



*Alaska's shrimp landings have increased 40-fold in only 15 years.*

## Alaskan Shrimp Fisheries

Commercial fishing for pandalid shrimp in Alaska began in 1916 in the southeastern area near Petersburg and until 1958 was confined almost exclusively to southeastern Alaska. This area's catch has remained relatively stable at 1 to 2 million pounds, except for the late fifties and early sixties when it peaked at 7.6 million pounds. The fishing here is mostly with the beam trawl and is centered in inside waters near Wrangell and Petersburg.

The shrimp fishing began in central Alaska in the late fifties, but the initial effort consisted mainly of exploratory efforts by local fishermen in the Cook Inlet and Kodiak areas. Full-scale shrimp operations in central Alaska began in 1959, when a catch of 2.9 million

pounds was landed at Kodiak. Since that time the catch has increased dramatically to a record 95 million pounds in 1971 (Table 1). The greatest portion of the central Alaska shrimp fishery is in the Kodiak area, but the fishery is actively expanding to the west along the Alaska Peninsula to the eastern Aleutian Islands. The primary gear used in central Alaska is the otter trawl.

Soviet and Japanese fleets both began shrimp fishing off the Alaska coast in 1961. The Japanese fleets operated mainly in the Bering Sea north of the Pribilof Islands, and the Soviets fished in the Gulf of Alaska off Shumagin Islands and Portlock Bank. Catches by the foreign fleets in these waters exceeded the total domestic catch until



1967 (Table 1) when the law creating the 9-mile contiguous fishery zone seaward of territorial waters was passed. This law protected most of Alaska's shrimp resources, because the fishing areas lie relatively close to shore. Other reasons for the increased catches beginning in 1967 were economic such as improved processing techniques and a steadily increasing domestic market.

Because the rapid expansion of the central Alaska fishery led to concern among local fishermen and processors about the possible depletion of the resource, catch quotas were initiated in the Kodiak and Kachemak Bay (Cook

**Table 1.—Domestic and foreign shrimp catches off Alaska, 1951-72 (in thousands of pounds).<sup>1</sup>**

Year	S.E. Alaska	Central Alaska	Total Alaska	Japan	USSR
1951	1,707	1	1,708	—	—
1952	1,944	9	1,953	—	—
1953	1,722	12	1,734	—	—
1954	1,438	14	1,452	—	—
1955	1,777	51	1,828	—	—
1956	3,032	12	3,044	—	—
1957	2,350	30	2,380	—	—
1958	7,606	256	7,862	—	—
1959	5,519	7,534	13,053	—	—
1960	3,343	4,093	7,436	—	—
1961	4,212	11,768	15,980	22,500	300
1962	3,884	13,059	16,943	46,200	600
1963	3,110	12,017	15,127	69,500	700
1964	2,793	4,934	7,727	45,100	9,000
1965	2,945	13,874	16,819	15,300	15,400
1966	3,785	24,408	28,193	7,500	23,100
1967	2,803	39,010	41,813	9,500	25,100
1968	2,104	39,919	42,023	2,900	6,300
1969	1,680	46,171	47,851	—	11,700
1970	958	73,298	74,256	—	9,300
1971	960	93,931	94,891	—	10,400
1972	910	80,352	81,262	—	5,100

<sup>1</sup> The catch figures are from documents published by the National Marine Fisheries Service and the Alaska Department of Fish and Game.



Left—A rain of shrimp. A container is being unloaded at a processing plant in Kodiak.

Above—Kodiak, the largest fish port in Alaska.

Inlet) areas in 1971. The Kachemak Bay quota was set at 5 million pounds annually; the quotas for the Kodiak area for 1971 and 1972 were 88 and 86.6 million pounds respectively, and 55 million pounds is proposed for 1973. The 1971 and 1972 Kodiak area catch quotas were not achieved because processing

had to be stopped because of water shortages. In addition, in 1972 a fisherman's strike for higher prices coupled with emergency orders of the Alaska Department of Fish and Game reduced fishing time.

Over the years, the techniques of processing and the type of the end product

have changed considerably. Early in the history of the industry, almost all of the shrimp were canned; for a short period frozen shrimp logs were made from the broken pieces. At present, the industry produces a mixture of high quality canned and frozen products, which have an almost unlimited market.

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*Beautiful Kachemak Bay in Alaska is the site of NMFS studies designed to further understanding of *Pandalus borealis*, the chief shrimp species in the Alaskan catch.*

## Pandalid Shrimp Life History Research at Kachemak Bay, Alaska

JAMES C. OLSEN

Pandalid shrimp stocks in the Gulf of Alaska are a resource that currently requires short-term and long-term studies so that effective management models can be developed and the effects of potential environmental changes can be evaluated. The stocks are heavily exploited, but little is known about the effect that fishing has on the shrimp or about how fluctuations in environmental factors are related to year-class abundance. It is possible, for instance, that fluctuations in year-class strength rather than fishing effort may ultimately determine levels of yield. Many investigators have shown that marine invertebrates, particularly short-lived species, usually have widely fluctuating levels of year-class success. This is especially marked in species whose larval stages are planktonic and at the mercy of the vicissitudes of the oceanic environment. Pandalid shrimp are relatively short-lived (5-7 years), in comparison with some other kinds of shellfish, but have relatively long planktonic larval periods

(up to 3 months). It is likely, therefore, that the cyclical nature of most pandalid shrimp fisheries is closely related to year-class success.

Although pandalid shrimp are fished in many areas of the world and numerous life history studies have been done on *Pandalus borealis*, the most important commercial species, there have been limited studies to determine the effect of a fishery on a pandalid stock or the role of the environment in governing year-class strength.

This lack of information continues to hamper management in setting regulations to protect this valuable resource in Alaska. The growth of the fishery continues to outpace research, primarily because long-term studies are required to establish life history information that relates to determining how fishing affects the resource.

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The NMFS Auke Bay Fisheries Laboratory has responded to the need for research by studying the dynamics of shrimp stocks in Kachemak Bay, Alaska (Figure 1). Kachemak Bay, an arm of lower Cook Inlet, is 42 miles long and 21 miles wide at the mouth and 3.5 miles wide at a constriction formed by the intrusion of Homer Spit (Figure 2). The northwest shore consists of shallow



Figure 1.—Alaska, showing location of Kachemak Bay.

mudflats, which run up to cliffs of sand and clay of about 500 feet elevation (Figure 3). The southeast shoreline borders the deeper side of the bay and consists of mountainous glacially eroded hardrock indented by many sheltered passages, islands, and deep bays. The bay is relatively shallow; the average depth is 165 feet and the maximum is 545 feet. Mixing, due to tidal action, is a dominant feature and involves water transport from the Gulf of Alaska into the bay.

Kachemak Bay has been used by the Auke Bay Laboratory as a study area for shellfish research since 1957. A field station has been developed on the south shore of Kachemak Bay at Kasitsna Bay (Figure 4) and is managed by a resident biologist. Kachemak Bay was chosen