18c Octopus Complex in the Gulf of Alaska

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Executive Summary

Through 2008, octopuses have been managed as part of the "other species" complex in the Gulf of Alaska (GOA), with catch reported only in the aggregate with sharks, squids, and sculpins. Due to increasing market value of some groups, retention of other species complex members is increasing. This appendix to the other species SAFE chapter was prepared to review available information that would be needed if the other species complex were to be split into separate components for future management. All octopus species would continue to be grouped into a species assemblage. At least seven species of octopus are found in the GOA, and the species composition both of the natural community and the commercial harvest is unknown at this time. Octopuses are taken as incidental catch in trawl, longline, and pot fisheries throughout the GOA; the highest catch rates are from Pacific cod pot fisheries in the central and western GOA (statistical areas 610 and 630).

The current data are not sufficient for any model-based assessment. The GOA trawl surveys produce estimates of biomass for octopus, but these estimates are highly variable and may not reflect the same species and sizes of octopus caught by industry. As an example of how this species complex might be managed under catch quotas, we have estimated Tier 6 and Tier 5 catch limits from available data (Tables 1-3). There are concerns that a strict Tier 6 approach could result in an overly conservative OFL limit that would affect cod fisheries. An alternative Tier 6 approach is also suggested; this method treats the existing data as a "probable safe catch rate", and uses the maximum incidental catch to set the OFL (Table 1). Another measure, proposed in September 2008 for both BSAI and GOA octopus, is to incorporate gear-specific discard mortality into future catch accounting for octopus.

Because of the lack of information at this time, we recommend that directed fishing for octopus be discouraged in federal waters of the GOA and that incidental catch be limited by conservative catch limits. As better catch accounting and biological data for these species are collected, possible future assessment methods can be investigated. The authors do not recommend transfer of octopus into the forage fish category, as their ecological role is very different from squid and other forage species.

Table 1. Calculations of octopus catch limits under different methods for 2007 and 2008. Provisional catch limits for 2009-2010 are the same as 2008. Note that Tier 6 estimates are based on average of the most 10 recent years of complete catch data, 1998-2007. *Modified Tier 6 with maximum incidental catch rate = OFL.

	2007		**2008**		**2009 - 2010**	
Method	**ABC**	**OFL**	**ABC**	**OFL**	**ABC**	**OFL**
Tier 5	730	973	730	973	730	973
Tier 6 (avg)	139	186	142	189	142	189
Tier 6 (max*)	298	398	224	298	224	298

Summary of Changes Since 2007

There is little new information about GOA octopuses since the 2007 assessment**.** Catch data have been updated through Oct 3, 2008 (Table 2). Total catch for 2007 was 263 tons, up slightly from 2005. The catch through October 24, 2007 was 228 tons, slightly higher than in 2005-2006. As in previous years, the majority of the reported catch came from statistical reporting areas 610 and 630. The long-term average catch rate for the most recent ten years of complete data (1998-2007) is 189 tons. There was no Gulf of Alaska trawl survey in 2008.

The only substantive addition to the stock assessment for 2008 is a suggestion to incorporate discard mortality into future catch accounting for octopus in both the BSAI and GOA. This suggestion was presented to the joint plan teams at the September 2008 meeting, and met with general support from the teams. Data collected by an observer program special project in 2006 and 2007 included a visual evaluation of the condition of the octopus by the observer. Table 4 summarizes this “condition factor” data, taken from octopus in both the Bering Sea and Gulf of Alaska. Observers were asked to classify each octopus as either: A) alive and healthy, M) missing an arm but otherwise healthy, I) injured, or D) dead. In the table above, octopus coded as A or M have been grouped as “Alive” Octopus coded as injured are included under “Dead”. The table shows the number of observations and the proportion of observed octopus alive or dead for each gear type.

These results cover only a portion of the octopus caught and are based on a subjective visual coding of condition. However, they provide preliminary data on the nature of discard mortality for octopus. In particular, the observed mortality rate for octopus caught in pot gear was less than one percent. Since 2003, over 85% of the annual incidental catch of GOA octopus has come from pot gear. These preliminary data suggest that a gear-specific discard mortality factor could be estimated for octopus, similar to the one now used for Pacific halibut. If a discard mortality factor were included in catch accounting for octopus, only a fraction of discarded octopus would be counted as "taken". Once the TAC for octopus was reached and all octopus were discarded, there would be very little further accumulation of catch toward OFL. This approach would control retention of octopus for market or bait by the TAC, but would prevent a low OFL for octopus (such as the Tier 6 estimate) from affecting Pacific cod fisheries. It would also ensure that estimated catch of octopus reflected only the animals retained or killed, which is more appropriate for management methods based on fishery mortality rate. More data need to be collected to firmly document discard mortality rates, and a more detailed and objective procedure needs to be developed for coding injuries and condition. The stock assessment authors recommend that studies be initiated to support future use of discard mortality for octopus.

In 2008, the NPFMC changed the practice for determining catch levels for the other species category. While the various species assemblages within this category are still managed under a single ABC/OFL, the plan teams will determine the overall catch levels for the category by combining separate catch levels calculated for each of the subgroups, including octopus. Table 1 includes a summary of ABC and OFL levels that would result from applying various methods to the existing data for octopus. Octopus remains difficult to place within the existing tier system for setting regulatory catch limits. In February 2006, the SSC concurred with the SAFE authors that the size difference between trawl and pot-caught octopus makes biomass data based on the trawl survey questionable for this species group. The best available estimates of octopus catch rates do not cover the time period specified for Tier 6 evaluation, and represent only incidental catch rates rather than targeted fishing. Ecosystem models of the GOA indicate that fishery catch is a tiny fraction of the estimated total predation mortality on octopus. The stock assessment authors remain uncomfortable with both the Tier 5 and Tier 6 approaches for this group.

Table 2. GOA catch estimates for octopus (all species), in metric tons. Catch estimates for 1997-2002 are estimated from blend data, 2003-2008 data are from AK region catch accounting. * 2008 Data are partial catch as of Oct 3, 2008.

Target Fishery	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Pacific cod	193.85	99.66	163.21	153.54	72.10	265.44
Pollock	0.74	3.51	0.03	-	0.18	0.04
Flatfish	1.35	4.34	2.43	0.69	0.84	17.16
Rockfish	2.26	0.76	0.47	0.18	0.04	0.66
Sablefish	22.41	0.27	0.18	0.52	2.01	0.99
Other/Unknown						
Total	232.19	112.00	166.33	156.12	87.59	298.14

Target Fishery	**2003**	**2004**	**2005**	**2006**	**2007**	**2008***
Pacific cod	188.90	266.54	140.68	146.22	248.09	218.80
Pollock	-	0.00	0.06	3.41	1.46	0.02
Flatfish	17.22	2.52	8.42	8.85	11.45	6.35
Rockfish	0.65	0.43	0.19	0.47	0.05	2.87
Sablefish	2.82	0.09	0.22	0.32	1.79	0.24
Other/Unknown	0.06	16.44	1.65	0.16	-	0.08
Total	209.65	286.01	151.22	159.43	262.85	228.38

Table 3. GOA trawl survey biomass estimates for octopus (all species), in metric tons, and Tier 5 calculations based on the average over the most recent 10 years (surveys from 1999-2007). Note that the M value of 0.53 used in calculations is estimated based on Hoenig's equation, which was developed for finfish and is of unknown accuracy for cephalopods.

Survey Year	Survey Hauls	Hauls with Octopus		Estimated Biomass (t)
1984	929	89	9.6%	1,498
1987	783	35	4.5%	2,221
1990	708	34	4.8%	1,029
1993	775	43	5.5%	1,335
1996	807	34	4.2%	1,960
1999	764	47	6.2%	994
2001	489	29	5.9%	994
2003	809	70	8.7%	3,767
2005	839	56	6.7%	1,125
2007	820	71	8.7%	2,296
		Average all		1,722
		Average 10 yrs		1,835
	Tier 5	OFL = **0.53***10yr		972.68
	Tier 5	ABC = 0.75*OFL		729.51

Table 4. Results of observer program special project (both BSAI and GOA) in 2003-2007.

	Observer Special Project Data from 2006 - 2007				
	Condition Reported for Observed Octopus				
Gear	No. Alive	No. Dead	Total	Alive	Dead
Bottom Trawl	32	43	75	42.7%	57.3%
Pelagic Trawl	28	161	189	14.8%	85.2%
Pots	431	2	433	99.5%	0.5%
Longline	132	36	168	78.6%	21.4%