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Soviet Fisheries for Bottomfish and Herring off the Pacific and Bering Sea Coasts of the United States

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INTRODUCTION

The signing by President Gerald Ford on 13 April 1976 of the Fishery Conservation and Management Act of 1976 has far-reaching implications for all nations which fish in waters off the United States. Under the terms of this Act, which will become effective on 1 March 1977, the United States will exercise exclusive management authority over all except highly migratory species of fish within a fishery conservation zone which extends 200 miles from shore.

The Act further provides for exclusive management authority over all continental shelf fishery resources beyond the fishery conservation zone and over all anadromous species of U.S. origin throughout their migratory range—except when they occur within another nation's territorial sea or fishery conservation zone. Impetus for the Act was a deep concern over the condition of fishery resources off the United States, many of which have been overfished and are in need of rebuilding, and the belief that the legislation is required to encourage the development of fisheries that are currently underutilized or not utilized by U.S. fishermen, including bottomfish off Alaska.

The Act prescribes certain requirements and conditions for domestic and foreign fisheries. Allocation of catches among foreign nations will be made only in excess of those capable of being harvested by U.S. fishermen. Such factors as the extent that the fishing vessels of each nation have traditionally fished within 200 miles of the United States will be considered—in addition to whether such nations have cooperated with the United States in enforcement and with respect to the conservation and management of fishery resources.

In view of these and other considerations, it seems appropriate to document the development and status of foreign fisheries off the United States. Such documentation may serve as an aid to those charged with developing fishery management plans relating to those nations which may apply to fish within the extended fisheries zone. This paper provides such documentation on Soviet fisheries for bottomfish and Pacific herring, *Clupea harengus pallasi*. Not discussed is the relatively small Soviet fishery for shrimp in the Gulf of Alaska, for which no Soviet catch was reported in 1975, or the fishery for crab in the eastern Bering Sea, which has not been carried out by the Soviets since 1971.

HISTORICAL PERSPECTIVE

Before describing contemporary Soviet fisheries it is useful to consider the evolution of that nation's fisheries. Fishing has always been an important source of food in Russia but was largely confined to rivers, lakes, and inland seas until recent times. Extension of marine fisheries from coastal waters of the USSR to ocean waters off other nations is almost entirely a post-World War II phenomenon.

The early historical pattern in Russia was to develop fisheries in lakes and rivers and then to move on to other lakes and rivers as the old ones came into full or over-production. By the 15th century all of the lakes and rivers of European Russia appear to have been fished, and the search for new fishing grounds was a factor in the opening of new Russian territories. By 1860 the total fish catch in Russia amounted to 320,000 metric tons; in 1913 it reached 1,050,000 tons, over 75 percent of which still came from inland waters.

Fisheries suffered severe setbacks during World War I and during the civil war. Catches fell to 893,000 tons in 1917 and to only 483,000 tons in 1922. Beginning in 1925, the Soviet government undertook to rehabilitate the fisheries, and by 1930 the catch reached 1,283,000 tons. As in earlier years, however, most of the production was still from inland waters. Although the emphasis gradually shifted to the ocean after 1930, most of the sea catch was from coastal waters. Deployment of a small fleet of trawlers to the

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Figure 1.—U.S. Coast Guard Cutter *Storis* with Soviet factoryship *Lamut* in custody. In foreground Soviet factoryship *50 Let Oktyabrya* moves by for a look. The *Lamut* was apprehended 17 January 1972 within the U.S. contiguous fishing zone off St. Matthew Island in the Bering Sea. Note ice in background.

Figure 2.—Factoryship *Arktika* with side trawler, *Lesh*, of SRT class alongside to unload catch taken off Kodiak Island in January 1973.

Barents Sea, with Murmansk as its base of operations, contributed to an increase in the sea catch in the 1930's.

Military operations and occupation of Soviet lands during World War II inflicted serious damage to Soviet fisheries. The catch in 1946 was only slightly larger than in 1913 and would have been smaller if steps had not been taken early in the war to accelerate the development of fisheries in the Soviet Far East.

Decisive measures were taken in the 1950's to expand all maritime activities, with early emphasis being given to developing a global fishing fleet. Growth of Soviet fishing power greatly influenced the international character of fisheries during the 1960's and served as a catalyst for other nations to undertake similar operations.

Expansion of ocean fishing after World War II was first to nearby waters of the Barents Sea, northeast Atlantic, Sea of Japan, Sea of Okhotsk, and to coastal waters of the western Bering Sea. A subsequent decline in stocks in those waters was compensated for by expansion of fishing to more distant waters. By 1964, fleets of the USSR were actively working virtually all of the North Atlantic fishing grounds, and operations also had been extended to the South Atlantic.

Expansion of Soviet Pacific fisheries occurred somewhat later than in the Atlantic, but once begun it was carried out at an even faster rate. Extension of fisheries in the eastern Pacific mostly has been to grounds off North America: to the Bering Sea in 1959; to the Gulf of Alaska in 1962; to the Aleutian Islands in 1963; and to waters off Washington, Oregon, and California in 1966. In recent years, grounds off the Pacific and Bering Sea coasts of the United States have accounted for a very significant part of the total fish harvest by the USSR; during the period 1970-74, they contributed 26 percent of the catch by the USSR from the entire Pacific Ocean and 10 percent of the catch from all marine waters.

Postwar expansion of Soviet fisheries was made possible by the construction of a large fleet of fishing and support vessels of standardized and proven design. Initial construction was largely contracted to shipyards in

western European nations because of their earlier experience with distant-water fisheries from which proven designs of vessels had evolved. These designs were judged by the Soviets to be good prototypes for their own use. As the USSR gained experience with its own distant-water fisheries and as facilities which had been destroyed or damaged in the war in the USSR and eastern European nations were rebuilt, the orders for ship construction were increasingly let to yards in Communist nations. Lessons learned by the Soviets from operating their own distant-water fisheries were incorporated into the design of the new vessels.

Use of large, factory stern trawlers became the dominant theme of the Soviet's distant-water fisheries. Although the concept of factory stern trawlers was developed by western European nations, the translation of the concept into the deployment of flotillas of such ships, working in close concert with support vessels, was mainly a Soviet achievement. Decision to speed up the construction of many factory stern trawlers, other kinds of catcher vessels and support vessels was reached in early 1956 by the 20th Congress of the Communist Party of the USSR. This decision was subsequently supported by the investment of over 10 billion rubles[1] in the fishing industry from 1956 to 1975. Over half was spent for new fishing and support vessels. As a consequence, the Soviet high seas fishing fleet is now the largest in the world, comprising over 5,400 distant-water vessels and accounting for at least half of the world's total gross tonnage for vessels of this size and type.

A substantial part of the Soviet investment in fisheries since World War II has been in the Far East region. Largest capital investments have been made in the Maritime Territory where the two ice-free ports of Vladivostok and Nahodka are located. They are major ports for the unloading of fish products, including catches from off the Pacific and Bering Sea coasts of the United States, and their transshipment to other parts of the USSR.

Pre-World War II catches in the Soviet Far East were mostly salmon, herring, and sardine, with lesser quantities of flounder and cod being taken from coastal waters. Sharp declines in the abundance of the coastal resources after the war stimulated an expansion of Soviet fishing operations to more distant fishing grounds in the North Pacific. This expansion, much of which was directed to grounds off the United States, was at least partially due to the depletion of fishery stocks in home waters. Depletion of local stocks of flounders was by overfishing, which also contributed to a decline in herring stocks. The decline in herring stocks was affected by Japanese as well as by Soviet fishing operations, and probably also by adverse environmental conditions which may have contributed to successively poor year classes.

In some ways, the growth of Soviet fisheries after World War II is an even more remarkable accomplishment than the resurgence of Japan's fisheries. Extension of Japan's fisheries was based on a long history of maritime activities in which ocean fisheries played an important role. The USSR had no comparable maritime legacy, and its prewar fisheries were almost entirely conducted in rivers, lakes, inland seas, or coastal waters. This not only meant that the Soviets had to train large numbers of fishermen and allied workers and make tremendous investments in vessels and shore facilities, but it also required that they develop a whole new deep-sea fishing tradition.

Growth of ocean fisheries was a reflection of a major Soviet commitment to raise the levels of all its maritime activities, including fisheries, merchant marine, and navy to major status among world powers. In pursuit of this objective, the ocean fisheries served as an important training ground for the merchant marine and navy. Total catch by the USSR in 1975 of all aquatic organisms, including plants and mammals, was 10.3 million metric

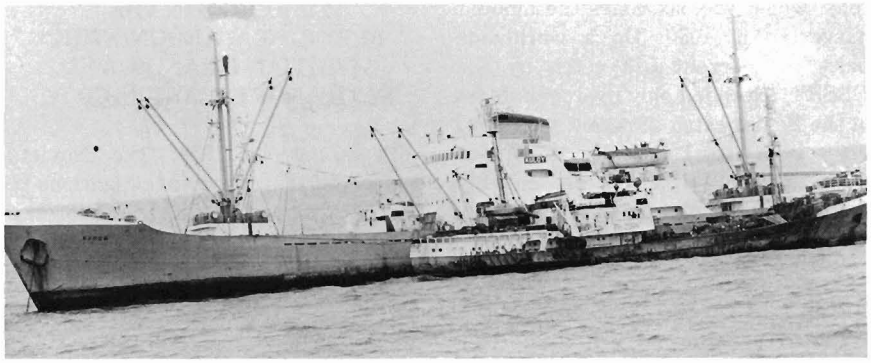

Figure 3.—Refrigerator transport *Kuloi* (Yana class), length overall 111 meters and crew of 61-63. Note side trawler of SRTM class alongside. A fishery support activity in the southeastern Bering Sea, January 1972.

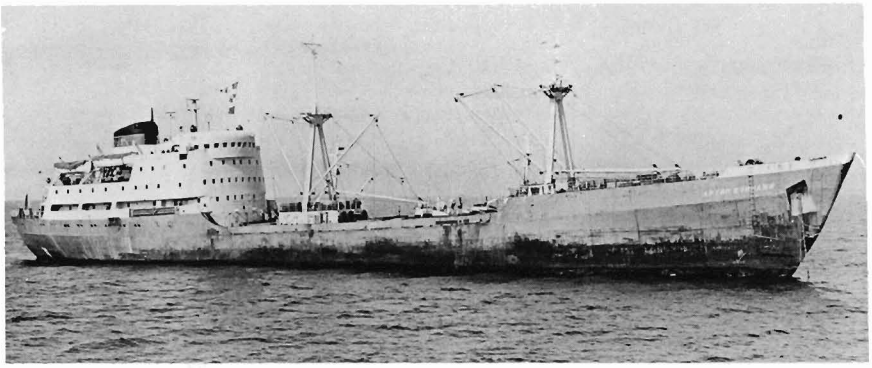

Figure 4.—Refrigerator transport, *Arkhip Kuindzhi* (Sibir class), length 130 meters, 6,100 gross tons. Anchored northwest of the Pribilof Islands in the Bering Sea, May 1966.

[1]The current rate of exchange is 1 ruble = $1.32 U.S.

tons, which was six times the amount harvested in 1950. On a worldwide basis the current fish catch by the USSR is exceeded only by Japan. Most of the Soviet catch in recent years has been from trawl fisheries in distant ocean waters which were entirely unknown to its prewar fishermen.

FISHERIES IN THE BERING SEA, AROUND THE ALEUTIAN ISLANDS, AND IN THE NORTHEAST PACIFIC

Beginning in 1958, the Soviets carried out extensive investigations in the North Pacific, with most of the effort being concentrated in the eastern Bering Sea. These were comprehensive studies and provided knowledge not only of the distribution and abundance of fisheries resources, but also much new information on water masses, currents, and the topography and geomorphology of the sea floor. As such, they were typical of the large-scale scientific support the Soviets characteristically have provided to the global expansion of their distant-water fisheries.

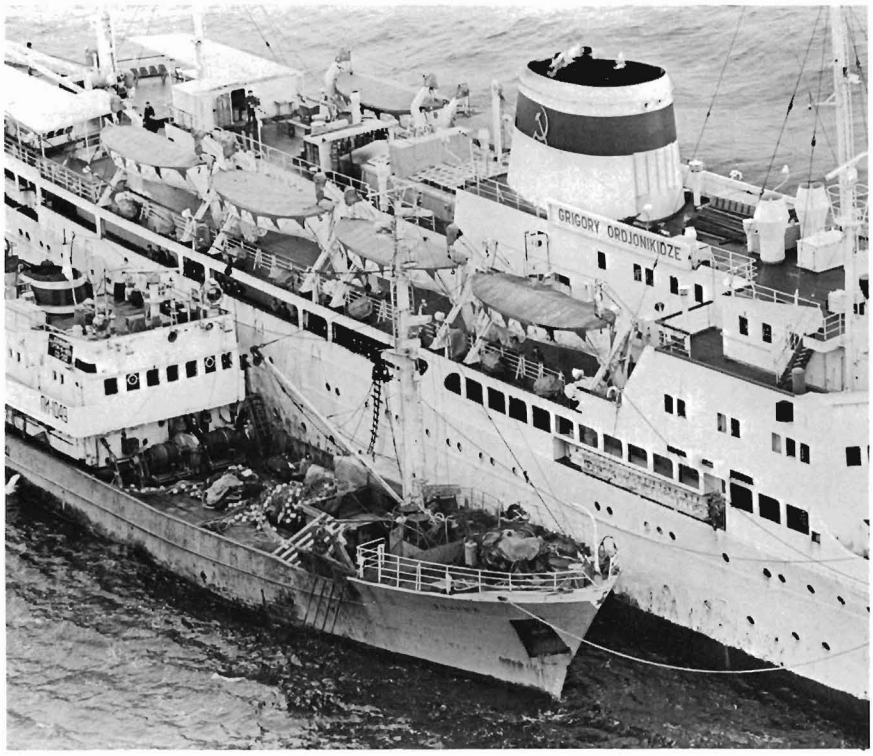

Figure 5.—Personnel transport *Grigory Ordzhonikidze* with side trawler *Lunnyi* of SRTM class nested alongside off Kodiak Island, February 1974.

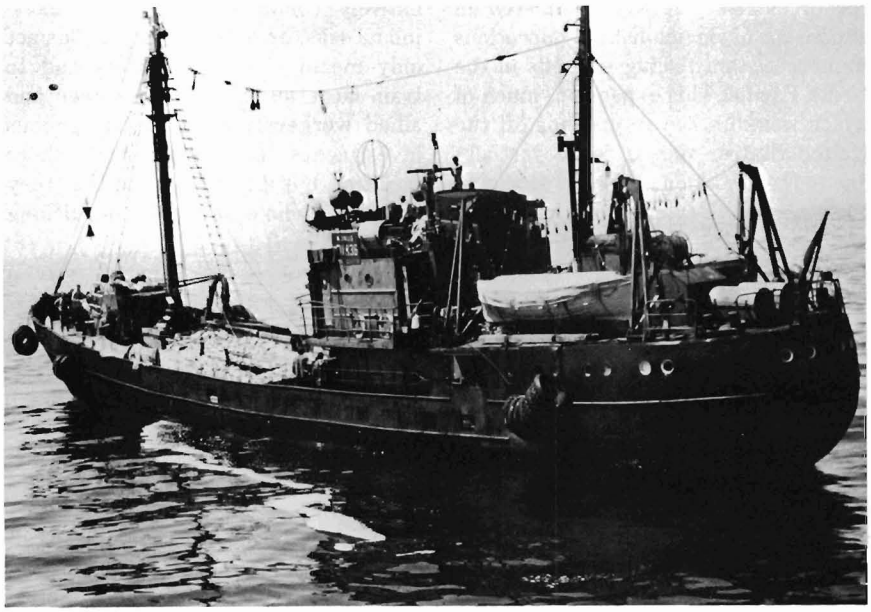

Figure 6.—Small side trawler of SRT class engaged in fishery for Pacific hake off Oregon, July 1966. Note catch of hake in forward deck bins and fish strung up to dry aft of wheelhouse. Fenders of tires are used when alongside another vessel.

Soviet fishing vessels first appeared off Alaska in the eastern Bering Sea in 1959 and expanded their area of operations into the Gulf of Alaska and along the Aleutian Islands in 1962-63. By the end of 1963, Soviet fleets were carrying out year-round operations along much of Alaska's vast coastline for herring and a variety of species of bottomfish. A large-scale fishery for Pacific hake, *Merluccius productus*, was launched by the Soviets off Oregon and Washington in 1966. This fishery subsequently was extended to include waters off British Columbia and California and other species of bottomfish besides Pacific hake.

Types of Fishing Operations

Soviet fishing operations involve catcher vessels which deliver their catches to factoryships or to transports for processing or freezing, and vessels which process their own catches. Off the Pacific and Bering Sea coasts of the United States all the bottomfish and herring harvested by the USSR are caught with trawl gear. This is in contrast to Japan which, although relying most heavily upon trawl gear, also employs Danish seines and longlines for catching bottomfish and gill nets for catching herring.

The USSR, perhaps more than any other nation, relies on the expeditionary or flotilla concept in its fishing operations. This involves the deployment of a variety of vessels in close support of its catcher fleet. Support vessels include factoryships (Figs. 1

and 2) for receiving and processing catches, refrigerator transports (Figs. 3 and 4) to replenish stores aboard the catcher vessels and to receive, freeze, and transport their catches to the homeland, oil tankers, personnel transports (Fig. 5), tugs, patrol vessels and, occasionally, even hospital ships.

Refrigerator transports are the mainstay of the support operations and even receive and transport fish products from large factoryships instead of the factoryships delivering their products to home port. This practice permits the factoryships to remain on the fishing grounds longer, since they do not have to leave for home when their holds become full. The refrigerator transports are of varied sizes with some upwards of 200 meters in length and 25,000 gross tons or more. A large refrigerator transport of 25,000 gross tons has a hold capacity capable of storing about 12,000 tons of frozen products, which is equivalent to the capacity loads of about 13 of the factory stern trawlers now in use and the capacity loads of 6 to 8 of the new *Gorizont* and *Meridian* classes of factory stern trawlers which were recently scheduled for serial production.

The two basic kinds of fishing vessels that have been used by the Soviets are side trawlers and factory stern trawlers. Side trawlers shoot and haul their nets over the side of the vessel and are considerably smaller and less versatile than the factory trawlers which deploy their nets over the stern of the vessel.

Three classes of side trawlers have been used. Smallest and oldest of the side trawlers is the SRT class of 265-335 gross tons and a crew of 22-26 (Fig. 6). Next largest of the side trawlers is the SRTR class of refrigerated medium trawlers of 505-630 gross tons and a crew of 26-28. Largest of the refrigerated side trawlers is the SRTM class of around 700 gross tons with a crew of about 30 (Figs. 7 and 8). Side trawlers, particularly SRTM's, often operate independently by processing and freezing their own catches; however, they also may offload their catches to factoryships for processing or freezing. In recent years, a new class of stern ramp trawler, apparently designed as an improvement on the SRTM, has appeared on the fishing grounds off Alaska. These vessels, known as SRTK's (Fig. 9), are about 775 gross tons and reportedly have the same basic hull and general machinery below deck as the SRTM's, but above deck the SRTK's are redesigned for more efficient trawling over the stern.

Factory stern trawlers are the largest and increasingly common kind of catcher vessel employed by the Soviets. There are almost 800 factory stern trawlers in the Soviet worldwide fleet. Collectively, they account for over 15 percent by number and about 33 percent by gross tonnage of the Soviet high-seas fishing and support fleet. Factory stern trawlers typically process and freeze their own catches in contrast to the smaller side trawlers which often offload their catches to support vessels for processing and freezing. Because of their larger size and layout for handling the trawl net

Figure 7.—Side trawler *Sadgorod* of SRTM class on an exploratory fishing mission in the Bering Sea, February 1970.

Figure 8.—Side trawler *Kombainer* of SRTM class with catch of pollock and flatfishes taken off Kodiak Island, February 1974. Note several large Pacific halibut on deck just forward of winches.

Figure 9.—Stern-ramp trawler *Guberovi* (*Zheleznii Potok* class). A new class of SRTK's which reportedly have the same hull and machinery below deck as SRTM's, but above deck are redesigned for more efficient trawling over the stern.

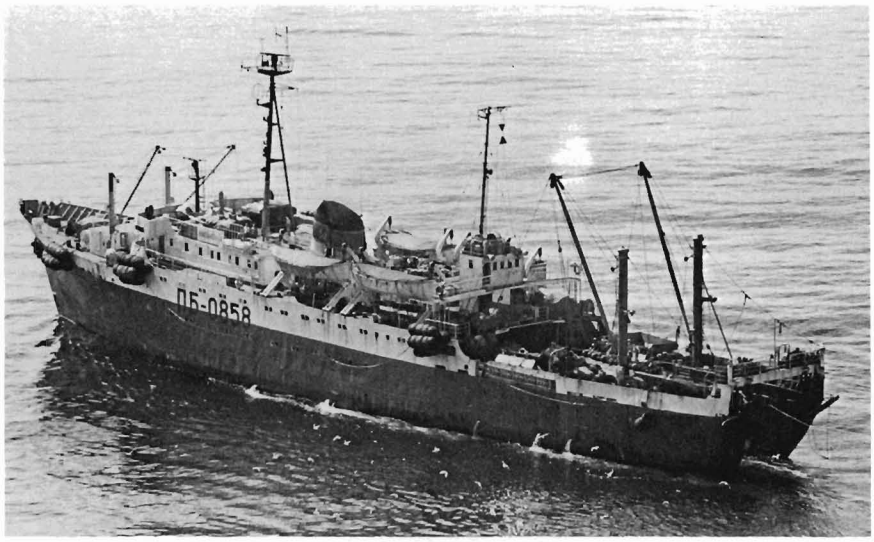

Figure 10.—Factory stern trawler *Anisimovka* of BMRT class fishing off Icy Bay in the Gulf of Alaska, July 1975.

over the stern, factory stern trawlers are capable of fishing under worse weather conditions than side trawlers.

The most common factory stern trawler employed off the Pacific coast of the United States has been the so-called BMRT (Fig. 10) of 3,170 gross tons and a crew of about 90. A new class of factory stern trawlers, the RTM (Fig. 11), has come into increasing use. It is somewhat smaller than the BMRT but has the advantage of a larger deck area aft for handling gear and fish. The capacity of most presently used factory stern trawlers for storing frozen products is about 600 to 900 tons. The daily production capacity is generally 30 to 50 tons of frozen products plus 20 to 35 tons of waste products or nontarget species for processing into fish meal and oil. During good fishing periods for Pacific hake, a BMRT must resupply and offload its processed catch every 2 months or less.

The numbers of different Soviet catcher vessels which have operated off Alaska from 1963 to 1974 and off Washington, Oregon, and California from 1966 to 1975 are shown in Tables 1 and 2, respectively. While there has been a reduction in the total number of vessels operating off Washington, Oregon, and California, there has been no loss (actually, an increase) in the fishing power of the fleet because the number of large and more efficient factory stern trawlers has greatly increased. Off Alaska, the fishing power has increased even more. This is because factory stern trawlers now comprise over one-third of the fleet off Alaska—compared to about 9 percent of the fleet in 1963-65—and the small SRT's have been replaced with larger SRTM's and SRTK's in the Gulf of Alaska. The gross tonnages for the combined classes of vessels shown in Tables 1 and 2 are better measures of the fishing power than just numbers of vessels. As can be seen from the tables, the gross tonnage and, hence, relative fishing power of the Soviet fleet has greatly increased with time.

Economics of Fishing Operations

The fishing industry plays an essential role in the Soviet economy. It provides for around one-third of the national consumption of animal protein and is a large employer of human and other resources. The Soviet Government sets the amount of funds to be invested in the fishing industry, fixes production targets for the industry, determines salaries, and establishes prices for fishery products to be sold in domestic and foreign markets. The distant-water industry is managed by a large, centralized State administration and supported by educational establishments to provide a skilled work force. Research and development programs seek to find new fishery resources and to determine efficient ways to harvest and process them for human and industrial use.

An often-expressed view in the western world is that the Soviet fishing industry "does not have to make a profit." There is some support for this view in that the Soviet Government may, at times, heavily subsidize special fishing operations because of their exploratory nature or for strategic reasons. Losses may be deliberately written off for fishing in new areas or for previously unexploited species. Fishing operations have sometimes provided a useful cover for intelligence activities, and they also provide excellent training for sailors of the Russian Navy.

Although social and other aspects are considered along with profitability in judging the success or failure of fishing operations, the industry is subject to a form of "economic accounting." However, in this accounting system, the Soviet fishing industry enjoys several advantages over its capitalistic counterparts. Funds for capital investment are made available from the central budget as nonreturnable grants. Thus, loans do not have to be obtained for construction of vessels and equipment, and the costly interest payments so common in private enterprise are avoided. The price paid for fish by the Soviet consumer is set by the State, and the higher the price, the easier it is to show a profit. Information on fish prices in the USSR is scarce, but it seems that many species are relatively more expensive than in western European nations.

Although funds for capital investment in vessels and equipment are interest-free, the remainder of the Soviet financial structure resembles that of private enterprise fisheries. Each Soviet enterprise must pay for depreciation which, together with operating costs, is not expected to exceed income from the venture. This yardstick is sometimes applied to individual ships as well as to particular fisheries. Workers' pay may be by piecework or by standard rate with additional incentives in the form of extra pay for long service, overtime, overfulfillment of quotas, and regional rates for hardship service. The latter may be for voyages of long duration, services in particularly stormy areas, etc., and are not necessarily related to income from the sale of products. Another incentive for exceeding production norms is the so-called "socialist competition" which may be between individual vessels, fleets, or other units. Winners of such competitions receive special recognition and are held up for others to emulate.

An insight into the efficiency of Soviet operations may be gained by comparing them with Japanese operations. Particularly illuminating is a comparison of daily catch rates and the numbers of vessels employed in support of the catcher fleets. Both kinds of comparisons indicate that the Soviets

Figure 11.—Factory stern trawler *Polevod* of new RTM class. Vessels of the RTM class are somewhat smaller than BMRT's but have a larger deck area aft for handling gear and fish.

Table 1.—Number and equivalent gross registered tonnage of different Soviet catcher vessels sighted off Washington, Oregon, and California, 1966-75. Sightings were by NMFS personnel and do not include repeated sightings of the same vessels.

Year	Side trawlers				Factory stern trawlers			Equivalent gross tons, all classes
	SRT	SRTR	SRTM	Total	BMRT	RTM	Total	
1966	149	9	13	171	39	—	39	177,000
1967	—	—	—	[1]126	48	—	48	?
1968	24	—	14	38	56	—	56	194,000
1969	12	—	6	18	44	—	44	147,000
1970	—	—	8	8	55	—	55	180,000
1971	—	—	6	6	64	—	64	207,000
1972	2	—	3	5	42	2	44	141,000
1973	12	—	8	20	51	11	62	200,000
1974	—	—	—	—	78	16	94	290,000
1975	—	—	—	—	82	15	97	300,000

[1] Not differentiated by class in 1967.

Table 2.—Number and equivalent gross registered tonnage of different Soviet catcher vessels sighted off Alaska, 1963-74. Sightings were by NMFS personnel and do not include repeated sightings of the same vessels. Observations not extensive enough to provide comparative numbers in 1959-62 and unavailable for 1975.

Year	Side trawlers					Factory stern trawlers			Equivalent gross tons, all classes
	SRT	SRTR	SRTM	SRTK	Total	BMRT	RTM	Total	
1963	155	7	—	—	162	10	1	11	79,000
1964	237	9	12	—	258	28	1	29	167,000
1965	330	11	25	—	366	36	3	39	233,000
1966	248	9	44	—	301	42	4	46	245,000
1967	191	7	66	—	264	53	4	57	279,000
1968	97	5	90	—	192	71	3	74	324,000
1969	66	9	127	—	202	79	6	85	377,000
1970	65	11	144	—	220	97	6	103	447,000
1971	92	7	102	2	203	102	5	107	438,000
1972	111	6	161	7	285	100	11	111	497,000
1973	25	7	155	9	196	105	15	120	498,000
1974	25	7	174	8	214	117	14	131	546,000

are less efficient than their Japanese counterparts.

The extensive support in the form of factoryships, refrigerator transports, tugs, etc., provided by the Soviets to their catcher fleets accounts for up to 20 percent or more of the total man-days expended in the combined fleet operations for some target species. The extent of support activity is highest in the Bering Sea where many Soviet side trawlers deliver their catches to support vessels for processing, freezing, and transporting to the homeland. However, even in the hake fishery off the Pacific Northwest and California, where factory trawlers process and freeze their own catches, the man-days of effort expended by the Soviets for support activities is a significant part of the total. The man-days of effort expended by Japan on support vessel activities in fisheries off the Pacific coast of the United States is considerably less than that expended by the Soviets in otherwise comparable fisheries. On a worldwide basis, more than half of the gross tonnage of the Soviet distant-water fishing fleet reportedly consists of support vessels compared to less than 20 percent of the Japanese fleet.

There are two factors which seem to account largely for the greater reliance on support vessels by the Soviets. The USSR does not make as extensive use of foreign ports as does Japan for resupplying its catcher fleet or for offloading and transshipping the catches. Off the Pacific and Bering Sea coasts of the United States the important factor seems to be that the catches are not processed to the same extent on Soviet vessels as on Japanese vessels. Aboard Japanese vessels the catches are typically processed into "surimi" (minced flesh), fillets, and fish meal; a relatively small proportion of the catch is frozen in the round or in a headed and eviscerated form. On Soviet vessels a larger fraction of the catch is frozen in the round or as headed and eviscerated products. The more highly processed Japanese products occupy less space aboard the catcher vessels, which means they do not have to unload as frequently as Soviet vessels; hence, there is less need for refrigerator transports to be used in support of the Japanese fishing operations.

Perhaps the most meaningful indicator of the comparative efficiency of Soviet and Japanese fishing operations is the catch per vessel-day and catch per man-day. For vessels of similar types and sizes operating in the Bering Sea and Gulf of Alaska, the catch in weight of fish per Japanese vessel-day appears to be considerably higher than the catch per Soviet vessel-day, and the catch per man-day on Japanese vessels is proportionately even higher than on Soviet vessels. When allowance is made for the more extensive use of support vessels by the Soviets, the greater efficiency of the Japanese is rather striking.

Although it would be instructive to compare the monetary value of the catches produced per vessel-day and per man-day aboard Soviet and Japanese vessels, it has not been possible to do so because of a lack of data on amounts of different products (fish frozen in the round, fillets, minced fish flesh, fish meal, etc.) produced aboard Japanese and Soviet vessels and the dockside values of the products. Moreover, the dockside values are not directly comparable because in Japan they are set by a relatively free market whereas in the USSR they are set by the State. As noted above, however, the Japanese catches are processed into more finished products than the Soviet catches. For a given catch, the Japanese products, therefore, would be of higher value than the Soviet products, if they were sold in free competition with each other. Allowing for this factor further increases the efficiency of Japanese operations compared to Soviet operations.

Adequacy of Data

From 1959 when the Soviets began commercial operations off Alaska until 1964, no statistics were provided on catches except what can be inferred from scientific reports published on a few species. In 1964, the USSR began providing the Food and Agriculture Organization (FAO) of the United Nations with figures on catches of certain species in the eastern North Pacific. However, the catch area identified by the Soviets essentially included all fishing grounds in the eastern North Pacific between northern California (lat. 40° 30' N) and Cape Prince of Wales, Alaska (lat. 65°N), and offshore to long. 175°W, which in the north intercepts the Chukchi Peninsula of the Soviet Union at East Cape, just south of the Arctic Circle (FAO Statistical Area 67). Catches for such a huge area are of extremely limited value in assessing the impact of fishing on individual stocks of fish and shellfish which typically inhabit much smaller areas and is in stark contrast to the detailed statistics on catches which were published or otherwise made available by the United States, Canada, and Japan for those years.

As a result of a bilateral fisheries agreement concluded between the United States and the USSR, statistics on the fisheries of the two nations in the eastern North Pacific were exchanged beginning in 1967. However, for most of the period since 1967 the data provided by the Soviets have lacked detail on the area of capture and on the species harvested. The practice, until quite recently, was to provide data on catches of only a few primary target species and to combine the catches of all remaining species in a "miscellaneous" or "other species" category. On a few occasions this has led to the anomalous situation whereby the reported catch of miscellaneous or other species approached or even exceeded the reported catches of some of the target species.

Another problem in evaluating the impact of Soviet fisheries has been the difference sometimes occurring between the size of their reported catches and the quantities estimated by National Marine Fisheries Service (NMFS) personnel to have been caught while observing actual Soviet fishing operations from patrol aircraft and vessels. Such discrepancies between Soviet reports and observations by NMFS personnel also have occurred regarding the numbers and kinds of vessels involved in the fishing operations.

Perhaps the best-documented example of the above kind of problem occurred with the development by the Soviets of a new fishery for Alaska pollock, *Theragra chalcogramma*, and flounders near Kodiak Island in the Gulf of Alaska. The fishery began in January 1973 when elements of the

Soviet fleet, which formerly were assigned to fish for flounders in the eastern Bering Sea, were diverted to the Gulf of Alaska. The reported catch by the Soviets in this new fishery during January-April 1973 was 8,273 metric tons, compared to an estimated catch of 40,000 to 50,000 tons by NMFS personnel. According to observations by NMFS personnel, side trawlers accounted for almost one-half of the vessel-days of effort expended in this fishery, but the Soviets reported that no side trawlers were involved in fishing. After a series of discussions between United States and Soviet officials concerning this large disparity between observed and reported fishing, the Soviets provided United States scientists with a supplement, which showed an additional 7,000 metric tons of bottomfish as having been caught. However, this still left a shortage of at least 25,000 metric tons between the revised catch figure of 15,000 tons reported by the Soviets and the catch of 40,000 to 50,000 tons estimated by NMFS personnel.

While the foregoing is not typical, differences between reported and observed catches and vessel operations have been frequent enough to limit the usefulness of much of the data provided by the Soviets on their fishing operations off the Pacific and Bering Sea coasts of the United States. The Soviet reports sometimes seem to err in over-reporting of catches or fishing effort as well as in under-reporting. Therefore, I believe that the inaccuracies reflect a failure of the Soviets to establish an adequate reporting system and to hold the vessel captains and others accountable for conforming to the system, rather than any deliberate attempt at subterfuge. However, the end result is the same; namely, the official Soviet statistics on catches and fishing effort have been of limited value to United States investigators for assessing the impact of Soviet fisheries on stocks of fish off the Pacific coast of North America.

Species Harvested—Kinds, Amounts, and Areas of Capture

A perspective of Soviet fisheries is obtained by comparing their harvests with those of other nations from waters off the Pacific and Bering Sea coasts of the United States. Cumulative catches of bottomfish by all nations during 1954-74 amounted to over 22 million metric tons. Of this amount, Japan accounted for over 15 million tons (67 percent), the USSR nearly 6 million tons (25 percent), and the United States about 1½ million tons (6 percent). The remainder was accounted for by the Republic of Korea (South Korea), Peoples Republic of Poland, Democratic Republic of Germany (East Germany), Federal Republic of Germany (West Germany), Republic of China (Taiwan), and Canada.

Although vessels of Japan and the USSR have operated throughout the eastern Bering Sea, around the Aleutian Islands, in the Gulf of Alaska, and off the States of Washington, Oregon, and California, these areas have been of different relative importance to each nation. Over 90 percent of Japan's harvest of bottomfish has been from the Bering Sea compared to about half of the Soviet harvest. The Gulf of Alaska and grounds off Washington, Oregon, and California, therefore, have been of greater relative importance to the USSR than to Japan. This was particularly true in the early and mid-1960's when the USSR carried out a very large fishery in the Gulf of Alaska for Pacific ocean perch, *Sebastes alutus*. The great decline in abundance of Pacific ocean perch in the Gulf of Alaska, which resulted from excessive catches, led the Soviets to direct much of their fishing effort to other species and to other areas. Fishing grounds around the Aleutian Islands have contributed only a minor part of the Soviet and Japanese total harvest but have been relatively more important to the Soviets than to the Japanese.

Catches by the USSR during 1959-75 are shown in Table 3. They have been derived from various sources. As a consequence of the lack of any official statistics on Soviet fisheries for the years prior to 1964 and the gross nature of those provided for 1964-66, it was necessary to estimate catches for 1959-66. For years after 1966 the catches are as provided by the USSR to the United States under terms of bilateral agreements, except in some instances where it was possible to provide more accurate figures from direct observations by NMFS personnel or from other sources.

Bering Sea In 1959, the USSR initiated winter fisheries for both flounder and herring in the eastern Bering Sea. Both fisheries were at least in partial response to declining catches in the Soviet Far East. The herring fishery is carried out on the outer continental shelf northwest of the Pribilof Islands to beyond St. Matthew Island in some years. Largest production of herring by the Soviets was attained in 1962-64, when annual catches of from 150,000 to at least 175,000 metric tons were taken by 100-150 side trawlers. Production of herring during 1965-67 was much less and in 1968-72 averaged about 60,000 metric tons annually, with large fluctuations occurring from year to year. The Soviet catch of herring was limited to 30,000 metric tons in 1975 and 1976 under terms of a bilateral agreement with the United States.

A traditional Soviet fishery for flounder has occurred on the Bristol Bay flats of the southeastern Bering Sea. The combined catches of yellowfin sole, *Limanda aspera*, by Japan and the USSR is thought to have reached a peak of about 600,000 metric tons in 1961. Thereafter, the combined catch of yellowfin sole by the USSR and Japan dropped to around 100,000 metric tons, recovered to about 200,000 metric tons in 1969-70, then fell to only about 30,000 metric tons in 1972-73. In 1973 the Soviets practically abandoned their winter fishery for yellowfin sole in the eastern Bering Sea and diverted much of their flounder fleet to grounds near Kodiak Island in the Gulf of Alaska. The catch of yellowfin sole reported as having been taken by the USSR from the eastern Bering Sea during the 1972-73 winter fishery was only 4,500 metric tons. In 1974 and 1975 the total catches of all species of flounders combined were 39,000 and 50,000 metric tons, respectively. Most were arrowtooth flounder (turbot), *Atheresthes stomias*, and Greenland turbot, *Reinhardtius hippoglossoides*, neither of which were catch targets in earlier years when yellowfin sole was abundant. Pacific halibut, *Hippoglossus stenolepis*, is reported not to be a target of Soviet fisheries; incidental

catches of 123 and 190 metric tons of Pacific halibut were reported as having been caught in 1974 and 1975, respectively.

Declining production from its traditional herring and flounder fisheries led the USSR to seek other species in the eastern Bering Sea as well as to send parts of its fleet to fishing grounds outside the Bering Sea. Within the Bering Sea, the most significant recent event has been the entry of the USSR into the fishery for Alaska pollock which, since its inception, has been dominated by Japan. The first catch of pollock reported by the USSR from the eastern Bering Sea was in 1969 when 27,000 metric tons were taken. The Soviet fishery for pollock thereafter assumed increasing importance, exceeding 300,000 metric tons in 1974. By agreement with the United States, the Soviet catch of pollock will not exceed 210,000 metric tons in 1975 and 1976.

Other bottomfish which have been sought by the Soviets include Pacific ocean perch, sablefish (blackcod), *Anoplopoma fimbria*, Pacific cod, *Gadus macrocephalus*, and grenadiers (rattails), *Coryphaenoides* sp. The fishery for grenadiers is a recent develment in deeper waters than those in which the other species of bottomfish are found.

Aleutian Islands Area Since its inception in the early 1960's, the main target of the Soviet fishery in the Aleutian Islands area has been Pacific ocean perch. The Soviet catch of rockfish (mainly Pacific ocean perch) was over 60,000 metric tons in 1965, a level which was never attained after that. The catch of rockfish fell to 3,017 tons in 1973 and 824 tons in 1974; but it was reported to have increased in 1975 to 11,877 tons. The catch in 1975 was just under the 12,000-ton limit agreed to with the United States.

As the abundance of rockfish declined, there was some diversion to other species, such as Alaska pollock, Atka mackerel, Hexagrammidae, and grenadiers. However, switching to other target species was not sufficient to maintain the total catch at former levels. In 1973 the combined catch of all species from around the Aleutian Islands fell to an all-time low of only 17,012 metric tons. There was some

Table 3.—Catches in metric tons by the USSR of bottomfish and herring from the eastern Bering Sea and Aleutian Islands areas combined and from the Northeast Pacific area, 1959-75.

Year and type of fish	Eastern Bering Sea and Aleutian Islands	Northeast Pacific[1]	Total
1959			
Herring	10,000	—	10,000
Flatfish	75,000	—	75,000
Total	85,000		85,000
1960			
Herring	10,000	—	10,000
Flatfish	75,000	—	75,000
Rockfish	20,000	—	20,000
Total	105,000	—	105,000
1961			
Herring	80,000	—	80,000
Flatfish	75,000	—	75,000
Rockfish	25,000	—	25,000
Total	180,000		180,000
1962			
Herring	150,000	—	150,000
Flatfish	75,000	—	75,000
Rockfish	20,000	50,000	70,000
Total	245,000	50,000	295,000
1963			
Herring	150,000	—	150,000
Flatfish	75,000	—	75,000
Rockfish	27,000	108,000	135,000
Total	252,000	108,000	360,000
1964			
Herring	175,000	—	175,000
Flatfish	50,000	—	50,000
Rockfish	72,500	230,000	302,500
Total	297,500	230,000	527,500
1965			
Herring	10,000	—	10,000
Flatfish	90,000	—	90,000
Rockfish	80,000	340,000	420,000
Total	180,000	340,000	520,000
1966			
Herring	5,000	—	5,000
Flatfish	100,000	—	100,000
Rockfish	30,000	157,000	187,000
Pacific hake	—	128,000	128,000
Total	135,000	285,000	420,000
1967			
Herring	—	—	—
Flatfish	123,000	—	123,000
Rockfish	47,000	111,000	158,000
Pacific hake	—	206,000	206,000
Sablefish	trace	—	trace
Other species	8,000	18,000	26,000
Total	178,000	335,000	513,000
1968			
Herring	22,000	—	22,000
Flatfish	72,000	—	72,000
Rockfish	30,000	69,000	99,000
Pacific hake	—	104,000	104,000
Sablefish	4,000	—	4,000
Other species	28,000	34,000	62,000
Total	156,000	207,000	363,000
1969			
Herring	94,000	—	94,000
Flatfish	121,000	—	121,000
Rockfish	23,000	23,000	46,000
Pacific hake	—	162,000	162,000
Sablefish	2,000	—	2,000
Alaska pollock	34,000	—	34,000
Other species	7,000	23,000	30,000
Total	281,000	208,000	489,000
1970			
Herring	117,000	—	117,000
Flatfish	115,000	—	115,000
Rockfish	53,000	3,000	56,000
Pacific hake	—	226,000	226,000
Sablefish	3,000	1,000	4,000
Alaska pollock	45,000	—	45,000
Other species	16,000	17,000	33,000
Total	349,000	247,000	596,000

Table 3.—Continued.

Year and type of fish	Eastern Bering Sea and Aleutian Islands	Northeast Pacific[1]	Total
1971			
Herring	23,000	—	23,000
Flatfish	143,000	2,000	145,000
Rockfish	7,000	33,000	40,000
Pacific hake	—	152,000	152,000
Sablefish	3,000	1,000	4,000
Alaska pollock	236,000	trace	236,000
Other species	8,000	1,000	9,000
Total	420,000	189,000	609,000
1972			
Herring	54,000	—	54,000
Flatfish	61,000	4,000	65,000
Rockfish	25,000	27,000	52,000
Pacific hake	—	117,000	117,000
Sablefish	2,000	1,000	3,000
Alaska pollock	215,000	20,000	235,000
Other species	109,000	27,000	136,000
Total	466,000	196,000	662,000
1973			
Herring	34,000	—	34,000
Flatfish	21,000	16,000	37,000
Rockfish	3,000	14,000	17,000
Pacific hake	—	153,000	153,000
Sablefish	1,000	trace	1,000
Alaska pollock	290,000	44,000	334,000
Other species	32,000	24,000	56,000
Total	381,000	251,000	632,000
1974			
Herring	20,000	—	20,000
Flatfish	39,000	2,000	41,000
Rockfish	33,000	17,000	50,000
Pacific hake	—	159,000	159,000
Sablefish	trace	trace	trace
Alaska pollock	331,000	31,000	362,000
Other species	32,000	33,000	65,000
Total	455,000	242,000	697,000
1975			
Herring	19,000	—	19,000
Flatfish	50,000	3,000	53,000
Rockfish	39,000	13,000	52,000
Pacific hake	—	154,000	154,000
Sablefish	—	—	—
Alaska pollock	220,000	38,000	258,000
Other species	49,000	31,000	80,000
Total	377,000	239,000	616,000

[1]During the period 1967-75 approximately 10 percent of the total landings from the northeast Pacific area were from off Canada; the remaining 90 percent was from off the United States. Sources: Chitwood (1969) and Forrester, Beardsley, and Takahashi (in press) for 1959-66 data. Later data is from statistics provided by the USSR under terms of bilateral agreements with the United States, with some changes based on observations by NMFS personnel.

recovery of the catch in 1974 and 1975, but only because of an increasing diversion to pollock as a target species.

Northeast Pacific (Gulf of Alaska to California) Pacific ocean perch was the target of the Soviet fishery in the Gulf of Alaska until the abundance was reduced to where it was necessary to seek other species. Both the USSR and Japan contributed to the great reduction in abundance of Pacific ocean perch, although the larger Soviet catches in the early years of the fishery set the stage for the subsequent declines. Indicative of the depletion of the Pacific ocean perch resource are the following average, annual catches of rockfish by the Soviets from the northeast Pacific (mostly Gulf of Alaska): 242,000 metric tons in 1964-66; 68,000 tons in 1967-69; 21,000 tons in 1970-72; and 15,000 tons in 1973-75. The catch of rockfish in the northeast Pacific was limited to 12,500 tons in 1975 and 1976 by agreement with the United States.

As the catches of Pacific ocean perch declined, the Soviets began to seek other species in the Gulf of Alaska such as Pacific cod, sablefish, Atka mackerel, flounders, and grenadiers. Starting about 1972, Alaska pollock became a target of the Soviet fishery in the Gulf of Alaska and catches of that species exceeded 30,000 metric tons in 1974 and 1975. By agreement with the United States, the Soviet catch of pollock will not exceed 40,000 metric tons in 1975 and 1976.

The launching of a new Soviet fishery for Pacific hake off Washington and Oregon in 1966 largely was to compensate for the reduced abundance of Pacific ocean perch in the Gulf of Alaska. Initially, Pacific ocean perch was a secondary target in the Soviet fishery for hake. This led to the depletion of stocks of Pacific ocean perch on some grounds traditionally fished by U.S. trawlers and the demise of a local fishery of considerable importance to Oregon trawlers. Since 1971, the Soviet catch of Pacific hake has been limited by agreement with the United States to 150,000 metric tons per year, the amount believed by U.S. scientists to be the maximum sustainable yield. The recent commencement of fishing for Pacific hake by other nations, particularly Poland, which reported its catch to be 57,000 tons in 1975, has resulted in the all-nation harvest exceeding by a substantial amount what the hake resource is believed to be capable of sustaining.

IMPACT ON U.S. FISHERIES

The kinds of impacts have been much the same from the distant-water fleets of the several nations participating in fisheries off the Pacific coast of the United States. The most obvious impacts have been the preemption of fishing grounds and the destruction of fishing gear employed by U.S. fishermen. A series of bilateral fisheries agreements has been the major factor in minimizing the number and severity of conflicts over fisheries between the United States, the USSR, and certain other distant-water fishing nations. Under terms of these agreements the other nations have refrained from fishing in some areas of special interest to the United States in exchange for concessions to fish and transfer cargoes at several places within the United States' 12-mile fisheries zone.

In recent years, the agreements with the USSR, Japan, and Poland have included quotas on the catches of some species and provisions not to target on other species of particular concern to the United States. The agreement with

South Korea does not contain catch quota provisions and prohibits only the taking of Pacific halibut among the several species of bottomfish of concern to U.S. fishermen. The United States has not signed any official agreements with the Democratic Republic of Germany (East Germany), Bulgaria, or the Federal Republic of Germany (West Germany), none of whom have yet mounted large-scale fishing operations off the Pacific or Bering Sea coasts of the United States. A special feature of the agreement with the USSR has been the establishment of a board to facilitate the settlement of monetary claims arising from the destruction of fishing gear or the interference with fishing operations.

Less obvious than the above-mentioned impacts have been those arising from overfishing. For lack of adequate statistics on catches and fishing effort, it has been particularly difficult to assess the effects of Soviet operations on stocks of fish. This situation has been aggravated by the pulse nature of the Soviet fisheries, which has tended to generate massive fishing effort on localized stocks and thereby rapidly reduce their abundance. United States investigators often have not been aware that this process was occurring until after the Soviet vessels had abandoned their operations to move on to other stocks, species, or fishing grounds. This was the typical situation for Soviet, as well as Japanese operations, until recent years when safeguards in the nature of quotas on the catches of some species and provisions not to target on other species were incorporated into the bilateral agreements.

Another kind of impact has been the reduction of stocks by foreign fleets to levels at which U.S. fishermen cannot afford to fish. Such levels often have been reached before biological depletion occurred. An example is in the eastern Bering Sea, where, among the many species of bottomfish present, only Pacific halibut is sought by U.S. fishermen. There are many reasons for this anomalous situation, including distance from U.S. markets and processing plants, but a contributing factor has been that foreign fishing, particularly by Japan and the USSR, has reduced stock densities of many desirable species to the level where they no longer are capable of yielding catch rates at which U.S. fishermen can afford to fish. The early foreign fisheries operated at high catch rates as a result of fishing on previously unutilized stocks. The effect of these high catch rates was to subsidize some of the costs required to develop the harvesting and processing technology for utilizing the resources. The U.S. fishing industry will not have the same advantage unless foreign fishing is reduced or stopped for a period of several years to allow the stocks to rebuild to higher levels of abundance.

Since the Soviet fleets are operated by the State and are not governed by the same economic considerations as U.S. vessels, it is clear they could preempt the fishing grounds if it was judged to be worthwhile to do so for strategic or political reasons. While this is possible in theory, there are no documented instances where it has occurred in relation to U.S. fishermen or to those fishermen of other nations operating off the Pacific or Bering Sea coasts of the United States.

To a greater degree than Japan, the Soviets have mounted large trawl fisheries for bottomfish in the Gulf of Alaska and off Washington, Oregon, and California where there is greater opportunity for impacting on established U.S. fisheries. Although confrontations have occurred between United States and Soviet fishermen, particularly in the years immediately after the arrival of the Soviet fleets, they have been fewer than perhaps most people expected. This can be partially attributed to the different character of the U.S. and Soviet fisheries in that they tend to seek different species off Washington, Oregon, and California and, as yet, there is no large U.S. trawl fishery for bottomfish off Alaska.

On the other hand, incidental as well as some intentional catches of Pacific ocean perch by the large Soviet hake fleet has so reduced their abundance that U.S. trawlers no longer find it profitable to fish for Pacific ocean perch on certain grounds off Oregon and Washington. A similar situation occurs as regards the impact of foreign fisheries, particularly those of Japan and the USSR, on the United States and Canadian setline fishery for Pacific halibut in the Bering Sea and Gulf of Alaska. Foreign catches of halibut, particularly incidental catches of small and immature halibut, have contributed to a decline in the abundance of fish available to setline gear. This has necessitated a great reduction in the catch quotas allocated to United States and Canadian fishermen to halt the decline and hopefully to rebuild this valuable resource.

Contributing to the fewer conflicts than expected with U.S. fishermen has been the way the USSR closely directs and monitors the activities of its fishermen. Each flotilla of fishing and support vessels is directed by a Fleet Commander who considers not only the Soviet production targets but also the need to comply with US-USSR bilateral agreements, including the minimizing of conflicts with United States fishermen. Compliance of Soviet fishermen with bilateral agreements and with the Fleet Commander's decisions is monitored by a higher degree of Soviet patrol activity than by Japan and probably any other nation seeking bottomfish off the Pacific and Bering Sea coasts of the United States. A reflection of this control has been that fewer Soviet vessels in relation to the total number employed have been apprehended by the United States in violation of its fisheries zone than has been the case for Japan, South Korea, and Taiwan. For example, a large Soviet fleet has fished for Pacific hake off the Pacific Northwest and California every year since 1966; yet, no Soviet vessels have been apprehended there in violation of the contiguous fishing zone of the United States.

THE FUTURE OF SOVIET FISHERIES

Predictions for the future should consider past performance, and the performance of the Soviet fishing industry has been most impressive. Within the two decades following 1946, the USSR had rebuilt its fishing fleets, ports, harbors, and other facilities which had suffered great war-time damages. A whole new deep-sea fishing tradition, was developed and Soviet fishing fleets ploughed the world's seas. By 1967, the USSR had become the world's third largest fish-producing nation, being

surpassed only by Peru and Japan. With the collapse of its anchovetta fishery, Peru fell from first to third place in 1972 and the USSR has since maintained second place behind Japan.

The USSR has aggressively sought to improve its fishery technology and to bring latent fishery resources into production. Efforts are continually underway to improve fishing tactics and gear and to develop new concepts for harvesting fish. Examples of past Soviet successes include the upgrading of both their Atlantic and Pacific fleets by outfitting them with new mid-water trawling capabilities. This was carried out rapidly and has improved the efficiency of harvesting many species as well as made it possible to begin harvesting species which were capable of avoiding the trawls previously available. The Soviets, along with the Japanese, have pioneered the development of an entirely new fishery for Antarctic krill, a small, shrimp-like animal capable perhaps of yielding catches as large or larger than the current world fish harvest.

Several factors mitigate against the further expansion of Soviet fisheries despite the importance attached to such expansion by the USSR. These factors apply to the distant-water fisheries of other nations as well as to those of the USSR. Many traditional fishery resources have been depleted by intensive international fisheries and this has resulted in declining harvests. International competition for resources has increased as many nations built up their distant-water fleets and as other nations launched new distant-water fisheries. Besides contributing to overfishing and reduced yields, this has meant that the harvests have had to be divided among more nations, with less for each. In addition, the unilateral extension of fishery zones by many nations has closed or reduced access to many important fishing grounds, and it is likely that international consensus will soon be reached for a worldwide extension of fishing limits by coastal nations to 200 miles from shore.

To date, Soviet planners appear to be relatively unimpressed by the worldwide signs which argue for caution in further expansion of fishing fleets. Some 900 new fishing vessels and 70 refrigerator transports were added to the Soviet fleet during the recently completed Ninth Five-Year Plan (1971-75). Capital investments for vessel construction during the next Five-Year Plan (1976-80) will be less, with a change in emphasis to smaller vessels for coastal fisheries and more automation aboard processing vessels. On the other hand, it was recently announced that the USSR had placed the most valuable single order (US$250 million) in the history of the Polish shipbuilding industry to construct 11 fish factoryships of a new design for delivery from 1978 through 1980. These factoryships will be 178 meters in length and have a potential for processing daily 100 tons of whole fish into frozen products, salting at least 150 tons of fish, canning 20 tons, and producing 100 tons of fish meal. Five other factoryships of a new and larger class, *Piatidesiatiletie*, will be built in Leningrad. They are 197 meters in length, with a crew of 500 and designed to operate with a fleet of catcher vessels in the development of underutilized species. Dozens of large refrigerator transports of a new class, *Piatdesiat Let*, are planned for construction which reportedly will last through 1990. These refrigerator transports are 172 meters in length and have a storage capacity of 16,200 metric tons.

Tests are also proceeding with new classes of supertrawlers to further increase or modernize the Soviet distant-water fleet of catcher vessels. Among the supertrawlers is the *Gorizont* class of factory stern trawlers which are 113 meters in length, 5,500 gross tons, 7,000 horsepower, and can produce up to 90 metric tons of frozen fish per day and store 2,000 metric tons in freezer holds. Another class of supertrawler is the *Meridian*, which is designed to replace the smaller *Maiakovskii* class BMRT factory stern trawlers. *Meridian* class vessels are 103 meters in length, 4,000 gross tons, 6,000 horsepower, and can produce up to 60 metric tons of frozen fish daily (double the *Maiakovskii* class) and store 1,500 tons (1.7 times the *Maiakovskii* class). The *Meridian* class has been ordered into serial production at Black Sea shipyards in the USSR.

The ambitious shipbuilding program by the USSR seems inimical to trends on the world fisheries scene. It is difficult to determine, however, how much of it is to further increase distant-water fishing capabilities, to replace outmoded vessels, or merely to subsidize shipyards in the Communist-bloc nations.

The future course of the Soviet fisheries off the Pacific coast of the United States will be influenced by many of the same factors influencing the fisheries of all nations which plan to fish there. Most important will be the implementation by the United States of a 200-mile fisheries zone on 1 March 1977. It seems probable that the USSR will recognize this unilateral action by the United States, if not officially at first, at least on an interim de-facto basis.

All foreign nations which fish after 1 March 1977 within 200 miles of the United States coast will be required to conform with certain requirements. These requirements include abiding by terms of Fisheries Management Plans to be developed by Regional Councils, which presumably will establish limits on the catches by foreign nations and will require that they obtain permits for their vessels; provide the United States with timely reports on their catches and other aspects of the fishing operations; and reimburse the United States for their fair share in the costs incurred for research, management, and enforcement. The initial effect on the USSR and other nations fishing within 200 miles of the U.S. coast will be to increase their operating costs and to reduce their catches of some presently overfished species and catches of some species which the United States is capable of utilizing. The USSR, in particular, will have to revise its reporting system to provide the United States with more detailed statistics on its fishing operations than it has in the past. Such reports, along with those from other nations, will be subject to verification by U.S. observers aboard the foreign vessels and by other means.

The subsidized and State-controlled nature of its fisheries seemingly should be an advantage to the USSR under extended jurisdiction, compared to Japan and other non-Communist nations. For example, the additional costs incurred could be absorbed by simply increasing the price of fish to the

Soviet consumer or might be justified solely on the basis of keeping people employed. As remarked earlier, the Soviet fisheries have been less efficient than those of at least Japan. Contributing to this situation has been that more people are employed by the Soviets on catcher and support vessels and they use more catcher and support vessels to obtain a given catch. Thus, it should be easier for the Soviets than the Japanese to increase productivity and thereby absorb the additional costs.

The above features of Soviet fisheries have important implications to the United States under extended jurisdiction. A benefit should be the ability to comply closely with United States requirements since the actions of Soviet fishermen are closely watched and controlled by the Fleet Commanders who carry out the orders of the State. Another benefit could be the cooperative use by United States and Soviet investigators of some of the many vessels in the Soviet fleet to carry out research on species and stocks of particular concern to the United States.

The relatively low efficiency of the Soviet fisheries poses important policy questions for the United States. Should the number of Soviet vessels to be issued permits be based on past performance or some "productivity norm" which is more comparable to that of, say, Japan? If past performance is the criterion, or no criterion is used, there will be considerably more Soviet vessels employed to take their assigned catch quota than would be employed by Japan to harvest the same quota. This could mean greater enforcement costs to the U.S. Government and the potential for more conflicts with U.S. fishermen than would be the case for another nation whose operations were more efficient.

As remarked earlier, a characteristic of the USSR has been the aggressive way it has developed new fishing technology and sought previously unexploited species. We can perhaps expect this policy to be intensified under extended jurisdiction as the Soviets seek to bring into production latent resources which are of no or low current interest to the United States. Included may be pelagic and deepwater fishes within 200 miles of the U.S. coast as well as high-seas pelagic forms such as lanternfishes, squids, and others which may occur in fishable aggregations over 200 miles from shore.

Along with Japan and other distant-water fishing nations, the USSR has been increasingly seeking joint fishing ventures with coastal nations. Joint ventures are particularly being sought with nations who already have or are expected to soon extend their zone of fisheries jurisdiction. Such ventures are a means of insuring a supply of fish for the homeland, keeping people and vessels employed and, if allowed to sell part of the catches to the coastal nations, of obtaining foreign currency. Proposals from the USSR for various kinds of joint ventures can be expected as a consequence of the United States extending its zone of fisheries jurisdiction. In making such proposals, the USSR would be well served by its large fleet of factoryships and refrigerator transports which could be offered to receive and process fish caught by U.S. fishermen. Such offers might be viewed by some as being particularly attractive on grounds, such as in the eastern Bering Sea, which are remote from U.S. facilities for processing bottomfish, but where a fleet of modern U.S. crab vessels operate and could readily convert to trawling. Similar proposals can be expected to be made by other nations, such as Japan.

Ultimately, the emphasis placed by the USSR on distant-water fisheries as well as on its own coastal fisheries will depend upon their productivity in relation to that of agriculture, the other major source of animal protein. In terms of output of animal protein per given expenditure of manpower, fisheries, until now, have been considerably more productive than agriculture within the USSR. Also favoring the past promotion of fisheries is that most agricultural products are produced by collective farms, which are more difficult to manage than distant-water fisheries. Until this situation changes, and until the costly investments which have been made and are still being made by the USSR in its high-seas fishing fleets have been amortized or rationalized, we can expect a continued presence of Soviet fishing vessels off the Pacific coast of the United States.

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