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Parasite Fauna Of 3 Species Of Antarctic Whales With Reference To Their Use As Potential Stock Indicators

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Abstract.—Seventeen species of parasites representing the Cestoda, Nematoda, Acanthocephala, and Crustacea are reported from three species of Antarctic whales. Thirty-five sei whales *Balaenoptera borealis*, 106 minke whales *B. acutorostrata*, and 35 sperm whales *Physeter catodon* were examined from latitudes 30° to 64° S, and between longitudes 106° E to 108° W, during the months of November to March 1976–77. Collection localities and regional helminth fauna diversity are plotted on distribution maps.

Antarctic host-parasite records from *B. borealis*, *B. acutorostrata*, and *P. catodon* are updated and tabulated by commercial whaling sectors.

The use of acanthocephalan parasites of the genus *Corynosoma* as potential Antarctic sperm whale stock indicators is discussed.

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The great whales of the southern hemisphere migrate annually between temperate breeding and Antarctic feeding grounds. However, results of Antarctic whale tagging programs (Brown 1971, 1974, 1978; Ivashin 1988) indicate that on the feeding grounds circumpolar movement by sperm and baleen whales is minimal. These whales apparently do not comprise homogeneous populations whose members mix freely throughout the entire Antarctic. Rather, each species appears to be comprised of functionally distinct breeding stocks, as demonstrated by the humpback whale *Megaptera novaeangliae*, which are isolated from one another by vast expanses of open ocean, large land masses, and geographically delimited feeding grounds (Klumov 1963, Mackintosh 1966, Gaskin 1976).

If commercial whaling is to resume at some future date (Marine Mammal Commission 1990), and if the whales are to survive, individual breeding stocks must continue to be managed throughout their entire range. Commercial quotas encompassing entire oceans are valid only if catch effort is proportionally spread across all stock units present in that ocean. In the past, economic considerations have resulted in concentration of fishing effort in localities where whales are most numerous and therefore easiest to find (Gaskin 1976). A direct result of this has been the successive overexploitation of several major whale species. To manage Antarctic whaling more effectively, identification and determination of whale stocks is of high priority (Schevill 1971, International Whaling Commission 1990).

The Antarctic whaling grounds were partitioned by the International Whaling Commission into commercial baleen and sperm whaling sectors (Fig. 1) based on the density distribution analyses of Hjort et al. (1932, 1933, 1935, 1938; as cited in Gaskin 1976). These sectors were thought to reflect whale stock distributions, and whaling quotas were previously allotted for individual sectors. Biochemical studies (Fujino 1960, 1964), morphometrics (Omura et al. 1970), scar density analyses (Shevchenko 1974), and marking studies (Brown 1979, Best and Butterworth 1980, Ivashin 1988) support these boundaries but indicate that more than one stock may occupy certain sectors. Definitive range limits are consequently still not known for most stocks of whales.

There is extensive scientific literature on the helminth fauna of Antarctic whales. However, the data have not been analyzed with respect to host distribution and stock identifica-

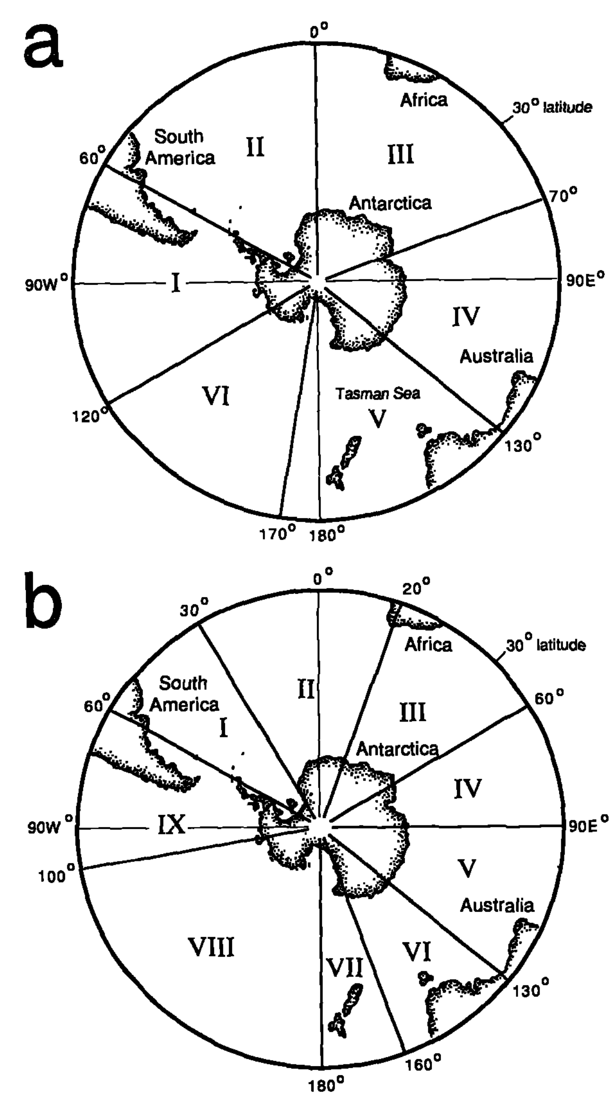

Figure 1
International Whaling Commission Antarctic commercial baleen (a) and sperm (b) whaling sectors.

tion. Reports have mostly discussed questions of helminth taxonomy or identified and cataloged the parasites. Klumov (1963) presented a zoogeographical analysis of the helminths of whales in the world oceans. Research on southern whales was begun by Russian helminthologists in 1963. In the course of two commercial voyages aboard the *Sovietskia Ukraina* and *Glory* during the 1963-64 and 1965-66 whaling seasons, 2164 marine mammals were necropsied; 2006 of these were whales. Due to the circumstances of commercial whaling, dissections were often incomplete with various organs being examined at varying degrees of thoroughness. The data obtained from this material were presented in a series of 22 papers from 1966 to 1975 (cited in Vogelbein 1981) and Skrjabin and Murav'eva (1978). Several British sources presented further data on cetacean helminths from various localities in the Antarctic Ocean (Prudhoe 1969, Markowski 1971, Gibson 1973, Gibson and Harris 1979).

The purpose of this paper is to report parasites from sperm, sei, and minke whales taken by two commercial vessels of the Japanese whaling fleet (1976-77). In addition, this paper will also update existing host-parasite lists, identify apparent variations in the zoogeographic distribution of helminths, and identify those helminths which are potential stock indicators.

Materials and methods

The data are obtained from two sources: Original materials collected by one of us (MDD) aboard the Japanese factory ships *Tonan Maru #2* and *Nisshan Maru #3* during November to March of the 1976-77 Japanese Antarctic whaling season, and Antarctic whale host-parasite literature records from 1915-89 (Vogelbein 1981, present study).

Baleen whales were captured in sectors I, IV, V, and VI (Fig. 1a); all sperm whales were captured in sector VIII (Fig. 1b). The length-frequencies and ages of the whales were not available to the authors. However, the catcher boats tend to take the largest animals possible during the harvest. Examinations of the external surface, blubber (subsample of ventral surface anterior to genital opening), organs (stomach, intestine, mesenteries, lungs, liver, kidneys, spleen, genitalia, placenta), blood, and fecal samples were carried out on a total of 176 whales, including 35 sei (*Balaenoptera borealis* Lesson, 1828), 106 minke (*Balaenoptera acutorostrata* Lacépède, 1804), and 35 sperm (*Physeter catodon* L., 1758). The helminths were prepared for identification using standard histological procedures (Dailey 1978). Voucher specimens are deposited at the Institute of Parasitology, California State University, Long Beach.

Results

Data collected during the 1976-77 Japanese Antarctic whaling season are presented in Tables 1 to 4 and Figures 2 and 3. A complete host-parasite record from all sectors for *B. borealis* and *P. catodon* is presented in Tables 5 and 6. Given the paucity of material reported from *B. acutorostrata* in Antarctic waters, a figure on parasites by sector has been omitted and only the information in Tables 1 and 3 represents this species. Several helminths are not identified beyond the generic level due to the condition of the specimens.

Table 1

Site of infection and percent infection rates for parasites of sei whale *Balaenoptera borealis*, minke whale *Balaenoptera acutorostrata*, and sperm whale *Physeter catodon* collected aboard Japanese whaling vessels during the 1976–77 Antarctic whaling season.

Parasites	Site of infection	Host species: *Balaenoptera borealis* (*N*35)	Host species: *Balaenoptera acutorostrata* (*N*106)	Host species: *Physeter catodon* (*N*35)
Cestoda				
Cyclophyllidea				
Tetrabothrius				
T. wilsoni	intestine	40.0		2.7
T. affinis	intestine	11.4		
T. curilensis	intestine			2.7
T. sp.	intestine	57.1	7.5	
Priapocephalus				
P. grandis	intestine	5.7		2.7
Pseudophyllidea				
Diphyllobothrium				
D. sp.	intestine			2.7
Diplogonoporus				
D. balaenopterae	intestine	11.4		
Tetraphyllidea				
Phyllobothrium				
P. delphini	blubber			100
Monorygma				
M. grimaldii	mesenteries			5.7
Nematoda				
Ascaridoidea				
Anisakis				
A. physeteris	stomach			100
A. simplex	stomach	2.8		
A. sp.	stomach		0.94	
Habronematoidea				
Crassicauda				
C. crassicauda	penis	82.6 (*N*23 males)		
Placentonema				
P. gigantissima	placenta			100 (*N*2 with placentae)
Acanthocephala				
Polymorphida				
Bolbosoma				
B. turbinella	intestine	100		
B. physeteris	intestine			31.4
Corynosoma				
C. bullosum	intestine			5.7
Crustacea				
Cyamus				
C. balaenopterae	external		7.5	
Pennella				
P. balaenopterae	external	11.4	0.94	

Balaenoptera borealis

Nine helminth parasite species were found in sei whales captured in three commercial whaling sectors (Table 2). The mesoparasitic crustacean *Pennella balaenopterae* Koren and Danielssen, 1877 is also listed but is not included in the analysis. Two helminths occurred at very high prevalence. The acanthocephalan *Bolbosoma turbinella* (Diesing, 1851) infected all 35 hosts in high numbers. All sei whales were infected with cestodes of the genus *Tetrabothrius* Rudolphi, 1819. Two

Table 2

Parasite fauna of the sei whale *Balaenoptera borealis* from commercial whaling sectors I, V, and VI. (See Figure 2 for localities.)

			Tetrabothrius								
	Locality	Date	*wilsoni*	*affinis*	sp.	*Priapocephalus grandis*	*Diplogonoporus balaenopterae*	*Anisakis simplex*	*Crassicauda crassicauda*	*Bolbosoma turbinella*	*Pennella balaenopterae*
		1976									
V (*N*10)	42°04′S 158°09′E	12-12	+	+			+		+	+	
	42°13′S 157°21′E	15-12			+		+			+	
	″	5-12	+							+	+
	41°29′S 160°06′E	17-12	+	+		+	+			+	
	42°15′S 158°09′E	18-12	+				+		+	+	
	44°22′S 153°39′E	25-12			+					+	
	43°41′S 156°06′E	26-12			+				+	+	
	″	26-12			+			+		+	+
	42°53′S 156°11′E	29-12			+				+	+	
		1977									
	46°22′S 173°01′W	6-01	+			+				+	
VI (*N*13)	48°24′S 153°48′W	15-01			+				+	+	
	50°00′S 144°00′W	19-01	+	+						+	
	55°00′S 141°00′W	21-01			+				+	+	
	56°34′S 140°58′W	25-01	+							+	
	58°41′S 148°50′W	27-01			+					+	
	″	27-01		+					+	+	
	59°28′S 155°47′W	29-01			+				+	+	
	″	29-01	+							+	
	″	29-01			+					+	+
	″	29-01	+							+	
	″	29-01			+				+	+	+
	53°24′S 149°20′W	1-02	+							+	
	54°00′W 145°49′W	2-02	+							+	
I (*N*12)	55°05′S 118°58′W	6-02			+				+	+	
	″	6-02	+							+	
	″	6-02	+						+	+	
	″	6-02			+				+	+	
	″	6-02			+				+	+	
	″	6-02			+				+	+	
	″	6-02			+				+	+	
	″	6-02			+				+	+	
	53°47′S 117°11′W	7-02	+						+	+	
	″	7-02			+					+	
	″	7-02			+				+	+	
	″	7-02			+				+	+	

Table 3
Parasite fauna of the minke whale *Balaenoptera acutorostrata* from commercial whaling sectors I, IV, and VI.

	Locality		Date	No. of whales	*Tetrabothrius* sp.	*Anisakis* sp.	*Cyamus balaenopterae*	*Pennella balaenopterae*
			1976					
IV	61°55′S	106°21′E	18-11	2			1	
(*N*51)	61°43′S	110°07′E	19-11	4	1		1	
	62°05′S	111°17′E	20-11	4				
	61°43′S	115°56′E	21-11	4				
	63°57′S	122°55′E	22-11	4				
	64°22′S	122°48′E	23-11	4	2			
	64°13′S	122°34′E	24-11	4				
	64°01′S	125°53′E	25-11	4				
	63°59′S	122°39′E	26-11	5				
	63°49′S	119°47′E	27-11	4				
	64°07′S	120°17′E	28-11	4				
	64°09′S	127°29′E	2-12	4				
	64°28′S	127°44′E	3-12	4				
			1977					
I	68°29′S	115°20′W	13-02	3				
(*N*40)	70°15′S	113°32′W	14-02	4				
	70°07′S	113°55′W	15-02	5	1		2	
	70°20′S	114°21′W	16-02	4			2	
	70°18′S	115°31′W	17-02	4				1
	70°01′S	114°57′W	18-02	4				
	70°54′S	112°12′W	19-02	3	1			
	70°19′S	110°08′W	20-02	4				
	69°58′S	108°15′W	21-02	5	1		2	
	70°34′S	113°57′W	22-02	4				
VI	70°45′S	121°21′W	23-02	3	1			
(*N*15)	70°44′S	124°36′W	24-02	2				
	70°55′S	123°11′W	25-02	10	1	1		

distinct species, *Tetrabothrius wilsoni* (Leiper et Atkinson, 1914) and *T. affinis* (Lönnberg, 1891; Lönnberg, 1892), and one form (*Tetrabothrius* sp.) that appears to fall between the two, comprised this tapeworm material (Table 1).

Helminth diversity appeared to be greater in the Tasman Sea (Sector V) animals than in whales captured on the open Pacific–Antarctic Ocean (Sectors I, VI) (Tables 2 and 5). Seven different helminths infected the sample of 10 sei whales from the Tasman Sea region of sector V. Only four helminths infected 13 whales from Pacific sector VI, while 12 whales from sector I were infected with only three species. The cestode *Diplogonoporus balaenopterae* Lönnberg, 1892 illustrates one disparity. This cestode infected 40% (Table 2) of the Tasman Sea sample yet it was absent in the other sectors. Likewise, the cestode *Priapocephalus grandis* Nybelin, 1922 and one nematode, *Anisakis simplex* Rudolphi, 1809, are seen only in sector V. *Tetrabothrius affinis* was found in sectors V and VI, and *T. wilsoni*, *Bolbosoma turbinella*, and

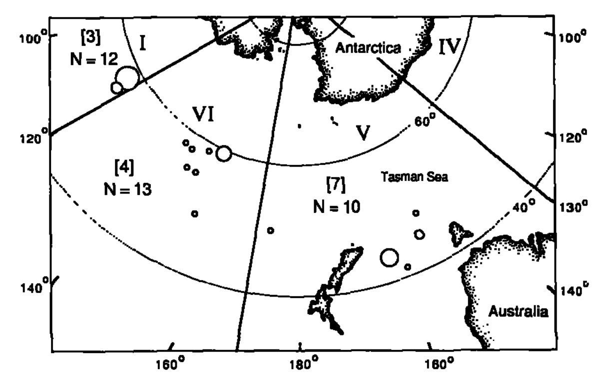

Figure 2
Location of 35 sei whale catches and number of helminth species found in IWC sectors I, IV, V, and VI. Circles indicate site of capture; circle size indicates relative number examined. Numbers in brackets are number of helminth species; *N* = number of whales examined.

Table 4
Parasite fauna of the sperm whale *Physeter catodon* from sector VIII. (See Figure 3 for localities and A, B, C, designations.)

		Tetrabothrius		*Priapocephalus*	*Monorygma*	*Phyllobothrium*	*Diphyllobothrium*	*Anisakis*	*Placentonema*	*Bolbosoma*	*Corynosoma*
Locality	Date	*curilensis* (B)	*affinis* (B)	*grandis* (C)	*grimaldii* (C)	*delphini* (A)	sp. (C)	*physeteris* (A)	*gigantissima* (C)	*physeteris* (A)	*bullosum* (B)
	1977										
VIII 44°49′S 168°53′W	7-01					+		+		+	
″	7-01					+		+			
″	7-01	+				+	+				
44°47′S 159°51′W	9-01					+		+			
54°15′S 144°38′W	20-01					+		+			
58°41′S 148°50′W	27-01		+			+		+		+	+
54°56′S 151°41′W	31-01					+		+		+	
64°35′S 116°44′W	12-02					+		+		+	+
51°54′S 159°54′W	3-03					+		+		+	
″	3-03					+		+			
″	3-03					+		+			
″	3-03					+		+			
″	3-03					+		+		+	
″	3-03					+		+			
46°24′S 162°31′W	5-03					+		+			
44°01′S 165°00′W	7-03					+		+		+	
″	7-03					+		+		+	
″	7-03					+		+			
″	7-03					+		+			
″	7-03					+		+			
″	7-03					+		+			
″	7-03					+		+			
41°25′S 164°48′W	8-03					+		+			
33°55′S 162°26′W	10-03					+		+			
31°56′S 164°40′W	11-03			+		+		+		+	
″	11-03					+		+			
″	11-03					+		+			
″	11-03					+		+			
″	11-03					+		+			
30°28′S 169°08′W	13-03				+	+		+		+	
″	13-03					+		+		+	
″	13-03				+	+		+			
″	13-03					+	+	+			
″	13-03					+		+	+		
″	13-03					+		+	+		

Crassicauda crassicauda (Creplin, 1829) Leiper et Atkinson, 1914 were found in sei whales from all three sectors.

Balaenoptera acutorostrata

In comparison with the preceding host species, the parasite fauna of the minke whale are relatively poor.

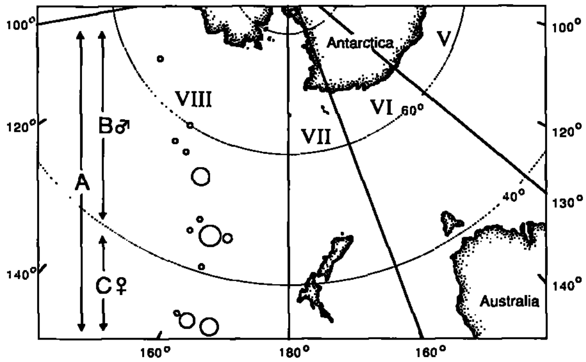

Figure 3
Helminth faunal diversity in 35 sperm whales from IWC sector VIII. Circles indicate site of capture; circle size indicates relative number examined. A = *Phyllobothrium delphini*, *Anisakis physeteris*, *Bolbosoma physeteris*. B = *Tetrabothrius curilensis*, *T. affinis*, *Corynosoma bullosum*. C = *Diphyllobothrium* sp., *Monorygma grimaldii*, *Placentonema gigantissima*, *Priapocephalus grandis*.

Four parasite species were found in 106 hosts captured in three whaling sectors (Table 3). The parasites included two helminths, *Tetrabothrius* sp. and *Anisakis* sp., and two parasitic crustaceans, *Pennella balaenopterae* and *Cyamus balaenopterae* Barnard, 1932. The ectoparasites are listed but not included in the analysis. A single female worm comprised the only *Anisakis* sp. infection. Since specific determination of adult anisakids requires examination of male specimens, this nematode was only identified to generic level.

Physeter catodon

Ten helminth species were recorded from 35 sperm whales (23 male, 12 female) captured in commercial sector VIII (Table 4). The larval cestode *Phyllobothrium delphini* (Bosc, 1802) and the nematode *Anisakis physeteris* Baylis, 1923 infected all sperm whale samples. The acanthocephalan *Bolbosoma physeteris* Gubanov, 1952, although infecting only 34.2% of the hosts, was found throughout the study area. Prevalence and intensity of infections for the remaining helminths were low and geographical distributions were restricted.

Figure 3 illustrates a latitudinal disparity in the helminth fauna of sperm whales from sector VIII. Group A represents three helminths (*P. delphini*, *A. physeteris*, *B. physeteris*) common in sperm whales throughout the study area. Group B comprises three helminths (*Tetrabothrius curilensis* (Gubanov, 1952), *T. affinis*, and *Corynosoma bullosum* (Linstow, 1892))

Table 5
Summary of the helminthological fauna of the sei whale *Balaenoptera borealis* reported for all six Antarctic whaling sectors (Vogelbein 1981; present study).

	Whaling sector					
Parasite	I	II	III	IV	V	VI
Cestoda						
Tetrabothrius affinis		+	+		+	+
Tetrabothrius wilsoni	+	+	+	+	+	+
Tetrobothrius sp.	+				+	+
Priapocephalus grandis		+			+	
Diplogonoporus balaenopterae		+	+		+	
Diphyllobothrium sp.		+				
Phyllobothrium delphini					+	
Acanthocephala						
Bolbosoma turbinella	+	+	+	+	+	+
Bolbosoma tuberculata		+				
Bolbosoma balaena				+	+	
Nematoda						
Crassicauda crassicauda	+				+	+
Crassicauda delamureana		+	+			
Crassicauda sp.		+				
Anisakis simplex		+			+	+
Anisakis sp.		+				
Trematoda						
Ogmogaster plicatus		+				
Ogmogaster antarcticus	+				+	
Lecithodesmus goliath		+				

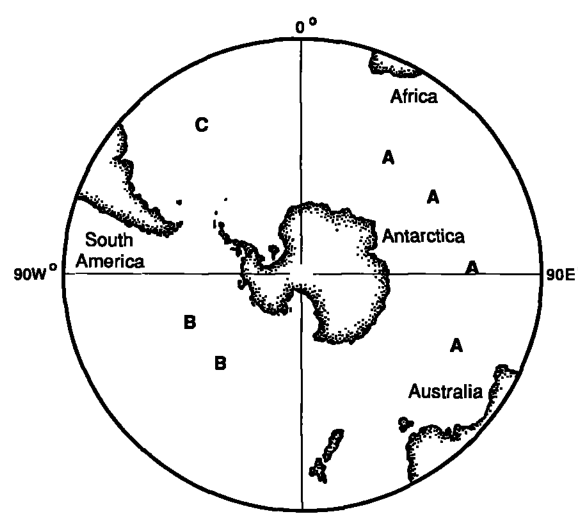

Figure 4
Distribution of acanthocephalans of the genus *Corynosoma* in Antarctic sperm whales. A = *C. mirabilis*; B = *C. bullosum*; C = *C. singularis*.

Table 6
Summary of the helminthological fauna of the sperm whale *Physeter catodon* reported for all nine Antarctic whaling sectors (Vogelbein 1981; present study).

Parasite	Whaling sector								
	I	II	III	IV	V	VI	VII	VIII	IX
Cestoda									
Diphyllobothrium sp.								+	
Tetrabothrius affinis	+		+					+	+
Tetrabothrius wilsoni							+		
Tetrabothrius curilensis								+	
Priapocephalus grandis		+					+	+	
Priapocephalus sp.								+	
Polygonoporus giganticus					+				
Multiductus physeteris								+	
Phyllobothrium delphini	+	+	+	+	+	+	+	+	+
Monorygma grimaldii								+	+
Tetraphyllidea sp.	+							+	+
Acanthocephala									
Bolbosoma physeteris								+	
Bolbosoma tuberculata				+					
Bolbosoma sp.		+							
Corynosoma singularis	+								
Corynosoma mirabilis			+	+	+				
Corynosoma bullosum								+	
Nematoda									
Anisakis physeteris	+	+	+	+				+	
Anisakis catadontis		+							
Anisakis simplex		+							
Placentonema gigantissima								+	+
Placentonema sp.									+

found only in large bulls from the higher latitudes. Group C comprises four helminths (*P. grandis*, *Monorygma grimaldii* (Moniez, 1889) Baylis, 1919, *Diphyllobothrium* sp., and *Placentonema gigantissima* Gubanov, 1951) found only in female whales captured in the lower latitudes.

Discussion

The prediction that, "When a species of host is divided into two or more population groups separated geographically in different environments, their respective parasite faunas will exhibit differences" (Noble and Noble 1964) is particularly true for helminths that generally require more than one host to complete their life history. The occurrence of a particular parasite in any geographic locality depends upon the presence of a suitable definitive host, suitable intermediate host(s), and complex biological factors which impart a strict interdependency on the organisms comprising the host-parasite complex.

Knowledge of host dietary composition is very important in studying cetacean helminth zoogeography. Over any area as large as the Antarctic Ocean, widely separated stocks of whales may exploit different food organisms.

Kawamura's (1974) report on the feeding ecology of southern hemisphere sei whales recognized a latitudinal succession of major food species. In its southward migration, the sei whale exploits several major food organisms: euphausiids at high latitudes, pelagic amphipods at low latitudes, and copepods at intermediate latitudes (Gaskin 1982). Kawamura (1974) also recognized longitudinal variations in the availability of prey species. Euphausiid crustaceans comprise the bulk of this host's diet in sectors IV through VI while amphipods are more prevalent in their diet in sectors III and IV. Calanoid copepods are of considerable supplementary importance in sectors V and VI. As a species, the sei whale is the most euryphagous balaenopterid whale (Klumov 1963). Budylenko (1978) lists over 80 prey species for this host. Yet Kawamura (1974) indicates that individual sei whales are stenophagous feeders, where stomachs containing more than one prey species are rare.

Since the prey species are, in all probability, the intermediate hosts of cetacean helminths, variable dietary compositions within species of whales will manifest themselves in their respective helminth faunas. Thus, individual stocks of whales may be distinguishable by regional helminthofaunal peculiarities.

Seventeen species of helminth have been reported from the sei whale (Table 5). Two of these helminths, the acanthocephalan *Bolbosoma turbinella* and cestodes of the genus *Tetrabothrius*, were found in all sei whales sampled in the 1976–77 season. Skrjabin (1968) also found a very high prevalence and intensity of these worms in sei whales throughout the Antarctic.

The tetrabothriids obtained from sei whales in 1976–77 represent two distinct species and one ambiguous form (Table 2). Two (*T. wilsoni*, *T.* sp.) have a very high prevalence of infection and the other (*T. affinis*) occurs less frequently.

The remaining helminths are encountered less frequently in sei whales and several have a very restricted geographical distribution (Table 5). Skrjabin (1975) reported several helminth species whose distributions were limited to specific geographical localities. He recorded the nematode *Anisakis simplex* only from sei whales of the "Notalia Zone" (northern boundaries of whaling sectors). Another nematode, *Crassicauda delamureana* Skrjabin, 1966, was reported only in the "Notalia Zone" of sectors II and III; the acanthocephalan *Bolbosoma tuberculata* Skrjabin, 1970 only in the South Atlantic; *Bolbosoma balaenae* (Gmelin, 1970) only in sectors IV and V; and the trematode *Lecithodesmus goliath* (van Beneden, 1858; Braun, 1902) was confined to the southeast coast of South America. The trematode *Ogmogaster antarcticus* Johnston, 1931 was recorded only from sectors I and V, while the larval cestode *P. delphini* parasitized sei whales only in sector V, south of New Zealand. Although prevalences of infection are low in all of the above cases, as more information is gathered these helminths may help to identify local, isolated stocks of whales.

Other helminths such as the cestodes *T. affinis* and *P. grandis* have a limited geographical distribution in sei whales, but the fact that these species are polyxenous extends their known range significantly. These helminths are consequently of limited potential value in identifying sei whale stocks.

Differences in the helminthofaunal diversity are evident between three host stocks captured in sectors V, VI, and I during 1976–77 (Fig. 2). It is probable that regions of upwelling in the coastal waters of New Zealand and Australia provide sufficient nutrients to support a greater diversity of free-living organisms than would be expected in the open Pacific Ocean. Consequently, a greater diversity of prey species (hence intermediate hosts) is likely to be exploited in the coastal waters, inflicting these sei whale stocks with a higher diversity of helminths.

The helminth fauna of the Antarctic minke whale has been poorly studied. The only prior investigation is that of Skrjabin (1975) who examined six hosts from the Balleny Island region (sector V) and sector IV, and found them uninfected. Our study is the first to examine a large number of Antarctic minke whales. The number of helminths found infecting this host was very few (Tables 1, 3). The only significant infection is that of *Tetrabothrius* sp. With this limited information available, Antarctic stocks are presently indistinguishable with respect to their helminth fauna.

Skrjabin (1975) believes that this poor helminth fauna is due to the minke whales' feeding habits. The diet of the southern minke whale is more restricted than that of other Antarctic whales. Ohsumi et al. (1970) reported that most minke whales congregate south of the Antarctic Convergence and feed almost exclusively on *Euphasia superba*. Stomach samples occasionally contained small amounts of other prey species. This host penetrates the furthest south of all the whales and inhabits the ice pack close to the Antarctic continent. It feeds almost exclusively on *E. superba* which are not found to be infected with larval helminths (Kagei 1974, Kagei et al. 1978).

The known helminth fauna of the sperm whale is presently comprised of 18 species (Table 6) which may be subdivided into several distinct components. Two helminths, the larval cestode *Phyllobothrium delphini*, and the stomach nematode *Anisakis physeteris*, occur at very high prevalence and intensity throughout the Antarctic. Since these parasites have a cosmopolitan distribution in odontocetes, they are probably useless in distinguishing between southern sperm whale stocks in the longitudinally defined IWC sectors of the Antarctic. However, *P. delphini* may be important from a latitudinal aspect. For example, Walker (1987) found latitudinal differences in the occurrence of this parasite in Dall's porpoise *Phocenoides dalli* True, 1885 taken in the northern North Pacific and Bering Sea. The absence of *P. delphini* in *B. acutorostrata* and the very low frequency of occurrence in *B. borealis* along with its ubiquitous occurrence in the sperm whale tend to substantiate the more pronounced seasonal north–south movement of the Antarctic sperm whale stock(s) into temperate waters. Best (1974), Gambell (1972), and Gaskin (1971) all report extensive migrations ranging from tropical latitudes (north of 35°S) to above 60°S for males forming "bachelor" herds. Best (1974) calculated from mark returns that the average annual movement was approximately 850 nautical miles (1410km) for males, and 372 (620km) for females.

Acanthocephalans belonging to the genus *Corynosoma* may, however, be of some value in distinguishing the Indian Ocean–Antarctic stocks of sperm whales from those in the Atlantic and Pacific–Antarctic (Fig. 4). *Corynosoma mirabilis* was found in 18 large male sperm whales from Africa to Australia (sectors III, IV, and V) in the Indian Ocean. This species was found only between 40° and 60°S latitude. In the 1976–77 material, whales taken in the southern portion of sector VIII were infected with immature *C. bullosum*. Sexually immature *Corynosoma singularis* are reported from a single sperm whale captured in the southwestern Atlantic Ocean (sector I) (Skrjabin 1971) and also as adults in a leopard seal from the Balleny Islands. Despite the fact that these acanthocephalans attain sexual maturity only in the Phocidae, these larval forms in the sperm whale may have the possibility of serving as regional stock indicators.

Local variations in the helminth diversity of sperm whales captured in sector VIII during 1976–77 are illustrated in Figure 3. Variable infections are noted between male and female sperm whales. It is difficult to say whether these distributional peculiarities are coincidental or real due to small sample sizes. Assuming that they are real, they become very difficult to interpret. *Tetrabothrius curilensis* and *T. affinis*, although recovered only from the higher latitudes in this sample, may have been carried south by migrating whales. *Tetrabothrius affinis* has previously been recorded from lower latitudes in other host species. *Corynosoma bullosum*, on the basis of the previous discussion, may be characteristic of the high-latitude feeding grounds. This helminth matures in pinnipeds from the Balleny Islands and the Antarctic coast. *Monorygma grimaldii* has thus far been reported only from the lower latitudes, and *Placentonema gigantissima* may also be restricted to temperate waters. To date, *P. gigantissima* has only been found in female whales which do not penetrate as far south as the males.

In his commentary on the case for scientific whaling, Nagasaki (1990) states, "Our ignorance about the biology of whales is delaying any informed discussion about the practice of commercial whaling." He goes on to discuss Japan's recent scientific whaling program. The data presented in this study on the parasitic fauna found in these Antarctic whales is just one more piece of information that can help the scientific community understand the Antarctic ecosystems and, hopefully, with it, improve our ability to better assess the status of Antarctic whale stocks.

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