



The role of environmental indicators in ecosystem-enhanced Bering Sea pollock fishery management

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Eastern Bering Sea pollock annually conducts long distance northward seasonal migration for feeding from winter and spawning grounds area located in the southeastern Bering Sea.

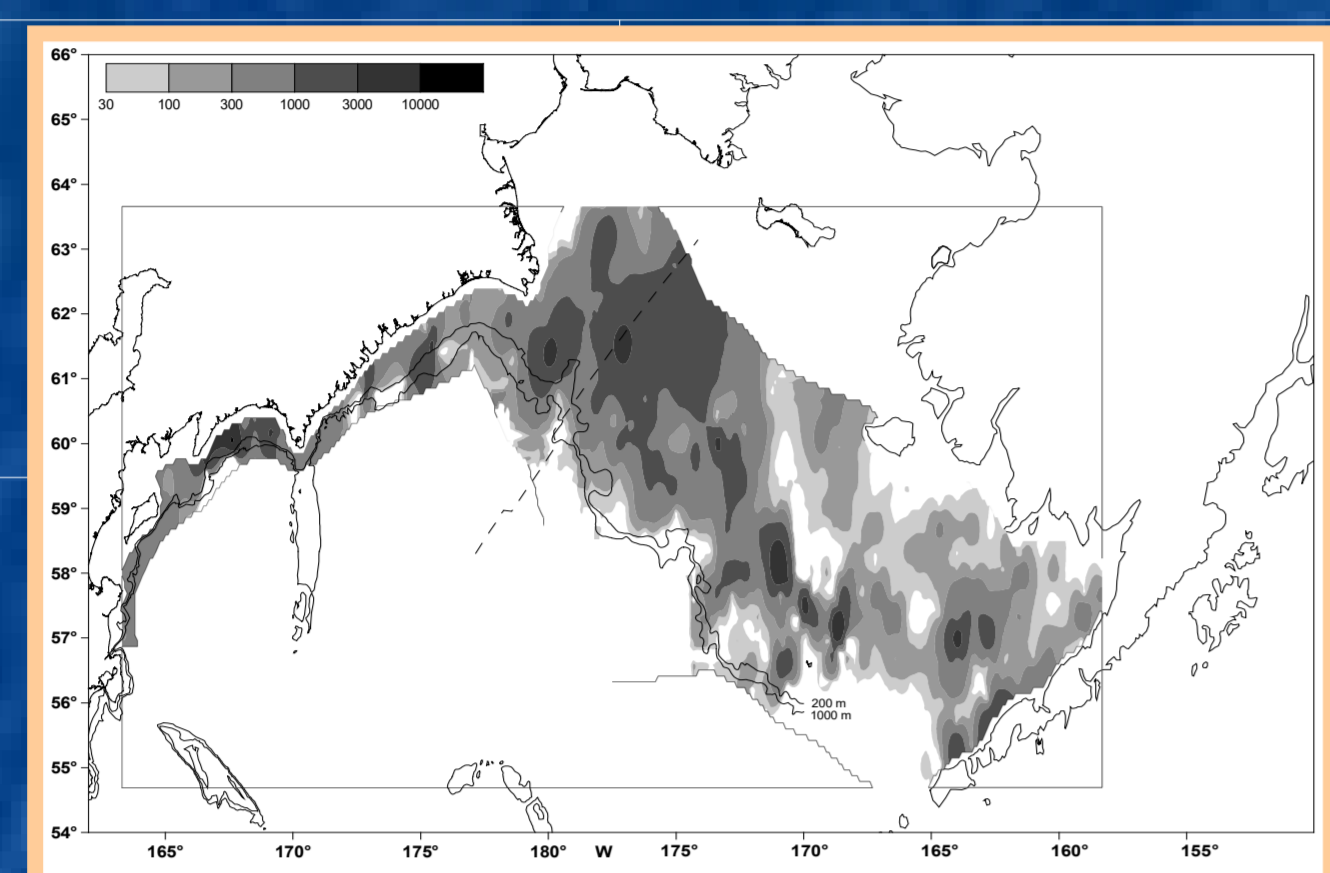


Fig. 1. Pollock regular distribution (fish/0.5 hour tow) in the Bering Sea in summer-autumn period

Great interannual shift to warming in 2013-2015 had clear effects on the pollock behavior and spatial distribution in the northwestern Bering Sea in feeding period.

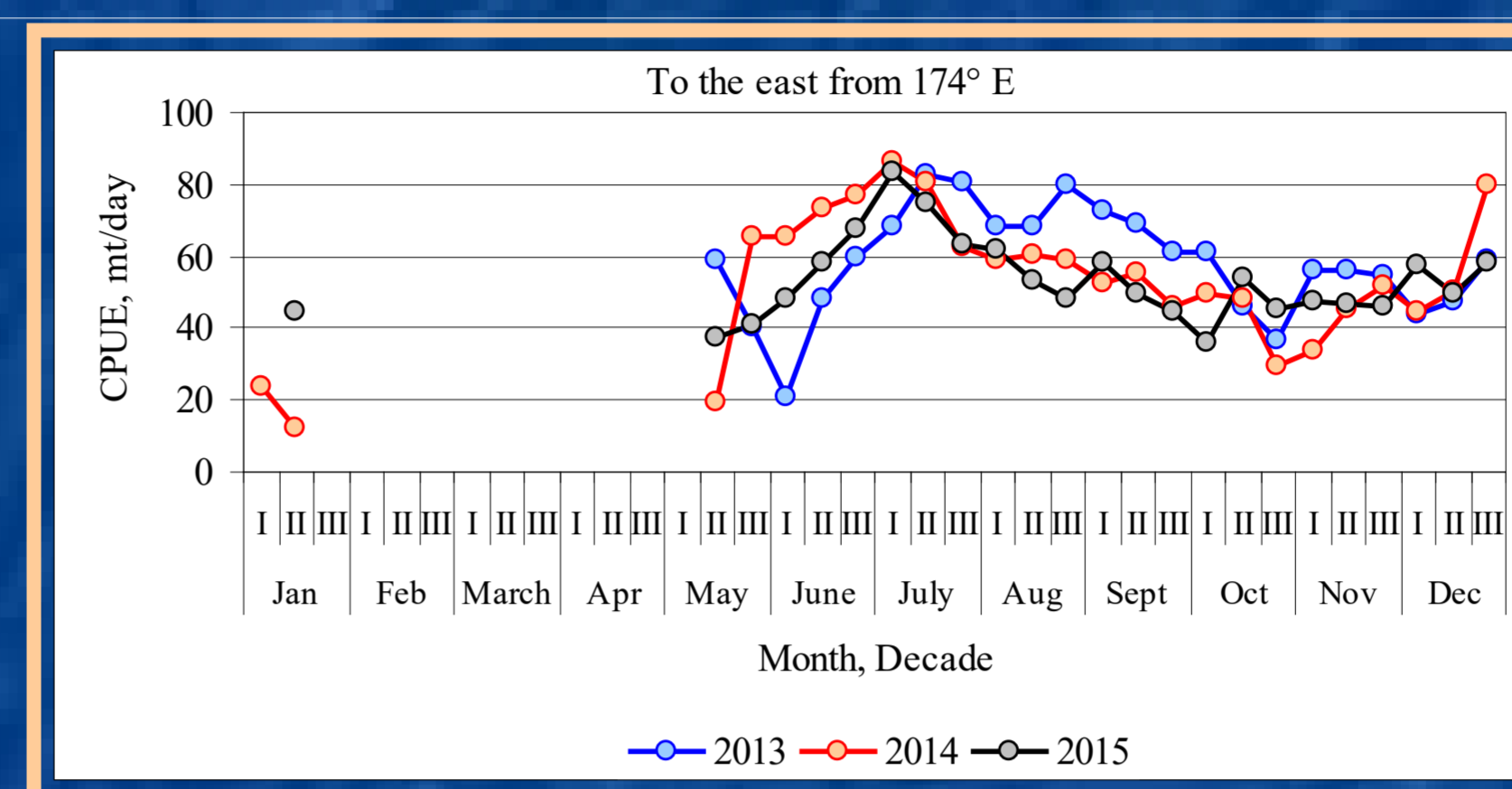


Fig. 2. Seasonal variability pollock catch by factory trawlers (mt/day) in the northern Bering Sea, 2013-2015

Seasonal pollock migration and distribution in the northwestern Bering Sea have high annual variability depends on bottom temperature and zooplankton abundance. Pollock demonstrated differences responses to cold and warm temperature.

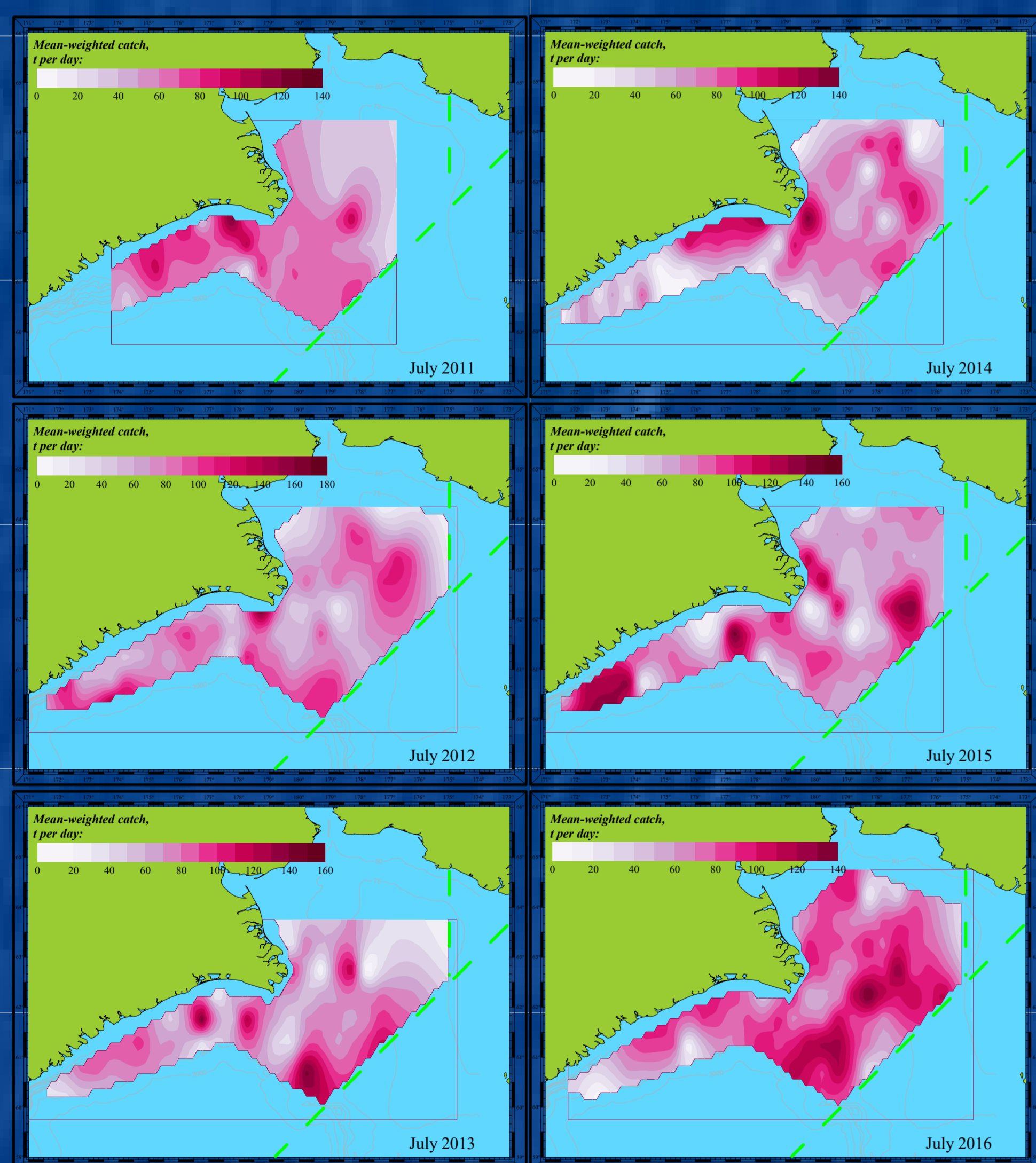


Fig. 3. The density distribution of pollock clusters in the northwestern Bering Sea (area east of 174° E) in July 2011-2016 (catch of factory trawlers, tons per day of fishing).



Fig. 4. Distribution density (ind./km2) of different size groups of pollock in the northwestern Bering Sea in July-August 2012 (based on the bottom trawl survey data).

Fig. 4. Distribution density (ind./km2) of different size groups of pollock in the northwestern Bering Sea in June-August 2015 (based on the bottom trawl survey data).

Total scale of pollock distribution into northwestern Bering Sea in summer feeding period is much higher in warm temperature condition, but comparable at different trophic level, in low or high zooplankton abundance in the Bering Sea.

The pollock northward migration speed is lower in years of high large zooplankton abundance, however it duration is longer (summer and first part of autumn), therefore maximum pollock biomass observed in the northwestern Bering Sea in autumn period. The pollock northward migration speed is much higher however it duration is much shorter (just in summer period) in years of low zooplankton abundance, therefore maximum pollock biomass in the northwestern Bering Sea observed in summer period.

The climate shift, bottom temperature and large zooplankton abundance are most valid environmental indicators for ecosystem-based strategy of the Bering Sea pollock fishery management explore.