Appendix 4: Forage fishes in the Gulf of Alaska

Olav A. Ormseth
Alaska Fisheries Science Center

Executive summary

The forage fish category in the Gulf of Alaska (GOA) Fishery Management Plan (FMP) contains over sixty species with diverse characteristics (Table 1). Although a forage fish report is not prepared for the Bering Sea, the taxonomic family groupings are identical to the GOA and presumably the same species are found there. Many of the species in both regions are rare and poorly sampled with standard survey methods, therefore the exact number and types of species in the forage fish category is not known. Species in the forage fish category have been identified as having ecological importance as prey, and directed fishing is prohibited for the group. Forage fishes are outside of the specification process and stock assessments are not conducted for this category. In 2007, the Plan Team requested that a full forage fish report be given in "off" survey years to allow more time for consideration of the report. A full report was prepared for the 2008 assessment cycle, and this report consists of only an executive summary with updated catch and survey data.

Summary of current forage fish management measures
In federal waters, management of this group is governed by section 50 CFR 679b20.doc of the federal code. Briefly:

1) directed fishing for species in the forage fish category is prohibited
2) catches are limited by a maximum retention allowance (MRA) of 2% by weight of the retained target species (Table 10 to 50 CFR part 679)
3) processing of forage fishes is limited to fishmeal production.

The regulation applies only to vessels fishing in federal waters, so onshore processors are not affected by the rule. In 1999, the state of Alaska adopted a statute with the same taxonomic groups and limitations (5 AAC 39.212 of the Alaska administrative code), except that no regulations were passed regarding the processing of forage fishes.

Overview of status and catch
The status of forage fish populations in the GOA is difficult to determine, largely because the standard survey gear does a poor job of sampling forage fish species. This is due to their small size and their distribution in pelagic waters and nearshore areas. Biomass estimates for species such as capelin vary widely. Eulachon are likely the best-sampled species due to their slightly larger size and frequent distribution near the seafloor. The 2009 eulachon biomass estimate is higher than the last survey estimate in 2007, and higher than the long-term average (Table 2). Eulachon are also the main species captured in commercial fisheries (Table 3). Most of this catch occurs in the pollock midwater trawl fishery. As of October, the 2009 catch of eulachon is down substantially from a high catch in 2008.

New developments
Two developments have implications for GOA forage fishes. The reauthorization of the Magnuson-Stevens Act and the resulting changes in NMFS guidelines require a reorganization of FMP species into "in the fishery" or "ecosystem components" (EC). Forage fishes are a likely candidate for the EC category, and the NPFMC is conducting analyses of this issue. A decision is scheduled for 2010. Management of forage fishes will likely not change substantially but may be modified, particularly if other stocks are added to the EC group. A second development is that the North Pacific Research Board will begin funding integrated ecosystem research (GOA IERP) in the GOA in 2010. Forage species are a central focus of this research plan and it is expected that the IERP will provide information to enhance the monitoring and assessment of forage fishes in the GOA.

Table 1. List of scientific and common names of species contained within the forage fish category.

Scientific Name	Common Name
Family Osmeridae	smelts
Mallotus villosus	capelin
Hypomesus pretiosus	surf smelt
Osmerus mordax	rainbow smelt
Thaleichthys pacificus	eulachon
Spirinchus thaleichthys	longfin smelt
Spirinchus starksi	night smelt
Family Myctophidae	lanternfish
Protomyctophum thompsoni	bigeye lanternfish
Benthosema glaciale	glacier lanternfish
Tarletonbeania taylori	taillight lanternfish
Tarletonbeania crenularis	blue lanternfish
Diaphus theta	California headlightfish
Stenobrachius leucopsarus	northern lampfish
Stenobrachius nannochir	garnet lampfish
Lampanyctus jordani	brokenline lanternfish
Nannobrachium regale	pinpoint lampfish
Nannobrachium ritteri	broadfin lanternfish
Family Bathylagidae	blacksmelts
Leuroglossus schmidti	northern smoothtongue
Lipolagus ochotensis	popeye blacksmelt
Pseudobathylagus milleri	stout blacksmelt
Bathylagus pacificus	slender blacksmelt
Family Ammodytidae	sand lances
Ammodytes hexapterus	Pacific sand lance
Family Trichodontidae	sandfish
Trichodon trichodon	Pacific sandfish
Arctoscopus japonicus	sailfin sandfish
Family Pholidae	gunnels
Apodichthys flavidus	penpoint gunnel
Rhodymenichthys dolichogaster	stippled gunnel
Pholis fasciata	banded gunnel
Pholis clemensi	longfin gunnel
Pholis laeta	crescent gunnel
Pholis schultzi	red gunnel

Table 1 continued. List of scientific and common names of species contained within the forage fish category. Data sources: GOA FMP, "Fishes of Alaska" (Mecklenburg et al. 2002).

Scientific Name	Common Name
Family Stichaeidae	pricklebacks
Eumesogrammus praecisus	fourline snakeblenny
Stichaeus punctatus	arctic shanny
Gymnoclinus cristulatus	trident prickleback
Chirolophis tarsodes	matcheek warbonnet
Chirolophis nugatory	mosshead warbonnet
Chirolophis decoratus	decorated warbonnet
Chirolophis snyderi	bearded warbonnet
Bryozoichthys lysimus	nutcracker prickleback
Bryozoichthys majorius	pearly prickleback
Lumpenella longirostris	longsnout prickleback
Leptoclinus maculates	daubed shanny
Poroclinus rothrocki	whitebarred prickleback
Anisarchus medius	stout eelblenny
Lumpenus fabricii	slender eelblenny
Lumpenus sagitta	snake prickleback
Acantholumpenus mackayi	blackline prickleback
Opisthocentrus ocellatus	ocellated blenny
Alectridium aurantiacum	lesser prickleback
Alectrias alectrolophus	stone cockscomb
Anoplarchus purpurescens	high cockscomb
Anoplarchus insignis	slender cockscomb
Phytichthys chirus	ribbon prickleback
Xiphister mucosus	rock prickleback
Xiphister atropurpureus	black prickleback
Family Gonostomatidae	bristlemouths
Sigmops gracilis	slender fangjaw
Cyclothone alba	white bristlemouth
Cyclothone signata	showy bristlemouth
Cyclothone atraria	black bristlemouth
Cyclothone pseudopallida	phantom bristlemouth
Cyclothone pallida	tan bristlemouth
Order Euphausiacea	krill

Table 2. Gulf of Alaska trawl survey biomass estimates (t) for GOA forage fishes.

		1984	1987	1990	1993	1996	1999	2001	2003	2005	2007	2009
Pacific sand lance	WGOA	0	2	0	0	1	1	5	2	1	1	0
	CGOA	3	13	63	2	5	8	7	8	32	4	2
	EGOA	0	0	1	0	0	2		1	0	0	1
	total GOA	**3**	**15**	**64**	**2**	**5**	**10**	**12**	**11**	**33**	**4**	**3**
Pacific sandfish	WGOA	12	28	16	69	2	9	6	29	0	0	9
	CGOA	1,858	558	329	155	135	22	89	80	383	931	93
	EGOA	354	529	377	296	16	542		3,832	75	315	50
	total GOA	**2,223**	**1,115**	**722**	**520**	**153**	**572**	**94**	**3,941**	**458**	**1,246**	**152**
unidentified smelts	WGOA	1	0	0	92	0	0	0	0	0	0	0
	CGOA	0	0	35	30	1	1	0	0	6	2	21
	EGOA	0	160	114	81	63	42		231	6	47	43
	total GOA	**1**	**160**	**149**	**203**	**64**	**43**	**0**	**231**	**12**	**48**	**65**
eulachon	WGOA	38	1,787	453	2,553	1,444	438	2,867	1,610	195	1,126	654
	CGOA	4,767	8,663	19,043	24,172	26,470	11,665	49,061	94,991	40,796	41,184	73,902
	EGOA	2,300	5,864	8,493	8,278	4,334	2,587		16,882	14,080	9,486	12,671
	total GOA	**7,105**	**16,314**	**27,988**	**35,003**	**32,248**	**14,690**	**51,928**	**113,482**	**55,071**	**51,796**	**87,227**
capelin	WGOA	37	5	0	2	5	34	4	18	2	29	82
	CGOA	387	38	136	46	718	102	275	7,272	428	631	295
	EGOA	7	8	14	76	755	106		298	586	125	112
	total GOA	**430**	**51**	**151**	**124**	**1,479**	**241**	**279**	**7,588**	**1,015**	**785**	**488**
pricklebacks	WGOA	7	0	5	23	19	2	7	10	8	12	58
	CGOA	163	9	141	180	100	187	2,001	230	221	1,427	351
	EGOA	0	5	3	1	24	28		39	1	1	10
	total GOA	**170**	**15**	**149**	**205**	**143**	**217**	**2,008**	**278**	**231**	**1,441**	**419**

Table 3. Forage fish catches in the GOA, 2003-2009. Data are from the Alaska Regional Office Catch Accounting System.

		GOA groundfish fishery catch (t)						
	area	2003	2004	2005	2006	2007	2008	*2009
capelin	WGOA	0.70	1.14	0.12	0.00	0.00	0.00	0.03
	CGOA	5.28	66.18	2.61	0.10	0.00	0.01	0.03
	EGOA	0.24	0.68	0.09	0.00	0.00	0.00	0.00
	GOA	**6.22**	**68.00**	**2.82**	**0.11**	**0.00**	**0.01**	**0.07**
eulachon	WGOA	1.26	6.84	37.84	17.58	52.30	159.87	31.39
	CGOA	16.68	161.35	797.89	377.63	167.73	580.50	189.58
	EGOA	0.15	1.70	14.38	3.52	0.44	11.39	2.69
	GOA	**18.10**	**169.89**	**850.11**	**398.73**	**220.47**	**751.76**	**223.66**
other smelts	WGOA	44.26	4.01	11.36	16.56	10.93	113.13	31.36
	CGOA	300.41	62.09	167.32	154.95	38.89	261.08	158.17
	EGOA	8.41	0.58	6.51	10.60	0.10	4.52	1.70
	GOA	**353.08**	**66.68**	**185.19**	**182.11**	**49.92**	**378.72**	**191.23**
P. sand lance	WGOA	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	CGOA	0.00	0.01	0.00	0.01	0.00	0.00	0.19
	EGOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	GOA	**0.00**	**0.01**	**0.00**	**0.01**	**0.00**	**0.00**	**0.20**
gunnels	WGOA	0.00	0.00	0.00	0.01	0.00	0.01	0.00
	CGOA	0.01	0.00	0.00	0.02	0.00	0.03	0.00
	EGOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	GOA	**0.01**	**0.00**	**0.00**	**0.03**	**0.00**	**0.04**	**0.00**
myctophids	WGOA	0.00	0.00	0.01	0.00	0.00	0.00	0.00
	CGOA	0.00	0.00	0.13	0.01	0.00	0.00	0.00
	EGOA	0.00	0.00	0.01	0.00	0.00	0.00	0.00
	GOA	**0.00**	**0.00**	**0.15**	**0.01**	**0.00**	**0.00**	**0.00**
pricklebacks	WGOA	0.02	0.00	0.96	0.12	0.05	0.00	0.02
	CGOA	0.47	0.11	1.24	0.78	0.28	0.15	2.69
	EGOA	0.00	0.00	0.00	0.01	0.00	0.00	0.01
	GOA	**0.49**	**0.11**	**2.20**	**0.91**	**0.33**	**0.15**	**2.71**

* 2009 catch data incomplete; retrieved October 7, 2009.

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