APPENDIX F.4

ESSENTIAL FISH HABITAT ASSESSMENT REPORT

for Scallop Resources of the Gulf of Alaska,

Bering Sea, and Aleutian Islands Regions

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Note:

Limited biological and site-specific scientific information may exist for the species. However, information is not adequate to describe accurate life histories for the species.

Introduction

In 1996, the Sustainable Fisheries Act amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to require the description and identification of Essential Fish Habitat (EFH) in Fishery Management Plans (FMPs), adverse impacts on EFH, and actions to conserve and enhance EFH. National Marine Fisheries Service (NMFS) developed guidelines to assist Fishery Management Councils in fulfilling the requirements set forth by the Act.

Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of essential fish habitat, "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

With respect to type, the information available for almost all species is primarily broad geographic distributions based on specific samples from surveys and fisheries, which have not been linked with habitat characteristics. Furthermore, NMFS' ability to precisely define the habitat (and its location) of each life stage of each managed groundfish species in terms of its oceanographic (temperature, salinity, nutrient, current), trophic (presence of food, absence of predators), and physical (depth, substrate, latitude, and longitude) characteristics is very limited. Consequently, the information included in the habitat descriptions for each species and life stage is restricted primarily to their position in the water column (e.g., demersal, pelagic), broad biogeographic and bathymetric areas (e.g., 100 to 200 meter [m] zone, south of the Pribilof Islands and throughout the Aleutian Islands [AI]) and occasional references to known bottom types associations.

Identification of EFH for some species included historical range information. Traditional knowledge and sampling data have indicated that fish distributions may contract and expand due to a variety of factors including, but not limited to, temperature changes, current patterns, changes in population size, and changes in predator and prey distribution.

Background

In preparation of the 1999 EFH Environmental Assessment, EFH Technical Teams, consisting of scientific stock assessment authors, compiled scientific information and prepared the 1999 Habitat Assessment Reports. These reports provided the scientific information baseline to describe EFH. Recent scientific evidence has not proved to change existing life history profiles of the federally managed species. However, where new information does exist, new data help fill information gaps in the region's limited habitat data environment.

Stock assessment authors used information contained in these summaries and personal knowledge, along with data contained in reference atlases (NOAA 1987, 1990; Council 1997a,b), fishery and survey data (Allen and Smith 1988, Wolotira et al. 1993, NOAA 1998), and fish identification books (Hart 1973, Eschmeyer and Herald 1983, Mecklenburg and Thorsteinson 2002), to describe EFH for each life stage using best scientific judgment and interpretation; see Table 1.

Species Profiles and Habitat Descriptions

FMPs must describe EFH in text, map EFH distributions, and include tables, which provide information on habitat and biological requirements for each life history stage of the species; see Tables 2 to 4. Information contained in this report details life history information for federally managed fish species. This collection of scientific information is interpreted, then referenced to describe and delineate EFH for each species by life history stage using the geographic information system (GIS). EFH text and map descriptions are not compiled in this report due to differences in the characteristics of a species life history and the overall distribution of the species. Specific EFH text descriptions and maps are in Appendix D.

References

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Wolotira, R.J., Jr., T.M. Sample, S.F. Noel, and C.R. Iten. 1993. Geographic and bathymetric distributions for many commercially important fishes and shellfishes off the west coast of North America, based on research survey and commercial catch data, 1912-1984. U.S. Dep. Commerce., NOAA Tech. Memo. NMFS-AFSC-6, 184 p.

Table 1. Summary of Major References and Atlases

	References				
Species	Allen and Smith 1988	NOAA 1987	NOAA 1990	Wolotira et al. 1993	NOAA 1998
Weathervane scallop	X	X	X	X	X
Pink scallop - see note					
Spiny scallop - see note					
Rock scallop - see note					

Note:

Limited biological and site-specific scientific information may exist for the species. However, information is neither available nor adequate to describe accurate life histories for the species.

Abbreviations used in the EFH report tables to specify location, depth, bottom type, and other oceanographic features.

Location

ICS =	inner continental shelf (1-50 m)	USP =	upper slope (200-1000 m)
MCS =	middle continental shelf (50-100 m)	LSP =	lower slope (1000-3000 m)
OCS =	outer continental shelf (100-200 m)	BSN=	basin (>3000 m)

BCH = beach (intertidal)
BAY = nearshore bays, give depth if appropriate (e.g., fjords)
IP = island passes (areas of high current), give depth if appropriate

Water column

D = demersal (found on bottom)
SD/SP = semi-demersal or semi-pelagic if slightly greater or less than 50 percent on or off bottom
P = pelagic (found off bottom, not necessarily associated with a particular bottom type)
N = neustonic (found near surface)

Bottom Type

M = mud	S = sand	R = rock
SM = sandy mud	CB = cobble	C = coral
MS = muddy sand	G = gravel	K = kelp

SAV = subaquatic vegetation (e.g., eelgrass, not kelp)

Oceanographic Features

UP = upwelling G = gyres F = fronts E = edges
CL = thermocline or pycnocline

General

U = Unknown N/A = not applicable

Table 2. Summary of Habitat Associations for Scallops

Scallop		Nearshore				Shelf			Slope					Stratum Reference							Location							Physical Oceanography					Substrate																				Structure												Community Associations												Oceanographic		
						Inner	Middle	Outer	Upper		Inter-mediate		Lower	Basin										Pelagic																																																													
Species	Life Stage	Freshwater	Estuarine	Intertidal	Subtidal	1-50m	51-100m	101-200m	201-300m	301-500m	501-700m	701-1000m	1001-3000m	>3000m	Shallows	Island Pass	Bay/Fjord	Bank	Flat	Edge	Gully	Surafce	Near surface	Semi-demersal	Demersal	1-200m (epi)	201-1000m (meso)	>1000m (bathy)	Upwelling areas	Gyres	Thermo/pycnocline	Fronts	Edges (ice, bath)	Organic Debris	Mud	Sand	Gravel	Mud & sand	Mud & gravel	Sand & mud	Gravel & mud	Gravel & sand	Gravel & sand & mud	Gravel & mud & sand	Cobble	Rock	Bars	Sinks	Slumps\Rockfalls\Debris	Channels	Ledges	Pinnacles	Reefs	Vertical Walls	Man-made	Algal Cover	Anenomes	Enchinoderms	Soft Coral	Hard Coral	Mollusca	Drift Algae\Kelp	Kelp	Polychaetes	Sea Grasses	Sea Onions	Tunicates	Temperature (Celsius)	Salinity (ppt)	Oxygen Conc (ppm)	Life Stage
WV Scallop	M					x	x	x																x				x						x	x	x	x	x	x	x	x	x	x																													**3-9.6**			M
	J					x	x	x																x				x						x	x	x	x	x	x	x	x	x	x																															J
	L					x	x	x																	x																																																	L
	E					x	x	x																	x																																																			E

Table 3. Summary of Reproductive Traits for Scallops

Scallop		Reproductive Traits																									
		Age at Maturity				Fertilization/Egg Development					Spawning Behavior						Spawning Season										
		Female		Male																							
Species	Life Stage	50%	100%	50%	100%	External	Internal	Oviparous	Ovoviviparous	Viviparous	Batch Spawner	Broadcast Spawner	Egg Case Deposition	Nest Builder	Egg/Young Guarder	Egg/Young Bearer	January	February	March	April	May	June	July	August	September	October	November	December
WV Scallop	M					X						X									X	X	X					
	LJ																											
	EJ																											
	L																											
	E																											

Table 4. Summary of Predator and Prey Relationships for Scallops

Scallop — Predator to

Species	Life Stage	Algae	Plants	Plankton	Zooplankton	Diatoms	Sponges	Eusphausiid	Hydroids	Amphipoda	Copepods	Starfish	Polychaetes	Squid	Philodae (gunnels)	Bi-valves	Mollusks	Crustaceans	Ophiuroids (brittle stars)	Shrimps, mysidacae	Sand lance	Osmerid (eulachon)	Herring	Myctophid (lantern fishes)	Cottidae (sculpins)	Arrowtooth	Salmon	Cod	Pollock	Halibut
WV Scallop	M			X																										
	LJ																													
	EJ																													
	L																													
	E																													

Scallop — Prey of

Species	Life Stage	Jellyfish	Starfish	Chaetognaths (arrowworms)	Crab	Herring	Salmon	Pollock	Pac fic Cod	Rockfish	Rock Sole	Flathead Sole	Yellowfin sole	Arrowtooth flounder	Hailbut	Salmon Shark	Northern Fur Seal	Harbor Seal	Steller sea lion	Dalls Porpoise	Beluga whale	Killer Whale	Minke whale	Eagles	Murres	Puffin	Kittiwake	Gull	Terrerstrial Mammals
WV Scallop	M		X																										
	LJ		X																										
	EJ		X																										
	L																												
	E																												

Habitat Description for Weathervane Scallops

(*Patinopectin caurinus*)

Management Plan and Area BSAI GOA

Scallops are managed under the Fishery Management Plan for the Scallop Fishery off Alaska. Scallops occur throughout the area covered by the FMP and extend south to California.

Life History and General Distribution

Weathervane scallops are distributed from Point Reyes, California, to the Pribilof Islands, Alaska. The highest known densities in Alaska have been found to occur in the BS, off Kodiak Island, and along the eastern gulf coast from Cape Spencer to Cape St. Elias. Weathervane scallops are found from intertidal waters to depths of 300 m, but abundance tends to be greatest between depths of 40 to 130 m on beds of mud, clay, sand, and gravel. Beds tend to be elongated along the direction of current flow. A combination of large-scale (overall spawning population size and oceanographic conditions) and small-scale (site suitability for settlement) processes influence recruitment of scallops to these beds. Sexes are separate and mature male and female scallops are distinguishable based on gonad color. Although spawning time varies with latitude and depth, weathervane scallops in Alaska spawn in May to July depending on location. Eggs and spermatozoa are released into the water, where the eggs become fertilized. After a few days, eggs hatch, and larvae rise into the water column and drift with ocean currents. Larvae are pelagic and drift for about one month until metamorphosis to the juvenile stage when they settle to the bottom.

Several other species of scallops found in the EEZ off Alaska have commercial potential. These scallops grow to smaller sizes than weathervanes, and thus have not been extensively exploited in Alaska. Pink scallops, *Chlamys rubida*, range from California to the Pribilof Islands. Pink scallops are found in deep waters (to 200 m) in areas with soft bottom, whereas spiny scallop occur in shallower (to 150 m) areas characterized by hard bottom and strong currents. Pink scallops mature at age 2 and spawn in the winter (January to March). Maximum age for this species is 6 years. Spiny scallops, *Chlamys hastata*, are found in coastal regions from California to the GOA. Spiny scallops grow to slightly larger sizes (75 mm) than pink scallops (60 mm). Spiny scallops also mature at age 2 (35 mm) and spawn in the autumn (August to October). Rock scallops, *Crassadoma gigantea*, range from Mexico to Unalaska Island. Rock scallops are found in relatively shallower water (0 to 80 m) with strong currents. Apparently, distribution of these animals is discontinuous, and the abundance in most areas is low. These scallops attach themselves to rocks, attain a large size (to 250 mm), and exhibit fast growth rates. Rock scallops are thought to spawn during two distinct periods, one in the autumn (October to January), and one in the spring-summer (March to August).

Fishery

The weathervane scallop resource consists of multiple, discrete, self sustaining populations that are managed as separate stock units. Scallop stocks in Alaska have been managed under a federal fishery management plan (FMP) since 1995. The FMP controls the fishery through permits, registration areas and districts, seasons, closed waters, gear restrictions, efficiency limits, crab bycatch limits, scallop catch limits, inseason adjustments, and observer monitoring. Most of these regulations were developed by the State prior to 1995. Dredge size is limited to a maximum width of 15 feet, and only two dredges may be

used at any one time. In the Kamishak District of Cook Inlet, only one dredge with a 6-foot maximum width is allowed. Dredges are required to have rings with a 4-inch minimum inside diameter. To reduce incentives to harvest small scallops, crew size on scallop vessels is limited to 12 persons, and all scallops must be manually shucked. Dredging is prohibited in areas designated as crab habitat protection areas, similar to the groundfish FMPs.

Since 1967, when the first landings were made, fishing effort and total scallop harvest (weight of shucked meats) have varied annually. Total commercial harvest of weathervane scallops has fluctuated from a high of 157 landings totaling 1,850,187 pounds of shucked meats by 19 vessels in 1969 to no landings in 1978. Prices and demand for scallops have remained high since fishery inception. Prior to 1990, about two-thirds of the scallop harvest has been taken off Kodiak Island, and about one-third has come from the Yakutat area; other areas had made minor contributions to overall landings. Harvests in 1990 and 1991 were the highest on record since the early 1970s. The 1992 scallop harvest was even higher at 1,810,788 pounds. The increased harvests in the 1990s occurred with new exploitation in the BS.

Relevant Trophic Information

Scallop predators have not been well studied. Scallops are likely prey to various fish and invertebrates during the early part of their life cycle. Flounders are known to prey on juvenile weathervane scallops, and seastars may also be important predators.

Approximate Upper Size Limit of Juvenile Fish (in cm): Weathervane scallops begin to mature by age 3 at about 7.6 cm (3 inches) in shell height (SH), and virtually all scallops are mature by age 4. Growth, maximum size, and size at maturity vary significantly within and between beds and geographic areas. Weathervane scallops are long-lived; individuals may live 28 years or more. The natural mortality rate is thought to be about 15 percent annually (M = 0.16).

Habitat and Biological Associations

Scallops are found from intertidal waters and to 300 m. Abundance tends to be greatest between 45 and 130 m on beds of mud, clay, sand, and gravel (Hennick 1973). Weathervane scallops are associated with other benthic species, such as red king crabs, Tanner crabs, shrimps, octopi, flatfishes, Pacific cod, and other species of benthic invertebrates and fishes.

Additional Information Source

Distributional information is contained in the Literature cited section.

Literature

Barnhart, J.P., I.W. Vining, and L.C. Byrne. 1996. A summary of data collected by scallop observers from the 1994/1995 commercial scallop fishery in Alaska's westward region. ADF&G, Commercial Fisheries Management & Development Division, Regional information report 4K96-33, Kodiak, AK.

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SPECIES: Weathervane Scallops off Alaska

Stage - EFH Level	Duration or Age	Diet/Prey	Season/Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	several days	None	May-July	MCS, ICS	D		N/A	
Larvae	2-3 weeks		May-August	ICS, MCS, OCS	P		N/A	
Juveniles	Age 0 to Age 3		August +	MCS	D	CL, M, S, G	N/A	
Adults	Age 3 - 28		Spawning May-July	MCS	D	CL, M, S, G	UNK	