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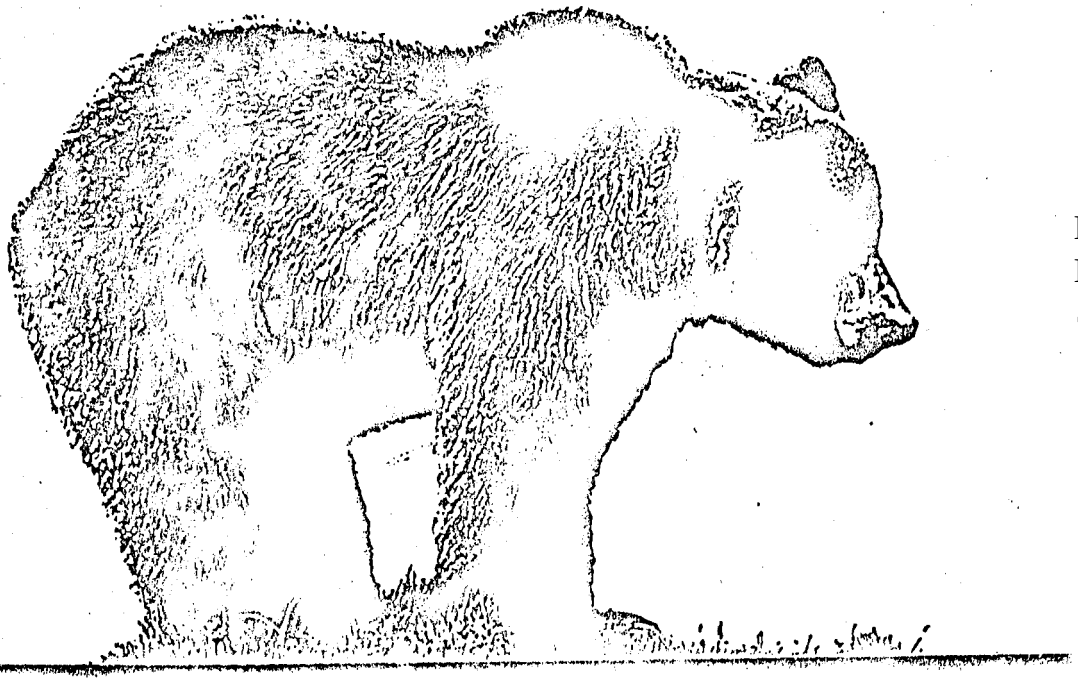

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COLUMBIA RIVER ESTUARY FINFISH AND SHELLFISH UTILIZATION

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Utilization of aquatic estuarine species other than salmonids is at best sporadic in the 92,000 acre system (Figure 1). Even a prized fish such as the white sturgeon, Acipenser transmontanus, rarely attracts more than several dozen recreational boats in a day. Commercial fishermen harvest many sturgeon, but it is primarily while they are in the process of fishing for salmon, Oncorhynchus sp. Even less interest is shown in American shad, Alosa sapidissima; Pacific herring, Clupea harengus pallasi; Surf smelt, Hypomesus pretiosus; and yellow perch, Perca flavescens. Perhaps it is time resource agencies focused the public's attention on the underutilized nonsalmonid species. Inhabitants of the Pacific Northwest should be aware of their renewable resources and be advised on practical methods for their harvest. Innovative methods for efficient harvesting may be needed to acquire some species. This may require legalizing some new methods but only if convincing evidence exists that other useful aquatic species will not be harmed.

The distribution and abundance of nonsalmonid finfish and shellfish in the Columbia River estuary is not well documented for most species, though a number of reports are available. An early study (Haertel and Osterberg 1967) provided salinity relationships of 33 species of bottom fish in the estuary west of Harrington Point. Types of fish found in estuary tributaries were reported the same year (Reimers and Bond 1967). The importance of commercial fisheries of the Columbia River was also described (Pruter 1966). Recreational fisheries found near the mouth of the Columbia were studied more recently (Gaumer, Demory, and Osis 1973). Environmental assessment and migrational timing studies on the estuary have yielded considerable site specific data on fish and shellfish: Youngs Bay (Higley and Holton 1975), Miller Sands (McConnell et al. 1978), and various other estuarine sites (Blahm et al. 1979; Durkin et al. 1975, 1976, 1977 a & b, 1979).

Migrational studies provided some associated information on nonsalmonids (Sims and Johnsen 1974; Johnsen and Sims 1973; Dawley et al. 1978, 1979). A survey report to the U. S. Army Corps of Engineers (Snyder et al. 1973) has been updated and will soon be published. The report lists zooplankton, fish, and benthic invertebrate species common to the lower Columbia River and estuary.

Salmonids have historically dominated any discussion of Columbia River estuarine finfish. Their prized food value provides monetary incentive to the fishing industry, whereas their size and fighting qualities attract recreational fishermen from great distances. Surely one of fishing's more interesting spectacles occurs each summer when commercial trollers, charter boat operators, fishermen in private boats, bank fishermen, and gill netters are all competing for salmon within a few miles of each other near the mouth of the Columbia River. Despite hatchery contributions, the pressure on salmonid stocks has gradually increased as technological improvements in fishing gear and techniques advance, and water

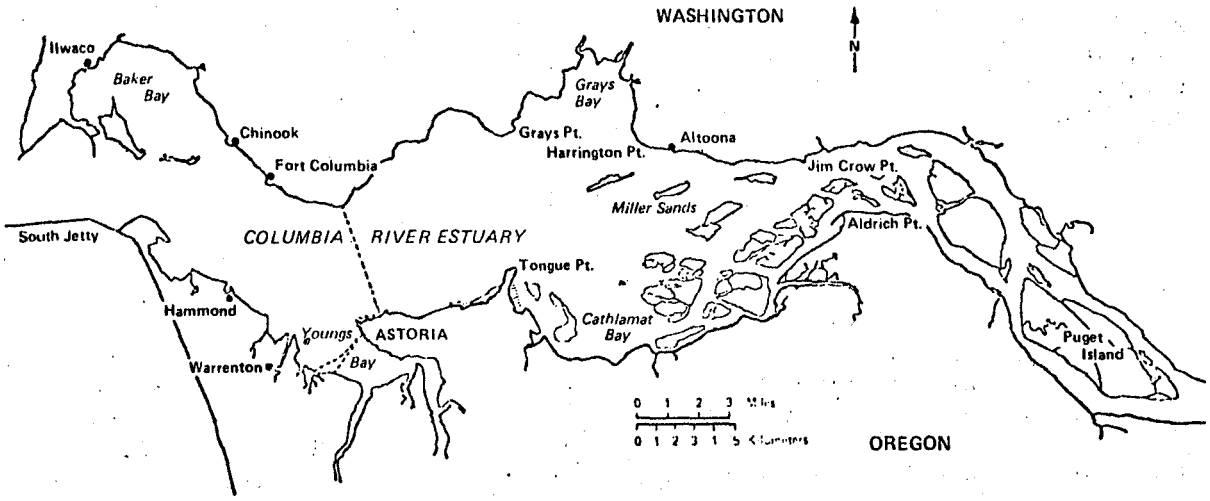

Figure 1.--The Columbia River estuary with some of its more prominent geographic features.

shed area, spawning habitat, and water quality decline.

Diversification of fishing effort toward other estuarine species may help reduce the commercial and recreational pressure on salmonid stocks, particularly if other high quality fish can he gathered and utilized. If salmonid conflicts can be reduced and nonsalmonid harvesting broadened, a greater appreciation of the potential value of the entire estuarine ecosystem would result. This report has three main objectives: (1) to list the estuarine fish and shellfish species and provide generalized tables of their abundance, distribution, and habitat (Tables 1 and 2); (2) to briefly discuss those species with a high potential for use by either commercial or recreational fishermen; and (3) to suggest that resource agencies consider both new as well as traditional means of harvesting nonsalmonid stocks.

Eleven of the ninety-five listed species. including salmonids have high potential for recreational or commercial harvest. The majority of these fish are pelagic and schooling species. Schooling behavior allows harvest by trap, purse seine, lampara net, beach seine, and size selective gill net.

American shad spawning migrants average 20 inches in length and weigh 2 to 5 pounds. They are in prime condition at they leave salt water and could be captured throughout the estuary. Shad roe had commercial value, adults can be eaten smoked or fresh, and juveniles can be used for bait or pickled. Traps or fish wheels might be appropriate harvesting methods, though they are not allowed by law.

Adult Pacific herring remain in pelagic deeper portions of the estuary below Tongue Point, whereas juveniles use the brackish western embayments. Juvenile herring are excellent baitfish, whereas adults and their roe are desirable food items.

White sturgeon are essentially deer) water bottom dwellers found primarily in the eastern portion of the estuary. The value of their flesh and eggs is well known.

Northern anchovy, a marine pelagic species, can be used as live bait fish for both the recreational salmon fishermen and commercial albacore fishermen. Anchovy may also have commercial value as fish meal. Purse seines and lampara nets can be used to collect them rapidly and efficiently.

Spawning eulachon, a winter anadromous resident, are far superior consumer products before they migrate. They can be harvested by traps or seines throughout the deeper areas of the estuary.,

Adult surf smelt are found nnl.v in the marine pelagic part of the estuary. They are large, firm, excellent quality fish, but there is little human use of the available stocks. Purse seines can be used since they are a schooling species.

Table I. Species of Columbia River estuarine finfish, their habitat association, and assessment of present and future use.

Family	Common name	Species	Distribution			Habitat				Estuarine	Potential Utilization		Present	Requires Alternate Harvest
			Marine	Mixed	Fresh	Bottom	Pelagic	Beach	Sloughs*	Abundance	Recreation	Commercial	Use	Method
Petromyrontidae														
	Pacific Lamprey	Entosphenus tridentatus	x	x	x	x	x			Common	None	Low	None	No
	River Lamprey	ampetra ayres	x		x	x	x			Common	None	None	None	No
Carcharhinidae														
	Blue Shark	Prionace glauca	x				x			Rare	None	None	None	no
Squalidae														
	Spiny Dogfish	Squalus acanthi				x	x			Rare	None	None	None	No
Torpedinidae											Low	Low		
	Pacific Electric Ray	Torpedo californica	x			x				Rare			None	No
Rajidae														
	Big Skate	Raja binoculata	x			x				Rare	Low	Moderate	None	No
	Longnose Skate	Raja rhin	x			x				Rare	Low	Moderate	None	No
Chimaeridae														
	Ratfish	Hydrolagus colli					x			Rare	Low	Low	None	No
Acipenseridae														
	Green Sturgeon	Acipenser medirostris	x	x		x				Rare	Low	Low	Low	Yes
	White Sturgeon	Acipenser transmontan	x	x	x	x	x		x	Common	High	High	High	Yes
Clupeidae														
	Pacific Herring	Clupea harengus pallasi	x		x	x	x	x		Abundant	High	High	None	Yes
	American Shad	Alosa sapidis si	x	x	x	x	x	x	x	Abundant	High	High	Low	
Engraulidae														
	Northern Anchovy	Engraulis morda	x	x		x	x			Abundant	Moderate	High	Low	Yes
Salmonidae														
	Chinook Salmon	ncorhynchus tshawytscha	x	x	x	x	x	x	x	Abundant	High	High	High	No
	Coho Salmon	ncorhynchus kisutch	x	x	x		x	x		Abundant	High	High	High	No
	Sockeye Salmon	Oncorhynchus nerka	x	x	x		x	x		Common	Low	Low	None	
	Chum Salmon	Oncorhynchus keta		x	x		x	x	x	Common	Low	Moderate	Low	Yes
	Pink Salmon	Oncorhynchue gorbuscha	x				x			Rare	Low	Moderate	None	No
	Rainbow Trout	Salmo gairdneri	x	x	x			x	x	Abundant	High	None	Low	No
	Cutthroat Trout	Salmo clarki	x	x	x			x	x	Common	Moderate	None	Low	No
	Mountain Whitefish	Prosopiun williamsoni			x		x	x		Rare	None	None	None	No

* includes stream mouths tributary to the estuary.

Family	Common Name	Species	Distribution			Habitat				Estuarine	Potential Utiliation		Present	Requires Alternate Harvest
			Marine	Mixed	Fresh	Bottom	Pelagic	Beach	Sloughs	Abundance	Recreation	Commercial	Use	Method
Osmeridae														
	Surf Smelt	Hypomesus pretiosus	x	x				x		Abundant	High	High	None	Yes
	Longfin Smelt	Spirinchus thaleichthys	x	x	x	x	x	x		Abundant	Moderate	Low	None	Yes
	Night Smelt	Spirinchus starksi	x			x				Rare	None	None	None	No
	Eulachon	Thaleichthys pacificus		x	x	x	x	x	x	Abundant	High	High	Moderate	Yes
	Whitebait Smelt	Allosmerus elongatus	x	x			x			Common	Moderate	None	None	No
	Rainbow Smelt	Osmerus mordax	x			x				Rare	None	None	None	No
Cyprinidae														
	Carp	Cyprinus cerpio		x		x		x	x	Common	Low	Low	Low	Yes
	Northern Squawfish	Ptychocheilus oregonensis			x	x	x		x	Rate	None	None	None	No
	Peamouth	Mylocheilus caurinus		x	x	x	x	x	x	Abundant	Low	Low	None	Yes
	Longnose Dace	Rhinichthys cataractae			x			x		Rare	Low	None	None	No
	Speckled Dace	Rhinichthys osculus			x	x	x			Rare	Low	None	None	No
	Redside Shiner	Richardsonius balteatus			x			x		Rare	None	None	None	No
Catostomidae														
	Bridgelip Sucker	Catostomus columbianus				x		x		Rare	None	None	None	No
	Largescale Sucker	Catostomus macrocheilus		x	x	x	x	x	x	Common	Low	Low	None	Yes
Ictaluridae														
	Black Bullhead	Ictalurus melas			x	x			x	Rare	Low	None	None	No
	Yellow Bullhead	Ictalurus natalis		x	x				x	Rare	Low	None	None	No
	Brown Bullhead	Ictalurus nebulosus			x	x			x	Rare	Low	None	None	No
	Channel Catfish	Ictalurus punctatus			x	x			x	Rare	Low	None	None	No
Percopsidae														
	Sand Roller	Percopsis transmontanus			x			x		Rare	None	None	Nona	No
Gadidae														
	Pacific Hake	Merluccius productus	x			x	x			Common	Low	High	None	Yes
	Pacific Tomcod	Microgadus proximus	x	x		x	x			Abundant	High	Moderate	Low	Yes
	Walleye Pollock	Theragra chalcogramma	x			x	x			Rare	None	None	None	No
Gasterosteidae														
	Threespine Stickleback	Gasterosteues aculeatus	x	x	x	x	x	x	x	Abundant	None	None	None	No
Syngnathidae														
	Bay Pipefish	Syngnathus griseolineatue	x	x		x		x		Common	None	None	None	No
Percichthyidae														
	Striped Bass	Morone saxatilis	x	x	x			x	x	Rare	None	None	None	No

Table I. (cont.) Species of Columbia River estuarine finfish, their habitat association, and assessment of present and future use.

Family	Common Name	Species	Distribution			Habitat				Estuarine	Potential Utilization		Present	Requires Alternate Harvest Method
			Marine	Mixed	Fresh	Bottom	Pelagic	Beach	Sloughs	Abundance	Recreation	Commercial	Use	
Centrarchidae														
	Pumpkinseed	Lepomis gibbosus			x				x	Rare	Low	None	Low	No
	Warmouth	Lepomis gulosus			x				x	Rare	None	None	None	No
	Bluegill	Lepomis macrochirus			x				x	Rare	Low	None	Low	No
	Smallmouth Bass	Micropterus dolomieui							x	Rare	Low	None	Low	No
	Largemouth Bass	Micropterus salmoides		x	x				I	Common	Moderate	None	Moderate	No
	White Crappie	Pomoxis annularis		x	x			x	x	Common	Moderate	None	Low	No
	Black Crappie	Pomoxis nigromaculatus		x	x			x	x	Common	Moderate	None	Low	No
Percidae														
	Yellow Perch	Perca flavescens		x	x			x	x	Common	High	Moderate	Low	Yes
Embiotocidae														
	Redtail Surfperch	Amphistichus rhodoterus	x x			x	x	x		Common	High	Low	Moderate	Yes
	Shiner Perch	Cymatogaster aggregata	x	x	x	x	x	x	x	Abundant	Moderate	None	Low	No
	Spotfin Surfperch	Hyperprosopon anale				x	x			Rare	Low	None	None	No
	Walleye Surfperch	Hyperprosopon ellipticum	x			x I				Rare	None	None	None	No
	Silver Surfperch	Hyperproaopon ellipticum	x			I	x			Rare	None	None	None	No
	White Seaperch	Phanerodon furcatus	x			x I				Rare	Low	None	None	No
	Pile Perch	Rhacochilus vac	x			x				Rare	Low	None	None	No
Trichodontidae														
	Pacific Sandfish	Trichodon trichodon	x			x				Rare	None	None	None	No
Stichaeidae														
	Snake Prickleback	Lumpenus sagitta		x x			x x			Abundant	None	Low	None	Yes
Pholidae														
	Saddleback Gunnel	Pholis ornat	x	x			x x			Common	None	None	None	No
Ammodytidae														
	Pacific Sand Lance	Ammodytes hexapterus	x I			x x				Common	None	None	None	No
Scorpaenidae														
	Black Rockfish	Sebastes melanops	x	x		x	x			Rare	None	None	None	No
	Darkblotched Rockfish	Sebastes crameri	x							Rare	None	None	None	No
	Vermillion Rockfish	Sebastes minatus	x			x				Rare	None	None	None	No
Hexagrammidae														
	Kelp Greenling	Hexagrammos decagrammus	x	x		x				Common	Low	None	Low	No
	Lingcod	Ophiodon elongatus	x I			x				Common	Low	None	Low	No

Family	Common Name	Species	Distribution			Habitat				Estuarine	Potential Utilization		Present	Requires Alternate Harvest Method
			Marine	Mixed	Fresh	Bottom	Pelagic	Beach	Sloughs*	Abundance	Recreation	Commercial	Use	
Cottidae														
	Padded Sculpin	Artedius fenestralis	x	x						Rare	None	None	None	
	Scalyhead Sculpin	Artedius harringtoni								Rare	None	None	None	No
	Roughback Sculpin	Chitonotus pugetensis				x				Rare	None	None	None	N
	Coastrange Sculpin	Cottus aleuticus				x				Rare	None	None	None	No
	Prickly Sculpin	Cottus asper			I I	x	x	x I		Abundant	Low	None	Lov	N
	Buffalo Sculpin	Enophrys bison	x x			x		x		Common	Low	None	None	No
	Red Irish Lord H	emilepldotus hemilepidotus				x x				Common	Low	None	Low	No
	Brown Irish Lord H	emilepidotus Spinosus	x							Rare	Low	None	Low	No
	Pacific Staghorn Sculpin	Leptocottus armatus	x x I			x I I			x	Abundant	Moderate	None	Moderato	N
	Cabezon	Scorpaenichthys maraoratua	x			x				Common	Low	None	Low	
Agonidae														
	Sturgeon poacher	Agonus acipenserinus	x			x				Rare	None	None	None	No
	Warty Poacher	Ocella verrucosa	x			x				Rare	None	None	None	No
	Tubenose Poacher	Pallasina barbata	x							Rare	None	None	None	No
	Pricklebreast Poacher	Stellerina xyosterna								Rare	None	None	None	No
	Blacktip Poacher	Xeneretmus latifrons				x				Rare	None	None	None	N
Cyclopteridae														
	Slipskin Snailfish	Liparis fucensis	x			x				Rare	None	None	Nona	No
	Showy Snailfish	Liparis pulchellus	x	x		x	x			Common	None	None	None	No
	Ringtail Snailfish	Liparis rutteri	x							Rare	Nona	None	None	No
Bothidae														
	Pacific Sanddab	Citharichthys sordidus	x							Rare	None	None	None	N
	Speckled Sanddab	Citharichthys stigmaeus	x I			I	x			Common	None	None	None	No
Pleuronectidae														
	Butter Sole Is	opsetta isolepis	x	x						Abundant	Low	Low	Low	No
	English Sole	Parophrys vetulus	x	x		x x		x		Abundant	Low	Low	None	No
	Starry Flounder	Platichthys stellatus	x	x	x	x	x	x I		Abundant	High	High	Moderate	Yes
	C-O Sole	Pleuronichthys coenosus	x	x						Rare	None	None	None	No
	Sand Sole	Psetttichthys melanostictus	x x			x	x x			Common	Moderate	Low	Low	o

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Table 2. Species of Columbia River estuarine shellfish, their habitat association, and assessment of present and future use.

Family	Common Name	Species	Distribution			**Habitat**				Estuarine	Potential **Utilization**		Present	Requires Alternate Harvest **Method**
			Marine	Mixed	Fresh	Bottom	Pelagic	Beach	Sloughs*	Abundance	Recreation	Commercial	Use	
Shellfish														
Corbiculidae														
	Asian Clam	Corbicula manilensis		x	x	x		x		Abundant	**High**	**High**	Low	Yes
Mvtilidae														
	Bay Mussel	Mytilus edulis	X	x		x		x		Abundant	**High**	Moderate	Low	**No**
Myidae														
	Softshell Clam	Mya arenaria	x			x		x		Rare	Low	None	Low	**No**
Unionidae														
	Freshwater Mussel	**Anodonta** sp.			x	x		x	x	Common	Moderate	Low	Low	**No**
Tellinidae														
	Tellins	Macoma balthica	x	x		x				Abundant	None	None	None	**No**
Crangonidae														
	Sand Shrimp	Crangon franciscorum	x	x	x	x	x	x	x	Abundant	High	Moderate	Low	Yes
	Sand Shrimp	Crangon stylirostris	x			x				Rare	None	None	None	No
	Sand Shrimp	Crangon alaskensis	x			x				Common	Low	None	None	No
	Sand Shrimp	Crangon nigromaculata	x			x				Rare	None	None	None	No
	Sand Shrimp	Crangon nigricauda	x			x				Rare	None	None	None	**No**
Cancridae														
	Dungeness Crab	Cancer magister	x	x		x				Abundant	**High**	**High**	Moderate	**No**
Astacidae														
	Pacific Crayfish	Pacifastacus leniusculus		x	x	x		x	x	Abundant	High	**High**	Moderate	**No**

* includes stream mouths tributary to the estuary.

Pacific tomcod are a desirable, edible recreational fish found only in the marine bottom zone. They tend to school and can be captured easily with trawls.

The closely related Pacific hake, another marine schooling species enters the estuary sporadically in pursuit of anchovy. When available, they can be harvested with gill nets.

Yellow perch occur in freshwater sloughs and streams tributary to the estuary. They are an excellent eating panfish and tend to school. It may be useful salmon management to encourage commercial harvest of the species. Traps or gill nets are effective means of catching perch.

Redtail perch, a marine fish found along beaches and in open water, is an excellent recreational species usually captured on an incoming tide.

The starry flounder occurs throughout the estuary, but individuals over 14 inches remain in the marine part of the lower estuary. Commercial harvest is essentially limited to individuals taken incidently in salmon gill nets -- this can amount to several tons in an evening. Recreational harvest is minor simply because other less desirable bottom fish take the bait first.

There are at least nine other abundant estuarine species. Most such as stickleback and shiner perch are small throughout their life cycle. Others only occur in the estuary during their juvenile stage, e.g. English sole. Larger species such as sculpins and peamouth are not desirable economic or recreational species.

Estuarine shellfish use is limited to a pair of bivalve species and three species of decapod crustaceans. Dungeness crab and Pacific crayfish are now harvested with traps and pots by both recreational and commercial fishermen.

The sand shrimp, Crangon franciscorum, can be used for human consumption and may also be used as bait for fish. Adult shrimp, averaging 3 inches, occur on bottom in the deep saline parts of the estuary. Juveniles are found throughout the western estuary, but predominate in shallow bays west of Harrington Point. Small mesh trawls appear to be the best way to catch adequate quantities of shrimp.

The Asian clam, Corbicula manilensis, is a freshwater species that extends its range into the brackish embayments. It is found along sandy bottom areas and could be harvested with a beam trawl. Corbicula may be suitable for aquaculture, if a market were developed.

The bay mussel, Mytilus edulis, is attached to rocks and pilings in the intertidal and subtidal zones where marine water prevails. Its recreational use is limited by access to these areas only during minus tides. A potential for acquaculture exists in protected marine habitat if suitable attachment material is provided.

In conclusion the Columbia River estuary contains at least 95 species of finfish

and 12 species of shellfish. About of these are rare or occasional visitors, whereas the remainder are common or abundant. Harvesting or utilizating any organism requires knowledge of its distribution, preferred habitat, and seasonal availability. Most species with potential economic or recreational value are now underutilized. Development of these fisheries should be encouraged by resource agencies if the means of catching them does not threaten other valued stocks.

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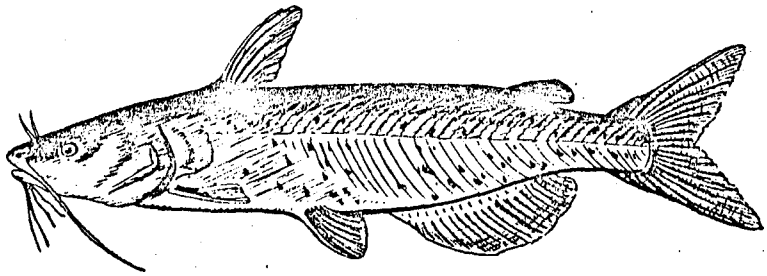
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