Hot Topics

We present items that are either new or otherwise noteworthy and of potential interest to fisheries managers as Hot Topics.

Hot Topics: Arctic

Evaluating and ranking threats to the long-term persistence of polar bears

Polar bears (*Ursus maritimus*) were listed as globally threatened under the Endangered Species Act in 2008. This listing was primarily due to observed reductions in their sea ice habitat and the expectation that sea ice coverage will continue to decline in the future (USFWS, 2008). The diminishing sea ice coverage also increases polar bear exposure to other stressors related to increasing anthropogenic activity in the Arctic, such as petroleum extraction and shipping. A new report from the United States Geological Survey (USGS) indentified stressors affecting the long-term persistence of polar bears worldwide and evaluated the relative influence of these stressors

(Atwood et al., 2015). Their study used a Bayesian network model which integrated environmental, ecological, and anthropogenic stressors.

Results indicate that the overall condition of sea ice and the availability of marine mammal prey had the most influence on the polar bear population outcomes. Stressors related to anthropogenic activity in the Arctic were much less influential to the population outcomes. The overall condition of sea ice and secondarily, the availability of marine mammal prey, were directly influenced by climate change. Polar bear population outcomes decreased by the end of the century under both stabilized and unabated greenhouse gas emissions. They concluded that minimizing the projected loss of sea ice habitat will be needed for the long-term persistence of polar bears, and will likely require stabilizing or reducing greenhouse gas emissions. Reducing the negative effects of anthropogenic activity on polar bears had a much smaller effect on polar bear population outcomes, but mitigating these human activities is more practical for resource managers to enact. *Contributed by Andy Whitehouse*

Hot Topics: Eastern Bering Sea

Chum salmon distribution, diet, and bycatch

Chum salmon diets and foraging behavior provide an important ecological dimension to understanding changes in chum salmon bycatch over time. The number of chum salmon captured incidentally as bycatch in eastern Bering Sea groundfish fisheries has varied significantly since the inception of the North Pacific Observer Program in 1991, ranging from approximately 700,000 in 2005 to 13,000 in 2010. A period of high bycatch of chum salmon in the pollock fishery occurred from 2004 to 2006. Since 2002, ecosystem studies on marine life and the physics and biology of the southeastern Bering Sea were conducted by AFSC during late summer and fall. During a period of warm years (2004-2006), the survey participants observed higher surface densities of age-0 pollock and a high proportion (90%) of age-0 pollock in the diets of immature chum salmon. Chum salmon bycatch numbers were positively correlated with surface trawl catches of age-0 pollock on the eastern Bering Sea shelf ($r = 0.83$, $p < 0.01$) and more strongly correlated surface trawl catches of age-0 pollock in regions where bycatch occurred ($r = 0.91$, $p < 0.001$). The close association between chum salmon feeding on age-0 pollock, surface trawl catch of age-0 pollock, and chum salmon bycatch highlights the importance of chum salmon foraging behavior (particularly on age-0 pollock) to chum salmon bycatch in eastern Bering Sea groundfish fisheries. *Contributed by Jim Murphy*

Increased sightings of dead birds at sea

The USFWS has conducted offshore seabird surveys on research vessels every year from 2006-2015, averaging approximately 20,000 km surveyed per year. Prior to 2014, during these surveys the USFWS observers recorded one or two dead birds a year. In 2014 there was a sharp increase in observations of dead seabirds (most appeared to be murres), with 51 recorded, including 28 during a three-day period in August; extrapolated numbers of dead birds for this offshore "die off" was conservatively estimated at approximately 32,500 birds, and was associated with a large coccolithophore bloom in the southern Bering Sea that year. In 2015, the USFWS seabird surveys recorded 19 dead birds in pelagic waters, with 8 in the coccolithophore bloom in the south Bering

Sea. In 2015, dead birds were encountered at sea from the northern GOA to the Chukchi Sea, from July through September. Throughout the spring, summer, and fall of 2015, there were also reports of dead and sickly seabirds (primarily murres) washing up on beaches throughout the northern GOA, and fewer reports in the Bering Sea. Other species affected were crested auklets, northern fulmars, shearwaters, puffins, murrelets, and gulls. At least 78 seabird carcasses were sent to the National Wildlife Health Center in Virginia for necropsy and tested for toxins. To date, nearly all birds were emaciated and none had indications of disease or toxins, suggesting the birds starved to death due to lack of food or because their ability to forage was affected. However, it is unknown if the starvation was proceeded by illness or toxic exposure that affected the bird's ability to forage. *Contributed by Kathy Kuletz and Elizabeth Labunski*

Hot Topics: Gulf of Alaska

Too warm for larval walleye pollock survival in 2015?

The 2015 Eco-FOCI GoA larval survey was conducted from May 14 to June 5. A total of 276 stations were sampled using the 20/60 cm bongo array with 0.153/0.505 mm mesh to collect larvae and zooplankton. Tows were conducted to 10 meters off bottom or 100 meters maximum. A Sea-Bird FastCat was mounted above the bongo array to acquire gear depth, temperature, and salinity profiles. Argos satellite-tracked drifters were released at each of the following locations: the base of Shelikof Strait, Gore Point, Amatuli trough, and the east side of Kodiak Island, to study drift and transport of walleye pollock larvae. All drifters were drogued at 40 meters (depth of larval pollock residence) to assess current strength and direction.

Larval walleye pollock rough counts for 2015 were consistently lower throughout the grid compared to the counts in 2013 (Figure 1, note drastic reduction in RCountL scale range for 2015). The temperature field at 40 meters in 2015 was also 3-5°C warmer than in 2013. From the drifter tracks, we found persistent eddies (Figure 2) at the base of Shelikof Strait and along the east side of Kodiak Island (a recent update shows that the Shelikof drifter has spun out of the eddy and is heading towards the Alaska Peninsula). The drifter released off of Gore Point did not pass through Kennedy Strait and down Shelikof Strait, as would be expected, but is instead heading down the east side of Kodiak Island. The Amatuli trough drifter has been flushed out into the Gulf of Alaska.

We found above-average abundances of larval walleye pollock in 2013, but the 2013 year-class was reported to have resulted in slightly below average numbers of age-1 recruits in Table 1.18 of the 2014 Gulf of Alaska pollock stock assessment. Based on the low rough counts of larval walleye pollock and higher temperatures found in 2015, will the 2015 year-class result in even lower age-1 returns and potentially be deemed a recruitment failure? *Contributed by Ann Dougherty*

Very few age-0 pollock in late summer, 2015

The purpose of Eco-FOCI late-summer research in the western Gulf of Alaska (GOA) is to extend a time series of age-0 walleye pollock abundance estimates, and to monitor the neritic environment with special focus on primary (walleye pollock, Pacific cod, rockfishes, sablefish, and arrowtooth flounder) and secondary (capelin and eulachon) fishery species. The goal during 2015 was to sample

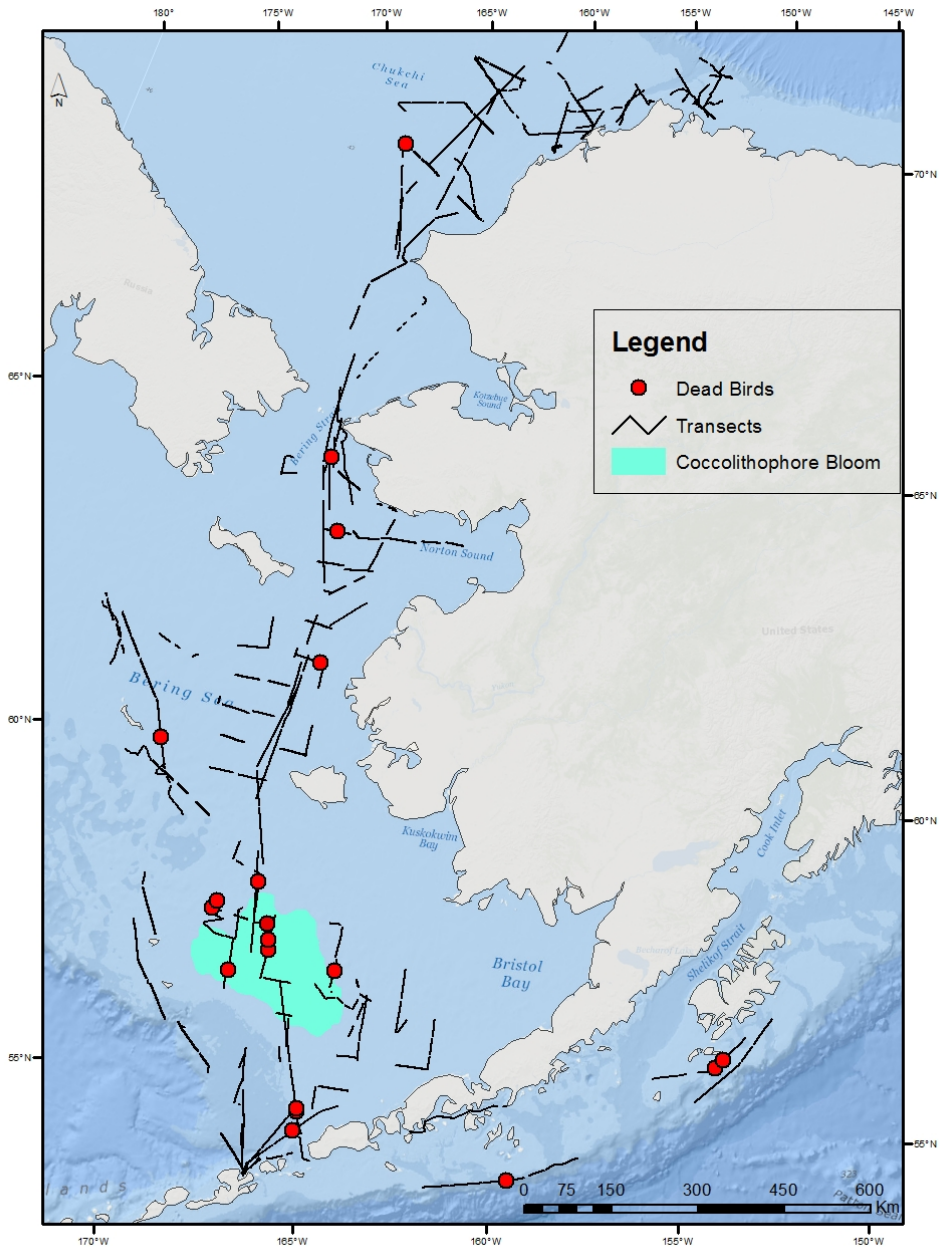

Figure 8: Dead birds observed during surveys from July through September 2015. A coccolithophore bloom is delineated in light blue.

at sites that were occupied during late-summer 2013; however, weather and ship time constraints prevented a complete repetition.

There were fewer age-0 walleye pollock in the Eco-FOCI index area in 2015 than in any other year in the time series (Figure 11). On average, there were 70 individuals per square kilometer of sea surface area (0.00007 fish / m^2). This corresponds with the low number of pollock larvae observed earlier during spring (see Dougherty topic above). Three of the 26 index sites were not occupied

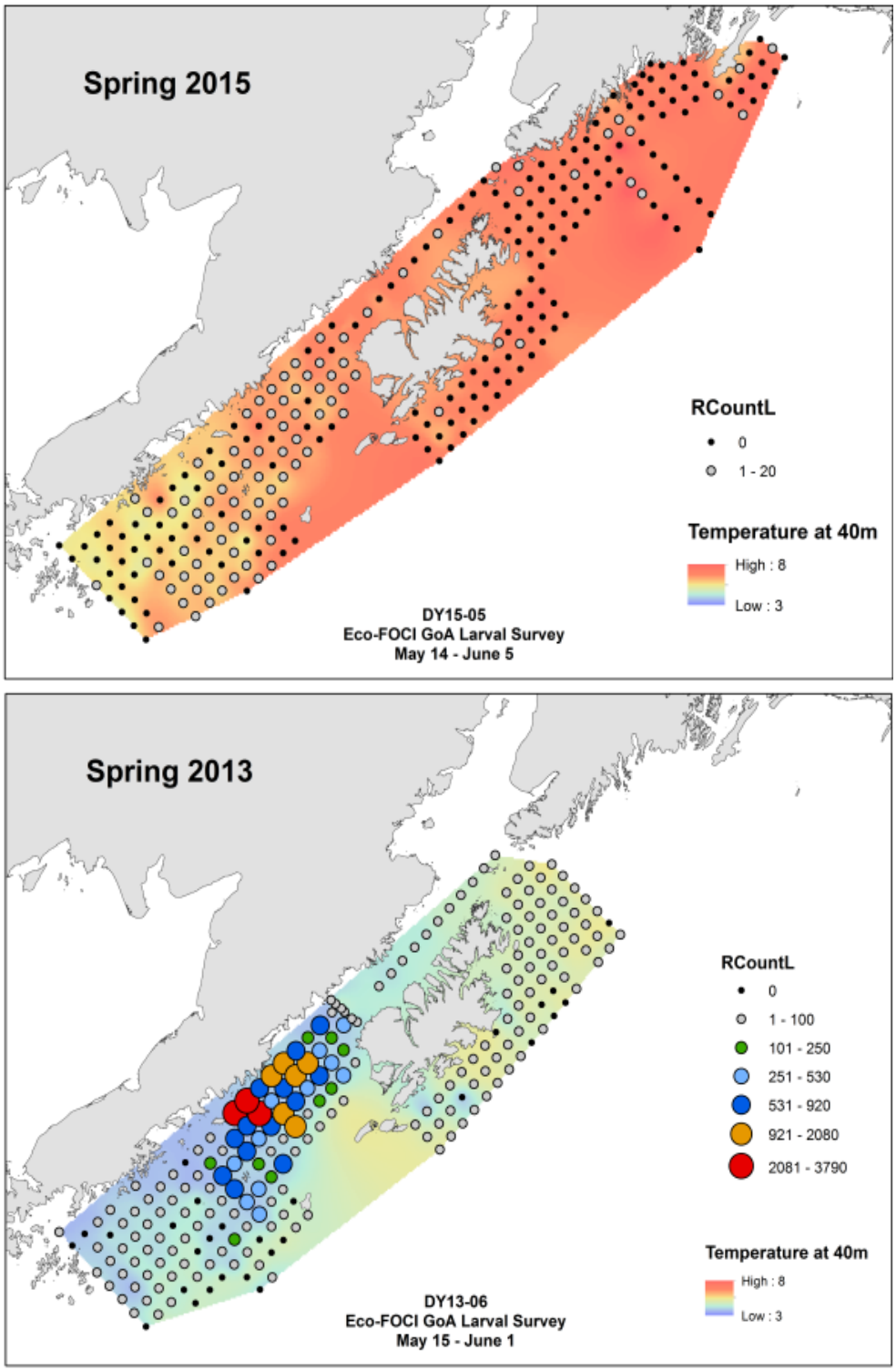

Figure 9: Temperatures and larval walleye pollock abundances as determined at sea in 2015 (top) and 2013 (bottom). 2015 was much warmer with many fewer larval pollock observed.

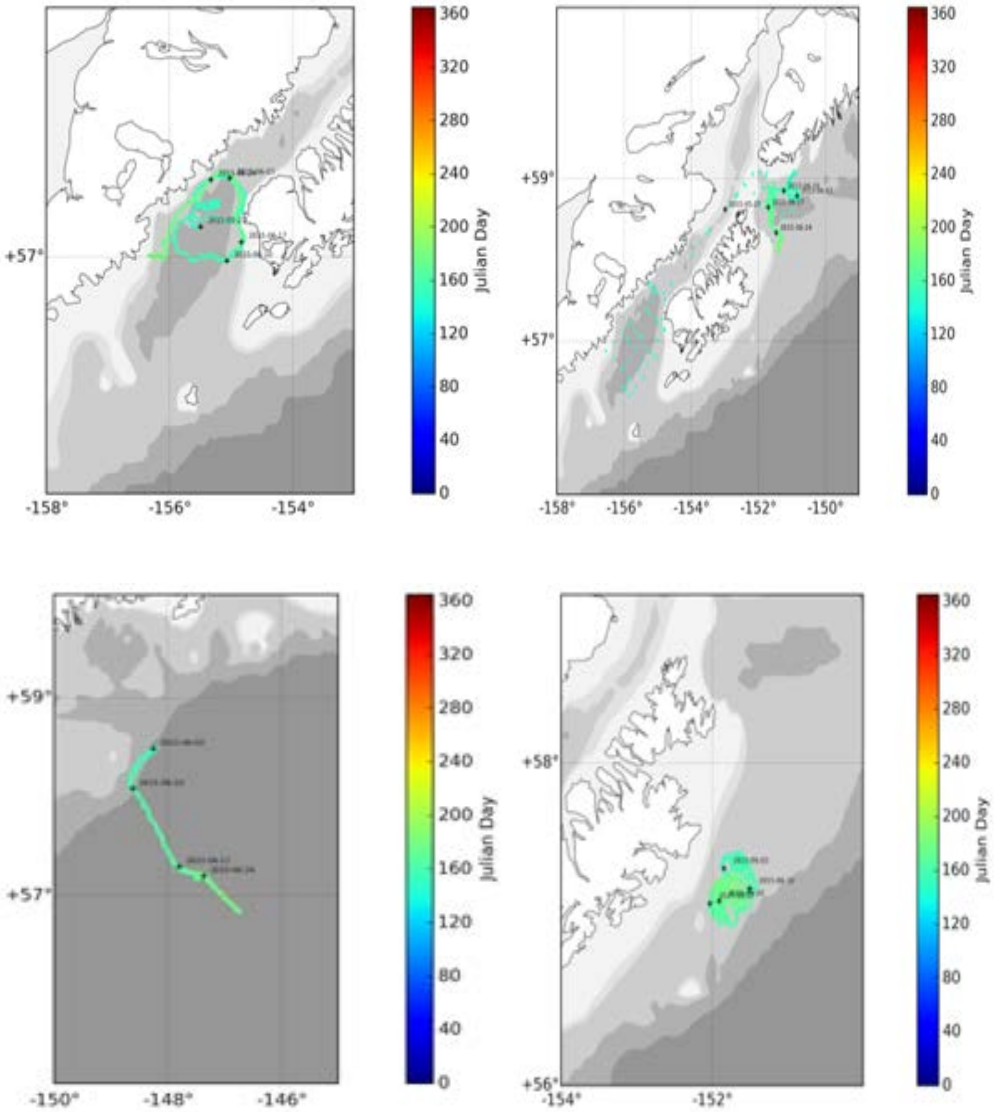

Figure 10: Trajectories of satellite-tracked drifters deployed during the EcoFOCI Late Larval Survey in 2015. Trajectories indicate anomalous circulation patterns over the GOA shelf in 2015.

due to bad weather; nevertheless, the 2015 year class appears to be very small.

Geographically, age-0 walleye pollock were more abundant in the Eco-FOCI index area than off east Kodiak Island (Fig. 1). This is consistent with previous years; however, the extended coverage revealed relatively high abundance estimates in Shelikof Strait (Figure 12). In addition to the low abundance of age-0 pollock, very few age-1 individuals were collected (ca. 14-20 cm SL) as evident in the size composition (Figure 12 inset). Another noteworthy finding was that large numbers of age-0 juvenile rockfishes (ca. 9-50 mm total length) were encountered in Shelikof Strait as part of a larger concentration around the eastern end of the Kodiak Archipelago (Figure 12). Age-0 rockfishes were also abundant west of the Shumagin Islands. This was the first year age-0 rockfishes were enumerated as part of the Recruitment Processes Alliance with the Ecosystems Monitoring

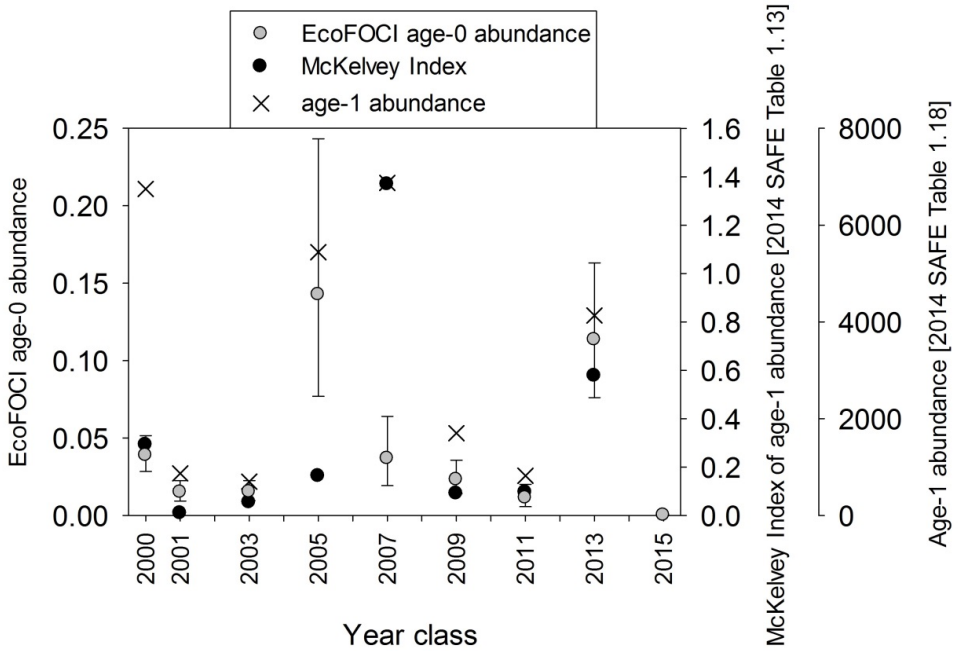

Figure 11: Abundance of year-classes of pollock measured as age-0's during late summer (Eco-FOCI, mean +1 SE), winter age-1 (McKelvey Index), and estimated as age-1 in the GOA pollock stock assessment (Dorn et al., 2014)

and Assessment Program at the Auke Bay Laboratory so it is not possible to compare late-summer abundance with previous years, but larval rockfishes were also unusually abundant during the spring ichthyoplankton survey (A. Dougherty pers. commun.).

Unusual Mortality Event for Marine Mammals

Since May 2015, elevated numbers of large whale mortalities have occurred in the Western Gulf of Alaska, encompassing the areas around Kodiak Island, Afognak Island, Chirikof Island, the Semidi Islands, and the southern shoreline of the Alaska Peninsula (Figures 13 and 14). This event has been declared an Unusual Mortality Event (UME). Most whale carcasses have been floating and were not retrievable. Also, the majority of carcasses were in moderate to severe decomposition with only one whale sampled to date. *As reported at* `http://www.nmfs.noaa.gov/pr/health/mmume/large_whales_2015.html`

One suspected cause is a harmful algal bloom, according to Bree Witteveen, UAF (Alaska Dispatch News, June 18, 2015).

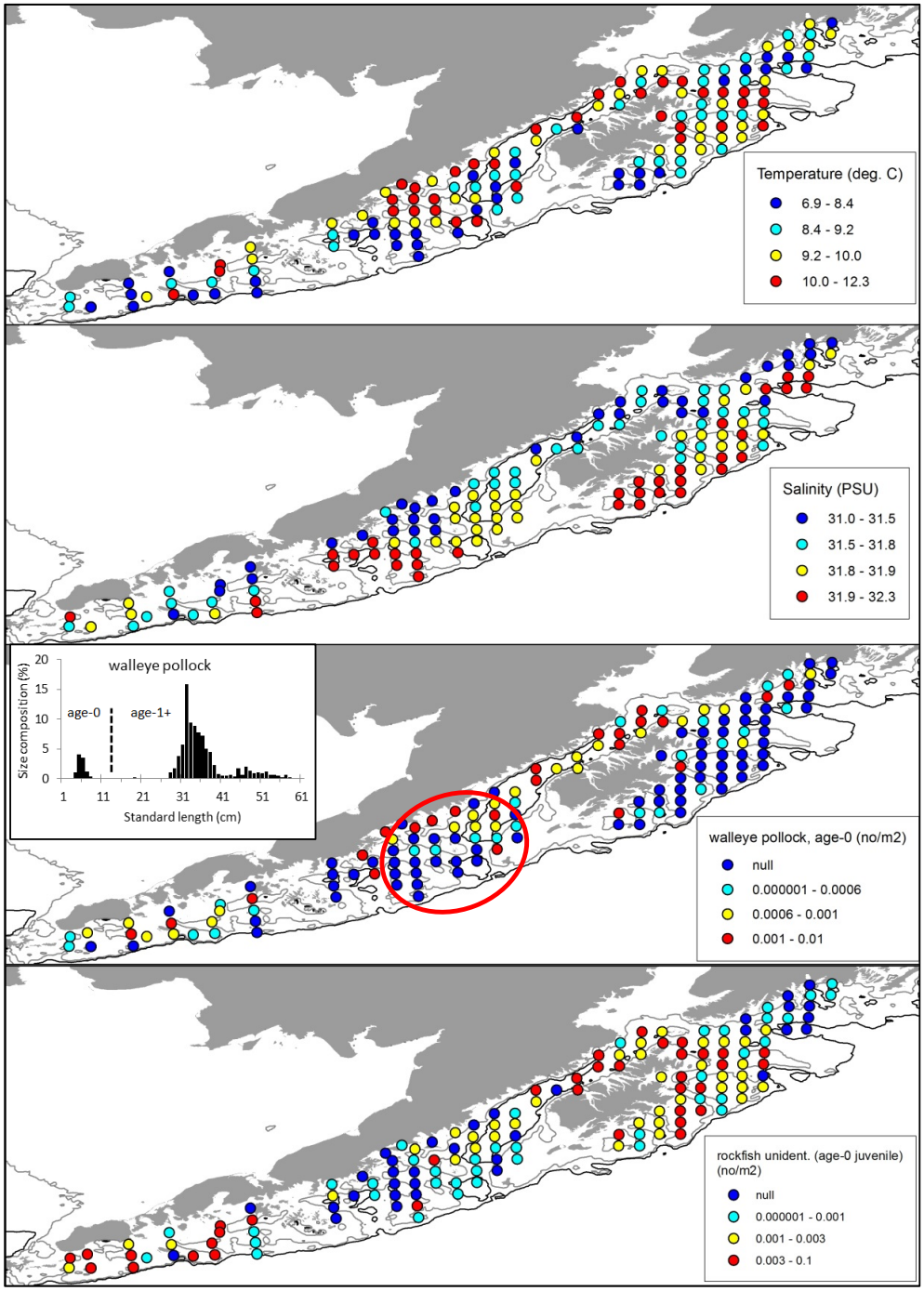

Figure 12: Geographic distributions of water temperature and salinity, measured at 40-m depth, and abundance estimates of two groups of age-0 juvenile fishes: walleye pollock and rockfishes during August-September 2015. For walleye pollock, the age-0 portion of the pollock population is identified on the inset size composition and the index area is within the red circle.

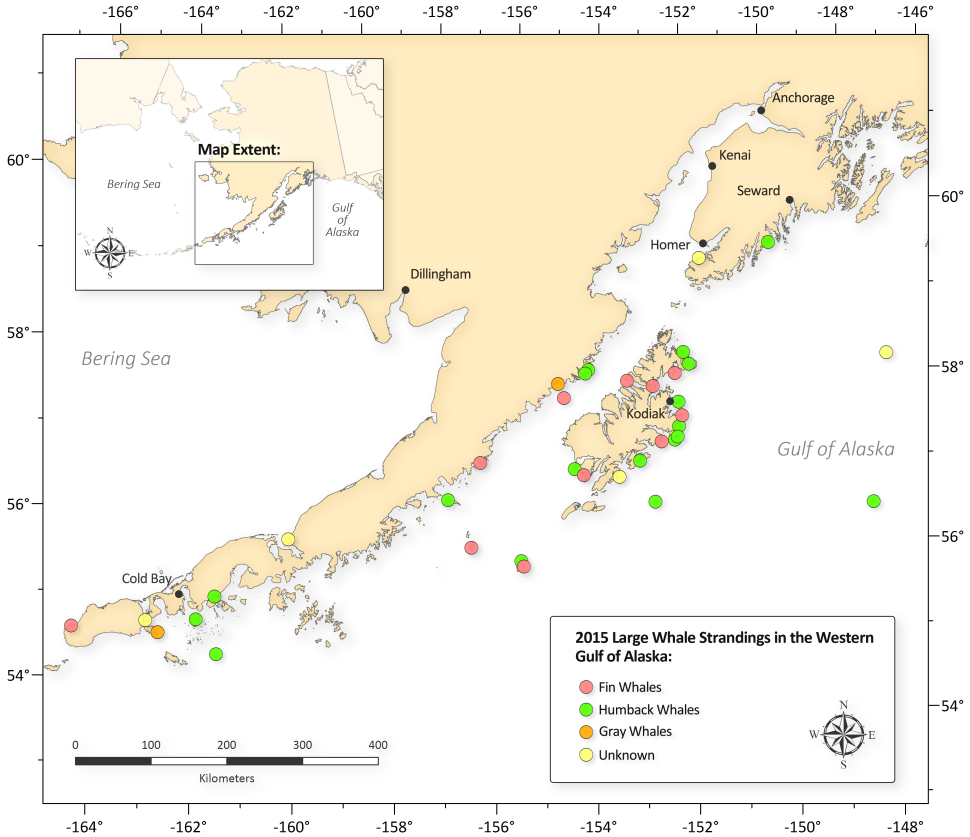

Figure 13: 2015 large whale stranding locations in the Western Gulf of Alaska through October 2, 2015 (`http://www.nmfs.noaa.gov/pr/health/mmume/large_whales_2015.html`)

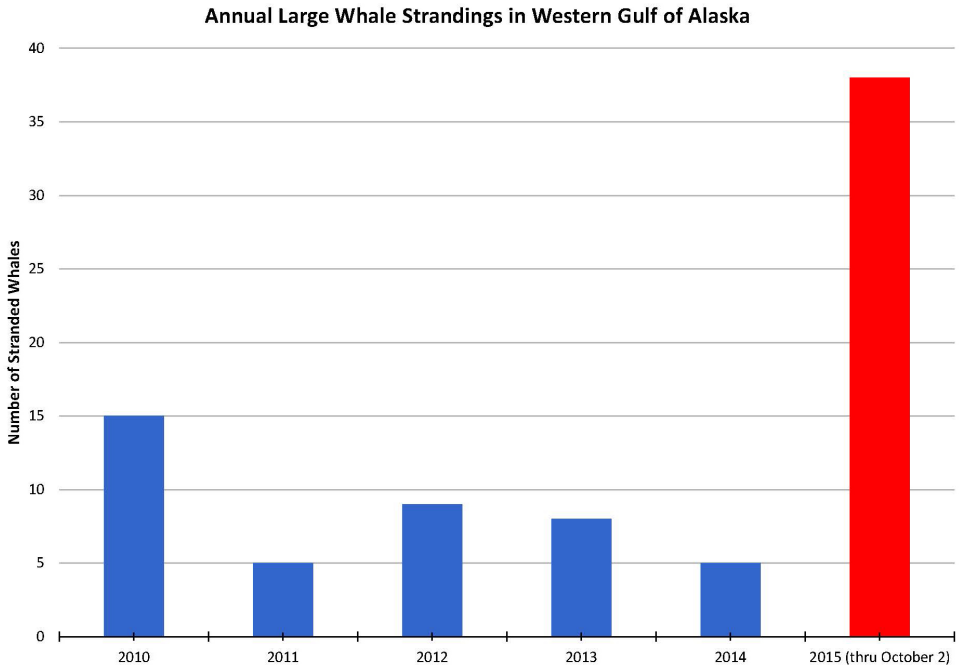

Figure 14: 2015 large whale stranding numbers in the Western Gulf of Alaska through October 2, 2015 (`http://www.nmfs.noaa.gov/pr/health/mmume/large_whales_2015.html`)