

TRAPPING OF AIR-BORNE INSECTS IN THE ATLANTIC-ANTARCTIC AREA¹

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Abstract: A preliminary report based on the results of the three voyages of the R.R.S. SHACKLETON and one voyage of the R.R.S. JOHN BISCOE between Southampton, England, and British Antarctic Survey bases in the Antarctic. The majority of the 3,417 specimens captured were Hemiptera (2006), Diptera (1006), Lepidoptera (76), and Hymenoptera (68).

Introduction: Since 1957 Bishop Museum has been carrying out a program of insect collection on ships at sea in order to study natural dispersal of air-borne insects across ocean from one land area to another. This program has since been expanded to the Antarctic and Atlantic Ocean areas. Preliminary reports on individual voyages showing catches and methods used may be found in *Pacific Insects* under the titles "Trapping of Air-borne Insects on the Pacific", and "Trapping of Air-borne Insect in the Pacific-Antarctic Area." This report is the first in a new series on "Trapping of air-borne insects in the Atlantic-Antarctic Area".

Acknowledgements: Much of the success of this trapping program on the British Antarctic Survey vessels is due to the interest and cooperation of Sir Vivian Fuchs, Director of the British Antarctic Survey for permission to run the nets on B.A.S. vessels; Dr Martin Holdgate, Director of Biological Research for the B.A.S., and W.L.N. Tickell for much aid in coordinating activities in England and elsewhere; Captain John Turnbull, Master of the R.R.S. SHACKLETON, and Captain Kelly, Master of R.R.S. JOHN BISCOE for their permission and interest in running trap-nets on their ships; the valuable assistance of the crews in helping to rig the nets; to those "FIDS" who volunteered to operate the nets on the Fall 1964 voyage of the SHACKLETON and the Spring 1965 voyage of the JOHN BISCOE; and to Dr J. L. Gressitt, Miss Setsuko Nakata, and others at the Bishop Museum for their aid and assistance in the preparation of the collection and this report.

Methods: Nylon free wind sock nets with 75 cm steel rings as described by Yoshimoto & Gressitt (1960, *Pacific Ins.* 2 (2): 239-243) were used on all voyages of the R.R.S. SHACKLETON and the R.R.S. JOHN BISCOE mentioned in this report.

The nets on the first voyage of the SHACKLETON were raised and lowered along the foremast stays by means of a length of 12 mm signal halyard passing through a block attached to the foremast near the point of attachment of the foremast stay. Four nets were used on each side of the mast during the entire voyage. The nets were held together by

1. Results of work supported by National Science Foundation Grant G-23720 to the Bishop Museum, Honolulu, Hawaii.

shackles, while a loop of line tied to each shackle guided the nets along the stays, leaving them free to revolve about the stay while remaining open to the wind regardless of the direction it was blowing from.

The lowest nets were approximately 3 m above the forepeak deck while the highest was approximately 6 m up. The forepeak deck is approximately fifteen feet above the water line, making the elevation of the nets between 6 and 12 m above the surrounding water.

On the second (Montevideo to Southampton; April–May 1964), and third (Southampton—Montevideo—Port Stanley—Grytviken—Port Stanley—Punta Arenas—Deception; Oct.—Dec. 1964) voyages of the SHACKLETON, eight nets were used; one series of four being suspended on each of the Port and Starboard signal halyards running through blocks on the ends of the foremast crosstree. The lowest net of each series was approximately 6 m above the forepeak deck and the top nets were about 10 m above the deck. Average net elevation above the water was 9 to 15 m. This additional height of the nets above the deck almost eliminated the contamination of samples with dust, paint chips, etc. from the deck which was heavy at times on the first trip of the SHACKLETON.

On the voyage of the R.R.S. JOHN BISCOE (Montevideo to Southampton, May 1965), the nets were on the foremast; probably on the signal halyards as they were on the SHACKLETON. The exact method of rigging and height above deck and water cannot be reported at this time since that information has not been received.

The nets were raised upon permission from the Master or First Mate of each vessel as soon as possible after leaving the harbor and busy shipping lanes, and remained aloft the entire trip unless high winds (30+ knots) and precipitation forced their removal. Inspection of the nets usually took place two or three times a day and sometimes more often when passing through an island group such as the Cape Verde Islands. Nets were removed shortly before entering each port.

Results: The total catch for the three voyages of the SHACKLETON numbered 3,417. Hemiptera (2006), Diptera (1006), Lepidoptera (76), and Hymenoptera (68) constituted the bulk of the specimens. Enumerated by voyage, the results vary as follows:

Voyage	Total Catch	Largest Groups	
Fall 1962	152	60	Diptera
		50	Hemiptera
		25	Araneida
Spring 1964	2132	1636	Hemiptera
		613	Diptera
		28	Lepidoptera
Fall 1964	1135	333	Diptera
		320	Hemiptera
		42	Lepidoptera

Specimens caught furthest from land during the three trips are as follows:

450 km SSW of Canary Islands	1	Hemiptera, Aphididae
410 km SSW of Cape Verde Is.	1	" Cicadellidae
	1	Diptera, Trypetidae
	1	Coleoptera, Chrysomelidae
400 km SW of Canary Islands	1	Lepidoptera, unidentified

R.R.S. SHACKLETON
Southampton to Montevideo 1962

DATE TIME GROUP	WIND		STARTING		ENDING		Approx. dist from nearest land in km	NO. of SPC.	ORDER	FAMILY
	Dir.	Vel. Knt.	Lat. N	Long. W	Lat. N	Long. W				
121062 0930	Var. light		44°23'	08°23'	41°14'	10°46'	180 km West of Portugal	10	Hemiptera	Aphididae
								2	"	Fulgoroidea
								1	Diptera	Chironomidae
								1	"	Trypetidae
								1	"	Anthomyiidae
								1	"	Syrphidae
								8	"	Ephydriidae
								5	"	Borboridae
								4	"	Ceratopogonidae
								32	"	Drosophilidae
								1	Lepidoptera	micro
1	Unidentified									
3	Hymenoptera	Eulophidae								
141062 1730	NW	10-14	33°30'	15°40'	31°34'	16°23'	125 km SE of Madeira Islands	1	Psocoptera	
								1	Diptera	Chironomidae
								1	"	Borboridae
								1	Hymenoptera	Encyrtidae
161062 1730	NNE	8-10	24°47'	19°17'	23°12'	20°05'	450 km SSW of Canary Is; 400 km West of Villa Cisneros, Spanish Sahara	1	Hemiptera	Aphididae
171062 0900	NNE	14-18	23°12'	20°05'	21°11'	21°13'	675 km, SSW of Canary Is.; 400 km West of Cape Blanco, Mauritania	1	Plant seed	
171062 1745	NE	20	20°40'	21°30'	19°10'	21°56'	850 km, SSW of Canary Is; 300 km NNE of Cape Verde Islands	1	Lepidoptera Plant material	
181062 0730	ENE	10-14	19°10'	21°56'	16°57'	23°13'	90 km, NNE of Cape Verde Islands	1	Hemiptera	Lygaeidae
								1	"	Nabidae
								14	"	Cicadellidae
								3	"	Fulgoroidea
								1	"	Aphididae
1	Coleoptera	unidentified								
181062 1200	ESE	10-14	16°57'	23°13'	16°11'	23°38'	In Cape Verde Islands 60 km, ESE of Sao Nicolau 60 km, WNW of Boa Vista 60 km, SW of Sal	1	Hemiptera	Nabidae
								3	"	Cicadellidae
								1	"	Aphididae
								1	Diptera	Cecidomyiidae
								1	Hymenoptera	Formicidae
3	Araneida									

181062 1800	NE	10-14	16°11'	23°28'	15°10'	24°05'	30 km, WNW of Sao Tiago Cape Verde Islands	2 1 1 2	Hemiptera " Diptera Coleoptera	Cicadellidae Aphididae Phoridae unidentified
191062 0700	Var. E'y	10-14	15°10'	23°38'	13°00'	25°01'	190 km, SSW of Cape Verde Is.	2 5 1 2	Hemiptera " Diptera Araneida	Nabidae Aphididae Agromyzidae
191062 1115	ExN	18-24	13°00'	25°01'	12°14'	25°21'	300 km, SSW of Cape Verde Is.	4	Araneida debris	
191062 1715	ESE	14-18	12°14'	25°21'	11°14'	25°41'	400 km, SSW of Cape Verde Is.	13 1	Araneida Diptera	fragments
221062 0700	SE	24-30	03°26' N	28°52' N	01°17' N	29°40' N	250 km, SW of St. Paul Rocks	1 3	Hemiptera Araneida	Nabidae
221062 1200	SE	24-30	01°17'	29°40'	00°30'	29°59'	340 km, SW of St. Paul Rocks	1 1	Hemiptera Lepidoptera	Nabidae micro
291062 0700	SE	24-30			26°15'	43°56'	250 km, SE of Santos Brazil	1 1	Diptera Lepidoptera	Calliphoridae
291062	SE	18-24	26°15' S	43°56' W	27°49'	45°45'	300 km, ENE of Florianopolis, Brazil	1 1	Diptera Lepidoptera	Drosophilidae
291062 1745	SE	18-24	27°49'	45°45'			225 km, E of Florianopolis, Brazil		Debris	
R.R.S. SHACKLETON Montevideo to Port Stanley										
141162 1730	ESE	18-24	S 38°18'	W 46°34'	S 39°36'	W 56°38'	190 km, ESE of General Alvarado, Argentina	1	Lepidoptera	micro

R.R.S. SHACKLETON Montevideo to Southampton 1964										
DATE TIME GROUP	WIND Dir.	Vel. Knt.	STARTING Lat. S	Long. W	ENDING Lat. S	Long. W	Approx. dist. from nearest land in km	NO. of SPC.	ORDER	FAMILY
1800							Cape Verde Islands	1	Hemiptera	Aphididae
230464 0930 to	W	18	33°39'	52°30'	32°40'	51°39'	90 km, East of Brazil coast near Rio Grande	160 3 35 34 1 2 1	Diptera " " " " " "	Tipulidae Culicidae Chironomidae Ceratopogonidae Mycetophilidae Cecidomyiidae Empidae

230464	W	18	S 32°40'	W 51°39'	S 31°42'	W 51°00'	30 km E of Brazil Coast near Lagoa dos Patos
1600 & 2045	S	14	31°42'	51°00'	31°00'	50°30'	

4	"	Dolichopodidae
2	"	Muscidae
1	"	Sepsidae
20	"	Ephyridae
1	"	Chloropidae
1	"	Milichiidae
14	"	Borboridae
2	"	unidentified
1	Lepidoptera	Gelechiidae
1	"	Pyralidae
16	"	unidentified
1	Trichoptera	"
1	Neuroptera	Myrmeleontidae
9	Coleoptera	Carabidae
1	"	Gyrinidae
2	"	Hydrophilidae
2	"	Staphylinidae
3	"	Chrysomelidae
1	"	Pselaphidae
1	"	Noteridae
1	Odonata	Zygoptera
654	Hemiptera	Cicadellidae
787	"	Fulgoroidea
3	"	Psyllidae
2	"	Veliidae
4	"	Mesoveliidae
1	"	Saldidae
14	"	Lygaeidae
15	"	Nabidae
55	"	Miridae
2	"	Corixidae
1	Diptera	Tipulidae
1	"	Culicidae
17	"	Chironomidae
16	"	Ceratopogonidae
3	"	Dolichopodidae
1	"	Sepsidae
9	"	Ephyridae
2	"	Chloropidae
3	"	Borboridae
1	Lepidoptera	unidentified
1	Hymenoptera	Scelionidae
3	"	Eulophidae
3	"	Braconidae
1	"	Berytidae
1	Odonata	
1	Dermoptera	

							1	Acarina	
							2	Hemiptera	Mesoveliidae
							2	"	Miridae
							6	"	Cicadellidae
							3	"	Fulgoroidea
240464	SSW	3	31°00'	50°30'	28°35'	48°51'	4	Diptera	Tipulidae
1100							1	"	Culicidae
							6	"	Chironomidae
							5	"	Ceratopogonidae
							3	"	Dolichopodidae
							1	"	Phoridae
							2	"	Anthomyiidae
							45	"	Ephydriidae
							1	"	Chloropidae
							26	"	Borboridae
							3	Lepidoptera	Pterophoridae
							1	"	Geometridae
							1	Trichoptera	unidentified
							1	Neuroptera	Coniopterygidae
							3	Coleoptera	Dytiscidae
							1	"	Staphylinidae
							2	Hymenoptera	Braconidae
							5	Hemiptera	Veliidae
							2	"	Mesoveliidae
							1	"	Corixidae
							40	"	Cicadellidae
							17	"	Fulgoroidea
							5	"	Psyllidae
240464	SW	14	28°35'	48°51'	28°05'	48°16'	1	Lepidoptera	Pterophoridae
1600							2	Hemiptera	Aphididae
250464	NE	18-24	28°05'	48°16'	24°20'	44°40'	5	Diptera	Chironomidae
1600							1	"	Ceratopogonidae
							2	Lepidoptera	Pterophoridae
							1	Hemiptera	Aphididae
							1	"	Cicadellidae
260464	E	14	22°38'	41°26'	21°46'	40°37'	1	Diptera	Drosophilidae
1815							1	Hymenoptera	Braconidae
							2	Hemiptera	Veliidae
							1	"	Cicadellidae
							2	"	Fulgoroidea
							2	"	Aphididae
270464	ExS	14	21°46'	40°37'	18°59'	39°11'	3	Lepidoptera	Nabidae
1100							4	Hemiptera	Fulgoroidea
							1	"	

R.S.S. SHACKLETON

Southampton to Montevideo 1965

DATE TIME GROUP	WIND		STARTING		ENDING		Approx. dist. from nearest land in km	NO. of SPC.	ORDER	FAMILY
	Dir.	Vel. Knt.	Lat. N	Long. W	Lat. N	Long. W				
131064 1430	NWxN	5	Southampton		48°02'	05°37'	200 km West of Ouessant	1	Lepidoptera	unidentified
181064 0930	NE	13	35°15'	15°52'	32°50'	17°19'	70 km NW of Madeira I.	1	Hemiptera	Lygaeidae
								8	"	Fulgoroidea
								1	"	Aphididae
								1	Neuroptera	Myrmeleontidae
								1	Lepidoptera	micro
								1	Psocoptera	unidentified
								2	Diptera	Drosophilidae
								1	"	Ephyrididae
								1	"	unidentified
181064 1330	NE	13	32°50'	17°19'	32°09'	17°42'	75 km SW of Madeira I.	9	Hemiptera	Fulgoroidea
								1	Psocoptera	unidentified
181064 1830	NE	13	32°09'	17°42'	31°06'	18°14'	210 km SW of Madeira I.	3	Hemiptera	Fulgoroidea
								1	"	Aphididae
191064 0930	NxW	9	31°06'	18°14'	28°44'	19°28'	155 km W of Canary I.	1	Lepidoptera	micro
191064 1600	NWxW	5	28°44'	19°28'	27°30'	20°06'	225 km W of Canary I.	1	Odonata	Zygoptera
191064 1900	N	5	27°30'	20°06'	27°03'	20°21'	270 km WSW of Canary I.	1	Hemiptera	Fulgoroidea
201064 0015	Var. light		27°03'	20°21'	25°49'	20°56'	300 km SW of Canary I.	1	Lepidoptera	Nymphalidae
201064 0930	NxW	5	25°49'	20°56'	24°30'	21°35'	390 km SW of Canary I.	1	Hemiptera	Aphididae
								1	Lepidoptera	micro
201064 1830	NExN	5	24°30'	21°35'	22°58'	22°18'	400 km SW of Canary I.	1	Lepidoptera	micro
211064 1830	NE	13	20°07'	23°47'	18°31'	24°24'	240 km NNE of Porto Grande Cape Verde I.	1	Neuroptera	Myrmeleontidae
231064 1000	Light airs		14°14'	26°09'	11°15'	27°12'	100 km SW to 350 km SSW of Cape Verde I.	4	Hemiptera	Cicadellidae
								1	"	Fulgoroidea
								2	"	Lygaeidae
								1	Araneida	unidentified
231064 1900	N'y	9	18°31'	24°24'	10°05'	27°30'	410 km SSW of Cape Verde Islands	1	Hemiptera	Cicadellidae
								1	Diptera	Trypetidae
								1	Coleoptera	Chrysomelidae

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311064 1930	WSW	5	22°01'	39°15'	23°20'	40°12'	165 km ESE of Cabo de Sao Tome	3	Hemiptera	Cicadellidae
								14	"	Fulgoroidea
								195	"	Psyllidae
								1	"	Aphididae
								1	"	Pleididae
								1	"	Lygaeidae
								2	"	Miridae
								2	Diptera	Tipulidae
								2	"	Ceratopogonidae
								1	"	Phoridae
								6	"	Chloropidae
								2	"	Ephydriidae
								1	"	Sepsidae
								1	"	unidentified
								2	Thysanoptera	unidentified
								6	Lepidoptera	micro
								1	unidentified	
011164 1100	SE	13	23°20'	40°12'	25°09'	42°13'	260 km SSW of Cabo Frio Brazil	1	Lepidoptera	fragment
021164 2000	SSW	9	28°01'	45°28'	29°13'	46°50'	195 km ESE of Cabo de Santa Marta, Brazil	1	Hemiptera	Miridae
								2	Diptera	Tipulidae
								1	Lepidoptera	micro
									debris	sand
									"	insect
031164 1100	SSW	9	29°13'	46°50'	31°17'	49°13'	140 km E of Brazil coast near Lagoa dos Patos	3	Hemiptera	Aphididae
								1	Diptera	unidentified
041164 1100	NNE	18	32°53'	51°10'	34°37'	53°53'	20 km SE of Uruguay coast near La Paloma	1	Hemiptera	Psyllidae
								1	Diptera	unidentified
								1	Lepidoptera	micro
041164 1600	Light airs		34°37'	53°53'	34°47'	54°20'	15 km SSW of La Paloma Uruguay	14	Hemiptera	Cicadellidae
								72	"	Fulgoroidea
								3	"	Psyllidae
								74	"	Aphididae
								2	"	Miridae
								1	"	Lygaeidae
								25	Diptera	Tipulidae
								287	"	Chironomidae
								149	"	Cecidomyiidae
								4	"	Drosophilidae
								11	"	Bibionidae
								6	"	Dolichopodidae
								7	"	Scatopsidae
								1	"	Syrphidae
								7	"	Sciaridae
								7	"	Ephydriidae

							1	Diptera	Anthomyiidae
							1	"	Coelopidae
							4	"	Mycetophilidae
							1	"	Calliphoridae
							1	"	Phoridae
							10	"	Agromyzidae
							6	"	Chloropidae
							23	"	Ceratopogonidae
							2	"	Lauxanidae
							19	"	Borboridae
							2	Thysanoptera	unidentified
							1	Psocoptera	unidentified
							1	Neuroptera	Myrmeleontidae
							5	Coleoptera	Staphylinidae
							1	"	Cantharidae
							5	"	Lathridiidae
							6	"	Dytiscidae
							1	Hymenoptera	Ceraphronidae
							2	"	Scelionidae
							1	"	Trichogrammatidae
							1	"	Platygastridae
							4	"	Eucoilinae
							8	"	Eulophidae
							24	"	Braconidae
							1	"	Pteromalidae
							10	"	Mymaridae
							1	"	Encyrtidae
							4	Lepidoptera	Pyralidae
							13	"	micro
							1	Araneida	immature
041164	Light airs	34°47'	54°20'	35°00'	55°33'	25 km S of Uruguay coast	1	Hemiptera	Fulgoroidea
2100						45 km ESE of Montevideo	4	Diptera	Sarcophagidae
							4	"	Calliphoridae
							2	"	Sciaridae
							2	"	Chironomidae
							2	"	Lauxaniidae
							1	"	unidentified
							3	Odonata	Zygoptera
							5	Neuroptera	Myrmeleontidae
							5	Lepidoptera	Pyralidae
							1	"	Tortricidae
							1	"	Noctuidae
							1	"	Geometridae
							1	"	micro

R.R.S. SHACKLETON
 Montevideo to Port Stanley

			S	W	S	W			
071164 1100	SSW	2	35°27'	56°17'	37°26'	56°26'	70 km E of Argentine coast	1	Lepidoptera micro
091164 1200	SSE	9	42°18'	56°42'	44°45'	56°53'	710 km ESE of Peninsula Valdes, Argentina	1	Diptera Tipulidae

Numbers of Specimens by Family
R.R.S. SHACKLETON 1962

ORDER	NO. of SPC.	FAMILY	ORDER	NO. of SPC.	FAMILY
Hemiptera	21	Cicadellidae	Diptera	1	Calliphoridae
	5	Fulgoroidea		1	Agromyzidae
	1	Lygaeidae		1	Syrphidae
	4	Nabidae		1	Trypetidae
	19	Aphididae		33	Drosophilidae
Lepidoptera	6	micro		2	Chironomidae
Hymenoptera	3	Eulophidae		4	Ceratopogonidae
	1	Encyrtidae		1	Cecidomyiidae
	1	Formicidae		8	Ephydriidae
Coleoptera	2	unidentified		6	Borboridae
Psocoptera	1	unidentified	1	Phoridae	
			1	Anthomyiidae	
			Araneida	25	immature

Numbers of Specimens by Family
R.R.S. SHACKLETON 1964

ORDER	NO. of SPC.	FAMILY	ORDER	NO. of SPC.	FAMILY	
Hemiptera	702	Cicadellidae	Diptera	1	Drosophilidae	
	810	Fulgoroidea		165	Tipulidae	
	8	Psyllidae		5	Culicidae	
	9	Veliidae		63	Chironomidae	
	8	Mesoveliidae		56	Ceratopogonidae	
	1	Saldidae		1	Mycetophilidae	
	14	Lygaeidae		2	Cecidomyiidae	
	19	Nabidae		1	Empidae	
	57	Miridae		10	Dolichopodidae	
	3	Corixidae		2	Muscidae	
	5	Aphididae		2	Sepsidae	
	Lepidoptera	19		micro	74	Ephydriidae
		1		Gelechiidae	4	Chloropidae
		1		Pyalidae	1	Milichiidae
		6		Pterophoridae	43	Borboridae
1		Geometridae	1	Phoridae		
Hymenoptera	1	Scelionidae	2	Anthomyiidae		
	3	Eulophidae	2	unidentified		
	6	Braconidae	1	Myrmeleontidae		
	1	Berytidae	1	Coniopterygidae		
Coleoptera	9	Carabidae	Odonata	2	Zygoptera	
	1	Gyrinidae	Dermaptera	1	unidentified	
	2	Hydrophilidae	Acarina	1	Oribatidae	
	3	Staphylinidae				
	2	Chrysomelidae				
	1	Pselaphidae				
	1	Noteridae				
	3	Dytiscidae				

Number of Specimens by Family
R.R.S. SHACKLETON 1964 Spring

ORDER	NO. of SPC.	FAMILY	ORDER	NO. of SPC.	FAMILY	
Hemiptera	5	Lygaeidae	Lepidoptera	29	unidentified micro-	
	109	Fulgoroidea				lepidoptera
	80	Aphididae			1	Nymphalidae
	22	Cicadellidae			9	Pyralidae
	198	Psyllidae			1	Tortricidae
	1	Pleidae			1	Noctuidae
Diptera	5	Miridae		1	Geometridae	
	5	unidentified	Coleoptera	1	Chrysomelidae	
	6	Drosophilidae			5	Staphylinidae
	10	Ephydriidae			1	Cantharidae
	1	Trypetidae			5	Lathridiidae
	30	Tipulidae			6	Dytiscidae
	25	Ceratopogonidae	Hymenoptera	1	Ceraphronidae	
	2	Phoridae			2	Scelionidae
	12	Chloropidae			1	Trichogrammatidae
	17	Bibionidae			1	Platygastridae
	1	Sepsidae		4	Eucoilinae	
	289	Chironomidae		8	Eulophidae	
	149	Cecidomyiidae		24	Braconidae	
	6	Dolichopodidae		1	Pteromalidae	
	7	Scatopsidae		10	Mymaridae	
	1	Syrphidae		1	Encyrtidae	
	9	Sciaridae	Psocoptera	3	unidentified	
	1	Anthomyiidae				
	1	Coelopidae	Odontata	4	Zygoptera	
	4	Mycetophilidae	Thysanoptera	4	unidentified	
5	Calliphoridae	Araneida	2	unidentified		
10	Agromyzidae					
4	Lauxaniidae					
19	Borboridae					
4	Sarcophagidae					
Neuroptera	8	Myrmeleontidae				

Trapping results were negative on voyages of the SHACKLETON between Port Stanley and Grytviken (twice), Port Stanley and Punta Arenas, Punta Arenas and Deception Island during the months of November and December 1964; results of the trapping done on board the BISCOE in May 1965 between Montevideo and Southampton were negative also.