# 21. Bering Sea and Aleutian Islands squids

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## Executive Summary

### *Summary of Major Changes*

Because reliable biomass estimates do not exist for squids in the Bering Sea and Aleutian Islands (BSAI), harvest recommendations are made using Tier 6 criteria. Under Tier 6 Acceptable Biological Catch (ABC) and Overfishing Level (OFL) are calculated using catch data from 1978-1995, and as a result the harvest recommendations do not change from year to year. New information regarding squids comes mainly from the eastern Bering Sea (EBS) slope and Aleutian Islands trawl surveys. Because these are biennial surveys, full assessments will only be conducted in years when those surveys occur. In "off" years, a short update of incidental squid catches and EBS shelf survey results will be provided.

### *Harvest recommendations*

The recommended allowable biological catch (ABC) for squids in 2012 and 2013 is calculated as 0.75 multiplied by the average catch from 1978-1995, or 1,970 t; the recommended overfishing level (OFL) for squid in the years 2010-2011 is calculated as the average catch from 1978-1995, or 2,624 t.

| | As estimated or *specified last* year for: | | As estimated or *recommended this* year for: | |
|---|---|---|---|---|
| **Quantity** | *2011* | *2012* | **2012** | 2013 |
| *M* (natural mortality) | *n/a* | *n/a* | **n/a** | n/a |
| Specified/recommended Tier | *6* | *6* | **6** | 6 |
| Biomass | *n/a* | *n/a* | **n/a** | n/a |
| *average historical catch 1978-1995* | *2,624* | *2,624* | **2,624** | 2,624 |
| Recommended OFL (max. hist. catch; t) | *2,624* | *2,624* | **2,624** | 2,624 |
| Recommended ABC (0.75*OFL; t) | *1,970* | *1,970* | **1,970** | 1,970 |
| **Status** | *As determined last year for:* | | As determined this year for: | |
| | *2009* | *2010* | 2010 | 2011 |
| Overfishing | *No* | *n/a* | No | n/a |
| Overfished | *n/a* | *n/a* | n/a | n/a |
| Approaching overfished | *n/a* | *n/a* | n/a | n/a |
| (for Tier 6 stocks, data are not available to determine whether the stock is in an overfished condition) | | | | |

## Overview

In the Bering Sea/Aleutian Islands regions there are at least 15 species of squid. The most abundant species is *Berryteuthis magister* (magistrate armhook squid). Members of these 15 species come from six families in two orders and can be found from 10 m to greater than 1500 m. All but one, *Rossia pacifica* (North Pacific bobtail squid), are pelagic but *Berryteuthis magister* and *Gonatopsis borealis* (boreopacific armhook squid) are often found in close proximity to the bottom. The vertical distribution of these three species is the probable cause of their predominance in the BSAI bottom trawl surveys relative to other squid species, although no squid species appear to be well sampled by BSAI surveys. Most species are associated with the slope and basin, with the highest species diversity along the slope region of the Bering Sea between 200 – 1500 m. Since most of the data come from groundfish survey bottom trawls, the information on abundance and distribution of those species associated with the bottom is much more accurate than that of the pelagic species.

In the BSAI, squids are generally taken incidentally in target fisheries for pollock. Historically squid were targeted by foreign vessels (from Japan and Korea) in the BSAI, but directed squid fisheries do not exist in Alaskan waters at this time. Squid species can be difficult to identify, and fishery observers in the BSAI currently record all incidentally-caught squid as “Squid unidentified”. After reaching 9,000 t in 1978, total squid catches steadily declined to only a few hundred tons in 1987-1995. Since 2000, squid catches have fluctuated around an average of approximately 1,000 t, with anomalously high catches in some years. The 2001 estimated catch of squid, 1,761 t (Table 3), was the highest in the past ten years and high catches also occurred in 2002 and 2006. The 2008 catch was 1,542 t, the highest since 2001. Catches in 2009 and 2010 were relatively low (360 t and 410 t, respectively). The 2011 catch is on track to be similarly low, standing at 320 t at the beginning of November 2011. Retention rates of squid by BSAI groundfish fisheries also vary widely, ranging between 12% and 84% from 1997-2010.

## Data

Table 1. Survey biomass estimates (t) for the EBS shelf, EBS slope, and AI. Biomass is shown for all squids and for the principal species caught in each survey.

| | EBS shelf | | | EBS slope | | | | AI |
|---|---|---|---|---|---|---|---|---|
| year | all squids | *R. pacifica* | *B. Magister* | all squids | *R. pacifica* | *B. Magister* | *G. borealis* | *B. Magister* |
| 1982 | 127 | | | | | | | |
| 1983 | 94 | 94 | | | | | | 9,571 |
| 1984 | 99 | 57 | 14 | | | | | |
| 1985 | 65 | 4 | 13 | | | | | |
| 1986 | 66 | 32 | | | | | | 15,762 |
| 1987 | 39 | 39 | | | | | | |
| 1988 | 101 | 97 | | | | | | |
| 1989 | 639 | 3 | | | | | | |
| 1990 | 5,751 | 5,680 | | | | | | |
| 1991 | 12 | | | | | | | 28,934 |
| 1992 | 26 | | | | | | | |
| 1993 | 32 | | | | | | | |
| 1994 | 8 | | | | | | | 11,083 |
| 1995 | 14 | 6 | | | | | | |
| 1996 | 6 | | | | | | | |
| 1997 | 1,297 | 3 | | | | | | 2,677 |
| 1998 | 68 | 60 | | | | | | |
| 1999 | 86 | 19 | | | | | | |
| 2000 | 392 | 13 | 45 | | | | | 2,759 |
| 2001 | 313 | 20 | 280 | | | | | |
| 2002 | 33 | 33 | | 1,270 | 52 | 1,198 | 2 | 2,087 |
| 2003 | 46 | 27 | 16 | | | | | |
| 2004 | 20 | 6 | | 1,642 | 58 | 1,418 | 52 | 3,250 |
| 2005 | 14 | 13 | | | | | | |
| 2006 | 56 | 9 | 47 | | | | | 1,467 |
| 2007 | 11 | 11 | | | | | | |
| 2008 | 8 | 8 | | 1,826 | 36 | 1,717 | 54 | |
| 2009 | 642 | 19 | 623 | | | | | |
| 2010 | 52 | 42 | 9 | 1,928 | 72 | 1,831 | 8 | 2,422 |
| 2011 | 26 | 25 | 1 | | | | | |

Table 2. Estimated total (retained and discarded) catches of squid (t) in the eastern Bering Sea and Aleutian Islands by groundfish fisheries, 1977-2010, and estimated retention rates. JV=Joint ventures between domestic catcher boats and foreign processors.

| | Eastern Bering Sea | | | | Aleutian Islands | | | | BSAI | % |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | foreign | JV | domestic | total EBS | foreign | JV | domestic | total AI | total | retained |
| 1977 | 4,926 | | | 4,926 | 1,808 | | | 1,808 | 6,734 | |
| 1978 | 6,886 | | | 6,886 | 2,085 | | | 2,085 | 8,971 | |
| 1979 | 4,286 | | | 4,286 | 2,252 | | | 2,252 | 6,538 | |
| 1980 | 4,040 | | | 4,040 | 2,332 | | | 2,332 | 6,372 | |
| 1981 | 4,178 | 4 | | 4,182 | 1,763 | | | 1,763 | 5,945 | |
| 1982 | 3,833 | 5 | | 3,838 | 1,201 | | | 1,201 | 5,039 | |
| 1983 | 3,461 | 9 | | 3,470 | 509 | 1 | | 510 | 3,980 | |
| 1984 | 2,797 | 27 | | 2,824 | 336 | 7 | | 343 | 3,167 | |
| 1985 | 1,583 | 28 | | 1,611 | 5 | 4 | | 9 | 1,620 | |
| 1986 | 829 | 19 | | 848 | 1 | 19 | | 20 | 868 | |
| 1987 | 96 | 12 | 1 | 109 | | 23 | 1 | 24 | 131 | |
| 1988 | | 168 | 246 | 414 | | 3 | | 3 | 417 | |
| 1989 | | 106 | 194 | 300 | | 1 | 5 | 6 | 306 | |
| 1990 | | | 532 | 532 | | | 94 | 94 | 626 | |
| 1991 | | | 544 | 544 | | | 88 | 88 | 632 | |
| 1992 | | | 819 | 819 | | | 61 | 61 | 880 | |
| 1993 | | | 611 | 611 | | | 72 | 72 | 683 | |
| 1994 | | | 517 | 517 | | | 87 | 87 | 604 | |
| 1995 | | | 364 | 364 | | | 95 | 95 | 459 | |
| 1996 | | | 1,083 | 1,083 | | | 84 | 84 | 1,167 | |
| 1997 | | | 1,403 | 1,403 | | | 71 | 71 | 1,474 | |
| 1998 | | | 891 | 891 | | | 25 | 25 | 915 | |
| 1999 | | | 432 | 432 | | | 9 | 9 | 441 | |
| 2000 | | | 375 | 375 | | | 8 | 8 | 384 | |
| 2001 | | | 1,761 | 1,761 | | | 5 | 5 | 1,766 | |
| 2002 | | | 1,334 | 1,334 | | | 10 | 10 | 1,344 | |
| 2003 | | | 1,246 | 1,246 | | | 36 | 36 | 1,282 | |
| 2004 | | | 1,000 | 1,000 | | | 14 | 14 | 1,014 | |
| 2005 | | | 1,170 | 1,170 | | | 17 | 17 | 1,186 | |
| 2006 | | | 1,403 | 1,403 | | | 15 | 15 | 1,418 | |
| 2007 | | | 1,175 | 1,175 | | | 13 | 13 | 1,188 | |
| 2008 | | | 1,494 | 1,494 | | | 49 | 49 | 1,542 | 67% |
| 2009 | | | 269 | 269 | | | 91 | 91 | 360 | 51% |
| 2010 | | | 305 | 305 | | | 105 | 102 | 410 | 63% |
| *2011** | | | *223* | *223* | | | *98* | *98* | *320* | *44%* |

* 2011 catch and retention as reported through November 3, 2011.

Data Sources: Foreign and JV catches-U.S. Foreign Fisheries Observer Program, AFSC Domestic catches before 1989 (retained only; do not include discards): Pacific Fishery Information Network (PacFIN). Domestic catches 1989-2002: NMFS Alaska Regional Office BLEND. Domestic catches 2003-present: NMFS AKRO Catch Accounting System. Retention rate estimates are from fishery observer data obtained from the AFSC Fishery Monitoring and Analysis program.

Table 3. Estimated catch (t) of all squid species combined by target fishery, 2003-2011. Data sources as in Table 2.

| target fishery | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | *2011** |
|---|---|---|---|---|---|---|---|---|---|
| arrowtooth | 7 | 6 | 10 | 4 | 3 | 46 | 96 | 104 | *67* |
| Atka mackerel | 21 | 7 | 9 | 9 | 5 | 12 | 14 | 16 | *5* |
| flathead sole | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | *0* |
| Gr. turbot | 3 | 6 | 0 | 0 | 0 | 4 | 23 | 1 | *0* |
| other flatfish | 3 | 2 | 6 | 0 | 2 | 1 | 0 | 0 | *0* |
| Kamchatka | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | *47* |
| Pacific cod | 9 | 6 | 3 | 1 | 1 | 0 | 0 | 0 | *0* |
| rock sole | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | *0* |
| rockfish | 12 | 6 | 7 | 6 | 8 | 25 | 18 | 12 | *26* |
| sablefish | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | *0* |
| yellowfin sole | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | *0* |
| pollock | 1,226 | 977 | 1,150 | 1,399 | 1,169 | 1,452 | 209 | 277 | *176* |
| **BSAI total** | **1,282** | **1,014** | **1,186** | **1,418** | **1,188** | **1,542** | **360** | **410** | ***320*** |

* 2011 catch as reported through November 3, 2011.

Table 4. Estimated catch (t) of all squid species combined by regulatory area, 2003-2011. Data sources as in Table 2.

| | area | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | *2011** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **508** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | *0* |
| | **509** | 2 | 7 | 5 | 162 | 13 | 25 | 1 | 5 | *3* |
| | **513** | 2 | 2 | 0 | 1 | 12 | 9 | 2 | 0 | *1* |
| | **514** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | *0* |
| | **516** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | *0* |
| **EBS** | **517** | 746 | 587 | 539 | 965 | 690 | 1,068 | 143 | 133 | *112* |
| | **518** | 0 | 0 | 0 | 0 | 0 | 23 | 40 | 17 | *29* |
| | **519** | 484 | 398 | 527 | 261 | 419 | 342 | 73 | 145 | *50* |
| | **521** | 12 | 5 | 95 | 15 | 26 | 25 | 9 | 5 | *16* |
| | **523** | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 1 | *0* |
| | **524** | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | *12* |
| | **541** | 9 | 4 | 3 | 2 | 2 | 25 | 66 | 90 | *74* |
| **AI** | **542** | 10 | 7 | 2 | 6 | 3 | 6 | 5 | 4 | *8* |
| | **543** | 17 | 3 | 12 | 7 | 8 | 18 | 20 | 11 | *16* |
| | **BSAI total** | **1,282** | **1,014** | **1,186** | **1,418** | **1,188** | **1,542** | **360** | **410** | ***320*** |
| | BSAI ABC | 1,970 | 1,970 | 1,970 | 1,970 | 1,970 | 1,970 | 1,970 | 1,970 | 1,970 |
| | BSAI TAC | 1,970 | 1,275 | 1,275 | 1,275 | 1,970 | 1,970 | 1,970 | 1,970 | 1,970 |

* 2011 catch as reported through November 3, 2011.

**Appendix: Summary of research catches**

To comply with National Standard guidelines, this appendix is included to report data regarding non-commercial catches of squids in the BSAI. The table below lists total catches of squids in research surveys conducted by the Resource Assessment and Conservation Engineering division of the AFSC.

| year | squid catch (kg) | | year | squid catch (kg) |
|---|---|---|---|---|
| 1964 | 1.1 | | 1991 | 2,941.9 |
| 1966 | 17.7 | | 1992 | 4.5 |
| 1971 | 6.4 | | 1993 | 6.8 |
| 1972 | 8.2 | | 1994 | 2,761.8 |
| 1973 | 146.2 | | 1995 | 7.7 |
| 1974 | 5.5 | | 1996 | 38.6 |
| 1975 | 73.3 | | 1997 | 512.6 |
| 1976 | 245.7 | | 1998 | 19.3 |
| 1977 | 9.5 | | 1999 | 21.7 |
| 1978 | 87.3 | | 2000 | 521.0 |
| 1979 | 9,095.1 | | 2001 | 84.3 |
| 1980 | 19,777.9 | | 2002 | 650.5 |
| 1981 | 7,454.3 | | 2003 | 9.9 |
| 1982 | 9,611.3 | | 2004 | 1,154.6 |
| 1983 | 14,920.6 | | 2005 | 26.9 |
| 1984 | 3.1 | | 2006 | 341.5 |
| 1985 | 4,865.7 | | 2007 | 11.6 |
| 1986 | 13,640.4 | | 2008 | 450.8 |
| 1987 | 7.5 | | 2009 | 248.7 |
| 1988 | 1,025.2 | | 2010 | 840.1 |
| 1989 | 46.8 | | 2011 | 0.8 |
| 1990 | 404.2 | | | |