm, with 200 or 400 ASA 35-mm slide film.

1979–1998 Bird Island sightings—Bird Island (54°00'S, 38°02'W) is a small island (6.5 km by 1.5 km) lying 0.5 km off the northwestern tip of South Georgia. The British Antarctic Survey (BAS) has occupied a research base there every summer since 1975–1976 and throughout the year since September 1983. In winter (May to October) personnel usually number three, occasionally four, and in summer (November to April) a maximum of eight. Incidental sightings of cetaceans were made from Bird Island during fieldwork being carried out on other species. These data are records of events, not individual whales, and sightings may involve more than one animal. Whales were recorded as a single sighting if they were observed together in a group. All sightings from Bird Island are recorded in an unpublished annual report (Bird and Mammal Report, Bird Island, South Georgia, British Antarctic Survey). This report is not peer reviewed, but sightings are recorded as “unidentified” if there is doubt as to the accuracy of the species identification from the description provided. Most sightings (>95%) were recorded by BAS personnel, all professional field biologists. However, no standard training in large whale identification was possible given the protracted period over which the observations were made, and the identifications, especially of the *Balaenoptera* species, must be considered tentative. Some sightings were recorded during dedicated sea-watching for seabirds and cetaceans, but the amount of time spent watching and the prevailing weather conditions are not known. Consequently, all sightings have been treated as incidental. Sightings of humpback and right whales were not always recorded individually during the summers of 1979 and 1980, nor minke whales during July 1992 and June 1993.

Mariner reports—The South Georgia Whaling Museum in Grytviken was founded in 1992 by the last sealing inspector on the island, the late Nigel Bonner. The museum is visited by yachts, cruise ships, and supply vessels, especially in the southern summer, and is a node for the exchange of information in the region. Since December 1995 a written log has been kept at the museum of position, date, time, and nature of cetacean sightings. Summaries of these sightings, along with those since 1992 from the logs of yachts *Curlew* and *Damien II*, commercial cruise ships, and British Navy ships, are given here. Reports that indicated any uncertainty as to species were classified

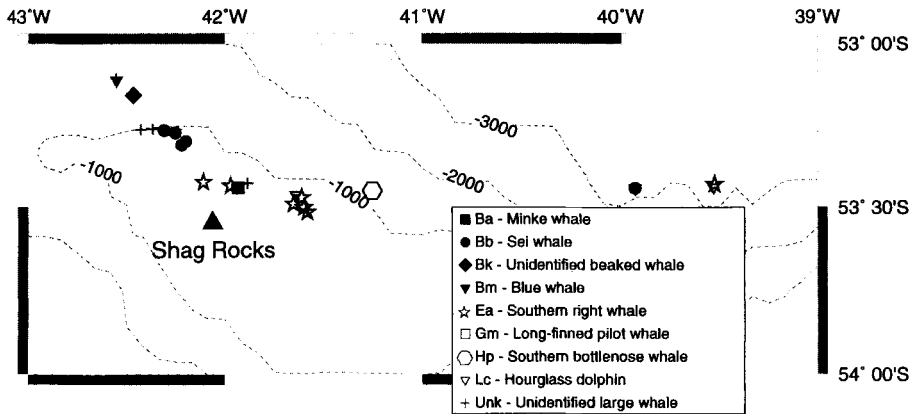


Figure 4. Cetacean sightings around Shag Rocks, 120 nmi west of South Georgia, 27 January 1997 and 12/13 February 1997. A sighting may represent more than one whale.

as unidentified. The species identification in this data set will inevitably be less reliable than the others reported here, and the data should be regarded as a general assessment of whale abundance, rather than a species-specific record.

Photographic analysis—Photographs of adequate quality from each individual right whale were compared with a catalog of photographs from Peninsula Valdés, Argentina, maintained by the Whale Conservation Institute, 191 Weston Rd., Lincoln, MA 01773.

RESULTS

Ship survey—The highest concentrations of baleen whales were observed in two major areas: adjacent to the Shag Rocks (Fig. 4) and to the north of South Georgia out to the 2,000-m isobath (Fig. 5). In the latter area all or part of seven planned track lines were surveyed. These lines were spaced at 15-nmi (27.75 km) intervals and ran perpendicular to the northwest/southeast axis of the island and northeast to the 2,000-m isobath. Surveys were conducted during daylight hours between the Falklands and South Georgia totaling 1,225 nmi (2,266 km). Sightings of one or more animals are plotted in Figure 4 (around the Shag Rocks) and 5 (north of South Georgia). The total number of individual mysticete whales observed were: southern right, *Balaena glacialis australis* (32); sei, *Balaenoptera borealis* (26); unidentified (12); fin, *Balaenoptera physalus* (5); humpback, *Megaptera novaeangliae* (5); minke, *Balaenoptera acutorostrata* (3); and blue, *Balaenoptera musculus* (2, a mother and calf). The number of individual odontocetes sighted were: longfinned pilot whale, *Globicephala melas* (~300); hourglass dolphin, *Lagenorhynchus cruciger* (28); unidentified beaked whales (9–10, probably including strap-toothed, *Mesoplodon layardii* and Arnoux's, *Berardius arnuxii*); unidentified dolphin (4); southern bottlenose whale, *Hyperoodon planifrons* (4); and killer whale, *Orcinus orca* (4). The number

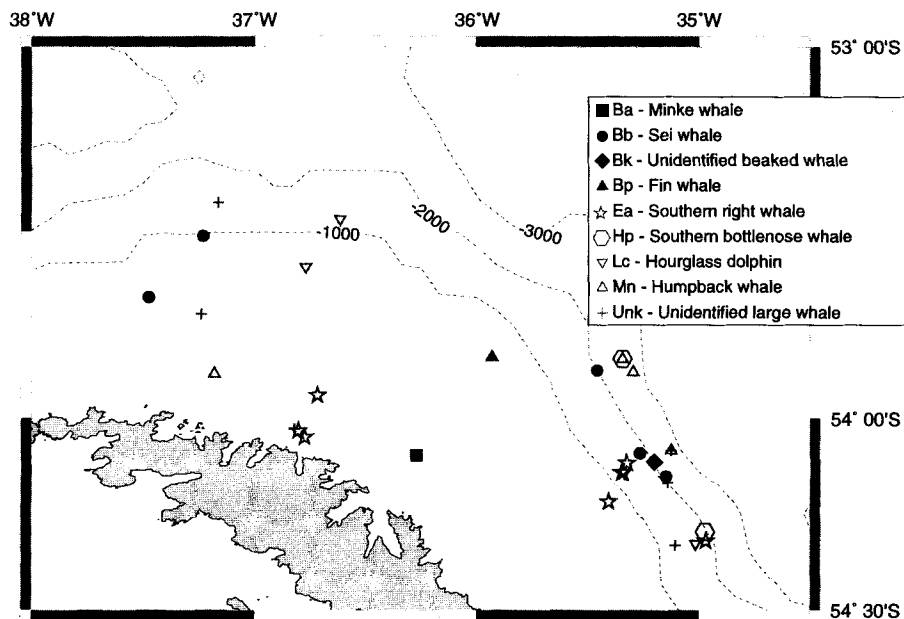


Figure 5. Cetacean sightings north of South Georgia, 30 January 1997 through 11 February 1997. A sighting may represent more than one whale.

of distinct sighting events in which these animals were seen is given in Table 1. Details of weather, effort, date, and positions of sightings are found in (Moore *et al.* 1998).

Sightings from Bird Island—A total of 141 sighting events were recorded from Bird Island between 1979 and April 1998 (Table 1). The sightings are shown by month for each species in Table 2. Whale species recorded in decreasing order of abundance were right, minke, humpback, sperm, and killer, with single sightings of fin, sei, blue, bottlenose, and pilot whales. Sighting frequency was highest in summer. In every month except February right whales were the most frequently reported whale species. At least one right whale was sighted in every month of at least one year during the time series. The years 1984 and 1994 were particularly favorable for right whale sightings (12 and 11, respectively). Right whales were seen “almost daily during January and February” in 1979 and 1980, humpback whales “regularly between December and March” in 1980, and minke whales “regularly in small numbers between November 1992 and March 1993.”

Mariner reports—Mariners reported sightings in every month of the year except August and October (Table 1). Sightings were distributed around the coast of South Georgia and during passages to and from the island. Some of the pre-1996 reports give only “winter” or “summer” as the date. The most common species were, in decreasing order: right, humpback, minke, fin, and killer whale. Blue, sperm, bottlenose, and pilot whales were also reported. The number of sightings per species is shown in Table 1.

Table 1. Sightings by species during 1997 ABEL-J cruise, from Bird Island between 1979 and 1998 and reported by mariners 1993–1998. A sighting may represent more than one whale.

	Blue	Fin	Sei	Hump- back	Right	Minke	Beaked	Sperm	Killer	Pilot	Unidenti- fied
1997 Cruise	1	2	8	4	15	2	3	0	1	1	20
Bird Island 1979–98	1	1	0	15	63	27	1	3	5	1	11
Mariners 1992–97	1	10	0	10	10	9	1	1	14	1	3

Table 2. Monthly distribution of sightings from Bird Island (1979–1998).

	Blue	Fin	Sei	Hump- back	Right	Minke	Bortlenose	Sperm	Killer	Pilot	Unidenti- fied	Total
Jan	0	0	0	2	12	4	0	0	1	1	4	24
Feb	0	1	1	3	7	11	0	0	2	0	1	26
Mar	1	0	0	2	8	7	1	1	1	0	3	24
Apr	0	0	0	3	3	1	0	0	1	0	0	8
May	0	0	0	3	11	2	0	0	0	0	2	18
Jun	0	0	0	2	5	1	0	0	0	0	0	8
Jul	0	0	0	0	6	0	0	0	0	0	0	6
Aug	0	0	0	0	7	0	0	0	0	0	0	7
Sept	0	0	0	0	1	0	0	2	1	0	1	5
Oct	0	0	0	0	3	1	0	0	0	0	0	4
Nov	0	0	0	0	1	2	0	0	0	0	0	3
Dec	0	0	0	1	4	3	0	0	0	0	0	8
Total	1	1	1	16	68	32	1	3	6	1	11	141

Table 3. Matches of individual right whales between South Georgia and Peninsula Valdés, Argentina.

Catalog ID	Gender	South Georgia		Peninsula Valdés, Argentina
		Date	Position	Year(s) + = sighted with a calf
PV79	Female	12 Feb 97	53°26.1'S, 41°58.1'W	1971, 1973, 1977+, 1984+, 1985, 1987+, 1990+
PV719	?	12 Jan 97	53°30.9'S, 41°35.1'W	1985

Catalog ID refers to unpublished catalog maintained by V. Rowntree and R. Payne, Whale Conservation Institute, Weston, MA, USA.

Comparison of photographs of right whale individuals with photographs from other South Atlantic habitats—Among photographs obtained from the 1997 ABEL-J cruise were matchable photographs from twelve right whales. Two of these animals have been previously observed from Peninsula Valdés, Argentina (Table 3 and Fig. 6). All available photographs are archived at the Right Whale Research Group, New England Aquarium, Boston, MA 02110.

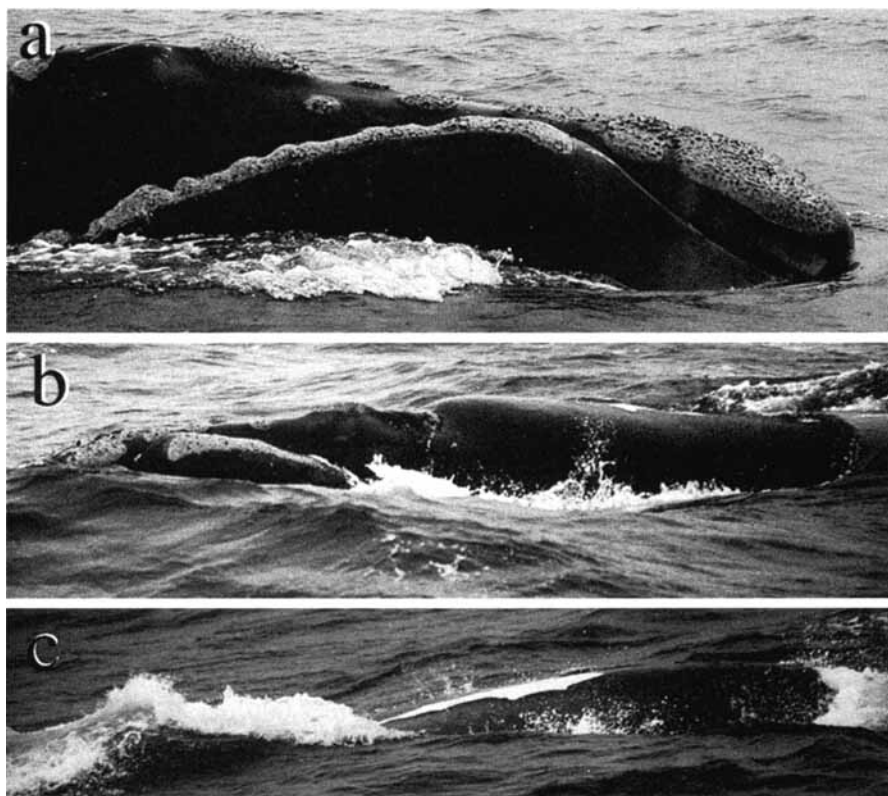


Figure 6. Southern right whales photographed off South Georgia matched to Peninsula Valdés, Argentina. a: PV719, b and c: PV79. See Table 3 for related data.

DISCUSSION

The data presented here reflect the most comprehensive assessment of large whale abundance in South Georgia waters since shore-based whaling from South Georgia ceased in 1965. To place these observations in a historic context, the catch record for the modern shore-based whaling era (1900–1965) is shown in Figure 1. Right whales were commercially extinct before this era began, humpbacks by 1915, blue whales by 1935, and fin and sei whales by 1960. The sperm whale take was always small. Figure 2 shows the parallel loss of catcher success with the passage of time.

Rarity of large whales in South Georgia waters—None of our data provide evidence of major concentrations of whales in this region despite a reported 18-yr absence of regional whaling. It is possible that the survey cruise missed major offshore concentrations, especially earlier in the summer. However, in the same season, the 1997 BAS survey cruise⁵ saw very few large whales, suggesting that the *ABEL-J* cruise did not miss large concentrations in that season. Significantly, in January/February 1998, over 200 whales were recorded around South Georgia by marine predator observers on the BAS ship *James Clark Ross*.⁵ These comprised mostly right (47), humpback (26), fin (16), and sei (8) whales, with the largest concentration being on the shelf break close to *ABEL-J* track 6. These numbers, while encouraging, are still far from historic levels. In the 1920s, when catchers were active in the area studied in this report, blue and fin whales were caught between October and May (Kemp and Bennett 1932). Blue whale catches usually peaked in December and fin whales in January (Kemp and Bennett 1932). The total catch in February (the season of the 1997 cruise) for these two species for the period 1923–1931 was 1,629 blue and 1,813 fin whales. Thus, if there had been a major concentration of either species, we would expect to have seen some evidence of this in the February *ABEL-J* cruise.

Preferred habitat—In the areas that were historically known to be large-whale habitat, *ABEL-J* naturalists observed more whales. In areas not known for whales, sightings were low regardless of sighting conditions. Thus, it appears that the historical whaling grounds are still preferred habitat. The area to the south of the island was not visited by the *ABEL-J*, but the mariner sightings reported here and historical data (Kemp and Bennett 1932) suggest that, as in the whaling era, the same species mix was present south of the island in areas and years of good krill abundance. The Bird Island and mariner databases contained a bias towards coastal observations that might have increased the likelihood of encountering right whales. Nonetheless, the cruise database showed the same preponderance of right whales, including sightings both at the Shag Rocks (130 nmi/240.5 km west of South Georgia) and up to 60 nmi north of the island in depths of up to 2,000 m.

Limitations in data and recommendations for future work—The accuracy of the species identification data in Table 1 is assumed to be high for the cruise and

⁵ Keith Reid, British Antarctic Survey, High Corss, Madingley Road, Cambridge CB3 0ET, UK 5/98.

Bird Island data sets. The cruise observers had substantial multi-ocean marine mammal identification experience. The Bird Island observers, though many were not marine mammal specialists, were trained marine biologists well versed in the use of field guides. Though one might expect some discrepancy when comparing the biologist data with the mariner data, the species composition of the mariner data set was similar to those of the other two sets.

A deficiency in all of the data is low detection rates as a result of poor visibility from high wind and sea state. For this reason we have refrained from any numerical analysis of the cruise sighting data beyond species composition and individual identification. Only a small minority of the time on watch was genuinely appropriate for rigorous quantitative survey. In order to use the time available maximally, surveys on the cruise were continued until conditions were substantially worse than what is usually regarded as acceptable for quantitative census.

Neither the Bird Island nor the mariner data sets are corrected for effort. All the Bird Island data are from a point source, which is inhabited throughout the year and provides some sighting effort in all seasons. Sightings were less likely to be made in the winter, as the weather is less favorable for outdoor activities and whale sighting and there are fewer personnel in the field. It is reasonable therefore to assume that sighting effort is lower during the winter months. This assumption is equally valid for the mariner database. Effort was recorded during the cruise, but the database is a single window in time in late January and February of 1997. Thus no measure of offshore changes in abundance with season can be made.

Status of Individual Species

Right whales—The most commonly sighted large whale in each of the three South Georgia databases reported was the southern right whale. Depleted to commercial extinction by the 1840s (Townsend 1935), right whales have been protected globally by the International Whaling Commission since 1932 (Tønnessen and Johnsen 1982). Some were taken by Soviet vessels north of South Georgia in the period 1951–1971 (Tormosov *et al.* 1998).

Most records reported here were made in the summer (December–March). Nonetheless, there are a number of winter sightings of right whales that were reported in all months. This suggests that either some right whales may spend the winter at South Georgia and not migrate to lower latitudes during this period, or that migrating right whales pass through in most months of the winter, as well as summer. Of the right whales that do leave during the southern winter, it appears that at least some of the South Georgia animals go to Peninsula Valdés, Argentina (Table 3), and possibly South Africa (Best *et al.* 1993). Argentinean and South African right whale populations are reported to be growing at around 7% per annum (Best 1990, Payne *et al.* 1990). Given the photographic linkage between right whales from South Georgia and Argentina presented in this report (Table 3) and elsewhere (Best *et al.* 1993) and the genetic linkage between South Georgia, Argentina, and South Africa

(Portway *et al.* 1998), we suggest that right whales seen around South Georgia migrate at least to Argentina and possibly elsewhere in the South Atlantic. Therefore, right whale numbers off South Georgia are possibly also growing at around 7%.

Blue whales—The area to the north of South Georgia was extremely productive during the 1920s for blue whales. The only blue whales observed in the cruise were a single mother-and-calf pair at the Shag Rocks, 130 nmi to the west. The identification of the blue whale in 1981 in the Bird Island data set is especially reliable, as a visiting scientist familiar with blue whales (Dr. D. Costa, University of California, Santa Cruz, CA) made this observation.

Fin and sei whales—The relative lack of sei sightings in the mariner data set may reflect confusion with some of the few fin whale sightings reported.

Humpback whales—This species has been relatively less common in South Georgia waters than around the Antarctic Peninsula (K. Robertson,⁶ Stone and Hammer 1988). Around South Georgia it was the first to be severely depleted by the modern whaling industry, apparently to the extent that this substock was essentially extirpated (Kemp and Bennett 1932).

Minke whales—The lack of sightings from July to September may be a product of adverse weather conditions rather than their absence. Minke whales are likely to have been underrecorded, as they are small in size, with a less observable blow that is easy to miss in high sea-states.

Beaked whales—The observation of bottlenose whales from Bird Island (1979) was reliable, as were the sightings in the cruise. Other beaked whales, observed but not identified to species during the cruise, required more time than was available to wait for further surfacings in order to investigate more fully. This area is certainly beaked whale habitat and would reward study dedicated to that group.

Killer whales—This species appears to occur mainly during the summer at Bird Island. The whales may be attracted by the large numbers of breeding fur seals, *Arctocephalus gazella* (1.55 million in 1992; Boyd 1993) and penguins (2.7 million pairs of macaroni, *Eudyptes chrysolophus*, 105,000 gentoo, *Pygoscelis papua*, and 400,000 king, *Aptenodytes patagonicus*; Prince and Croxall 1996). The killer whale has also been described associated with a longline fishery for Patagonian toothfish around South Georgia (Ashford *et al.* 1996). No indication of historical relative abundance was available for comparison, but it is known that substantial historical culling by whalers to minimize large-whale carcass scavenging occurred (Bonner 1980).

Factors Affecting Abundance

Recruitment is most likely to have been limited by extirpation of animals from this particular feeding ground. For humpback whales at least, and perhaps fin whales, stocks exhibit strong maternal fidelity to particular areas. In some cases this fidelity persists over an evolutionary time scale (Clapham and

⁶ Kim Robertson, New Island, Falkland Islands, 12/97 (Cruise ship naturalist).

Mayo 1987, Clapham and Seipt 1991, Palsbøll *et al.* 1995, Larsen *et al.* 1996). Thus, removal of a stock from a particular area may well preclude immigration from another area, at least over the time scale of the current century. Other possibly significant contributory factors may include competition by traditional krill predators such as penguins and seals (Croxall 1992) and more recently by humans, an unusually high rate of natural mortality (Lambertsen 1992), habitat change such as alteration in sea ice coverage (Mare 1997), and/or the impact of ongoing whaling (Baker *et al.* 1996, Lento *et al.* 1998).

It is not possible to compare relative rates of recovery, as there is no means of knowing relative abundances in the 1960s, nor is there any certainty that the catch data reviewed here represent the actual takes in recent decades. The last reported pelagic antarctic take of a whale larger than a minke was 1980 (Anon. 1995). It is important to note here the substantial underreporting of the Soviet catch through the 1970s (Yablokov 1994, Zemsky *et al.* 1995); thus, the actual date of the cessation of pelagic whaling in these waters is unclear. Non-reporting of takes of one or more species would seriously skew any comparisons that could be considered. It is sufficient to conclude that there is no large whale species that is abundant in this area at the present time.

Conclusion/Perspective

Given the absence of populations of whales anywhere close to pre-exploitation levels, it is important to continue to assess the status of each species in the region. In recent decades most research on vertebrates in South Georgia has been limited to shore-based observations of birds and seals. There may never be the opportunity for investigations on the scale of the R/V *Discovery* again, but a consistent effort at monitoring whale stocks in this important area should be considered. Statistically valid estimates of trends in the low abundance of these stocks will be difficult, given their broad distribution and the poor working conditions in this area. Nonetheless, on the assumption that some data are better than none, a consistent sighting series by knowledgeable observers should be attempted. Such an effort might constitute a routine dedicated large-whale observer on current research cruises in the area. The results presented here provide the opportunity to assess the initial data in terms of statistical power in order to determine the cost-benefit of such monitoring and define the best approach for future work.

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