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The Pacific Northwest Commercial Fishery for American Shad

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The American shad, *Alosa sapidissima,* is similar in appearance to other herring-like fishes and, with lengths up to 30 inches (76 cm), is the largest member of the herring family (Clupeidae) in North America (Fig. 1). It is an anadromous fish which in the spring ascends rivers and streams to spawn. The species is native to the North Atlantic Ocean and coasts of North America from the St. Lawrence River region southward and westward into the Gulf of Mexico. The shad is one of the best known fishes of the U.S. east coast and a target of commercial and recreational fishermen (Cheek, 1968). It was introduced to the west coast during the latter part of the nineteenth century and soon became well established as a species of commercial interest. This report describes the introduction of the species to the west coast; it also reviews the commercial fishery in Oregon, Washington, and British Columbia.

INTRODUCTION TO THE WEST COAST

American shad were first introduced from the east coast into California's Sacramento River in 1871. In 1885 and 1886 a total of 910,000 shad fry were planted in the northwest's Columbia, Snake, and Willamette Rivers. No further plantings have been made, so the successful establishment of shad in rivers of the Pacific Northwest must be attributed to the 1885-86 plants and to whatever adults migrated into the rivers from the populations of the Sacramento River and other locations south of the Columbia (Craig and Hacker, 1940).

In 1891 mature shad were first taken in the Fraser River in British Columbia and the Stikine River in southeastern Alaska, according to Welander (1940). He stated that the spread and the increase of the shad along the Pacific coast of North America has been one of the most remarkable in all cases of introduced species. Shad now range from the Todos Santos Bay, Baja California, to Cook Inlet and Kodiak Island, Alaska (Fig. 2) according to Hart (1973).

HISTORY OF THE FISHERY

The success of attempts to establish shad in the Pacific Northwest was indeed remarkable. First commercial landings of shad were reported from the Columbia River in 1889, and the shad's abundance had depressed the market value as early as 1893 (Craig and Hacker, 1940). The average annual commercial landings of shad in the Columbia River districts of Oregon and Washington are shown in Table 1. Catches were at their highest levels from 1926 to 1930 and in 1946 and 1947. Between 1 and 1.5 million pounds (453,515 and 680,272 kg) were taken in each of these years. In spite of the fact that there has been enough shad

Figure 1.—American shad, *Alosa sapidissima.*

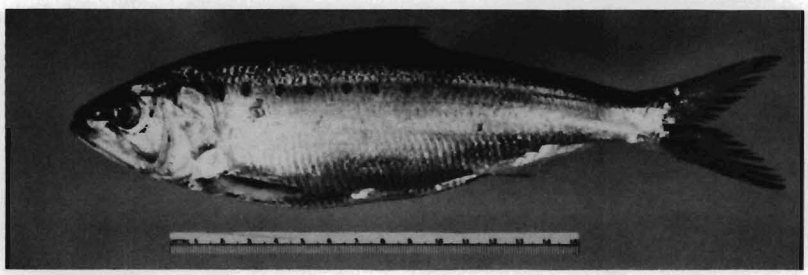
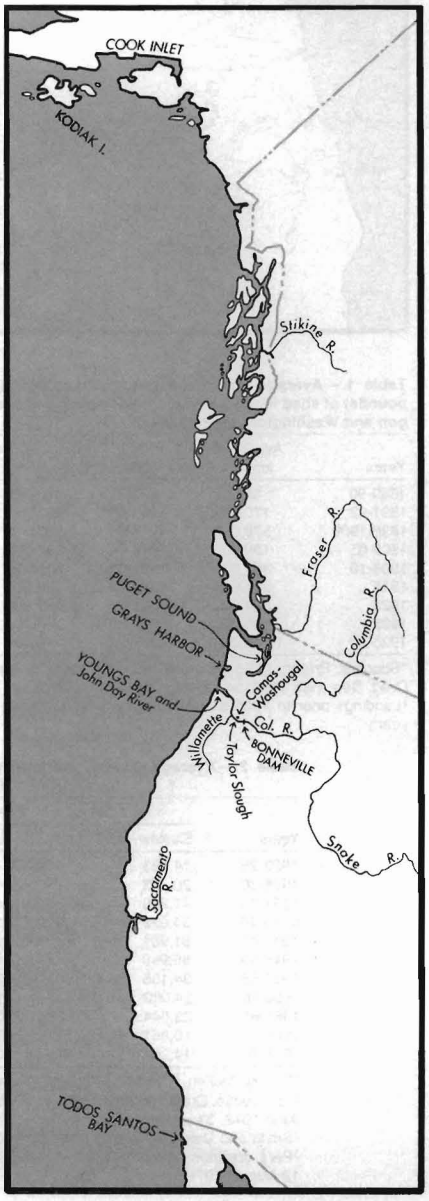


Figure 2.—West coast range of American shad.



in the Columbia River to support a larger fishery, the catches of shad were rather incidental and supplemental to the Pacific salmon, (*Oncorhynchus* spp.) fisheries until the mid-1940's. The main reason was that the run of shad coincided with the run of sockeye salmon, *O. nerka,* and summer chinook salmon, *O. tshawytscha,* which have higher market values than shad. Average commercial shad catches of 218,000 pounds (98,866 kg) in the Columbia River during the last 5 years (1971-75) were less than half those of the previous 10 years.

A commercial fishery for shad also exists in the same five rivers along the Oregon coast where striped bass, *Morone saxatilis,* have been taken commercially (Fig. 3). These are the Siuslaw, Smith, Umpqua, Coos, and Coquille Rivers. Mature shad were first taken in rivers in southern Oregon in 1882 (Welander, 1940). The commercial catch data for shad in these rivers began in 1923 when a total of 182,000 pounds (82,540 kg) was landed (Table 2). The largest catches occurred between 1945 and 1951 when 789,000-1,339,000 pounds (357,823 to 616,326 kg) were landed. Average commercial shad catches in these rivers of 326,339 pounds (148,000 kg) during 1971-74 were well below average for the previous 10 years. Only during the 1956-60 period were the average catches lower than those of the 1971-74 period.

Small incidental catches of shad are made in Oregon and Wasington coastal waters and rivers, in Grays Harbor, and in Puget Sound. These incidental catches generally range from a few pounds to a few thousand pounds and are taken primarily by gillnets in the rivers and harbors and by otter trawls in coastal waters and in Puget Sound.

In addition, shad have been taken commercially in the Fraser River in British Columbia (Table 3).

Figure 3.—Location of five western Oregon rivers with commercial fisheries for shad (from Mullen, see footnote 4).

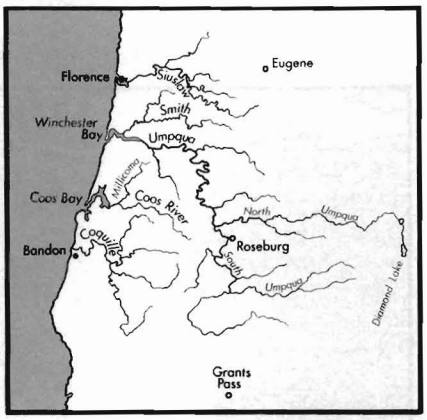


Table 1.—Average annual commercial landings (in pounds) of shad in the Columbia River districts of Oregon and Washington, 1889-1975[1].

Years	Avg. annual landings[2]	Years	Avg. annual landings
1889-90	68,000	1931-35	483,000
1891-92	170,000	1936-40	295,000
1896-1900	572,000	1941-45	545,000
1902-05	189,000	1946-50	841,000
1906-10	357,000	1951-55	311,000
1915	581,000	1956-60	178,000
1923	334,000	1961-65	563,000
1925	665,000	1966-70	476,000
1926-30	1,245,000	1971-75	218,000

[1]Sources: Pruter (1972) for 1889-1965; for 1966-75 from Oreg. Dep. Fish Wildl. and Wash. Dep. Fish. (1976).
[2]Landings prior to 1925 are known only for the indicated years.

Table 3.—Average annual commercial landings in pounds of shad in the Fraser River district of British Columbia, 1917-73[1].

Years	Avg. annual landings	Years	Avg. annual landings
1917-20	8,200	1946-50	0
1921-25	1,060	1951-55	245,400
1926-30	700	1956-60	161,800
1931-35	740	1961-65	56,200
1936-40	0	1966-70	47,800
1941-45	340	1971-73	44,000

[1]Source: Fishery Statistics of Canada—Canada Summaries.

Table 2.—Average commercial landings of shad from Oregon coastal streams, 1923-74.[1]

Years	Average landings in pounds					
	Siuslaw	Smith	Umpqua	Coos	Coquille	Total
1923-25	14,683	[2]349,981		51,582	178	416,424
1926-30	20,353	452,855		88,437	849	562,494
1931-35	41,240	293,696		101,152	10,029	446,117
1936-40	34,022	326,080		75,955	10,109	446,166
1941-45	51,901	396,329		196,886	10,211	655,327
1946-50	65,999	674,944		272,743	4,294	1,017,980
1951-55	34,185	179,061	239,679	142,330	14,960	610,215
1956-60	24,082	51,631	185,051	38,490	11,772	311,026
1961-65	23,644	45,829	383,326	90,085	32,302	575,186
1966-70	10,861	62,277	350,547	54,557	16,231	494,473
1971-74[3]	14,261	24,118	221,443	58,451	8,066	326,339

[1]Source: Mullen, R. E. 1972. Ecology of shad and striped bass in coastal rivers and estuaries. Fish. Comm. Oreg., Manage. Res. Div., Public Law 89-304 Proj., Annu. Rep. 1 July 1971 to 30 June 1972, 31 p. Typescript.
[2]Smith and Umpqua Rivers combined through 1950.
[3]Pers. commun., Jerry MacLeod, Aquatic Biologist, Oreg. Dep. Fish Wildl., Coos Bay, Oreg., 12 August 1976.

PRODUCTS

Although shad are regarded as a great delicacy on the east coast of the United States and demand a high price in the markets of that region, they have never been favorably received as a food fish by the people of the west coast (Craig and Hacker, 1940). In recent years shad have been harvested primarily for the eggs or roe of the females as there is only limited demand for shad flesh, although it is considered quite palatable by some despite a profusion of small bones[1]. Roe with the highest market value consists of ovaries containing all immature opaque eggs (Hasselman, 1966). Small quantities are sometimes frozen whole. However, the carcasses of females have often been sold for cat or mink food, for reduction, or for use as crab bait, while the males are sometimes returned to the water at the time of capture. Recent prices in the Columbia River shad fishery are approximately 15 cents per pound for round roe shad and from 4 to 10 cents per pound for males, depending upon the quality. Prices for male shad have been as low as 1½ cents per pound during some past years[2].

DESCRIPTION OF THE FISHERY

Areas

In the Columbia River, shad are abundant in all of the lower portions of the river in season. The gillnet fishery normally extends about 140 miles upstream from the mouth of the Columbia River to a commercial fishing boundary 5 miles below Bonneville Dam (Hasselman, 1966). The Camas-Washougal shad fishing areas have often contributed from 30 to 50 percent of the total catch. Since 1969 small new shad fisheries have been developed in John Day River, Taylor Slough, and Youngs

[1]Young, F. 1970. Biology of Columbia River shad and the development of selective commercial fishing gear. Fish. Comm. Oreg., Res. Div., Prog. Rep., Jan. 1969-Sept. 1970, 12 p. Typescript.
[2]Pers. commun., Duncan K. Law, Assoc. Professor, Oreg. State Univ., Dep. Food Sci. Technol., Seafoods Lab., Astoria, Oreg., 13 August 1976.

Bay. These fisheries were initiated in an attempt to selectively harvest shad without endangering runs of summer chinook salmon[3].

In the Siuslaw, Smith, Umpqua, Coos, and Coquille Rivers in Oregon, most commercial fishing for shad and for striped bass is conducted in the tidal portion of each river, although nets may legally be used in bays[4].

In the Smith and Umpqua Rivers, shad are only taken (in any numbers) within about 15 miles of the rivers' mouths, although the commercial fishery is permitted to operate some distance farther up river (Gharrett, 1950).

Seasons, Gear, and Regulations

Shad are present in the Columbia River beginning in late April and occur mainly as an incidental catch during the spring and summer salmon seasons. Peak catches are usually made at the time of the spawning migration which occurs during the month of June. Roe rather than flesh is the target of most fishermen. Consequently, though many shad remain in the river after 1 July, the fact that spawning has already occurred and roe is no longer available ends the fishery at about this time[5].

Both season and gear restrictions are primarily designed to protect the run of summer chinook—in the same area and at the same time as peak shad abundance—in the Columbia River. Fishermen in the main Columbia River have been unsuccessful in selectively harvesting shad without having a high incidental catch of summer chinook. As a result, a limited shad season is allowed each year in the main Columbia River after the peak of the summer chinook run passes beyond the shad fishing area.

In the past, traps, seines, and fish wheels have all been used to catch shad in the Columbia River, but only gillnets are now used commercially (Cleaver, 1951). Two types of gillnets are used. These include both set-nets and drift-nets. More recently the gear has been restricted to shad nets with a required maximum breaking strength to allow salmon to break free.

In the shad fishery on the Siuslaw, Smith, Umpqua, Coos, and Coquille Rivers, there have been no recent changes in the commercial fishing regulations. The major regulations are the same as those which existed for striped bass and consist of fishing deadlines (or boundaries), gear type, mesh size, and seasonal restrictions by river. Gear and season restrictions are primarily designed to protect spring chinook in the early spring and steelhead trout, *Salmo gairdneri*, in the summer. Each fisherman in the set-net fishery is allowed to fish six nets while drift-net fishermen are restricted to one net. The fishermen are required to sell all of their catch to a licensed wholesale fish buyer (see footnote 4). In these Oregon coastal rivers, as in the Columbia, the shad are caught in the late spring and early summer when they enter the rivers to spawn.

CURRENT TRENDS AND FUTURE STATUS

The history of the gillnet fisheries for shad has demonstrated that commercial quantities of shad cannot be harvested with gillnets in Pacific Northwest rivers when salmon are abundant without a large catch of salmon being taken. If methods could be developed to selectively capture shad without harming the salmon runs, the shad fishery could be expanded and the catch increased considerably. New drift-net fisheries have been developed in John Day River, Taylor Slough, and Youngs Bay in an attempt to find ways to selectively harvest shad. These fisheries have provided some additional harvests of the Columbia River shad resource without catching salmonids (see footnote 3).

The lack of demand for and the low value of shad products other than roe have also resulted in reduced fishing effort. The shad catches, therefore, are largely incidental to the salmon fisheries in the Columbia River and western Oregon rivers.

Since 1959 there have been dramatic increases in the shad counts over Bonneville Dam as shad extended their range far up the Columbia River and utilized the reservoirs as spawning and rearing areas. Annual shad runs to the Columbia River usually average in excess of 1 million fish, assuming that the lower river populations have not decreased greatly since the construction of Bonneville Dam. Of these an average of only 140,000 were caught commercially during the late 1960's, and most of those were from the upriver portion of the run (see footnote 1).

Studies by Walburg and Sykes (1957) on the Atlantic Coast streams indicate that a harvest of at least 50 percent is normal on intensively fished runs, while a maximum harvest of about 14 percent occurs in the Columbia River (see footnote 1).

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[5] State of Wash., Dep. Fish., Annu. Rep. 1947.

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