

Russian Investigations and Deep Water Fishery on the Corner Rising Seamount in Subarea 6

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Abstract

Investigations and fishery on deep water fish at the eastern area of the Sargasso Sea on the Corner Rising seamounts (34–37°N, 47–53°W) in NAFO Subarea 6 have been conducted by the Soviet Union/Russia since 1976. The total catch taken during the period amount to more than 19 000 tons. The most important species of this fishery was Alfonsino (*Beryx splendens*). Besides Alfonsino, black scabbard fish (*Aphanopus carbo*), wreckfish (*Polyprion americanus*), barrelfish (*Hyperoglyphe perciforma*), cardinal fish (*Epigonus telescopus*) and flint-perch (*Hoplostethus mediterraneus*) were also of commercial importance on the Corner Rising. Biological observations on the main species, including spawning and feeding habits, distribution and formation of deepwater aggregation, and hydrographic conditions are described. Noting the limited stock sizes observed during this long-term study, an international management of the fisheries is advised.

Key words: Alfonsino, biology, Corner Rising, deep water fish, distribution, fishery, USSR/Russia investigations

Introduction

Seamounts of the Corner Rising in the eastern area of the Sargasso Sea (34–37°N, 47–53°W) (Fig. 1) are of special importance among the areas of deep water fishery in the North Atlantic. The importance of this area is highlighted by its relatively close proximity to countries which have well developed exploratory fishery capabilities, free enterprise development regimes for fisheries, and high market value for fish and fish products.

Commercial aggregations of deep water fish in the Corner Rising area were discovered for the first time by the Union of Soviet Socialist Republics (USSR) research vessels in 1976. Further complex fisheries expeditions were then repeatedly carried out on banks, during which a considerable body of research and commercial data has been obtained. In separate years, a commercial fishery was conducted in the area based on the results of the research.

The aim of this paper is to present the results from research and commercial investigations conducted by the USSR and the Russian Federation in the Corner Rising area since 1976.

Materials and Methods

This study was based on extensive biological and hydrographic data collected between 1976 and 1995, during which time 26 scouting and research surveys and commercial vessel cruises were carried out by the USSR and Russia. The scouting and

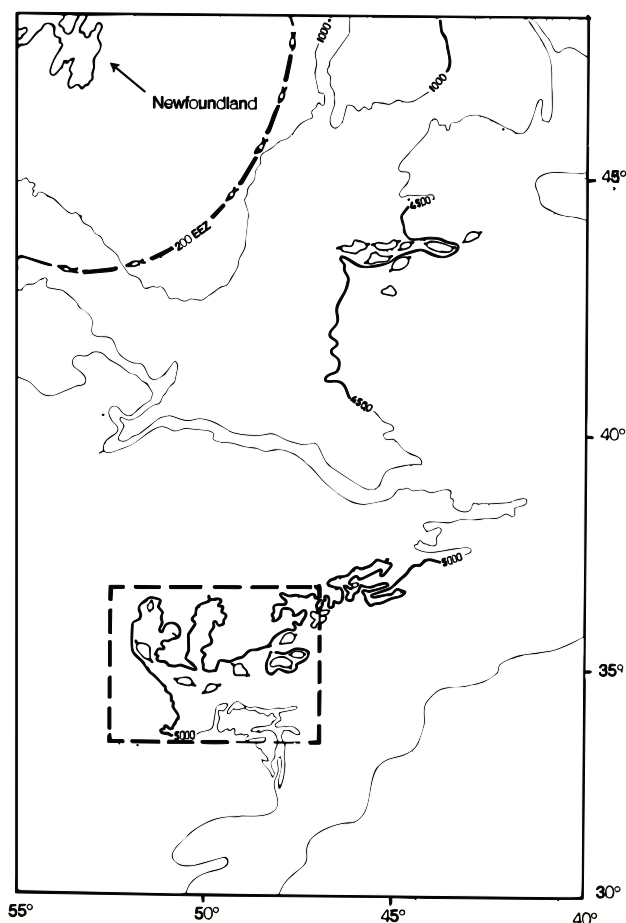


Fig. 1. Area of deepwater investigations on the Corner Rising (boxed in area) in relation to the 200-mile EEZ line.

research vessels were from Polar Research Institute of Marine Fisheries and Oceanography (PINRO) and Atlantic Research Institute of Marine Fisheries and Oceanography (AtlantNIRO).

On board all vessels, observations were done on ichthyology, meteorology and oceanography in accordance with actual instructions and PINRO/VNIRO methods (Anon., 1980; 1982). Catches of deepwater fish were taken by pelagic and bottom trawls (60–90 mm minimum mesh size). The following measurements were done by the vessels during the whole period of investigations: a total of 6 551 water profile records, and a total of 6 202 salinity records were taken. On the deepwater fish collected, a total of 66 516 fish total body length measurements were taken, 13 818 maturity determinations were conducted and 13 818 fish were studied for feeding habits. A total of 4 147 age readings were also carried out.

Behaviour and distribution of fish on seamounts were studied based on results from hydroacoustic observations and the biological studies of the ichthyological samples.

Results and Discussion

Historical Review of Investigations and Fishery

The USSR oceanographic observations in the Corner Rising area had been initiated in 1959 by RV *Mikhail Lomonosov*, and in the 1960s these were followed by the RV *Sedov*, RV *Petr Lebedev*, RV *Akademik Kurchatov*, RV *Akademik Vernadsky* and other vessels from the Institute of Oceanography named after Shirshov. During these expeditions special attention was given to studying the topography and sediments of the sea bottom.

Commercial aggregations of deepwater fish on the Corner Rising seamounts were first found by exploratory vessel *Atlant* in 1976. Commercial fishing, in which 2–17 trawlers participated, was organized based on the results from the investigations in the area. In total above 10 000 tons, mainly Alfonsino (*Beryx splendens*), were caught there during the year.

In 1977 operations on the Corner Rising were performed by a scouting-fishing expedition, comprising of the exploratory vessels EV *Bakhchisarai*, EV *Korifena* and 6 fishing trawlers. No stable fish aggregations were found on the banks during the whole period of investigations and fishery. These conditions were interpreted to have resulted from the extremely by large removal of fish in the previous year. The total catch for 1977 was about 800 tons.

No commercial fishing was carried out on the Corner Rising in the subsequent decade. Only scouting and research operations were performed in that period (a total of 14 cruises). Most of them have shown the availability of deepwater fish at different density and stability on seamounts. In total, about 2 000 tons of deepwater fish (mainly of Alfonsino) were taken by these research and scouting trawlers on the Corner Rising from 1978 to 1986 (Table 1).

A set of special underwater observations (Zaferman and Sennikov, 1991) was also done in the same period, during which fish aggregations on seamounts were revealed, and the possibility for a fishery on deepwater crab (*Gerion affinis*) with set gears (e.g. pots) was determined.

In parallel with the scouting-fishing operations, most part of the investigations were on the area oceanography, the biology, behaviour and distribution of deepwater fish, and the conditions for their aggregation formations. The operations included the use of *SEVER-2*, an autonomous underwater apparatus (Pshenichny *et al.*, 1986; Zaferman and Shestopal, 1991; Kukuev, 1991).

In 1987 a commercial fishing program with 1 to 4 trawlers was once again arranged on the Corner Rising banks based on the results from a research and scouting investigation carried out by the EV *Socrat*, which resulted in a total catch of 2 300 tons.

No investigations nor fishery were carried out in the area in subsequent years. The operations were resumed in 1994 and 1995 when several scouting and fishing cruises were arranged on the Corner Rising by Russian Fishing Industry, together with PINRO, based on the earlier experiences. In 1994 about 400 tons of Alfonsino were taken there by trawler *Petr Petrov*. In 1995 from 1 to 5 Russian trawlers operated on the Corner Rising banks, the total catch of which attained 3 500 tons.

In 1996 the fishery in the area was continued by 2 Russian vessels. In total 600 tons of Alfonsino were caught by them between February and April.

Thus, since the time of the seamounts discovery, the total catch taken by the USSR and Russia in the Corner Rising area has constituted above 19 000 tons (Table 1).

Biological Characteristics of Ichthyofauna

As a result of the USSR and Russian investigations on ichthyofauna (Kukuev, 1991; Anon., 1993) on the Corner Rising, a total of 175

TABLE 1. The timing and catches (tons) of deep sea fishes by vessels conducting investigations and fisheries in the Corner Rising area.

Year	Vessel	Total catch (000 tons)
1976	EV <i>Atlant</i> EV <i>Bahkchisarai</i> EV <i>Spectr</i>	10 200*
1977	EV <i>Korifena</i> EV <i>Bakhchisarai</i>	800*
1978	RV <i>Evrika</i>	130
1979	EV <i>Atlant</i> EV <i>Andrei Markin</i>	530
1980	EV <i>Pavel Kaikov</i>	200
1981	EV <i>Kapitan Demidov</i> EV <i>Mikhail Verbitsky</i>	260 130
1982	EV <i>Evrika</i> EV <i>Efim Krivosheev</i>	10 200
1983	EV <i>Mikhail Verbitsky</i> EV <i>Nikolai Kuropatkin</i> EV <i>Odissei</i>	140 20 –
1984	EV <i>Nikolai Kuropatkin</i>	240
1985	RV <i>Genichesk</i>	10
1986	EV <i>Nikolai Kononov</i>	110
1987	EV <i>Sokrat</i> EV <i>Ekliptika</i> EV <i>Obva</i>	2 300*
1987	RV <i>Kapitan Shaitanov</i>	–
1994	EV <i>Petr Petrov</i>	400
1995	EV <i>Petr Petrov</i> EV <i>Olenitsa</i>	3 500*
1996	1–2 fishing vessels	600

* with allowance for catch by fishing vessels

fish species from 53 families have been observed (Table 2).

Alfonsino was the main species group sought by the trawl fishing on seamounts of the Corner Rising. Cardinal-fish (*Epigonus telescopus*), black scabbard fish (*Aphanopus carbo*), wreckfish (*Polyprion americanus*), barrelfish (*Hyperoglyphe*

perciforma) and flint-perch (*Hoplostethus mediterraneus*) were also of commercial importance.

Alfonsino (*Beryx splendens*). Alfonsino was represented in the catches by specimens ranging from 20 to 59 cm fork length, mainly between 34 and 43 cm (Fig. 2), and the mean weight ranging

TABLE 2. List of ichthyofauna encountered on Corner Rising seamounts (Anon., 1993).

Family, species	Family, species
Scaptonorhynchidae	<i>M. spilorhynchus</i> Regan et Trewavas
<i>Mitsukurina owstoni</i> Jordan	<i>M. tentaculatus</i> (Regan et Trewavas)
Scyliorhinidae	<i>M. melapos</i> Brauer
<i>Parmaturus manis</i> Springer	<i>Bathophilus metallicus</i> (Welsh)
Squalidae	<i>Chirostomias pliopterus</i> Regan et Trewavas
<i>Centroscymnus coelolepis</i> Bocage et Capello	<i>Flagellostomias bourel</i> (Zugmayer)
<i>Squaliolus laticandus</i> Smith et Radcliffe	<i>Grammatostomias circularis</i> Morrow
Bathylagidae	<i>G. flagellibarba</i> Holt et Byrne
<i>Bathylagus longirostris</i> Maul	<i>G. dentatus</i> Goode et Bean
<i>B. berycoides</i> (Borodin)	<i>Pachystomias microdon</i> Gunther
<i>B. euryops</i> Goode et Bean	<i>Trigonolampa miriceps</i> Regan et Trewavas
Argentinidae	<i>Photonectes braneri</i> (Zugmayer)
<i>Microstoma microstoma</i> (Risso)	<i>P. margerita</i> (Goode et Bean)
Opisthoproctidae	<i>P. bifilifer</i> Beebe
<i>Opisthoproctus soleatus</i> Vaillant	<i>Echiostoma barbatum</i> Lowe
<i>O. grimaldii</i> Zugmayer	<i>Eustomias obscurus</i> Vaillant
<i>Rhynchohyalus natalensis</i> Gilchrist et von Bonde	<i>E. bigelowi</i> Welsh
<i>Dolichopteryx longipes</i> (Vaillant)	<i>E. dubius</i> Parr
Gonostomatidae	<i>E. parri</i> Regan et Trewavas
<i>Gonostoma denudatus</i> Kafinesque	<i>E. filifer</i> (Gilchrist)
<i>G. clanqatus</i> Gunther	<i>E. schidti</i> Regan et Trewavas
<i>G. bathyphilum</i> (Vaillant)	<i>E. braure</i> Zugmayer
<i>Banapartia pedaliota</i> Goode et Bean	<i>E. tetranema</i> Zugmayer
<i>Margrethia obtusirostra</i> Jespersen et Taning	<i>E. bibulbosuas</i> Parr
<i>Ichthyococcus ovatus</i> (Cocco)	<i>E. radicifilis</i> Borodin
<i>Vinciguerria attenuata</i> (Cocco)	<i>E. achirus</i> Parin et Pokhilskaya
<i>V. poweriae</i> (Cocco)	<i>Leptostomias gladiator</i> (Zugmayer)
<i>Diplophos taenia</i> Yunther	<i>L. analis</i> Regan et Trewavas
Sternoptychidae	<i>L. leptobolus</i> Regan et Trewavas
<i>Sternoptyx diaphana</i> Harmann	<i>L. bermydensis</i> Beede
<i>Argyrolepecus aculeatus</i> Valenciennes	
<i>A. hemigymnus</i> Cocco	Malacosteidae
Chauliodontidae	<i>Malacosteus niger</i> Ayres
<i>Chauliodus sloani</i> Schneides	<i>Photostomias guernei</i> Collett
<i>Ch. danae</i> Regan et Trewavas	<i>Aristostomias tittmani</i> Welsh
Astronesthidae	<i>A. lunifer</i> Regan et Trewavas
<i>Astronesthes gemmifer</i> Goode et Bean	
<i>A. macropogon</i> Goodyear et Yibbs	Idiacanthidae
<i>A. leucopogon</i> Regan et Trewavas	<i>Idiacanthus fasciola</i> Peters
<i>Neonesthes capensis</i> (Gilchrist et Von Boudé)	
<i>Borostomias antarcticus</i> (Lonnberg)	Alepocephalidae
Stomiidae	<i>Einara macrolepis</i> (Koefoed)
<i>Stomias brevibarbus</i> Ege	<i>Xenodermichthys copei</i> (Gill)
<i>S. boa ferox</i> Reinhardt	
<i>Macrostomias congibarbus</i> Brauer	Platytrichtidae
Melanostomiidae	<i>Maulisia maui</i> Parr
<i>Melanostomias valdiviae</i> Brauer	<i>Sagamichthys schnakenbecki</i> Krefft
<i>M. melanoporoda</i> Regan et Trewavas	Notosudidae
	<i>Anliesaurus berryi</i> Bertelsen, Krefft, Marshall
	<i>Scopelosaurus maui</i> Krefft, Marshall
	<i>S. lepidus</i> (Krefft et Maul)
	<i>S. smithii</i> Bean
	Evermannellidae
	<i>Coccorella atlantica</i> (Parr)
	<i>Evermannella indica</i> Brauer
	Paralepididae
	<i>Paralepis coregonoides</i> Ricco

TABLE 2. (Continued). List of ichthyofauna encountered on Corner Rising seamounts (Anon., 1993).

Family, species	Family, species
<i>P. harryi</i> (Maul)	Moridae
<i>P. elongatys</i> (Brauer)	<i>Physiculus dalwigki</i> Kaup
<i>Notolepis rissoi</i> (Bonaparte)	Melanonidae
<i>Lestidiops jayakari</i> (Boulenger)	<i>Melanonus zugmayeri</i> Norman
<i>L. affinis</i> (Ege)	Macrouridae
<i>Lestidium atlanticus</i> Borodin	<i>Nezumia sclerorhynchus</i> (Valenciennes)
<i>Stemenosudis intermedia</i> (Ege)	<i>N. lingibarba</i> (Goode et Bean)
<i>S. gracile</i> (Ege)	<i>N. longibarba</i> (Goode et Bean)
<i>Sudis hialina</i> Rafinesque	<i>Malacocephalus laevis</i> (Lowe)
<i>S. atrox</i> Harri	<i>Odontomacrus murrayi</i>
Omosudidae	<i>Coryphaenoides rupestris</i> Gunnerus
<i>Omosudis lowei</i> Gunther	Regalecidae
Alepisauridae	<i>Regalecus glesne</i> Ascanius
<i>Alepisaurus ferox</i> Lowe	Trachipteridae
<i>A. brevirostris</i> Gibbs	<i>Iu cristatus</i> (Bonelli)
Myctophidae	Radiicephalidae
<i>H. macrochir</i> (Gunther)	<i>Radiicephalus elongatus</i> Osorio
<i>M. selenops</i> Taning	Berycidae
<i>L. gemmellari</i> (Cocco)	<i>Beryx splendens</i> Lowe
<i>Diaphus metopoclampus</i> (Cocco)	<i>B. decadactylus</i> Cuvier
<i>D. effulgens</i> (Goode et Bean)	Diretmidae
<i>D. taningi</i> Norman	<i>Diretmus argenteus</i> Johnson
<i>Lampadena speculigera</i> Goode et Bean	<i>Diretmoides parini</i> Post et Quero
<i>L. urophaos atlantica</i> Maul	Trachichthyidae
<i>L. anomala</i> Parr	<i>Hoplostethus atlanticus</i> Collett
<i>L. chavesi</i> Collett	<i>H. mediterraneus</i> Cuvier
<i>L. macdonaldi</i> (Goode et Bean)	Melamphaidae
<i>L. festivus</i> Taning	<i>Melamphaes suborbitalis</i> (Gill)
<i>L. ater</i> Taning	<i>Scopelogadus mizolepis</i> (Gunther)
<i>L. lineatus</i> Taning	<i>Paromitra capito</i> Goode et Bean
<i>L. teniformes</i> Brauer	<i>P. crassiceps</i> (Gunther)
<i>Lepidophanes guentheri</i> (Goode et Bean)	Anoplogasteridae
<i>C. warmingi</i> (Lutken)	<i>Anoplogaster corunta</i> Valenciennes
<i>Bolinichthys supralateralis</i> (Parr)	Oreosomatidae
<i>B. indicus</i> Nafpactitis	<i>Neocyttus helgae</i> Holt et Byrne
<i>Notoscopelus resplendens</i> (Richardson)	Grammicolepididae
<i>N. sandispinosus</i> (Johnson)	<i>Xenolepidichthys dalgleishi</i> Gilbert
Neoscopelidae	Serranidae
<i>Neoscopelus macrolepidotus</i> Johnson	<i>Polyprion americanus</i> Schneider
Eurypharyngidae	Apogonidae
<i>Eurypharynx pelecانoides</i> Vaillant	<i>Epigonus telescopus</i> (Risso)
Derichthyidae	Cheilodipteridae
<i>Derichthys serpentinus</i> Gill	<i>Howella brodiei</i> Ogilby
Serrivomeridae	
<i>Serrivomer beani</i> Gill	
<i>S. parabeani</i> Bertin	
<i>S. brevidentatus</i> Roule et Bertin	
Nemichthyidae	
<i>Nemichthys scolopaceus</i> Richardson	
<i>Nessorhamphus ingolfianus</i> (Schmidt)	

TABLE 2. (Continued). List of ichthyofauna encountered on Corner Rising seamounts (Anon., 1993).

Family, species
Chiasmodontidae
<i>Chiasmodon niger</i> Johnson
<i>Ch. microcephalus</i> Osorio
<i>Pseudoscopelus altipinnis</i> Parr
<i>P. scriptus</i> Lutken
<i>Kali macrura</i> (Parr)
Ophidiidae, Brotulidae
<i>Brotulotaenia crassa</i> Parr
Gempylidae
<i>Gempylus serpens</i> Guvier
<i>Diplospinus multistriatus</i> Maul
<i>Neolotus tripes</i> Johnson
<i>Lepidocybium flavobrunneus</i> (Smith)
<i>Ruvettus pretiosus</i> Cocco
Scombrabrachidae
<i>Scombrabra heterolepis</i> Roule
Trichiuridae
<i>Aphanopus carbo</i> Lowe
Centrolophidae
<i>Centrolophus niger</i> Gmelin
<i>Schedophilus medusophagus</i> Cocco
<i>Hyperoglyphe perciforma</i> (Mitchill)
Nomeidae
<i>Cubiceps gracilis</i> Lowe
<i>C. baxteri</i> Mculoch
<i>Psenes pellucidus</i> Lutken
<i>P. maculatus</i> (Lutken)
Lophiidae
<i>Sladenia shafersi</i> Caruso et Bullis
Chaunacidae
<i>Chaunax pictus</i> Lowe
<i>Ch. nuttingi</i> Garman
Ceratiidae
<i>Cryptosaras couesi</i> Gill

from 1.2 to 1.7 kg. The fish caught were at ages ranging from 2 to 11 years (from scale and otolith age determinations).

The growth rate during the first year of life was found to be relatively high, with the mean length-at-age of 1, 2, and 3 year olds being 8, 15, and 22 cm, respectively. Sexual maturation was found to begin in the second year of life at a mean length of 18 cm, and by age 5–6 years all specimens had become mature at 25–30 cm length (Pshenichny *et al.*, 1986; Anon., 1993).

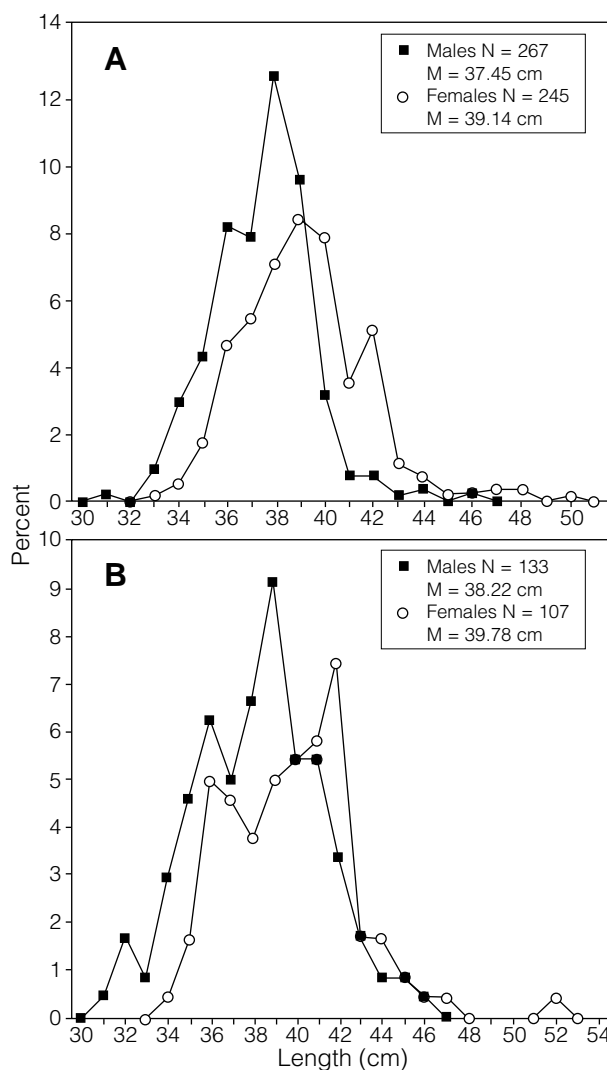


Fig. 2. Length composition of Alfonsino in the Corner Rising area in May 1995.

The main spawning period was observed in July–August in bottom layers of the water at temperatures of 7–12°C. Spawning of Alfonsino was intermittent, and observed as a number of batches at a time of around 10–12. The duration of individual spawning period was estimated to be about two months (Alekseeva, 1983). Young Alfonsino of 25–98 mm length were caught by the fry-sampling trawl in the 0–600 m water layers in autumn, where water temperatures were 14–26°C (Sherstyukov and Noskov, 1986). Alfonsino were reported to feed on different mesopelagic fish species (lanternfishes, hatchetfishes, viperfishes, etc.), squid and shrimp (Pshenichny *et al.*, 1986; Anon., 1993).

Black scabbard fish (*Aphanopus carbo*). The specimens observed had total lengths ranging from 70 to 144 cm at ages 3–13 years (age was

determined by otoliths) and ranging from 1.1 to 2.4 kg in weight. Fish at ages 6–7 years with 100–110 cm lengths and 1.1–1.3 kg weights constituted the bulk of catches. Size of fish caught increased with increasing depths. The weight-at-length of black scabbard females were higher than in males. Fish were found to mature at 80–85 cm length and 0.9–1.1 kg weight. Spawning was noted to take place in mid-water in summer. Larvae and juveniles were found pelagically. The black scabbard fish are known to feed on deepwater fish, squid and shrimp (Pshenichny *et al.*, 1986; Anon., 1993).

Barrelfish (*Hyperoglyphe perciforma*). The total length of the fish caught ranged from 22 to 108 cm (68–88 cm mean length) and 0.4–18.0 kg in weight. Barrelfish were noted to become sexually mature at 55–60 cm length at age 6–8 years (age was determined by scales and otoliths). Spawning was found to take place in summer. These fish are reported to feed mainly on deepwater shrimp, squid, fish and holothurians (Pshenichny *et al.*, 1986; Anon., 1993).

Cardinal fish (*Epigonus telescopus*). The catches of Cardinal fish consisted of fish with total length ranging from 32 to 85 cm, with the main portion of specimens being 38–47 cm in length. They were noted to become sexually mature at age 7 (age was determined by scales and otoliths). Males were predominant in catches. Spawning was noted to take place in spring–summer. They are known to feed on mesopelagic fish (lanternfishes, lightfishes, hatchetfishes), squid and shrimp (Pshenichny *et al.*, 1986; Anon., 1993).

Wreckfish (*Polyprion americanus*). The catches of these fish had total lengths ranging from 70 to 142 cm. The mean length was 107.6 cm, and mean weight was 22.6 kg. Wreckfish spawning was observed in the summer period. They are known to feed on different deepwater fish.

Flint-perch (*Hoplostethus mediterraneus*). The fork length of flint-perch in catches varied from 11 to 32 cm (the weight range was 100–900 g), with the lengths 19–26 cm predominating. Females in catches made up 50–80%. Spawning was found to occur in spring–summer. Flint-perch are known to feed mainly on shrimp, and seldom on fish (mainly lightfishes and lanternfishes).

Behaviour, Distribution and Conditions of Formation of Deepwater Fish Aggregations

Behaviour and distribution of deepwater fish on seamounts on the Corner Rising area were noted to show considerable variability.

Alfonsino aggregations were distributed at 300–950 m depths (mainly at 420–750 m), both in

bottom and mid-water layers (Fig. 3). Specimens were usually fished with pelagic and bottom trawls (Pshenichny *et al.*, 1986; Anon., 1993).

Accessibility of Alfonsino for a commercial fishery depends first on peculiarities of its vertical distribution and bottom conditions of seamounts. The main factor which appeared to determine a pattern of Alfonsino vertical migrations, was the vertical shifting of its food organisms. The latter, in turn, were closely related to variations in light penetration in the sea (i.e. the sunlight and moonlight conditions) and hydro-meteorological conditions in the area of seamounts. The results from the investigations have revealed several types of Alfonsino vertical migrations (Vinnichenko, 1996b). The horizontal migrations of Alfonsino have been observed to be limited by the area of seamounts, and their distances did not exceed beyond a few miles of the seamounts (Galaktionov, 1984; Vinnichenko, 1996a).

Unlike Alfonsino, the other potential commercial deep water fish were mainly distributed at the bottom in the area of the seamounts. However, the black scabbard fish, which sometimes formed mixed aggregations with Alfonsino but in a depth range of 650–1 200 m, was an exception. This species was constantly observed as by-catch during bottom and pelagic fishery on Alfonsino, and it was the main fish species found deeper than 900 m.

Cardinal-fish were caught at depths from 780 to 900 m together with Alfonsino. This species was mainly distributed in the bottom layers, although sometimes found to perform vertical migrations to mid-water. Some catches taken by a bottom trawl consisted mainly of Cardinal fish.

Flint-perch occurred in catches taken by the bottom trawl at depths of 760–880 m. These fish performed daily vertical migrations related to feeding, and in bright times of the day it was distributed at the bottom while it ascended to the mid-water in the night, moving away a distance of 90 m from the bottom.

The wreckfish and barrelfish were frequently recorded in small quantities in catches from a bottom trawl and were mainly taken at 660–800 m depths.

Intraspecific Structure of Deep Water Fish

Studies on deep water intraspecific structure were previously limited to only Alfonsino. As for the Alfonsino intraspecific structure, there have been two points of view. In the opinion of most Russian investigators, this species is believed to form an independent population on each separate seamount

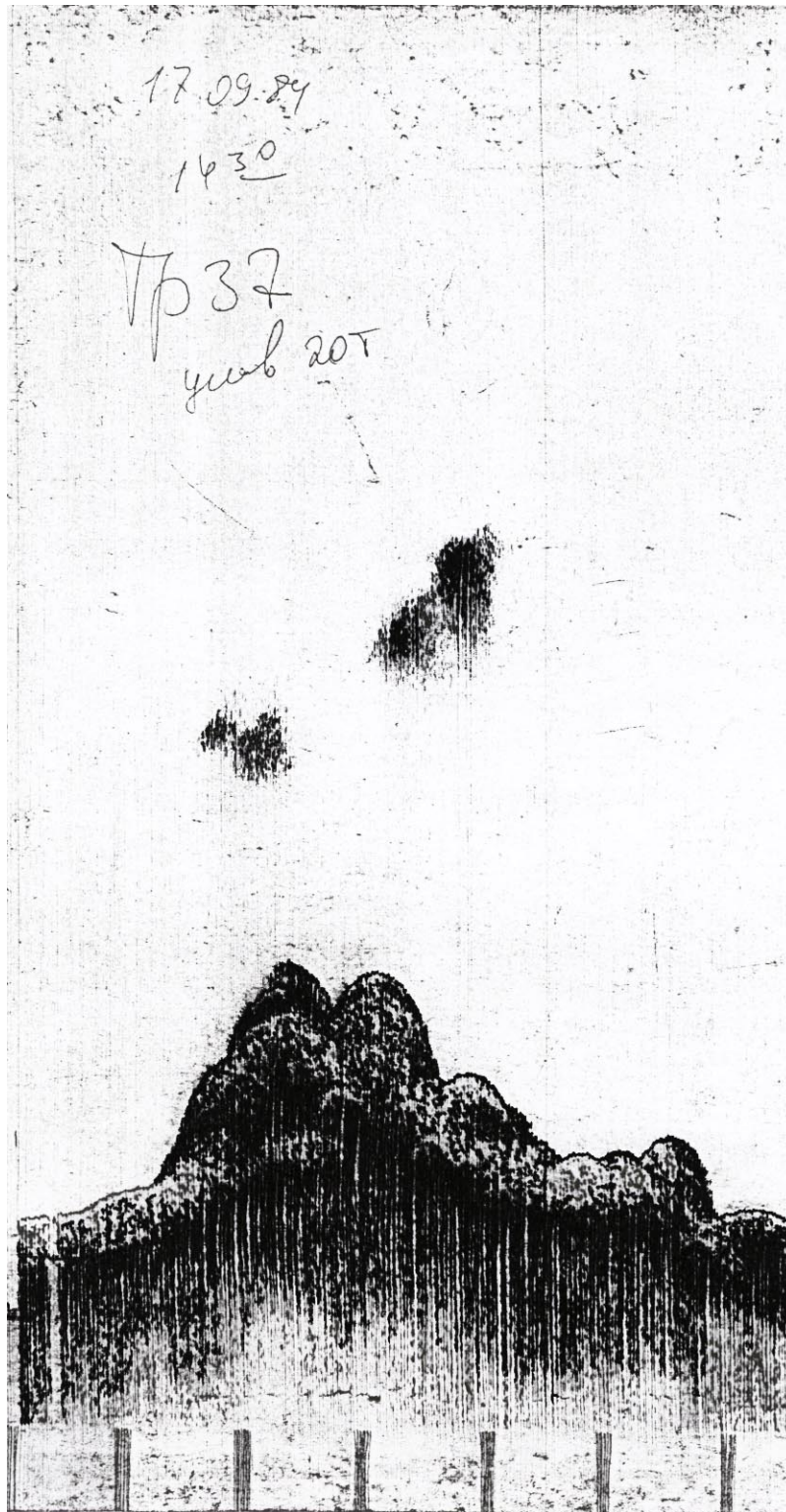


Fig. 3. Aggregations on Alfonsino over the "Vybornaya" Bank on the Corner Rising seamount.

in the open sea areas of the Northwest Atlantic and all stages of its life cycle are developed within those separate seamounts (Titova, 1981; Klimenko, 1983; Vinnichenko, 1995). At the same time, some other scientists support a hypothesis based on their availability that migrations between banks occur and therefore the existence of a single population of Alfonsino in the North Atlantic (Alekseev *et al.*, 1987).

Conclusions

The Soviet Union was a pioneer in the exploration and commercial fishing of deep water fish stocks on the Corner Rising in the region of the eastern Sargasso Sea. The main contribution to the study of the area and its fish resources, and the harvesting of a large portion of the deepwater fish stocks from the seamounts (around 19 000 tons) in the course of about 20 years, has been made by the Soviet Union and its successor Russia.

The main fishing resource on seamounts is Alfonsino. Other deepwater fishes, such as black scabbard fish, barrelfish, wreckfish, Cardinal fish and flint-fish are of minor commercial importance, but the biology and distribution information collected in these studies provide a good insight to the deep sea fish resources in the area and their susceptibility to fishing activities.

Limited stocks of deep water fish found in the area by these studies suggest there should be concerns for these resources which are in an area where free enterprise fisheries can develop easily. These concerns demonstrate the necessity for the development of an international fishery management plan for the area of the Corner Rising and other seamounts.

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