

**EXECUTIVE SUMMARY OF RECENT TRENDS:  
Bering Sea, Aleutian Islands, and Gulf of Alaska**

**Alaska Fisheries Science Center  
(from 2008 SAFE Report)**

**Fishing Effects on Ecosystems**

- No BSAI or GOA groundfish stock or stock complex is overfished and no BSAI or GOA groundfish stock or stock complex is being subjected to overfishing. One crab stock is overfished.
- Community size spectrum analysis of the eastern Bering Sea fish community indicates there has not been a systematic decline in the amount of large fish from 1982 to 2006.
- Recent exploitation rates on biological guilds are within one standard deviation of long-term mean levels. An exception was for the forage species of the Bering Sea (dominated by walleye pollock) which has relatively high exploitation rates 2005-2007 as the stock declined. The 2008 and 2009-recommended catch levels are again within one standard deviation of the historical mean. This is a more direct measure of catch with respect to food-web structure than are trophic level metrics.
- Seventy-two (82%) BSAI fishing communities have had increasing populations between 1990 and 2007. Communities with decreases during this time period are concentrated in Aleutians East and West along with Lake and Peninsula and Bristol Bay Boroughs.
- Discards and discard rates have remained below those observed prior to 1998, when regulations were implemented prohibiting discards of pollock and cod.
- Five new closures implemented in 2008 as part of protection for Essential Fish Habitat encompass a large portion of the northern Bering Sea. Almost 50% of Alaska's EEZ is now closed to bottom trawling.
- In 2007, observed BS hook and line and bottom trawl effort decreased, AI and GOA bottom trawl effort increased and BS and AI pelagic trawl effort increased. Other gear effort remained relatively stable.
- The number of hook and line vessels participating in the groundfish fisheries off Alaska have decreased over the last 4 years (2004-2007); whereas, the number of pot and trawl vessels have remained relatively stable over the last four years (2004-2007).

**Climate and Physical Environment Trends**

- Negative values of the PDO developed in 2007 and have persisted into 2008. It is highly uncertain whether the PDO will remain negative for an extended period. A positive PDO is associated with positive coastal sea surface temperature anomalies.
- Near-neutral ENSO conditions became established in the summer of 2008 and these conditions are expected to persist into spring 2009, implying a low predictability for the North Pacific climate system in the upcoming 6-9 months.
- In the Bering Sea, the year 2008 was the third sequential year with cold temperatures and extensive springtime sea ice cover, partially due to La Nina and a positive Arctic Oscillation.
- Bering Sea bottom and sea surface temperatures were cold in summer 2008. In the summers of 2006-2008, the extent of the cold pool increased from low values observed during 2000-2005. Cold pool size and location may affect the distribution and dynamics of Bering Sea fish species.
- The Bering Sea contrasted with much of the larger Arctic which had extreme summer minimum sea ice extents in 2007 and 2008 and positive autumn 2007 surface temperature anomalies north of Bering Strait of greater than 5°C.
- Despite continuing warming trends throughout the Arctic, Bering Sea climate will remain controlled by large multi-annual natural variability, relative to a small background trend due to an anthropogenic (global warming) contribution. Over the next five years we should look for the next shift back toward warmer temperatures and less sea ice.
- Eddy energy in the Aleutian Islands region was lower than average in the spring of 2008

- In the GOA, there was a prevalence of westerly wind anomalies over the last year, resulting in an increase in the North Pacific Current in the eastern North Pacific. Since the flow in the California Current System has also been stronger, while the flow in the coastal Gulf of Alaska has changed little, the proportion of the flow across the Pacific entering the Gulf has been lower than normal.
- The air temperature in the coastal Gulf was on the cool side during the spring and summer of 2008, which probably implies somewhat delayed snowmelt, and depressed glacial melt.
- In the Gulf of Alaska, higher eddy kinetic energy values were observed in the spring of 2007 and 2008. This implies phytoplankton biomass likely extended farther off the shelf and cross-shelf transport of heat, salinity, and nutrients were greater than in 2005-2006.

### **Climate Effects on Ecosystems and Ecosystem Trends**

- In a comparison between warm years (2002 to 2005) and cold years (2006 and 2007) in the Bering Sea BASIS survey, age-0 EBS pollock appear to be more broadly distributed and of higher relative abundance during warm years. They tended to be more cannibalistic in warm years and had lower energy density; whereas, in cool years they tended to switch to euphausiid-foraging and had higher energy densities. Juvenile sockeye salmon tended to consume age-0 pollock during warm years and also switched to sandlance and euphausiids in cool years. Overall there appears to be a negative relationship between relative abundance of age-0 pollock from the BASIS survey (high in recent warm years) and subsequent recruitment to age-1 pollock (low following warm years). Finally, declines in biomass of most species of jellyfish were observed in the BASIS survey in 2006 and 2007 compared to 2004 and 2005.
- Bering Sea zooplankton biomass appears to have returned towards average levels in 2006-2007 since a prolonged low period in 2001-2005.
- The relative CPUE of Arctic cod increased dramatically in the area of the cold pool in the summer Bering Sea bottom trawl survey.
- Togiak herring abundance in 2007 was below average but the stock is considered stable.
- EBS groundfish condition was low in 1999 and tended to be high in 2002-2003. Condition also tended to be higher on the outer shelf, but this may be due to the survey sampling timing.
- Spring wind-driven advection of rock sole larvae was onshore to favorable nursery areas in 2008 suggesting the potential for an above average strength 2008 year class.
- In the Bering Sea, there was an indication of a return to below average groundfish recruitment across multiple stocks in 2004. There is strong indication for above-average groundfish recruitment in the GOA from 1994-2000 and below-average recruitment since 2001.
- Overall annual surplus production in the GOA and EBS has been relatively stable. Annual surplus production of all non-pollock species in the EBS, however, decreased significantly from 1977 to 1995, increased and then has been very stable since 2000.
- EcoFOCI's pollock survival indices based on measured precipitation and wind, indicate the 2008 yearclass of GOA pollock will be average to strong and average, respectively.
- Mesozooplankton abundance in the GOA tended to peak later in the year and was longer in duration in cool, PDO-negative years compared to warmer, PDO-positive years, when the peak abundance was earlier in the year and of shorter duration. Preliminary data suggest peak mesozooplankton abundance occurred later in the year in 2008.
- The purse seine herring sac roe harvests are still closed in Prince William Sound because projected biomass is below the threshold spawning biomass.
- The mean-weighted distribution of GOA rockfish (1990-2007), especially juvenile POP, appeared to be farther north and east and was more contracted in 2007, possibly indicating a change in rockfish distribution around the GOA. The distribution of rockfish in the AI during 1991-2006 has not changed relative to depth, temperature, or position.
- An increase in lingcod bycatch in the GOA bottom trawl fleet targeting rock sole and arrowtooth flounder northeast of Kodiak Island was observed from 2005, with a dramatic increase in 2008.

- The 2007 GOA large mesh survey caught a record number of Tanner crabs at some stations in Ugak Bay. Arrowtooth flounder continues to be the main component of the offshore catches, while Tanner crab and flathead sole were the largest catches inshore. Also, Pacific cod catches were noticeably low inshore in 2007.