The Second Cruise of the RTMS *R.V. Geroevka*, September 1980 – March 1981

Exploratory fishing operations were undertaken in the area of the Southwest Indian Ridge from 20 October 1980 until 10 march 1981 during which time Seamounts 102, 251, 150, 358, 440, 475, 415, 422 and 360 were surveyed involving 260 trawl hauls (Table 5.1.8). Fishing over seamounts was done using 110/468 m midwater trawls that had a vertical opening of 38–45 m and were towed at a speed of 4.3–4.8 knots, a 110/600 m trawl with a vertical opening of 32–40 m, which was towed at a speed of 4.5–5.6 knots and a 81.8 m trawl with a vertical opening of 30–48 m,which was towed at a speed of 2.5–3.5 knots. While fishing at Seamount 150 and for other bottom trawling, a 1625A design 31.2 m bottom trawl was used. The pelagic trawls of types 110/468 m and 110/600 m were equipped with hexagonal 28 mm mesh codends. A 81.8/241-6 m trawl was equipped with a 46.0 m kill codend cover of 7 and 20 mm mesh.

Table 5.1.8
Results of trawl surveys at the Southwest Indian Ridge Seamounts during the 2nd Cruise of the *R.V. Geroevka*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %							
				Alfonsinos	Wreckfishes	Rubyfishes	Butterfishes	Jack mackerel	Tunas	Sharks	Other
102	20 October 1980 9–19 January 1981 15 February 1981	10	13.56	+		80.4			8.9	+	+
251	22–24 October 1980 13 December 1980 12 January 1981 12, 15 February 1981	14	25.15	2.0	0.5	65.0	30.0		+	+	+
150	October–December 1980 January–March 1981	305	673.5			89.3	5.0	5.0			0.7
358	6–9 November 7 December 1980, 20 January 1981	13	15.1	68.9	+	3.0	2.0				+
422	3–4 January, 13 February 1981	~8									+
360	7–8 January 1981	3									+

Fish aggregations were associated with the tops and slopes of the seamounts (excluding Seamounts 360 and 422). Seamounts 358 and 415 were discovered during this cruise. Based on the results of these commercial fishing operations detailed fishing assessments of the seamounts were prepared. Seamounts 102, 251 and 150 were the most productive, fish aggregations were recorded here and fishing was successful. There was no record of fish at Seamounts 422 and 360. Fishing over Seamounts 102, 251 and 150 were possible at night only, when fish schools rose off the bottom. The majority of the catch consisted of two species of rubyfishes and butterfishes. Jack mackerel was found only at Seamount 150.

During the period November – February at Seamounts 358, 440, 475 and 415 within the depth range 300–600 m, alfonsino (*Beryx splendens*) aggregations were found that were distributed in the near-bottom layer over the slopes and peaks of seamounts. Some schools reached 110 m height and 600 m length. The fish often escaped the trawl by diving under the ground rope. Development of new variations of trawls gears, suitable for such fish behaviour were suggested if successful exploitation of resources in these areas was going to be possible.

1981

The First Cruise of the RTMS *R.V. Zvezda Chernomorya*, February – July 1981

Exploratory fishing operations at the Southwest Indian Ridge area were undertaken 5–7 April 1981. These operations surveyed Seamount 150 of Madagascar Ridge. In June and July operations were carried out at the Ninety-East Ridge (Seamounts 927, 870 and 631) at the Mid-Indian Ridge (Seamount 336) and at the area of the Broken Ridge. More than 150 trawl hauls in total were undertaken over the seamounts and in the pelagic zone.

The following trawls were used: a 110/468 trawl with a vertical opening of 50–60m; a 110/600 trawl made by Klaipeda, Lithuanian trawl factory, which had a vertical opening of 35–40 m; and a 110/600 trawl made by the Kerch, Ukrainian trawl factory, which had a vertical opening of 35–40 m. Midwater trawls without fine-mesh covers were used for fishing at Seamounts 150 and 336, which is believed to be the reason why small-sized species of the sound scattering layer were absent from the catches in that area. Towing speeds were rather high, 3–5.3 knots. The results of the operations at seamounts where commercial catch rates were encounter are given in Table 5.1.9. According to the estimates of the survey scientists, fish biomass at Seamount 631 were not high and during the period of operations biomass present was unlikely to exceed 600 t.

Table 5.1.9
Results of trawl surveys at the Southwest Indian Ridge, Mid–Indian and Ninety–East Ridge Seamounts during the 1st Cruise of the *R.V. Zvezda Chernomorya*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %				
				Alfonsinos	Rubyfishes	Butterfishes	Jack mackerel	Other
Southwest Indian Ridge								
150	5–7 April 1981	10	13.5	...	92.4	...	4.0	+
Mid–Indian Ridge								
336	27 June–4 July 1981	19	31.5	...	...	...	...	...
Ninety–East Ridge								
631	25–25 June 1981 28 June–2 July 1981	22	31.7	75.2	...	...	...	+

The First Cruise of the RTMS *R.V. Zvezda Azova*, March – August 1981

This vessel undertook exploratory fishing operations in the eastern part of the Southwest Indian Ridge in the are of 24–30 °S, 60–70 °E from 5–30 may and over the seamounts of the Mid-Indian Ridge and Ninety East Ridge from 24 April–15 July 1981. Surveys were made of Seamounts 260 and 336 in the area of operations of the RTMS *Novoukrainka* in late October–early November 1980. For the first time the deep seamounts 631 and 549 were surveyed and the deep seamounts 400 and 620 were discovered. Acoustic studies of bottom topography were also carried out. Two underwater elevations in the area of Seamount 336 were discovered. A total of 143 trawl hauls were done in the pelagic zone

and over seamounts with duration of 205 hours of fishing. The results of the operations over the seamounts are given in Table 5.1.10.

Table 5.1.10
Results of trawl surveys at the Mid–Indian and Ninety–East Ridge Seamounts during the 1st Cruise of the *R.V. Zvezda Azova*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %						
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfishes	Scabbardfish	Armourhead	Other
Mid–Indian Ridge										
260	25 June–5 July 1981	29	28.3	20.0		80.0	+			
336	29 April–15 July 1981	78	133.0	5.0		80.0	10.0	3.0		+
400/ 336	June 1981	3	7.5	100						+
Ninety East Ridge										
631	16–26 June 10–11 July 1981	21	19.4	80.6	9.2				9.8	+
549	18–22 Jun 1981	12	16.9	+			67.5	20		+

Fishing was undertaken using 110/600 and 123/640 pelagic trawls and the vertical opening of trawls varied from 55 to 58 m. Acoustic surveying was done using Priboj-10 and Sargan-E systems and trawling was controlled with a Igla echosounder.

The First Cruise of the RTMS *Zvezda Sevastopolya*, March – September 1981
Operations were undertaken from 4 July to 22 August. A total of five seamounts (102, 430, 251, 150, and 358) were studied during this period. Fish aggregations, which may present particular interest for potential commercial fisheries was found, these dense fish concentrations formed under conditions of the winter cooling of waters. The results of the fishing operations are presented in Table 5.1.11. A 110/600 midwater trawl was used. Attempts to use a bottom trawl resulted in trawl damage.

Table 5.1.11
Results of trawl surveys at the Southwest Indian Ridge Seamounts during the 1st Cruise of the *R.V. Zvezda Sevastopolya*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %					
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfishes	Jack mackerel	Other
102	6 June – 1 August 1981	27	48.15	44.5	12.6	27.7	13.5	0.8	0.9
430	23 – 30 July 1981	12	7.67	99.9					0.1
251	20 June – 22 August 1981	50	69.08	6.9		31.2	55.9		6.0
150	23 June – 16 August 1981	55	91.17			71.8	1.3	22.7	4.2
358	June – August 1981	3							+

The Sixteenth Cruise of the RTMA *R.V. Chatyr-Dag*, March – September 1981

The main goal of the cruise was the exploration of commercial fish concentrations at seamounts of the Southwest Indian Ridge. Seamounts 150, 251, 430 and 360 were surveyed. A 72 m trawl and fine-meshed 86 m trawl were used for pelagic fishing. A 1625-design bottom trawl was used for demersal fishing. The principal results of fishing operations are presented in Table 5.1.12.

Table 5.1.12
Results of trawl surveys at the Southwest Indian Ridge and Madagascar Ridge Seamounts during the 16th Cruise of the *R.V. Chatyr–Dag*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %							
				Alfonsinos	Cardinal fish	Rubyfishes	Butterfishes	Jack mackerel	Tuna	Lanternfishes	Other
150	4–7 April 1981	10	29.4			76.5		14.7	4.1		4.7
	17–22 May 1981	18	41.7								
	28 May–4 June 1981	19	56.9								
102	June 1981	7	~7	93.1	3.1		3.3				0.5
	July 1981	21	23.6								
	1–8 August 1981	19	32.0								
430	8–23 July 1981	49	54.3	67.2			32.7				0.1
360	June 1981	38[1]	21.8	74.0	5.7					14.1	5.5
		20[2]	~20								
	July 1981	5	2.0								

[1] Bottom trawling.
[2] Pelagic trawling.

Exploratory fishing operations were carried out of Seamount 150 during three periods: in April, May and May – June. Trawl operations using a 72 m trawl and a fine-meshed trawl were used. An unsuccessful attempt was made to fish with a 1625-design bottom trawl at depths of 190–195 m. At Seamount 251, two trawl hauls were undertaken on 24 June. Acoustic equipment did not detect any fish aggregations and no catch was taken. At Seamount 102 fish aggregations were not recorded from March until July. In August the fishing situation improved greatly Alfonsino aggregations were distributed at the depths from 90 to 200 m. At Seamount 360, which is located in the zone of the Sub Antarctic front, acoustic equipment did not record any fish aggregations. An area suitable for bottom trawling was found at depths of 290–340 m. Experimental hauls by trawl showed positive results.

Vertical "drop" line fishing stations were undertaken at Seamounts 150 and 102 using the vessel's hydrological winches. Wreckfishes (*Polyprion americanus* and *Polyprion oxygeneios*) were principal species in the catch.

The Third Cruise of the RTMS *Geroevka*, April – August 1981

Fishing search operations were carried out at the Southwest Indian Ridge Seamounts 150, 358, 251 and 102 and at the Walters shoals of the Madagascar Ridge. Midwater trawls of the designs 110/468 and 110/600 were used. The largest catch was recorded using a 110/468 trawl, probably as a result of its high vertical opening (55 m); the speed of trawling varied from 3.9 to 5.2 knots with an average of 4.7 knots. Trawling was carried out along 1–3 transect lines. At the Walters Shoals trawling operations

were generally conducted with an upgraded 110/600 trawl; only 2 trawl hauls were made with the 110/468 m trawl. The upgraded 110/600 trawl, which was lighter and its trawling speed was higher (up to 6 knots); it was used for target fishing. Its vertical opening was 50 m. During the research on the seamounts, fish aggregations were generally located in zones that were unsuitable for fishing. The principal results of operations are given in Table 5.1.13.

Table 5.1.13
Results of trawl surveys at the Southwest Indian and Madagascar Ridge Seamounts during the 3rd Cruise of the *R.V. Geroevka*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %						
				Wreckfishes	Rubyfishes	Butterfishes	Jack mackerel	Tuna	Swordfish	Other
Southwest Indian Ridge										
150	26 April–6 June 1981	54	77.5		54.0		36.5			9.5
358	6–7 May 1981	4	4	+	+			+	+	+
251	17–19 May, 5 June 1981	9	14.5		90.0	+	+			+
102	20–21 May 1981	6	7.5		+			+		+
Madagascar Ridge										
Walters shoals	23 May–1 June 1981	43	61.56				99.6			0.4

The Fourth Cruise of the RTMS *Geroevka*, December 1981 – May 1982
The *Geroevka* operated from 2 February until 2 May 1982 at the seamounts of the Southwest Indian and Madagascar Ridges as well as in the area of the ridges in more open waters. Fishing operations were carried out over Seamounts 358, 150 and 630 and over a newly discovered seamount, numbered 690. A total of 64 trawl hauls were undertaken. The principal results of studies are given in Table 5.1.14. During this cruise, potentially productive zones were examined that had been insufficiently studied earlier. Fish searching was carried out using Priboj, Sargan, Simrad and a Koden colour acoustic fish detection equipment. Fish was caught only at night and during the evening and morning twilight period.

Midwater trawls of the 110/600 and 110/468 designs were used. Vessel towing speed varied from 2.8 to 4 knots and fishing was undertaken in the 50–350 m lay. The codend had a mesh size of 40–60 mm; the trawls were equipped with a fine-mesh cover. The speed of the vessel varied from 2.8–4.2 knots when fishing in the 600–800 m layer and increased to 5.5–6.3 knots when trawling in the 0–60 m layer.

The Second Cruise of the RTMS *Zvezda Chernomorya*, August 1981 – January 1982
Survey operations were undertaken at Seamounts 150, 251, 102, 700 and 420 of the Southwest Indian Ridge from 1 until 25 September. Sixty-five trawl sets were made for a total duration of 144 hours. At

Seamounts 260, 336 and 631 of the Mid-Indian Ridge the vessel operated during 5–9 October 1981 and 12–14 January 1982. A total of eight bottom (15 hours) and twelve surface trawls (for 12.2 hours) were undertaken. The results of the operations are given in Table 5.1.15. Midwater 110/468 (42 hauls) and 110/600 (23 hauls) trawls used for fishing. Trawls of the 110/468 design have a vertical opening of 54 m at a trawling speed of 5.2–5.5 knots and the 110/600 trawls had an opening of 54–48 m at a trawling speed of 5.0–5.5 knots.

Table 5.1.14
Results of trawl surveys at the Southwest Indian Ridge and Madagascar Ridge Seamounts during the 4th Cruise of the *R.V. Geroevka*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %							
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfishes	Jack mackerel	Wreckfishes	Armourhead	Other
Southwest Indian Ridge											
690	2–23 March 1982	35	42.3	80.9	2.9		+		+	15.3	+
358	24–26 March 1982	6	6.0	97.6	1.9		+		+		+
150	27–30 march 1982	12	10.8			77.6		16.2			+
630	26–31 March 1982	6	6.8	91.2			2.7		+		+
Madagascar Ridge											
Walters shoals	February 1982	5	8.7			+		93.1			6.9
690	24–26 February 1982	4	4								100
516	April 1982	1	1								+

As a result of the fishing operations, fish aggregations and schools were observed with specific features. Interaction of circulating currents with bottom elevations in the Southwest Indian Ridge resulted in upwelling of deep Antarctic waters rich in biogenic elements. The consequence was the development of all levels of the trophic chain from phytoplankton and zooplankton to fish. Formation and the stability of alfonsino aggregations was in direct relation to the synoptic gyres. Favourable fishing situations were recorded in anti-cyclone gyres where alfonsino aggregated densely and were foraging actively. The optimal temperature of alfonsino aggregation was 8–12 °C in depths of 400–200 m.

The Third Cruise of the RTMS *Vozrozhdenie*, June – December 1981

Fish scouting operations in the area of the Southwest Indian Ridge were undertaken from 6 September until 31 October 1981. Seamounts 360, 680, 422, 415, 940, 102, 900, 251, 150 and 358 were examined. At the Mid-Indian and Ninety East Ridges, the RTMS *Vozrozhdenie* surveyed from 6 November until 8 December 1981. Seamounts 260, 336, 400, 620, 631 and 549, which are in the area 24–35 °S, 80–88 °E, were examined. During this cruise, Seamounts 462, 433, 800, 760, 741

Table 5.1.15
Results of trawl surveys at the Southwest Indian, Mid–Indian and Ninety–East Ridge Seamounts during the 2nd Cruise of the *R.V. Zvezda Chernomorya*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %			
				Alfonsinos	Cardinalfish	Rubyfishes	Other
Southwest Indian Ridge							
251		2	5.8			86.0	14.0
150		1	2.5			50.0	50.0
102		44	96.0	99.2	0.3		0.5
700		14	31.0	99.9			0.1
420		4	9.0				+
Mid–Indian Ridge							
260	5–9 October 1981 12–14 January 1982	20	27.2				+
336				100			
631				100			

and 510 were discovered. A 110/468 m trawl was used. The results of the fishing operations are given in Table 5.1.16.

The Fourteenth Cruise of the RTMA *R.V.Fiolent*, August 1981 – January 1982
Fishing survey operations were undertaken 13 August 1981 until 14 January 1982 at the seamounts 358, 150, 251, 102, 415 and 720 of the Southwest Indian Ridge. The results of operations are given in Table 5.1.17. Midwater trawls of the type 85.2/400, length 86 m and with a maximum codend mesh size 20 mm. The vertical opening of the trawls was 30–35 m (as measured with a netsounder) and with a horizontal opening of 45–50 m. Fishing started using a 86 m trawl which was lost in the beginning of fishing operations and it was replaced by trawl of a 85.2/400 m design.

During the fourteenth cruise of the RTMA *Fiolent* an acoustic survey of the Southwest Indian Ridge in the area of Seamounts 358, 150 and 251 was undertaken. According to provisional calculations, the total fish biomass at the seamount 150 was about 3 700 t during the period of the assessment cruise. During the acoustic survey at the Southwest Indian Ridge seamounts suitable for the occurrence of fish resources were found with minimum depths 540, 640 and 680 m.

1982
The Eighteenth Cruise of the BMRT *R.V. Skif*, March – September 1982
The main area of this expedition was the Antarctic waters of the Indian Ocean. Search operations in the southern part of the Southwest Indian Ridge were carried out periodically on 29 July and during 2–5 and 30–31 August. A total of twelve one hour trawl hauls were undertaken over the peaks of the seamounts as well as in depths from the surface down to 340 m. The catches were small and varied from 1 to 70 kg; fish of the family Myctophidae predominated in the catch. Some seamounts not indicated on the chart were discovered.

The Fifth Cruise of the RTMS *R.V. Geroevka*, June – November 1982
Exploratory fishing of the seamounts of the Southwest Indian Ridge was done during the period June – November 1982 to determine the state of fish resources. Twelve seamounts were surveyed involving 219 trawl hauls. The results of operations at the most important seamounts are given in Table 5.1.18. Three trawl designs were used: a 110/600 m trawl that had a minimum inner mesh size

of 60 mm; a 110/600 trawl with a krill cover and codend with a minimum inner mesh size of 13 mm and an experimental finemesh 120/230 m trawl with a minimum mesh size 13 mm. Surface trawl hauls were made at speeds of 5.8–6.0 knots and trawl hauls with fine-meshes were made at speeds of 3.5–4.8 knots.

Table 5.1.16
Results of trawl surveys at the Southwest Indian and Madagascar Ridge Seamounts during the 3rd Cruise of the *R.V. Vozrozhdenie*

Seamount	Period of study	No. of trawl hauls	Hours of trawl-ing	Catch of principal species %							
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfishes	Jack mackerel	Skabbardfish	Armourhead	Other
Southwest Indian Ridge											
900	18 September, 11 December 1981	1	3.5								100.0
251	18 September, 11 December 1981	4	–			+					+
102	8–9 September, 26 October 1981	~5–8	–	100.0							
150	13–15 September, 11, 21–24 October 1981	13	–			99.9		+		+	
415	18–29 September 1981 27–29 October 1981		–	100.0							
358	11–26 October 1981	2	–	+		+	99.9				+
Mid–Indian Ridge											
260	17–22 November 1981	18	–	27.5		27.5	44.8				+
Ninety East Ridge											
336	12–24 November 1981	3	–				95.0				+
400/ 336	14, 23 November 1981	2	–	95.0							+
631	24 November– 1 December 1981	16	–	99.0	+						+
549	2 December 1981	10	–	60.0			30.0		10.0		

The Third Cruise of the RTMS *R.V. Zvezda Sevastopolya*, March – August 1982
Survey and fishing operations were undertaken at eight seamounts of the Southwest Indian Ridge and at some seamounts of the Madagascar Ridge. Research was undertaken in two stages: from 18 April to 13 May and from 1–13 June 1982. Seamount 690 was examined most completely and the rest of the seamounts were surveyed intermittently. Trawling was done with a 110/600 midwater trawl whose vertical trawl opening depended on the speed of towing; it reached 60–70 m during trawling at depths of 50 m. The results of the fishing at seamount 690 are given in Table 5.1.19.

The Fifteenth Cruise of the RTMA *R.V. Fiolent*, June – November 1982
Research activities in the Southwest Indian Ridge region were carried out from 21 June till 7 July 1982 at Seamounts 690, 150 and 251. Fifty-three trawl stations were undertaken with a 78/520 rope trawl that had a 28 m codend. The chafer was made of 20 mm net. Trawling operations at the Broken Ridge were conducted from 18–20 July. Eight bottom trawl sets were undertaken over the top surface of the Ridge in depth ranges of 890–1 000 m for a total duration of 12.9 hours. Smoothheads, orange roughy and dogfish were the predominant species in the catches. Trawl sets were made with a

1625 design bottom trawl with a 20 mm mesh size in the codend and standard rigging. The results of operations at the most important seamounts are given in Tables 5.1.20 and 5.1.21.

Table 5.1.17
Results of trawl surveys at the Southwest Indian and Madagascar Ridge Seamounts during the 14th Cruise of the *R.V. Fiolent*

Seamount	Period of study	No. of trawl hauls	Hours of trawl-ing	Catch of principal species %							
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfishes	Swordfish	Wreckfishes	Scabbardfish	Other
358	13 October 1981–11 January 1982	33	46.2	9.0		12.0	77.0		+		2.0
150	13 September 1981–14 January 1982	47	65.1			93.6	4.9		0.03	0.5	1.0
251	10 October 1981, 2–3 January 1982	4	2.8			67.0			19.0	8.0	1.0
102	28 September–1 October 1981	4	11.1	9.0		10.0		38.0	42.0		1.0
720	30 November 1981	1	4.4								
415	3 October 1981	2	6.8	76.0	1.0						23.0

The Sixth Cruise of the RTMS *R.V. Geroevka*, December 1982 – June 1983

The main objective of this cruise was to obtain estimates of the potential commercial fish production of the most productive seamounts of the Southwest Indian Ridge. The seamounts 690, 980, 358, 610, 150, 251, 102, 700, 360 and 422 were surveyed. A new seamount, 940, was also located. Fish aggregations were not found over tops of seamounts with the exception of Seamounts 150 and 251. According to echo sounder records fish aggregations migrated into deeper waters and were distributed near the slopes of seamounts, thus being inaccessible for fishing with a midwater trawl. Seamount 260 of the Mid-Indian Ridge was also surveyed. The results of operations at the most important seamounts are given in Table 5.1.22.

Orange roughy (*Hoplostethus atlanticus*) photographed from a submersible deployed from a Soviet research vessel. Although orange roughy occur through out the southern Indian Ocean, they were never targeted by Soviet fishing operations in this area (because of the purgative effect when fillets are improperly skinned).

Table 5.1.18
Results of trawl surveys at the Southwest Indian Ridge Seamounts during the 5th Cruise of the *R.V. Geroevka*

Seamount	Period of study	No. of trawl hauls	Hours of trawl-ing	Catch of principal species %						
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfishes	Armourhead	Jack mackerel	Other
690	12 June–28 October 1982	148	200.5	57.3	5.0		5.4	32.2		0.1
150	12 June–19 October 1982	35	59.7			90.8	1.9		4.8	2.5
251	2–4 October 1982	6	7.9	85.7						14.3
610	8–10 July, 5–20 October 1982	7	3.2	75.0						25.0
358	12 June–17 October 1982	6	3.5	100.0						
415	1 October 1982	2	1.7	100.0						
102	8 August–1 October 1982	9	10.1			83.7	6.1			10.2
960	3	2.7								+
700	3	1.2								+

Table 5.1.19
Results of trawl surveys at the Southwest Indian Ridge during the 3rd Cruise of the *R.V. Zvezda Sevastopolya*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %				
				Alfonsinos	Cardinalfish	Butterfishes	Armourhead	Other
690	18 April–13 June 1982	40	133.6	57.9	1.0	3.3	37.2	0.6

All trawl hauls were made with 110/600 midwater trawls. A 110/600 trawl with a krill or sprat codend was used when fishing myctophidae aggregations in the sound scattering layer. The speed of towing when targeting rubyfishes, alfonsino and jack mackerel varied from 4 to 5 knots; for Myctophidae fishing and fishing targeting the sound scattering layer, a fine-mesh trawl was used towed at a speed of 2.2–3.5 knots. The depth of fishing varied from 0 to 920 m.

1983

The Seventh Cruise of the RTMS *R.V. Geroevka*, July – November 1983

The objective of this cruise was to continue the assessment of the fishing potential of the seamounts of the Southwest Indian Ridge. The search for fish concentrations in the region of the seamounts was undertaken using first preliminary acoustic surveys and then controlled trawl hauls. Two rope pelagic

trawls of 110/600 and 91.4/468 designs and Priboj-101G, Sargan-G, Priboj-101E and Koden (with colour display) echo sounders were used. A Sargan-E navigational echo sounder was also used as a search devices. A Simrad acoustic system was used to assess the fish biomass. The cruise examined fish aggregations of the following seamounts: 150, 710, 480, 690, 415, 251, 102, 358, 610, 630 and 422. The results of operations at the most important seamounts are given in Table 5.1.23.

Table 5.1.20
Results of trawl surveys at the Southwest Indian Ridge Seamounts during the 15th Cruise of the *R.V. Fiolent*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %							
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfishes	Armourhead	Jack mackerel	Scabbardfish	Other
690	21–23 June1982	9	11.3	38.2	2.7		1.4	57.1			0.4
150	24 June–7 July 1982	40	50.2			81.1	13.5		3.1	1.0	1.3
251		3				50.0					50.0

Table 5.1.21
Results of trawl surveys at the Broken Ridge Seamounts during the 15th Cruise of the *R.V. Fiolent*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %					
				Alfonsinos	Orange roughy	Spiky dory	Sharks	Grenadiers	Others
	18–20 July	8	12.9	4.4	13.4	4.6	13.6	8.4	55.6

The Nineteenth Cruise of the RTMA *Chatyr-Dag*, August –November 1983

Operations at the seamounts of the Southwest Indian Ridge were carried out during 8–19 September (Seamount 490) while *en route* to the principal area of research, the Antarctic Ocean. Thirty midwater trawl hauls, for a total duration of 44.2 hours, were undertaken using a 78/520 trawl. The catch consisted of alfonsino (92%) and butterfish (8%). The length of alfonsino in the catches varied from 19 to 39 cm and the modal fish size was 30–32 cm; average weight of individuals was 658 g. Alfonsino aggregations were observed at night over peaks of seamounts in a small area.

The Ninth Cruise of the BMRT *R.V. Mys Ostrovskogo*, October 1983 – April 1984

The principal area of operations were the Antarctic waters of the Indian Ocean. The search operations at the Southwest Indian Ocean were carried out at the end of the cruise, from 31 March to 9 April over Seamounts 150 and 690. A 1498 design midwater trawl was used in near-bottom mode, mainly at night. Alfonsino, rubyfishes, and armourhead predominated in the catch. The principal results of operations are presented in Table 5.1.24.

Table 5.1.22
Results of trawl surveys at the Southwest Indian Ridge and Mid–Indian Ridge Seamounts during the 6th Cruise of the *R.V. Geroevka*

Seamount	Period of study	No. of trawl hauls	Hours of trawl-ing	Catch of principal species %							
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfishes	Armourhead	Jack mackerel	Spiky dory	Other
Southwest Indian Ridge											
150	25 January–27 March 1983	43	23.5			79.6	14.4		4.3		1.7
358	25 January 1983	1	3	100.0							
251	1–2 February 1983	3	2.75	10.0		46.9	20.8				22.3
102	3–4 February 1983	3	4.6			93.1	2.9		4.0		
700	27 March 1983	2	2.1	14.8						85.2	
690	5 January–3 June 1983	6	11.5	20.0	5.0			70.0			5.0
Mid–Indian Ridge											
260	10 Jan 1983	2	3.3	89.7		10.3					

Table 5.1.23
Results of trawl surveys at the Southwest Indian Ridge during the 7th Cruise of the *R.V. Geroevka*

Seamount	Period of study	No. of trawl hauls	Hours of trawl-ing	Catch of principal species %					
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfisshes	Armourhead	Other
150	25 July–4 November 1983	62	99			80.2	15.5		4.3
710	16 October–8 November 1983	44	38.2	81.0			16.8		2.2
480	31 August–3 September, 9 November 1983	12	9.2	59.2	10.9		29.4		0.5
690	17 July–11 November 1983	8	11.2	15.0	5.0			80.0	
415	2 September 1983	2	1.7	13.0			86.6		0.4
251	9 August–25 October 1983	3	4						100.0
102	3 September 1983	2	2						100.0

Table 5.1.24
Results of trawl surveys at the Southwest Indian Ridge during the 9th Cruise of the *R.V. Mys Ostrovskogo*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %							
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfisshes	Armourhead	Snoek	Jack mackerel	Other
150	April 1983	3	1.51	–	–	84.0	–	–	7.0	4.0	5.0
690	6–8 April 1983	5	4.32	64.0	–	–	–	32.8	–	–	3.2

1984

The Sixth Cruise of the RTMS *Zvezda Chernomor'ya*, December 1983 – May 1984

The principal area of the operations for this expedition was the southeastern Pacific and the Antarctic waters of the Indian Ocean. The survey operations in the area of the Southwest Indian Ridge were carried out at the end of the cruise, from 5–10 April over Seamounts 150, 690 and 358. The area of the Mozambique and Madagascar Ridges was examined as well. Trawl hauls were made with a 110/600 design pelagic trawl. The catches were small and mainly consisted of alfonsino, rubyfishes and armourhead.

The Seventh Cruise of the RTMS *Zvezda Chernomor'ya*, June – November 1984

The goal of the operations of this expedition was to search for commercial aggregations of pelagic and bottom fish species and squids in the high seas of the southern Indian Ocean. The main areas of research were the Mid-Indian and Ninety East Ridges. Search operations were carried out on the Southwest Indian Ridge, pelagic waters of the southern Indian Ocean southwards and south-westwards from Australia, the Saya-de-Malha Bank and equatorial seamounts. The cruise examined Seamounts 260, 330, 400, 620 of Mid-Indian Ridge and 631, 510 of the Ninety-East Ridge. Acoustic search was undertaken using Priboj 101 Eh, Priboj 101 G, Sargan G, Sargan Eh echosounders and a Igla netsounder was also used. Trawl hauls were carried out using a 110/600 m pelagic trawl. When fishing for pelagic species the trawling speed was kept in the range of 3.5–5.5 knots. When fishing for small and bottom fishes the trawling speed was in the range 2.8–3.5 knots. The principal results of operations are presented in Table 5.1.25.

F.R.V. 'Skif'

The BMRT fishery research vessel, ~~*F.R.V. Akademik Knipovich*~~, used in Southern Indian Ocean surveys. This vessel 's design was based on the *Mayakoskiy* type factory trawler. The Nicolaev and Baltiya shipyards built 109 мэяковский-class fishing vessels between 1958 and 1969. They have dimensions of 1519/1300 dwt, 3162/2691 GRT) (Greenway 1980).

1985

The Eight Cruise of the RTMS *Zvezda Chernomor'ya*, January – June 1985

The main area of operations for this expedition was Antarctic waters of the Indian Ocean. The search operations in the area of the Southwest Indian Ridge were carried out at the beginning

of the cruise from 24–31 January on Seamount 150 (Geroevka) and at the end of the cruise from 27 April to 9 May on Seamounts 150, 480, 710 and 102. Trawl sets were undertaken using a 110/600 pelagic trawl; towing speed was 5.5 knots. Significant fish concentrations were only registered at Seamount 150, but they quickly disaggregated under the impact of fishing, which lasted for two to three days. The principal results of the operations are presented in Table 5.1.26.

Table 5.1.25
Results of trawl surveys at the Mid–Indian, Ninety–East and Southwest Indian Ridges during the 7th Cruise of the RTMS *Zvezda Chernomor'ya*

Seamount	Period of study	No. of trawl hauls	Hours of trawl-ing	Catch of principal species %						
				Alfonsinos	Cardinalfish	Rubyfishes	Butterfisshes	Armourhead	Jack mackerel	Other
Mid–Indian Ridge										
260	15–30 July1984	10	12	43.0	–	53.0	–	–	–	4.0
335	17–25 July1984	18	20	14.0	–	82.0	–	–	–	4.0
631	21–27 July1984	15	17	91.0	2.0	–	–	7.0	–	–
Southwest Indian Ridge										
710	12–17 November 1984	13	10	98.0	–	–	–	–	–	2.0
480	13–16 November 1984	12	12	98.0	–	–	–	–	–	2.0
150	18–20 November 1984	6	6.5	–	–	85.0	5.0	–	5.0	5.0
690	22–23 November 1984	4	4	90.0	–	–	–	7.0	–	3.0

Table 5.1.26
Results of trawl surveys at the Southwest Indian Ridge during the 8th Cruise of the RTMS *Zvezda Chernomor'ya*

Seamount	Period of study	No. of trawl hauls	Hours of trawl-ing	Catch of principal species %				
				Alfonsinos	Rubyfishes	Butter-fishes	Jack mackerel	Other
150	24–31 January 1985	15	27.4		99.1		0.4	0.5
	27 April–9 May 1985	18	30.1		73.1	20.6	5.7	0.6
710	May 1985	1	0.5	63.5				36.5
480	May 1985	4	9.2	99.2				0.8
102	May 1985	3	3.6					100.0

1987

The Fourteenth Cruise of the BMRT *R.V. Mys Ostrovskogo*, June – August 1987

The main goal of this expedition was to explore for commercial aggregations of mesopelagic fish (generally Myctophidae family) and determine the prospects for profitable fishing in the zone of the Subantarctic front of the Indian Ocean. The area of the Madagascar Ridge (Walters Shoals, Seamount 516) and the Southwest Indian Ridge (Seamounts 102, 415, 480 and 150) were examined as additional areas for research. A 78.7/416 trawl was used for pelagic fishing, which had a vertical opening of 30–45 m. The trawling speed was 4.5–5.6 knots. When targeting mesopelagic fish, a 98/640 trawl with a vertical opening of 45–60 m was used; the trawling speed was 2.7–3.7 knots. The principal results of operations are presented in Table 5.1.27.

Table 5.1.27

Results of trawl surveys at the Madagascar and Southwest Indian Ridges during the 14th Cruise of the BMRT *R.V. Mys Ostrovskogo*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species %				
				Alfonsinos	Rubyfishes	Butter-fishes	Scabbard-fish	Other
Madagascar Ridge								
Walters shoals	20–21 June 1987	5	12.17					100.0
516	13–17 June 1987 1–2 July 1987	12	32.08	3.8			89.9	6.3
Southwest Indian Ridge								
102	3–6 July 1987	8	18.00		70.2	25.6		4.2
415	7–8 July 1987	3	4.92	56.0				44.0
480	7–8 July 1987	2	8.33	100.0				
150	20–21 August 1987	2	3.58		81.5	16.5		2.0

The Fifteenth Cruise of the BMRT *R.V. Mys Ostrovskogo*, October 1987 – March 1988

The main goal of this expedition was to search for commercial aggregations of mesopelagic fish (generally Myctophidae family) and to determine the prospects for profitable fishing of mesopelagic fish in the zone of the Subantarctic front and the Antarctic waters of the Indian Ocean. Six tows were made in the southern part of the Southwest Ridge but there were no significant catches.

1988

Cruise of the BMRT *Mys Ostrovskogo*, 17 September 1988 – February 1989

Seamounts 690 and 358 were examined along the Southwest Indian Ridge. Three and two tows were of 3.1 and 1.5 hours, respectively. No catch was taken.

1992

The Twenty-ninth Cruise of the RTMS *R.V. Zvezda Kryma*, April 1992 – April 1993

This vessel examined the seamounts of the Southwest Indian Ridge, Broken Ridge and Ninety East Ridge from June 1992 until February 1993.

Broken Ridge: Here, twelve pelagic tows over Seamount 590 and one bottom tow on the plateau southeast of the seamount were undertaken (Table 5.1.28).

Ninety East Ridge: Over this seamount, one trawl haul was undertaken at Seamount 631 (Table 5.1.28).

Southwest Indian Ridge: The main operations were carried out over seamounts of the Southwest Indian Ridge (Table 5.1.29).

Table 5.1.28
Results of trawl surveys at the Broken Ridge Seamounts and Ninety East Ridge Seamounts during the 29th Cruise of the *R.V. Zvezda Kryma*

Seamount	Period of study	No of trawl hauls	Hours of trawl-ing	Catch of principal species %			
				Alfonsinos	Orange roughy	Armourhead	Other
590	27–30 June 1992 17–18 July 1992	12[1]	5.28	48.5	0.1	51.0	0.4
631	20 July 1992	1	3.7	50.0		50.0	

[1] Pelagic trawling.

Surveys were undertaken from 27 July 1992 until 4 February 1993 in three stages (27 July – 5 September 1992, 6 October – 23 November 1992 and 13 December 1992 – 4 February 1993). In totally there were 365 pelagic tows for a total of 450 hours fishing. The results of operations are given in Table 5.1.29. The main species in catches over the Broken Ridge were pelagic armourhead (37–57 cm fork length, but generally 40–46 cm; alfonsino 19–48 cm fork length, but generally of 32–41 cm, and orange roughy. At the Ninety East Ridge seamounts the principal species taken were alfonsino, and pelagic aromourhead of 38–56 cm fork length,but generally of 43–49 cm.

At the Southwest Indian Ridge the species catch composition varied greatly by seamounts (Table 5.1.29). Alfonsino, rubyfishes, butterfishes, armourhead and jack mackerel were the main commercial species. Over Seamounts 710, 690, 480 and 415, alfonsino characterized the distribution layers. Large, pre-spawning and foraging individuals as a rule stayed in the deeper layers over the slopes, usually at a depth lower than the top of the seamount. At the same time medium-sized and small-sized alfonsino formed aggregations over the seamount tops in the lower part of the sound scattering layer and mesopelagic zone. Cape bonnetmouth were found in the catches at three seamounts – 150, 251 and 102. Large-sized fishes were recorded at Seamount 251 with individuals of minimum size found at Seamount 102. This species spawned in July – September; by December all of the Cape bonnetmouth were foraging. Armourhead were also recorded at two seamounts – 690 and 710, but only at 690 in commercial quantities. Aggregations of this species reached the largest density during the middle of the night.

Bluenose warehou were recorded in the catches from most of the seamounts but did not form dense aggregations. Jack mackerel were caught in small amounts at Seamount 150 where they formed small but dense schools in the lower part of the sound scattering layer at night during January – February. Cardinalfish, dories, Roudi escolar (*Promethichthys prometheus*), Myctophidae, Gonostomatidae, and viperfishes (Chauliodontidae) were the principal bycatch species from the Southwest Indian Ridge seamounts.

5.2 Vertical mechanized lines

Experimental fishing at the seamounts of the Southern Indian Ocean was carried out during several cruises using mechanized vertical (drop) lines as listed in Appendix 2. Medium-size trawlers of SRTM and SRTMK classes were used (Table 4.1). Although high daily catches were sometimes recorded (generally for hapuku (wreckfish) (*Polyprion oxygeneios*) and wreckfish (*Polyprion*

Table 5.1.29
Results of trawl surveys at the Southwest Indian Ridge Seamounts during the 29th Cruise of the *R.V. Zvezda Kryma*

Seamount	Period of study	Trawl hauls	Hours of trawling	Catch of principal species %							
				Alfonsinos	Cardinal fish	Dory	Butterfishes	Rubyfishes	Jack mackerel	Armourhead	Other
690	27–28 July 1992, 6 October–23 November 1992 10–23 November 1992 13 December 1992	76	141	69.1	1.3		3.6			26.0	
358	29 July 1992, 28 October 1992	2	3.7	97.2		0.8					
	30 July–27 August 1992 8 October 1992	14	10.0				6.2	90.0	2.3		+
150	15 December 1992–4 February 1993	49	64.3				4.5	88.2	6.4		+
251	1–28 August 1992 3–5 September 1992 8–9 October 1992 16 December 1992	77	57.7	5.7			47.4	45.0			+
710	28–29 August 1992 9–27 October 1992	32	28.5	86.5	0.1	2.0	11.2				+
	17 December 1992–11 January 1993	21	30.3	67.3	4.8	4.3	22.7				+
480	29 August–2 September 1992 12–20 October 1992	21	20.0	80.1			19.2				0.7
	19 December 1992–9 January 1993	33	52.5	85.0	0.6		14.1				+
415	31 August–2 September 1992 15–16 October 1992 27–29 December 1992	13	18.7	62.6			36.2				+

americanus)), such fishing was found to be unprofitable for several reasons: total catches obtained for the cruise during vertical line fishing were low, the fishing operations were impeded by the great depths, small superficial areas of the seamounts and banks and strong and highly variable currents. In this connection it was suggested that using the bottom longlines might increase the efficiency of fishing of large demersal fish in these areas.

5.3 Bottom longlines

Experimental longline exploratory fishing targeting large demersal fishes at seamounts of the Southwest Indian Ridge was carried out by medium-size trawlers of SRTM and SRTMK classes (Table 4.1) converted for bottom long-line fishing. The first attempts at bottom longline fishing were carried out during several vertical-line fishing expeditions. Experiments with specially designed bottom longlines at deepwater seamounts of the Southwest Indian Ridge were started on the SRTM *Langust* during June and July, 1983. This work continued during two subsequent research expeditions by the SRTM *Golub Mira* in 1984 and 1985 and during exploratory fishing expeditions by the SRTMK *Primorets* in 1993 and 1994.

The Twentieth Cruise of the SRTM *R.V. Stepan Poshivalnikov*, July – December 1982

The principal goal of this cruise was to undertake vertical line (drop line) fishing and fishing for spiny lobster with pots, as described in the Sections 5.2 and 5.4. During the cruise three experimental sets of bottom longlines (made of pelagic tuna long-line) were undertaken: two sets at Seamount 150 using 250 hooks in total and one set at Seamount 102 using 100 hooks. The total catch was 136 kg of wreckfishes and mako shark (*Isurus* sp.). It was noted in the cruise records that for efficient operation it would be necessary to use specialized bot-tom longlines and longline hauling equipment.

Fishing vessel of the "Маяк" SRTM class used in Southern Indian Ocean exploratory fishing. These "*Mayak*" class side-trawlers used a 25 m trawl, had a trawl drum capacity of 570 m, LOA 54.2 m, speed of 11.6 knots, 929 GRT, main engine 800 hp, crew of 30 and a 33 day at-sea endurance. Freezing capacity was 6 t/day at -18°C (Anon. 1968).

The Twenty-eighth Cruise of the SRTM *R.V. Langust*, June – July 1983

The objective of this cruise was to undertake the first experimental fishing for large demersal fish with mechanized bottom longline at the deepwater seamounts at the Southwest Indian Ridge. To do this, the Ukrainian fisheries exploration organization Yugrybpromrazvedka[7] freighted from the Russian city of Kaliningrad the SRTM *Langust*, which was equipped with *Albatros* Soviet-built mechanized bottom longline fishing equipment. The SRTM *Langust* carried out research in the Southwest Indian Ridge area using bottom longlines from 2 June 1983 to 13 July 1983 (i.e. the austral winter). The basis for sending the SRTM *Langust* to the area of the Southwest Indian Ridge were results of the previous Soviet (Ukrainian) surveys of the biological resources in this area. During the period 1976–1983

[7] At present this fishing company is called PPP Yugrybpoisk.

results of scientific research expeditions had indicated the potential feasibility of vertical line fishing for large demersal fishes over the peaks of the seamounts and banks of the Southwest Indian Ridge using the mechanized lines.

In the zones of longline sets, hydrological sections were undertaken at a number of hydrological stations. Acoustic examination of the tops and slopes of the banks were intended to find the target species and determine areas for the bottom longline fishing.

A total of 22 longline sets were made of which six malfunctioned (Table 5.3.1). One set was made at Seamount 360, four sets were made at Seamount 251 and 17 sets at Seamount 150. Longlines were set on and off the bottom. Frozen mackerel and squid were used as bait. Sets were made in the first half of a day (0600–1200), in the afternoon (1200–1800) and at night (2000–06.00). The length of the longlines varied from 300 to 1 850 m. The longline construction design was changed from set to set to find the optimal modification for best catch rates. The optimal mode was found to be a bottom longline set that fished the near-bottom layer of 5 m. The principal results are shown in Table 5.3.1.

Table 5.3.1
Results of longline survey at the Southwest Indian Ridge Seamounts during the 28th Cruise of the *R.V. Langust*

Seamount	Period of study	No of sets by types			No of hooks	Average number of hook (%)		Catch by species (%)			
		Bottom	Bottom–suspended	Vertical		Baited	Effective	Hapuku wreck–fish	Wreck–fish	Rose–fish	Sharks and rays
360	2 June 1983	1	0	0	400	53.0				100	
251	6–9 June 1983	4[1]	0	0	1600	47.2		62.5	20.3		17.2
150	9–17 June 1983 11–13 July 1983	6[2]	10	1	9810	64.6		67.9	15.5		16.6

[1] One longline was lost and one longline set missed the seamount.
[2] Three longlines were broken.

A total of 13 fish species from 12 families were caught. The catch consisted mainly of hapuku wreckfish *(Polyprion oxygeneios)* and wreckfish (*Polyprion americanus)* (68% and 15% by weight). The bycatch (17%) consisted of sharks and other fish species. The length of hapuku wreckfish (*Polyprion oxygeneios*) in catches (standard length) varied in the range 50 to 95 cm, and in weight from 2.6 to 13.2 kg. The majority of the catch consisted of fishes 60–75 cm in length and 4.2–6.6 kg in weight. The wreckfish (*Polyprion americanus*) was represented in catches by the individuals of 50–105 cm length and 4.8–28.5 kg in weight. Fishes of 55–70 cm length and 4.7–10.0 kg in weight predominated.

Wreckfish (*Polyprion americanus*). A bathydemersal fish occuring in depths of 40–600 m between 70 °N and 55 °S. Usually solitary, it feeds on large crustaceans, cephalopods and benthic fishes.

Gonads of wreckfishes were at the II, III and IV maturity stages. Cape bonnetmouth and alfonsino were found in stomachs of both wreckfish species.

The Twentieth Cruise of the SRTM *R.V. Golub Mira*, December 1984 – February 1985

To continue the experimental surveys using the bottom longline gear to target large demersal fishes of the Southwest Indian Ridge seamounts, the SRTM *Golub Mira* was equipped in 1984 with **Mustad** automated bottom longline equipment in the Lithuanian port of Klaipeda. During the 20th cruise of the *Golub Mira* research were undertaken in the area 32–40 °S, 45–60 °E from 18 December 1984 to 19 February 1985 (i.e. the austral summer). The techniques and technology for longline fisheries were developed during the cruise and also fishing tactics for targeting large demersal fishes on the deepwater seamounts under the conditions of complex bottom topography. Their biology and distribution were also studied. Oceanographic researches was carried out to estimate the impact of environmental factors on distribution and behaviour of large demersal fishes. Recommendations were developed for fisheries at the Southwest Indian Ridge seamounts using the automated bottom long-line.

An automated **Mustad** bottom longline gear system was used. Longlines were set in three design variations: standard bottom design as designed by Mustad, in off bottom sets and suspended variants, which were not deigned by company standards. For one set there were shot from 100 to 2100 hooks. Frozen mackerel and squid were used as bait. During the expedition, records of qualitative and quantitative results were made of all long-line operations. These were described in the following terms:

"*Longline set*" – consisted of a long-line shot over the board, soak period and gear retrieval. The duration of each operation was registered.

"*Hooks shot*" – a number of hooks used in a long-line set.

"*Tangled branch lines* (hooks)" – a number of hooks on a long-line, shot tangled over the board. Usually they are without a bait and are included in the number of non-baited hooks

"*Baited hooks*" – the number of baited hooks used.

"*Non-baited hooks*" – the number of unbaited hooks used

"*Broken (ragged, torn) hooks*" – the number of hooks lost as a result of bottom fouling or breaking of the long-line.

"*Percentage of hooks baited*" – the percentage of hooks shot that were baited.

"*Effective hooks*" – the number of baited hooks, directly deployed in the area. The number of effective hooks as determined as a difference between all hooks shot and broken and tangled hooks, taking into account the percentage baited.

"*Catch per 100 effective hooks* (or catch per time unit)" – a fishing characteristics of the bottom long-line exploitation in every specific set.

Results

The meteorological conditions during the period of the survey did not impede the longline fishing operations. During the cruise, the South Indian Ocean barometric maximum shifted southwards, which influenced the change of weather conditions from December to January. During the cruise the wind direction changed from north-westerlies and westerlies to northerlies. Winds with force 3–5 predominated (average wind was 4–9 $msec^{-1}$, with a maximum of 17 $msec^{-1}$). The wind-waves roughness was in the range of 3–5 points.

Longlines were set at Seamounts 102, 251, 150 and 690. A total of 148 longline sets were made. Nineteen fish species were caught from 13 families. Hapuku wreckfish *(Polyprion oxygeneios)* and common wreckfish *(Polyprion americanus)* predominated. The majority of the bycatch consisted of morwong *(Nemadactylus macropterus)*, rosefish *(Helicolenus mouchezi)* and dogfish *(Squalus* sp) (Table 5.3.2). At Seamount 102 a total of eight bottom longlines of 840–2 520 m length were set. One had from 700 to 2 100 No. 26 hooks. Hapuku wreckfish comprised about 90% of the catch. Dense feeding aggregations of hapuku wreckfish were observed. The total hook loss rate was 30% caused mainly by shark bites.

Hapuka (*Polyprion oxygeneios*) - A deepwater species that generally occurs over rough ground from the central shelf (about 100 m) down to the upper slope. It feeds on neritic and bottom-dwelling fishes and is caught by dropline down to 400 m and by trawl.

At Seamount 251 a total of 65 longlines sets were made, mainly bottom sets. Due to the small size of the seamount the maximum length of the longline set did not exceed 1 800 m. No. 18 and No. 26 hooks were used. Dense aggregation of wreckfishes (hapuku and common wreckfishes) were also found. In the catch from the seamount 62% were hapuku wreckfish and 24% were common wreckfish. Hook loss rates were 19% of those shot, the main cause was bottom fouling.

Mr Viktor N. Razumovskij of the YUGRYBpoisk (subsequently YugNIRO) seen preparing subsamples for biological measurements of alfonsino during a voyage by the *F.T. Chatyr-Dag* in 1997.

At Seamount 150 a total of 79 longline sets were amde, among which 21 were vertical or suspended. The length of longlines was in the range 216–312 m. The number of hooks varied from 100 to 1800. Numbers 18 and 26 hooks were used. For the vertical sets, 10% of the upper vertical hooks were not baited as no commercial fish species were found in the epipelagic zone. Of the total catch at the seamount, hapuku wreckfish composed 74%, morwong – 14%; sharks predominated the bycatches. Total hook loss rate was 11.5%. The cruise records note that at night hapuku wreckfish were caught about 100 m from the top of the seamount. It was concluded that Seamount 150 had potential for commercial longlining given the good catches and the small number of hooks lost on the bottom.

At Seamount 690 two longlines were set in the bottom and bottom-suspended modes. The length of longlines was

Table 5.3.2
Results of longline survey off the Southwest Indian Ridge Seamounts during the 20th Cruise of the *R.V. Golub Mira*

Seamount	Period of study	No of sets by types			No of hooks (total/average per set)	Average number of hook (%)		Catch by species (%)					
		Bottom	Bottom–suspended	Vertical		Baited	Effective	hapuku wreck–fish	Wreck–fish	Mor–wong	rosefish	Sharks and rays	Other
102	18–20 December 1984	7	1	0	11200/1400	33.9	22.6	90.0	1.0	6.0			3.0
251	20–25 December 1984 8–13 January 1985	6 0	2	3	50700/780	47.8	38.0	62.0	24.0		3.0	8.0	3.0
150	26 December 1984 1–7 January 1985 24–26 January 1985	4 1	28	10	63200/800	48.2	42.9	74.0	7.0	14.0		4.0	1.0
690[1]		1	1	0	1400/700[1]	–	–						100

[1] One longline was lost and one longline set missed the seamount.
[2] Three longlines were broken.

700 and 840 m. In both cases the longlines sets were almost all broken and lost because of the rather heavy grounds on the top of the seamount. The main target species for this fishing was hapuku wreckfish, which were 45–108 cm in length (standard length) and 1.9–24.2 kg in weight. Fishes of 51–63 cm long and 2.6–4 9 kg in weight predominated in catches. The length of common wreckfish varied within the range 42 to 105 cm, and in weight from 3.0 to 35.3 kg. The majority of the catches consisted of individuals of 54–66 cm long and 5.3–7.5 kg in weight. The wreckfishes gonads were at the II and III maturity stages.

The Twenty-first Cruise of the SRTM *R.V. Golub Mira*, March – August 1985

The 21st cruise of the **R.V. Golub Mira** continued the experimental fishing operations using bottom longline to fish large demersal fishes of the deep-water seamounts of the Southwest Indian Ridge. Operations over the Southwest Indian Ridge were conducted from 30 March to 6 May 1985, i.e. the austral autumn. Fishing techniques and gear technology for longline fisheries were further refined during the cruise as were fisheries tactics for targeting the large demersal fishes of the deep-water seamounts under conditions of complex bottom topography. Automated Mustad (Norway) bottom long-line gear was used.

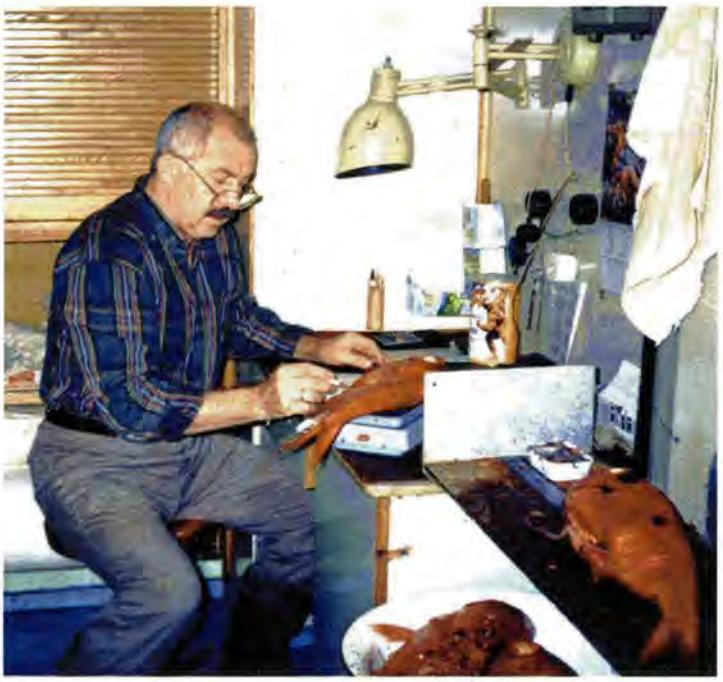
Results

Longline were set at Seamounts 150, 251, 358 and 690 (Table 5.3.3). A total of 148 longline were set. Frozen squid, and at the last stage of operations – mackerel, was used as a bait. The catches mainly consisted of Hapuku wreckfish (*Polyprion oxygeneios*) and common wreckfish (*Polyprion americanus*). Morwong, bluenose warehou (*Hyperoglyphe antarctica*) and dogfish were predominant in bycatch (Table 5.3.3). The main scope of operations was carried out at seamonut 150. Here, a total of 139 longline sets were deployed, of which 72 were bottom sets and 67 were vertical or and suspended-mode sets. An average of 800 hooks were shot per set. In the total catch at the seamount, wreckfishes comprised 78% of the catch, bluenose warehou 9% and sharks and other fishes 13%.

Antarctic butterfish or bluenose warehou (*Hyperoglyphe antarctica*) – A benthopelagic fish found at depths of 200-900 m, 28–55 °S inhabiting the outer continental slope and shelf waters of southern South America, South Africa, New Zealand and Australia. The fish are found over rough ground and at the edges of canyons and steep drop-offs. Longevity to 15 years, 140 cm total length and maximum weight, 20 kg.

It was noted, that at night wreckfishes were distributed in depths of 100–300 m and during the day and in the evening their aggregations migrated to depths of 400–900 m. The commercial prospects of Seamount 150 for fisheries of large demersal fishes with bottom long-line were confirmed.

At Seamount 251 a total of two longline sets were made in the suspended variant. Sharks predominated in the catch; the percentage of wreckfishes in the catch was 19%. At Seamount 358 three longlines were set, in bottom and bottom-suspended variants. There was no catch. At Seamount 690 four longlines were set, in bottom and off-bottom modes. An average of 525 hooks were used. The catch consisted of sharks and other fishes; there were no wreckfishes in the catches.



Mr Viktor Razumovskij takes scales and weight measurements of alfonsinos (*Beryx splendens*)

The expedition confirmed the commercial fishing prospects of seamounts in the Southwest Indian Ridge for large demersal fishes harvested using bottom longlines. However, after this cruise neither research nor further exploration with bottom longlines at the Southwest Indian Ridge seamounts were undertaken. Ukrainian vessels conducted fisheries with this fishing gear at the Southwest Indian Ridge only *en route* to fishing areas or returning from fishing for Patagonian toothfish (*Dissostichus eleginoides*) in the EEZ of France (Kerguelen Archipelago) (FAO Area 58).

The Twenty-seventh Cruise of the SRTMK *R.V. Primorets*, January 1993 – May 1994

During the 27th cruise of the *R.V. Primorets* a short period of bottom longline fishing (from 7 April to 7 June) was undertaken at the seamounts of the Southwest Indian Ridge. Mustad longline gear was used for fishing.

Results

Longline sets were made at Seamounts 150 and 251. A total of 31 longlines were sets. Blue whiting was used as bait. Eleven fish species were taken belonging to 10 families. Common wreckfish was the predominant species and spiny shark, alfonsino and rosefish comprised the majority of the bycatch (Table 5.3.4).

Fishing operations were undertaken for 18 days at Seamount 150 and 26 longline sets were made at depths of 230–1 180 m. On average, 822 hooks per longline were set. Among wreckfishes, only common wreckfish occurred (52% of catch). No hapuku wreckfish was taken although it was the main species taken at seamount in previous years. Dogfish comprised 35.5% of the catch. A species from the family Moridae (*Mora moro* or *Physiculus* sp. — species identification is unclear) was recorded in the catches at the depths 600–900 m. Before the arrival of the *R.V. Primorets* and after the period 7–9 April, an Argentinean vessel, the *Libertas Funsphal* fished in the area using bottom longline at the southern part of the seamount. After 9 April this vessel proceeded to Seamount 251 where she operated until 3 April, the date of arrival of the *R.V. Primorets* on this seamount.

At Seamount 251, bottom longline fishing was conducted for four days. A total of five longline sets were made. Common wreckfish comprised 11% and hapuku wreckfish 4% of the catches. The lengths of the common wreckfish were from 85 to 202 cm and their weights were from 9.3 to 18.9 kg. The reasons for the small catches of wreckfishes were believed to be a low concentration of fishes at the seamounts and unsuitable bait (blue whiting). According to the scientific observer, wreckfish stocks on the seamounts under examination were destroyed by other 'foreign' bottom long-line fisheries. It was also mentioned that wreckfishes caught by longline often had hooks in the mouth torn off from other longline gear.

Table 5.3.3
Results of longline survey at the Southwest Indian Ridge seamounts during the 21th Cruise of the *R.V. Golub Mira*

Seamount	Period of study	No. of sets by types			No of hooks (total/average per set)	Average number of hook (%)		Catch by species (%)					
		Bottom	Bottom–suspended	Vertical		Baited	Effective	hapuku wreckfish	wreckfish	Morwong	Butterfishes	Sharks	Other
150	30 March–23 April 1985 30 April–3 May 1985	72	37	30	111340/801	43.1	36.6	54.1	23.7	6.5	9.0	5.1	7.5
251	24–29 April 1985		2		2240/1120	26.6	24.5	19.0				57.1	23.9
358	4–5 May 1985	1		2	1540/513	32.5	27.7						
690	6 May 1985		1	3	2100/525	42.0	13.9					91.5	8.5

Table 5.3.4
Results of longline survey at the Southwest Indian Ridge seamounts during the 27th Cruise of the *F.V. Primorets*

Seamount	Period of study	No. of sets by types			No of hooks (total/average per set)	Average number of hook (%)		Catch by species (%)					
		Bottom	Bottom–suspended	Vertical		Baited	Effective	hapuku wreckfish	wreckfish	Alfonsino	rosefish	Dogfish	Moras (Moridae)
150	7–24 April 1993 17–26 June 1993	26[1]			21360/822	53.5			51.8	0.4	0.1	35.8	11.9
251	22 April–3 June 1993	5			5400/1080	40.0		3.6	11.5		7.5	77.4	

[1] Three sets with malfunctions.

5.4 Lobster pot fishing

The Second Cruise of the SRTM *R.V. Geroevka* (September 1980 – March 1981)
The cruise resulted in the first record of rock lobsters on the Southwest Indian Ridge. Large rock lobsters were found on 16 January 1980 during the Soviet expedition of the 2nd cruise of the *Geroevka* when they were taken by trawl from the surface of Seamount 150 (a detailed description of the operations of that cruise is given in Section 5.1, Trawl surveys). The species was preliminarily identified as *Jasus lalandii*.

The Seventeenth Cruise of the SRTM *R.V. Myslitel*, November 1980 – April 1981
In January 1981 during the 17th cruise of the SRTM *Myslitel* a large rock lobster was incidentally caught with a hook on a vertical line during line fishing for wreckfishes over Seamount 150. During the same expedition experiments were undertaken using pots to fish for lobster on Seamount 150 (Table 5.4). Fishing records describing the pot fisheries stated that the *Jasus lalandii* concentrations supported a fishery. The length (TL) of lobster that were caught varied from 32 to 61 cm; their weight varied from 870 to 5 020 g. Two length groups were predominant: 41–44 cm and 49–54 cm. The lobsters taken from the seamounts of the Southwest Indian Ridge were much longer, had a much larger body and inhabited much deeper waters than is the case for the southwestern coast of the South Africa.

The Fifteenth Cruise of the SRTMK *R.V. Primorets*, June – November 1981
During the cruise of the ***Primorets***, which started in June 1981 (cruise 15) to the Southwest Indian Ridge and Madagascar Ridge, rock lobsters (*Jasus lalandii*) was found, besides Seamount 150, on top of other seamounts of the Southwest Indian Ridge and on the banks 102, 358, and 251. A description of cruise fishing operations (number of sets and areas of pot fishing) is given in Table 5.4. The lobsters caught at Seamounts 150 and 102 were identified according to R.N. Burukovsky's guidebook (1974); two species were found, the rock lobsters *Jasus lalandii* and *Palinurus gilchristi*. The length of the *P. gilchristi* taken from Seamounts 150 and 102 varied from 42 to 47 cm and their weights varies from 1 740 to 3 050 g. Unlike *Jasus lalandii, P. gilchristi* was not found in dense aggregations. In the Madagascar Ridge area on the top surface of Walters shoal lobsters of the *Palinurus* genera were found though it was not identified to species. However, it was assumed to be *Palinurus gilchristi*. The lengths of these lobsters were in the range 35–40 cm and their weights 1 260–3 000 g.

The Sixteenth Cruise of the SRTM *R.V. Aelita*, November 1981 – March 1982
The survey by this vessel also undertook lobster pot fishing operations, the details of which (number of sets and area of pot sets) are given in Table 5.4.

The Nineteenth Cruise of the SRTM *R.V. Stepan Poshivalnikov*, February – June 1982
The expedition undertook longline and lobster pot fishing operations, details of which are given in Table 5.4.

The Nineteenth Cruise of the SRTM *R.V. Kerchenskij Rabochij*, January – June 1982
The expedition undertook longline and lobster pot fishing operations, the details of which are described in Table 5.4. Fishing pots with dimensions of 1.50 × 0.75 × 0.60 m were used. The pots were set in groups of 3–5 pots with a separation of 25 m. No lobsters were taken at either of the seamounts that were surveyed.

The Twentieth Cruise of the SRTM *R.V. Kerchenskij Rabochij*, July – December 1982
This expedition undertook longline and lobster pot fishing as described in Table 5.4. The dimensions of the pots that were used were 1.60 × 0.80 × 0.60 m. The distance between pots was 10–15 m. Lobsters were only taken on the Southwest Indian Ridge seamounts.

The Twentieth Cruise of the SRTM *R.V. Stepan Poshivalnikov*, July – December 1982
This cruise undertook longline lobster pot fishing on Seamounts 150, 251, 102, 358, 415, 690 and on Walters shoal. Details of the operations and areas fished are given in Table 5.4. The pots used had a

Table 5.4
Results of lobster pot fisheries surveys at the Southwest Indian Ridge Seamounts

Vessel name and class, Cruise No.	Period in which pots were fished (year, month)	Ridges, area	Seamount	A number of pot sets	An amount of set pots	Lobsters measured	Lobsters analyzed
Myslitel – 17th Cruise	2 Jan–5 Feb 1981	Southwest Indian Ridge	105	8	20	148	
Primorets – 15th Cruise	18 Jun–25 Sept 1981	Southwest Indian Ridge	150, 251, 102,	83	83	250	250
		Madagascar Ridge	Walters shoal				
Aelita – 16th Cruise	9 Dec 1981–Feb 1982	Southwest Indian Ridge	150, 251, 102, 358	66	114	1017	1017
		Madagascar Ridge	Walters shoal	4	6		
Stepan Poshivalnikov – 19th Cruise	16 March–4 June 1982	Southwest Indian Ridge	150, 102, 251, 360, 422, 415, 215, 350	24	105	545	
		Madagascar Ridge	Walters shoal	3	15		
Kerchenskij Rabochij – 19th Cruise	May 1982	Mid–Indian Ridge	260	1	3		
	March–April 1982	Ninety East Ridge	335	4	20		
Kerchenskij Rabochij – 20th Cruise	9 August–7 December 1982	Southwest Indian Ridge	150	195	600	857	733
		Mid–Indian Ridge	260	0	0		
		Ninety East Ridge	335	3	12		
Stepan Poshivalnikov – 20th Cruise	15 August–22 October 1982	Southwest Indian Ridge	150, 102, 251, 358	130	130	973	
		Madagascar Ridge	Walters shoal	8	8		
Sevastopolskij Rybak – 17th Cruise	10 February–9 May 1983.	Southwest Indian Ridge	150, 102, 251	~217	434	1429	1429
		Madagascar Ridge	Walters shoal	30	30		
Myslitel – 18th Cruise	October 1982–February 1983	Southwest Indian Ridge	150	255	256	386	135
		Mid–Indian Ridge	260	3	6		
Myslitel – 19th Cruise	1 May–26 July 1983	Southwest Indian Ridge Mid–Indian Ridge Ninety East Ridge	150 260, 462 336	18 2 1	84 2 1	215	165

Table 5.4 (continued)

Vessel name and class, Cruise No.	Period in which pots were fished (year, month)	Ridges, area	Seamount	A number of pot sets	An amount of set pots	Lobsters measured	Lobsters analyzed
Primorets – 16th Cruise	22 July–18 September 1983	Southwest Indian Ridge	150	24	78	160	
Sevastopolskij Rybak – 18th Cruise	10 August–7 October 1983	Southwest Indian Ridge	150, 251, 102	139	139	116	116
Myslitel – 20th Cruise	23 September–25 December 1983	Southwest Indian Ridge	150, 251, 102	41	652	656	478
Primorets – 17th Cruise	6 February–22 March1984	Southwest Indian Ridge	150, 102	~150	315	1613	548
Primorets – 18th Cruise	24 August–22 September 1984	Southwest Indian Ridge	150, 251, 102	18	36		130
Slava Kerchi – 22nd Cruise	11 March–30 April 1985	Southwest Indian Ridge	150, 360	13	~40	350	
Yunaya Smena – 2nd Cruise	29 January–10 February 1986	Southwest Indian Ridge	150	31	103	97	
Primorets – 19th Cruise	29 March–03 April 1986	Southwest Indian Ridge	358	1	3	–	–
Primorets – 20th Cruise	13 August–09 December 1986	Southwest Indian Ridge	150, 251	38	38	48	7
		Madagascar Ridge	Walters shoal	3	3		

parallelepiped shape and dimensions of 1.7 × 0.6 × 0.75 m with one inlet opening. Pots with two inlets were constructed by rigidly connecting two ordinary pots so that the resultant pot was 1.5 times bigger than usual. Rotten fish (Cape bonnetmouth, heads of wreckfishes, sharks) were used as bait. During this expedition to the Madagascar Ridge (Walters shoal) the only species encountered was tentatively identified as *Palinurus gilchristi*.

The Seventeenth Cruise of the SRTM *R.V. Sevastopolskij Rybak*, January – July 1983
This expedition undertook longline and lobster pot fishing on Seamounts 150, 251, 102 and Walters shoal (see Table 5.4). The lobster pots used had dimensions of 150×75×55 cm and two or three openings. The pots were set in groups of 2–4 pots and connected with nylon ("kapron") rope. Heads of wreckfishes and mackerel, Cape bonnetmouth and other small fish were used as bait. At Seamount 516 at the Madagascar Ridge small-sized deepwater lobster (not identified to species) was found in stomachs of wreckfishes.

The Eighteenth Cruise of the SRTM *R.V. Myslitel*, January – July 1983
The expedition undertook longline and lobster pot fishing at Seamount 150 on the Southwest Indian Ridge and pot fishing on Seamount 260 of the Mid-Indian Ridge (see Table 5.4). The pots used for lobster fishing had dimensions of 150 × 75 × 55 cm and two openings. the pots were set in groups of 4–5 connected with nylon ("kapron") rope.

The Nineteenth Cruise of the SRTM *R.V. Myslitel*, January – July 1983
This expedition undertook longline and lobster pot fishing on Seamount 150 of the Southwest Indian Ridge, Seamounts 260 and 462 of the Mid-Indian Ridge and Seamount 336 of the Ninety East Ridge (see Table 5.4 for details of areas fished and gear used). Lobsters were found at Seamount 150.

The Sixteenth Cruise of the SRTM *R.V. Primorets*, May – October 1983
This expedition undertook longline and lobster pot fishing but only Seamount 150 of the Southwest Indian Ridge was surveyed using pots. Details of fishing operations are given in Table 5.4. During this cruise identification of the lobster species inhabiting Seamount 150 was precise and the lobster species earlier identified as *Palinurus gilchristi,* was determined to be *Palinurus delagoae*. The identity of the lobster *Jasus lalandii* was confirmed.

The Eighteenth Cruise of the SRTM *R.V. Sevastopolskij Rybak*, July – December 1983
This expedition carried longline and lobster pot fishing on Seamounts 150, 251, 102. Details of fishing operations are given in Table 5.4. Lobsters were fished using pots with dimensions of 150 × 75 × 55 cm having two or three openings. On Seamount 150 the pots were set in groups of three or four and on Seamount 251 in groups of 7–16, connected with nylon rope. Heads and guts of wreckfishes and mackerel were used as a bait. The expedition recorded the presence of *Palinurus delagoae* from Seamount 251.

The Twentieth Cruise of the SRTM *R.V. Myslitel*, September 1983 – January 1984
This expedition undertook long-line fishing and lobster pot fishing on Seamounts 150, 251 and 102. Details on the amount and area of pot fishing operations are given in Table 5.4. The pots were set in groups of 2–5 at the distance of 10 m of each other and connected with nylon rope. Wreckfishes and alfonsino were used as a bait.

The Seventeenth Cruise of the SRTMK *R.V. Primorets*, January – May 1984
This cruise undertook longline and lobster pot fishing on Seamounts 150, 102. The lobster pots. had dimensions of 150 × 75 × 55 cm and one or two openings. The pots were set in groups of two to four and were connected with by nylon rope. Details of the pot fishing operations are given in Table 5.4.

The Eighteen Cruise of the SRTMK *R.V. Primorets*, June – November 1984
The expedition carried out operations for long-line fisheries and lobster pot fisheries. Seamounts 150 and 102 were examined by means of pots. Pots were set as orders consisting of 2–4 pots and

connected with nylon ("kapron") rope. The amount of operations for pot fisheries is given in Table 5.4.

The Twenty-Second Cruise of the SRTM *R.V. Slava Kerchi*, January – May 1985
This cruise undertook longline lobster pot fishing on Seamount 150 at the Southwest Indian Ridge. The pots were set in groups of three to four and were connected with nylon rope. Details on the amount of fishing operations are given in Table 5.4.

The Nineteenth Cruise of the SRTMK *R.V. Primorets*, February – July 1986
This cruise undertook longline and lobster pot fishing on Seamounts 150 and 358 of the Southwest Indian Ridge. The pots were set in groups of two to four and were connected by nylon rope. Details of the fishing operations are in Table 5.4.

The Second Cruise of the SRTMK *R.V. Yunaya Smena*, October 1985 – February 1986
This cruise undertook trawl, long-line and lobster pot fishing operations on Seamount 150 of the Southwest Indian Ridge. The lobster pots were set in groups of two to four with a separation of 10 m. They were connected by nylon rope. Small squids, dentex and Cape bonnetmouth were used as bait. Details on the amount and area of the pot fishing are given in Table 5.4.

The Twentieth Cruise of the SRTMK *R.V. Primorets*, August – December 1986
This expedition undertook longline and lobster pot fishing on Seamounts 150, 251 of the Southwest Indian Ridge and Walters Shoal, the Madagascar Ridge. The pots were set in groups of two to four and were connected by rope. The nature of the pot fishing operations are given in Table 5.4.

In the expeditions undertaken after 1983 the lobster species *Jasus lalandii and Palinurus delagoae* were taken at Seamounts 150 and 251 as well as other seamounts of the Southwest Indian Ridge. Rock lobster from the genus *Palinurus,* conventionally named *P. delagoae* were found in 1981 in the area of the Madagascar Ridge (Walters Shoal) as well though the species identity should be confirmed. The lobster *Jasus lalandii* predominated in the catches from all expeditions. During the expedition of the *Primorets* in 1986, the length of *J. lalandii* harvested from the Southwest Indian Ridge at Seamount 150 ranged from 33 to 61 cm and their weights varied from 1 260 to 5 950 g. Individuals of 39–54 cm length comprised the majority of the catch. The length of *P. delagoae* at the same seamount ranged from 36 to 54 cm and from 1 940 to 4 200 g in weight. Lobsters were not found at the seamounts surveyed in the Mid-Indian and Ninety East Ridges.

Lobster pots
Lobster pots were set only from the vessels of the SRTM and SRTMK classes. Experimental lobster fisheries with pots were usually a part of a wider range of fisheries research activities that were undertaken during the expeditions. Sometimes pots were set in tandem with the accompanying operations or when vessels were proceeding to the other areas to undertake survey operations. Most pots were set on the seamounts of the Southwest Indian Ridge.

The lobster pots were constructed by the ship-owners through special orders. Usually the pot consisted of a metal frame covered with a thick polyamide net or metal net with inlet openings for lobsters and with a metal sinker inside. Sometimes the pots were made of bamboo. Pots of parallelepiped, cylindrical, opera-house, conical and tetrahedron shape were used. The number of inlet openings varied from one to four. Pots of parallelepiped shape were used most often; their size was 150 × 75 × 50 cm. They had one, two or three inlet openings. Fish, most often those species that inhabited the Southwest Indian Ridge seamounts (Cape bonnet mouth, butterfish, heads and guts of wreckfishes and sometimes baitfish specially harvested at Saya-de-Malha Bank: emperors and grunts) were used as a bait used.

Because the tops and the slopes of most of the seamounts had sharply cut and rough surfaces, it was impossible to simultaneously set a great number of pots (i.e. in the hundreds) as is the common practice in most crustacean pot fisheries. Therefore, only individual pots or sets of a few dozen pots

were set simultaneously on the seamounts on the Southwest Indian Ridge. During the cruise various shapes and sizes of pots were deployed and their efficacy was examined. The optimal number of pots to be set was in the order of one. Optimal soak time of the pots was also examined. Attempts were also made to determine the optimal depth of pot settings, the affect of the covering mesh, the affect of composition of the bait and the soak time in relation to the catch success of the fishing operations. Techniques to deploy pots under conditions of great fishing depths, rough seafloor, high winds and rough seas were developed and the costs associated with these variables was also examined.

The biology of the lobsters was studied including the length-weight relationship, spawning periods, moulting periods and the distribution of lobsters by seasons. The area of pot fishing was approximately estimated.

6. ACOUSTIC AND TRAWL SURVEYS

The Second Cruise of the RTMS *R.V. Zvezda Sevastopolya* September 1981 – February 1982

The first assessments of fish biomass at several seamounts in the Southern Indian Ocean were obtained during the second cruise of RTM-S *Zvezda Sevastopolya*. Detailed descriptions of the methodology of the stock assessment were not presented in the cruise report therefore we can present here only brief comments on the results of the cruise and the stocks assessments. The seamounts were surveyed at night. The peaks and slopes of seamounts were fished using trawls where there were occurrences of fish-like records obtained with echosounders. During the daytime acoustic surveys of seamounts were done within a previously planned design of survey tracks. Midwater trawls 110/600 and 123/640 had similar dimensions (vertical opening 55–60 m, depending on the weight of depressors used, horizontal opening 55–60 m, the trawling speed was 4–5.8 knots depending on the depth of trawling. At Seamount 360 the bottom trawl No. 16.25 was used.

RTMS R.V. Zvezda Sevastopolya. These *Super Atlantik* types were built at Stralsund in East Germany by Volkswerft from 1971 to 1979; 95 vessels of this class were built. They had dimensions of 1988/ 2063 dwt; 3000/3977 gross tons, 1780/1830 net tons and a LOA of 102 m. They were powered by an 8-cylinder Dieselmotorenwerke 3880 bhp engine giving 15 knots (Greenway 1980).

Operations in the southern Indian Ocean started in November 1981 of Seamounts along the Madagascar Ridge in the area of Seamount 516. The cruise examined Seamounts 350, 422, 360, 102, 430, 251, 630, 150, 358 and 516 as well. The numbers of trawl hauls, catch composition by species are given in Table 6.1.

As a result of trawl surveys at Seamount 516 of the Madagascar Ridge fish biomass were estimated to be 150 t; at Seamounts 360 – 180-485 t and at Seamount 630, the total acoustic estimate of fish biomass was 800-1 000 t.

Table 6.1
Results of trawl surveys during the Second Cruise of the *R.V. Zvezda Sevastopolya*

Seamount	Period of study	No. of trawl hauls	Hours of trawling	Catch of principal species (%)							
				Alfonsinos	Cardinal fish	Rosefishes	Butterfisshes	Rubyfishes	Jack mackerel	Armourhead	Others
516	14–17 Nov 1981	12	38.83	7.1						89.8	3.1
	25–26 Dec 1981	2	2.25	60.0							40.0
360	30 Nov.–07 Dec. 1981	27	17.92	37.9	40.3	17.0					4.8
	30 Jan.–20 Feb. 1982	24	14.50	2.2	74.9	19.6					3.3
102	07–18 Nov. 1981	7	14.75	15.4	20.5	–		7.7			56.4
	22 Dec. 1981	2	10.67	12.7	23.0		17.6	0.6			46.1
430	27–29 Oct. 1981	6	14.17	83.0	2.7		10.7				4.2
	08–20 Nov. 1981	18	40.75	98.1			0.4				1.5
	20–24 Dec. 1981	9	33.25	98.9			0.2				0.9
	26 Jan. 1982	2	11.25	32.8			53.7				13.5
251	26 Oct.–05 Nov. 1981	3	6.42								100
	16–31 Dec. 1981	18	37.58				38.7	46.2			15.1
	11–25 Jan. 1981	5	14.33				91.0	5.2			3.8
630	12–15 January 1982	5	11.17	60.5	19.6		19.6				0.3
	20–26 January 1982	15	35.42	57.9	16.1		25.9				0.1
	07–08 February 1982	4	11.50	97.8							2.2
150	13–16 Dec. 1981	15	25.00					74.8	27.9		0.3
	06–21 Jan. 1982	21	39.67					93.3	6.6		0.1
	06–14 Feb. 1982	19	33.42					69.8	17.3		12.9

The Seventeenth Cruise of the RTMA *R.V. Fiolent*, April – September 1983

In 1983 the research cruises to the seamounts of the Southwest Indian Ocean Ridge, Mid-Indian Ridge and Ninety East Ridge were designed to achieve more precise estimates of commercial fish biomass, the density of fish aggregations and the migration patterns using acoustic methods. The area of operations covered 25–45 °S, 40–60 °E and 30–36 °S, 80–90 °E. Eleven seamounts were examined in the Southwest Indian Ridge region, (690, 150, 251, 710, 102, 480, 630, 358, 360, 650, 430) and 7 seamounts in the area of the Mid-Indian Ridge and Ninety East Ridge (260, 470, 462, 510, 400, 336, 620). A midwater trawl of the type 78/520 was used. The vertical opening of the trawl was 40–43 m, horizontal ~ 60 m. A total of 172 trawl hauls were undertaken including those at seamounts of the Southwest Indian Ridge (138 tows), Mid-Indian Ridge (11) and Ninety East Ridge (23). Details of the number of trawl hauls and species catch composition are presented in Tables 6.2 and 6.3.

Table 6.2
Results of trawl surveys at the Southwest Indian Ridge Seamounts during the 17th Cruise of the *R.V. Fiolent*

Seamount	Period of study	Trawl hauls	Hours of trawling	*Catch of principal species %*						
				Alfonsinos	Cardinal fish	Butterfisshes	Rubyfishes	Jack mackerel	Armourhead	Others
150	April 1983	8	6.5			27.8	67.2	0.6		4.4
	August 1983	17	17.5			60.6	36.4	0.8		2.2
251	May 1983	22	18.1	0.1		72.1	27.3			0.5
102	June 1983	3	2.3	47.8	1.0	18.4	16.2			16.6
690	June 1983	6	6.4	43.8	0.1				48.9	7.2
710	June 1983	35	33.2	78.3		21.4			0.2	0.1
	July 1983	21	18.7	67.5		31.5				1.0
480	August–September 1983	19	15.6	65.1	4.7	30.1				0.1

Table 6.3
Results of trawl surveys at the Mid–Indian Ridge and Ninety East Ridge Seamounts during the 17th Cruise of the *R.V. Fiolent*

Seamount	Period of study	Trawl hauls	Hours of trawling	**Catch of principal species %**				
				Alafonsinos	Cardinal fish	Rubyfishes	Jack mackerel	Others
260	July 1983	11	11.8	55.8	2.8	39.1	0.5	1.8
470	July 1983	23	7	97.4	0.5			2.1
462	July 1983		4.9	25.3	13.8		20.3	40.6
510	July 1983		6.5	97.5	1.3		1.2	
400	July 1983		6.6	91.8				8.2
336	July 1983		3.2	34.8		21.7	43.3	0.2
620	July 1983		1.9	74.8	9.8			15.4