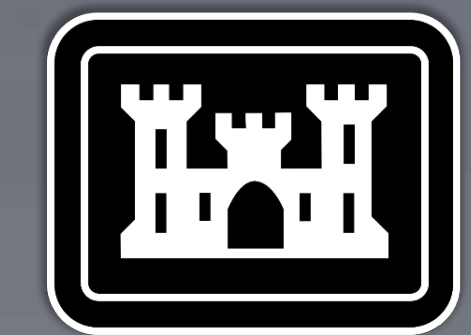




Biological Monitoring of Dredged Material Disposal Sites Offshore of the Mouth of the Columbia River

Joel H. Salter¹, Bridgette A. Lohrman¹, James M. McMillan²

¹ U.S. Environmental Protection Agency – Region 10, Portland, Oregon. ² U.S. Army Corps of Engineers, Portland District.



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Portland District

BACKGROUND

Regional sediment management occurs in a collaborative and effective manner at the Mouth of Columbia River (MCR) through the interagency and multi-stakeholder Lower Columbia Solutions Group. The US Army Corps of Engineers-Portland District (USACE) annually dredges up to 5 million cubic yards (Mcy) of sand from the 6-mile long MCR federal entrance channel. Maintenance of this channel ensures safe navigation for mariners and facilitates interstate and foreign trade for ports in the Pacific Northwest.

Up to 5 Mcy of sand are dredged annually to maintain the MCR channel. The U.S. Environmental Protection Agency (EPA) and USACE co-manage a network of three nearshore sites and one offshore site in the Pacific Ocean to receive this dredged material. These sites are managed in accordance with the Marine Protection, Research, and Sanctuaries Act and the Clean Water Act with emphasis on beneficial use of the dredged material by the resource agencies and the Lower Columbia Solutions Group. At the MCR, placement of dredged material closer to shore allows for the material to provide resiliency to the coastline by feeding beaches and protecting coastal infrastructure and communities.

GOAL & OBJECTIVE

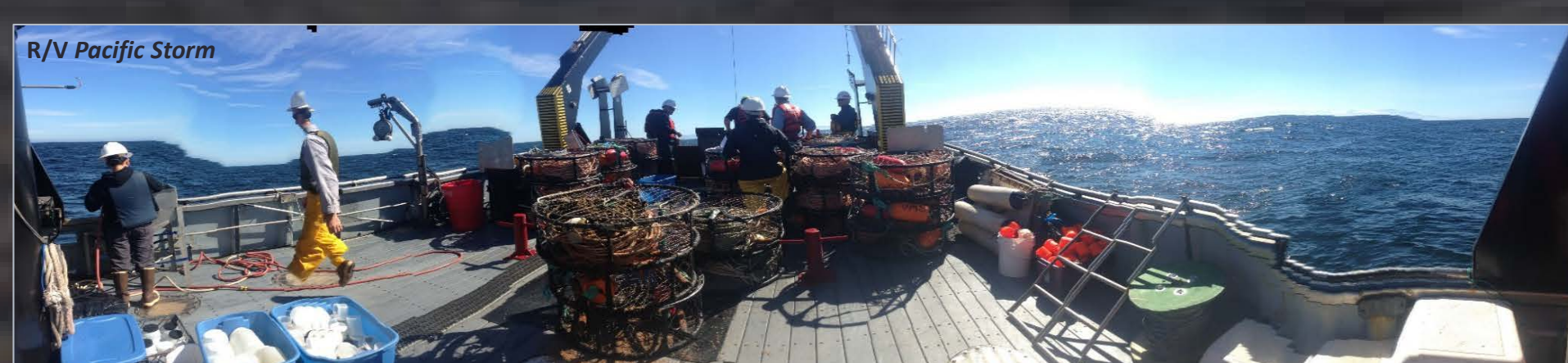
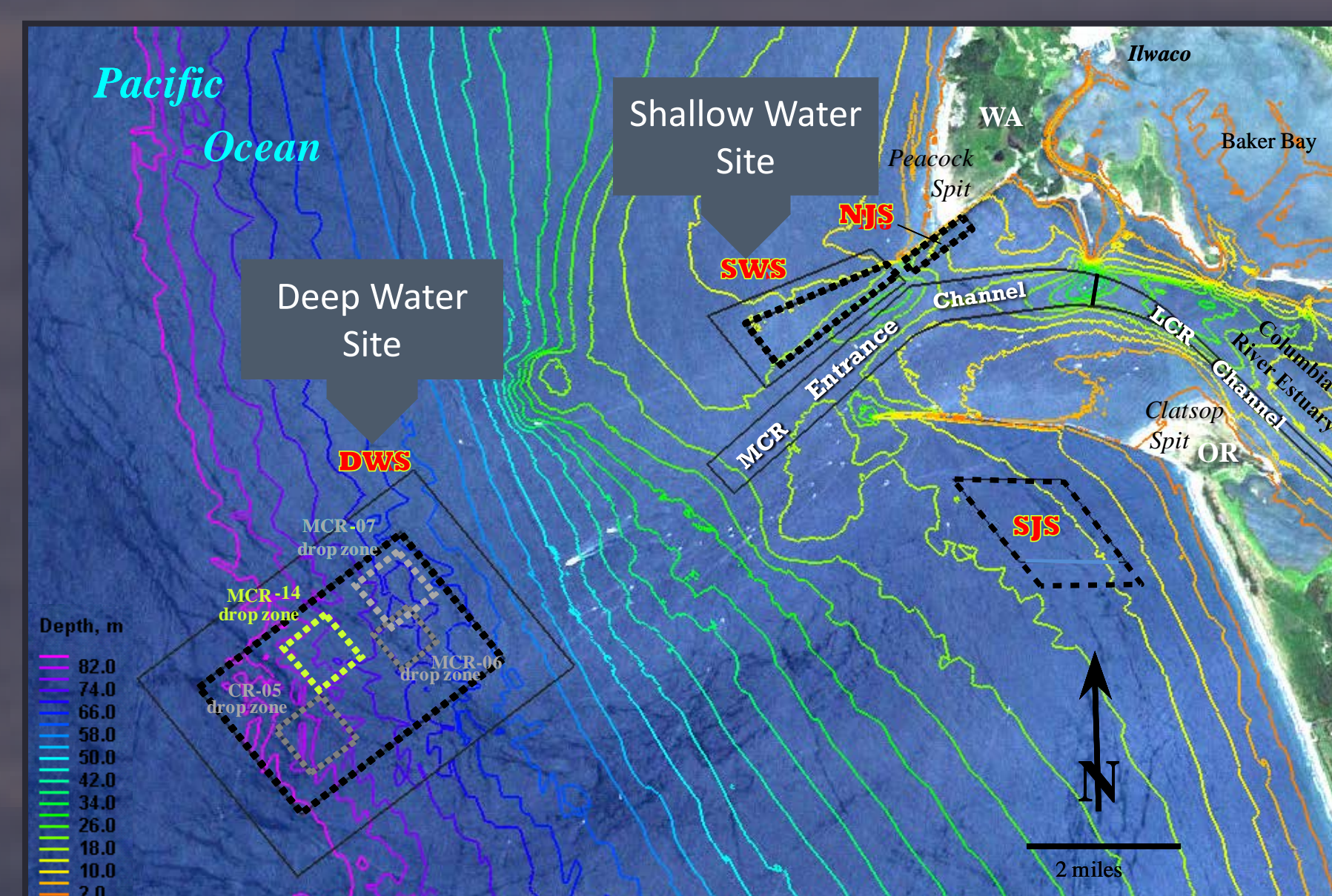
Goal: Ensure that the nearshore Shallow Water Site and offshore Deep Water Site are managed in compliance with the Marine Protection, Research, and Sanctuaries Act.

Objective: Assess the impacts of dredged material disposal on benthic and epibenthic communities at EPA's Shallow Water Site and Deep Water Site.

SURVEY AREA

Shallow Water Site (SWS): Located within 2 nmi of shore. Area: 1,198 ac (465 ha). Depth: 45-75 ft. ~1.7 Mcy dredged material disposed annually between July and October.

Deep Water Site (DWS): Located 6 nmi offshore. Area: 10.5 nmi² (4 drop zones [DZs]). Depth: 170-320 ft. ~1.3 Mcy dredged material disposed annually between July and October.

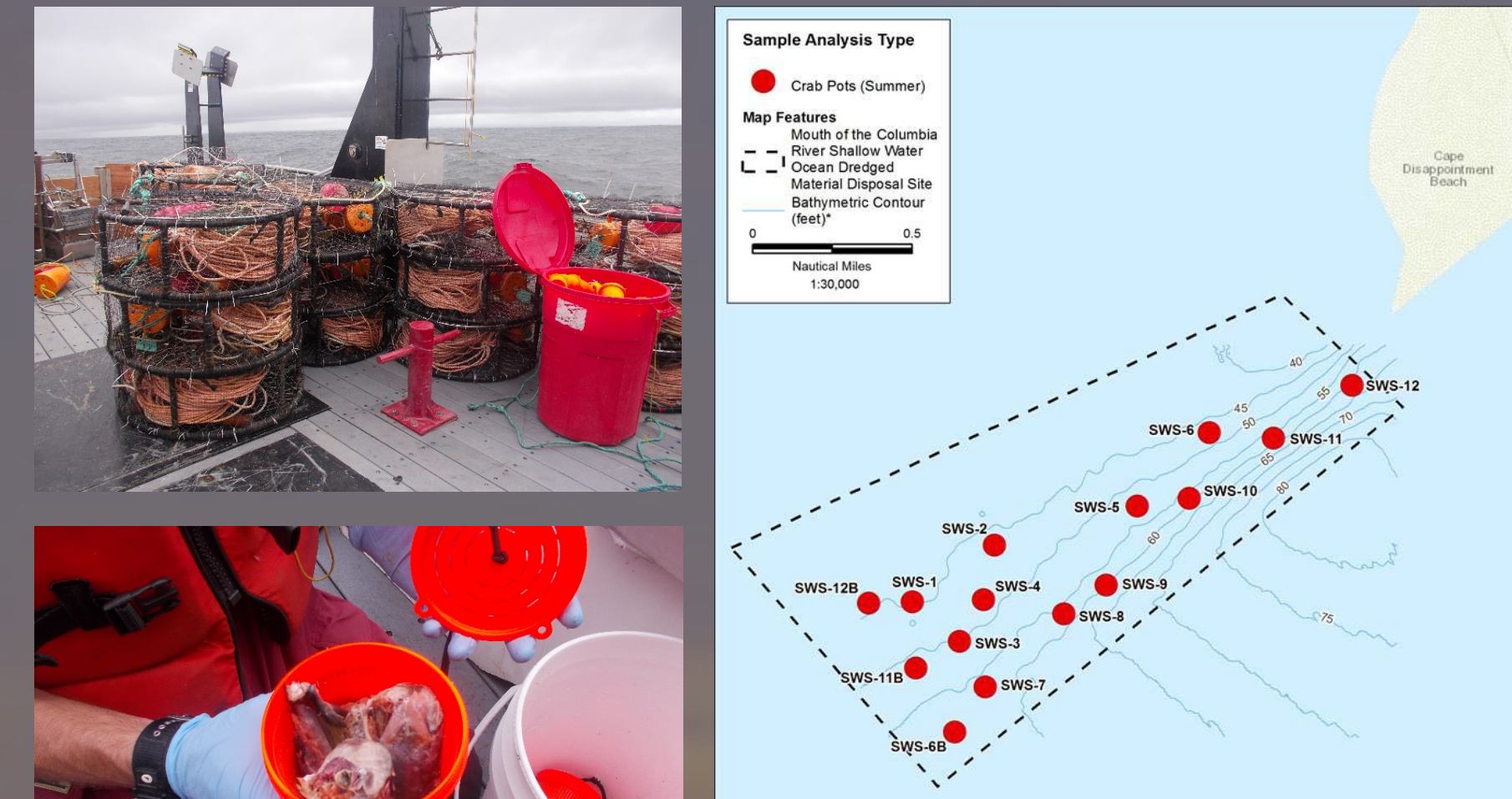


METHODS

EPA surveyed the Shallow Water Site and Deep Water Site in summer and fall 2014.

SHALLOW WATER SITE (SWS)

Summer 2014. Deployed commercial crab pots covered in ¾-inch diagonal mesh at 15 stations for 2-24 hour soaks. Crabs were sexed, measured, examined for shell condition, and returned to the water.

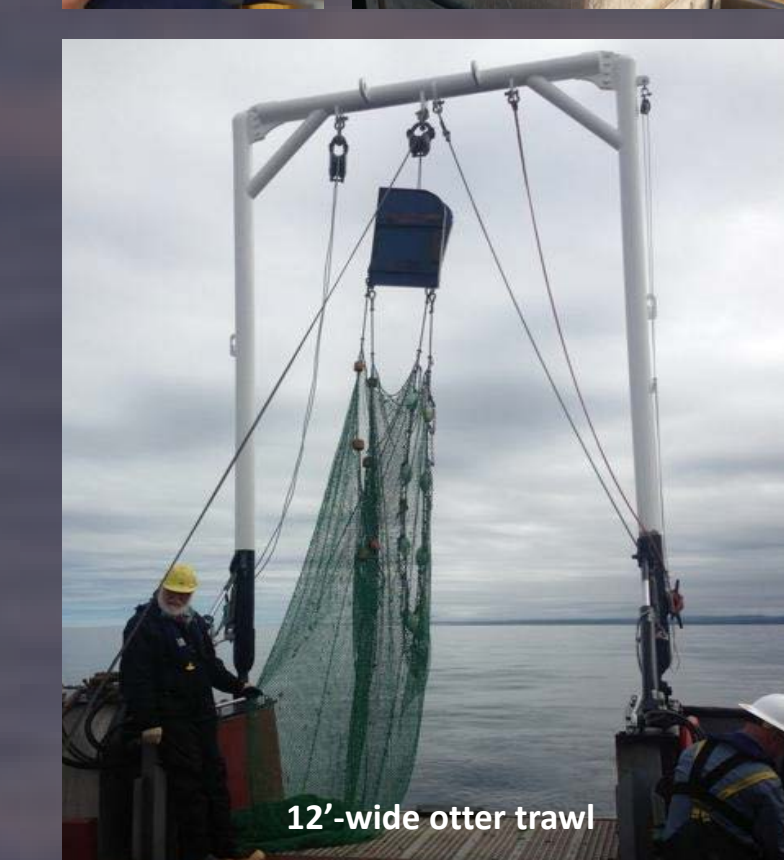
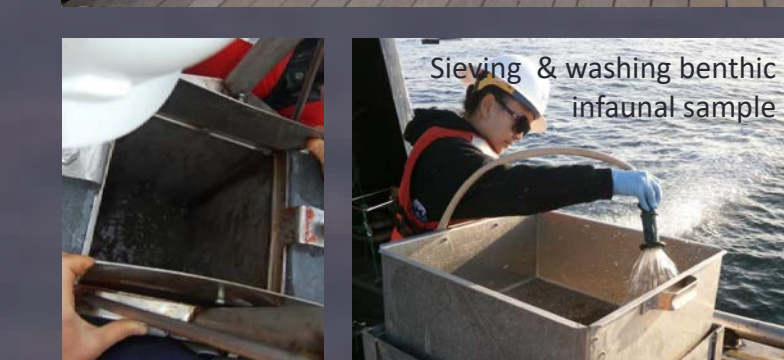
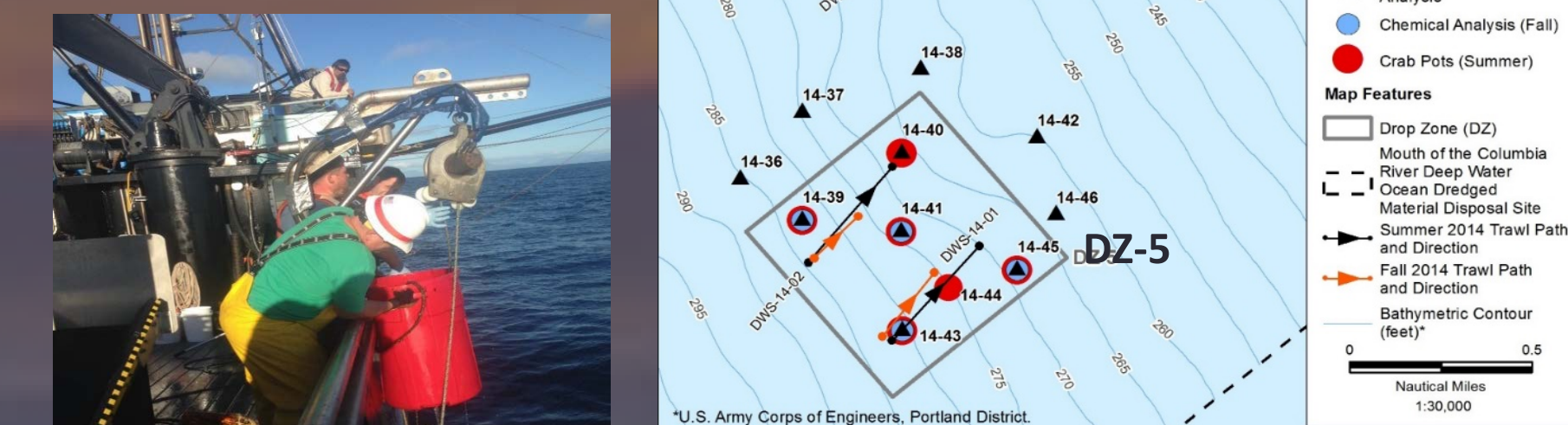


Each crab trap was baited prior to soak; crab pots were set within 50' of the station.

DEEP WATER SITE (DWS)

DZ Disposal History

- DZ-5 used 5 years prior to sampling;
- DZ-6 used 8 years prior to sampling;
- DZ-7 used 1 year prior to sampling;
- DZ-14 1st used in 2014 (during fall).

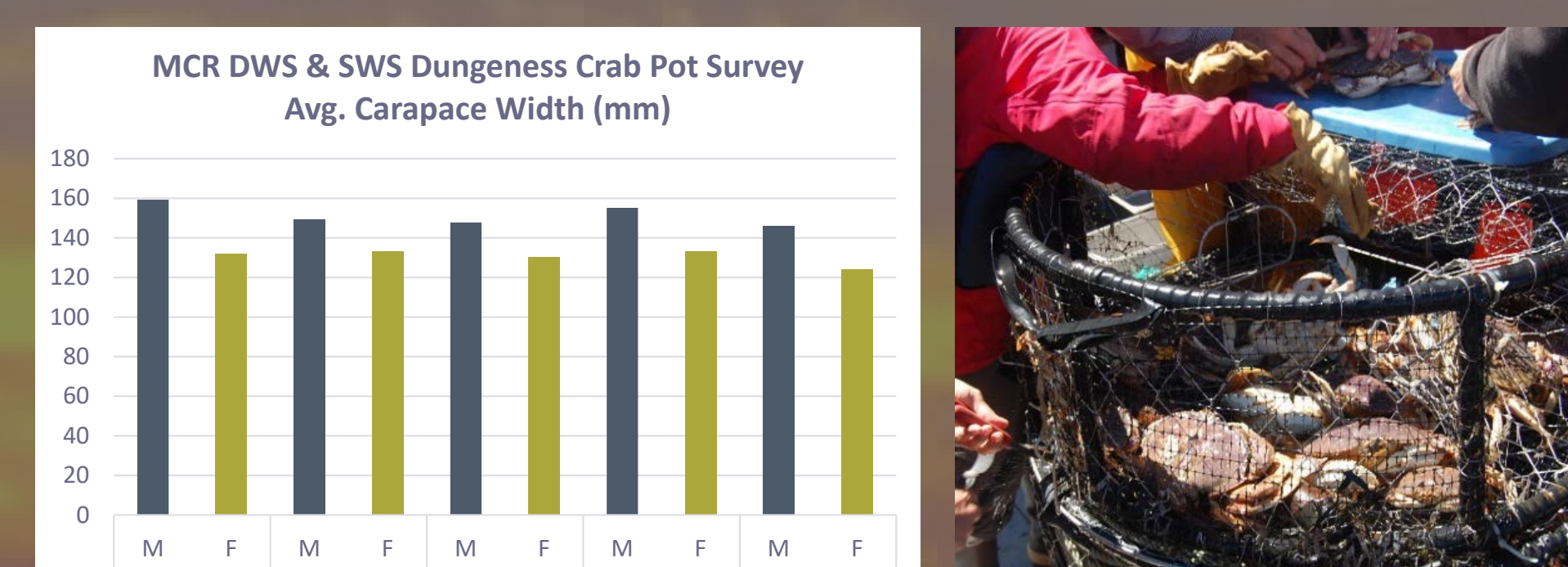
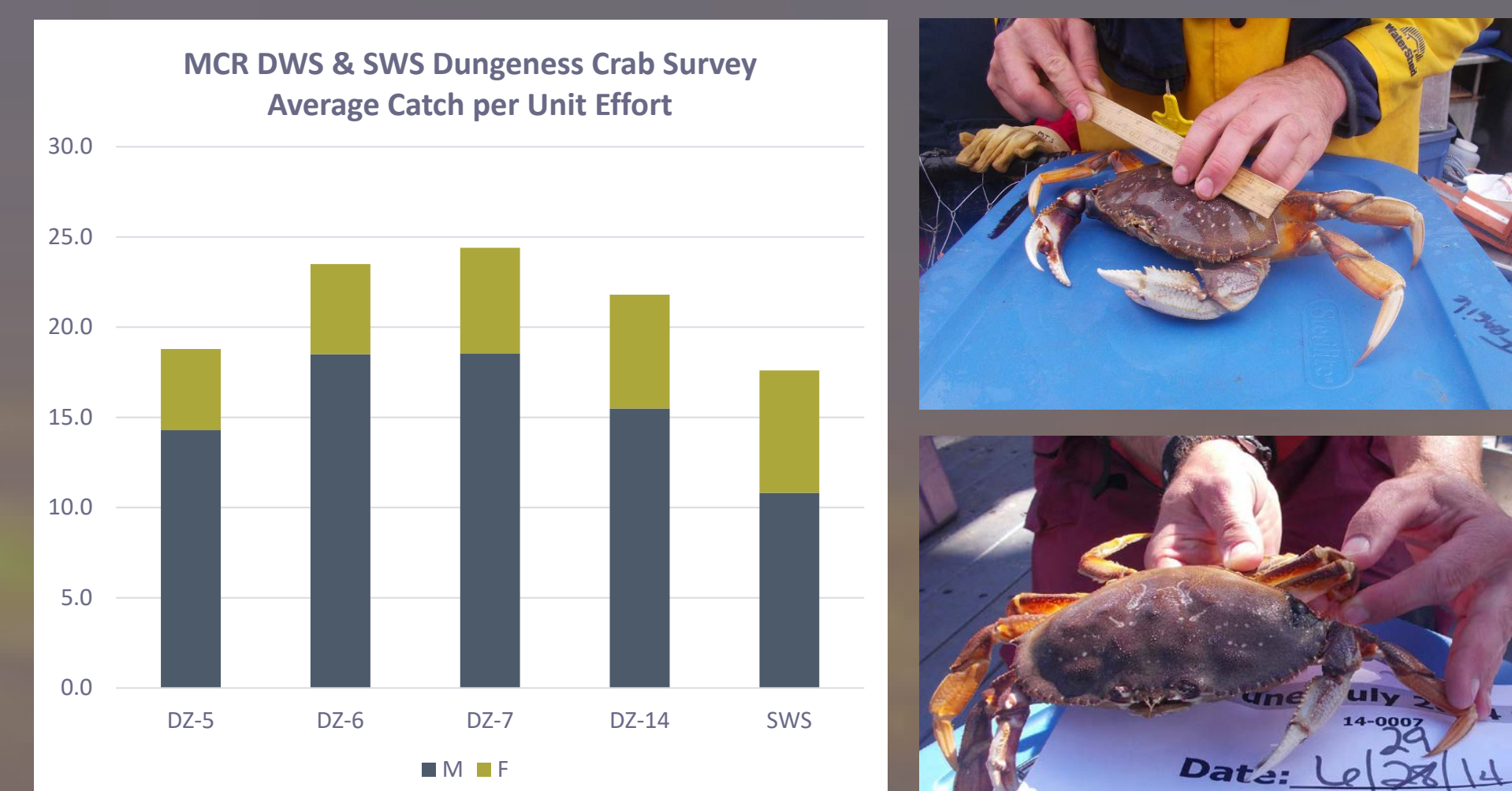


- Dungeness crab (summer only). Commercial crab pots deployed at 24 stations in all 4 DZs. 2, 24-hr soaks. Crabs counted, sexed, measured, and assessed for lesions/damage.
- Benthic infauna (summer and fall): 5 stations inside and outside of DZs 5, 6, 7. 10 stations inside DZ 14.
 - Each sample checked for penetration (5 cm minimum).
 - Sediment was gently washed through a 0.5-mm-mesh box sieve.
 - Material retained on the sieve collected, preserved, and sent to a lab for taxonomic ID.

- Epibenthic fish and invertebrates (summer and fall): 2, 10-min trawls in DZs 5, 7, and 14.

RESULTS

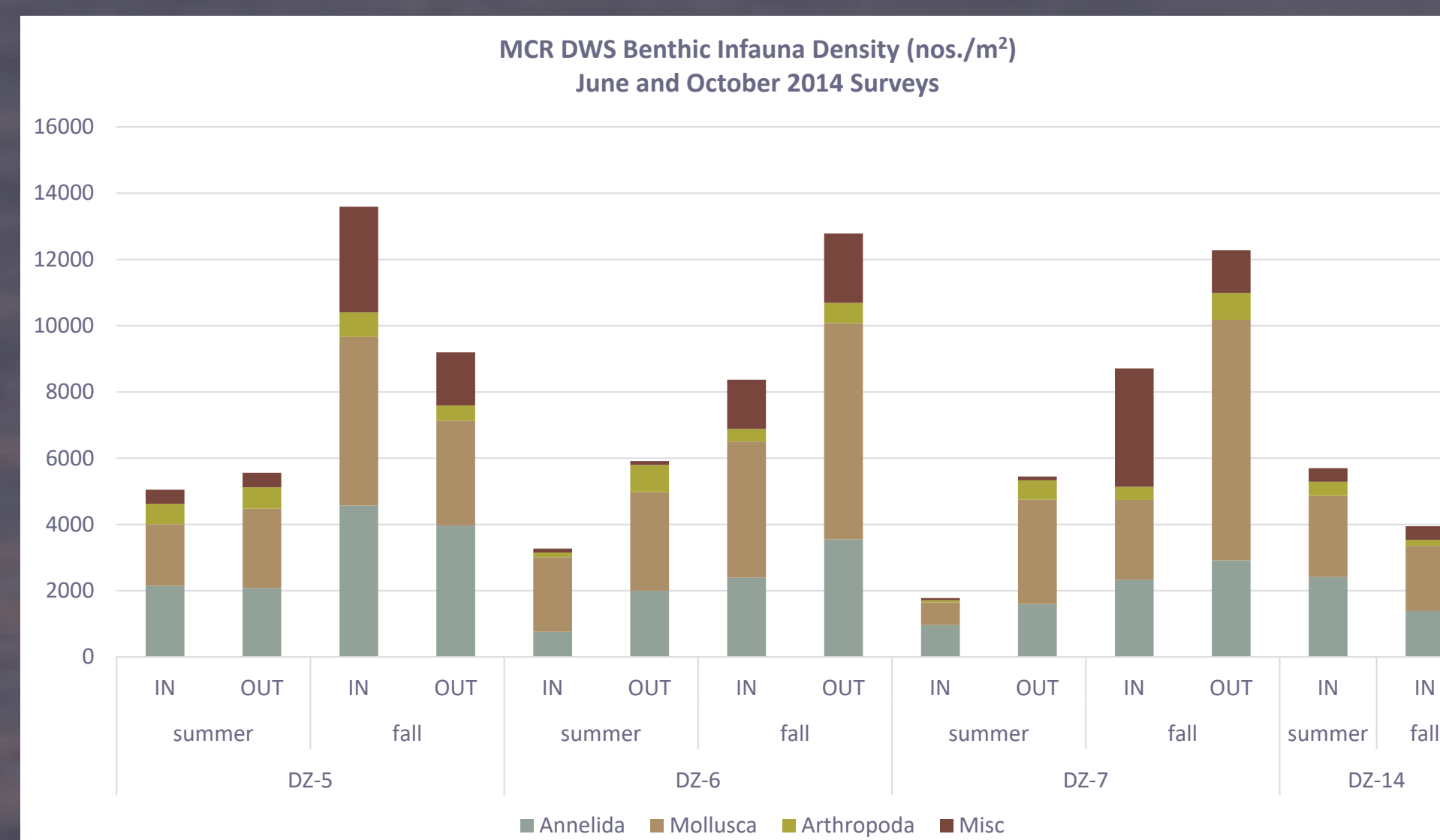
COMMERCIAL CRAB POT SURVEY (SHALLOW WATER SITE & DEEP WATER SITE)



A total of 423 individuals were caught in the SWS – a similar catch per unit to a 2005 EPA survey. More males were caught per unit effort than females. The sex ratio at the SWS was found to be ~3M:1F.

A total of 1,044 individuals were caught in the DWS – also a similar catch per unit to EPA's 2005 survey. More males were caught per unit effort than females. The sex ratio of crabs at the DWS was similar to that found at the SWS. Male carapace size was slightly larger with increasing depth.

BENTHIC INFAUNA (DEEP WATER SITE ONLY)



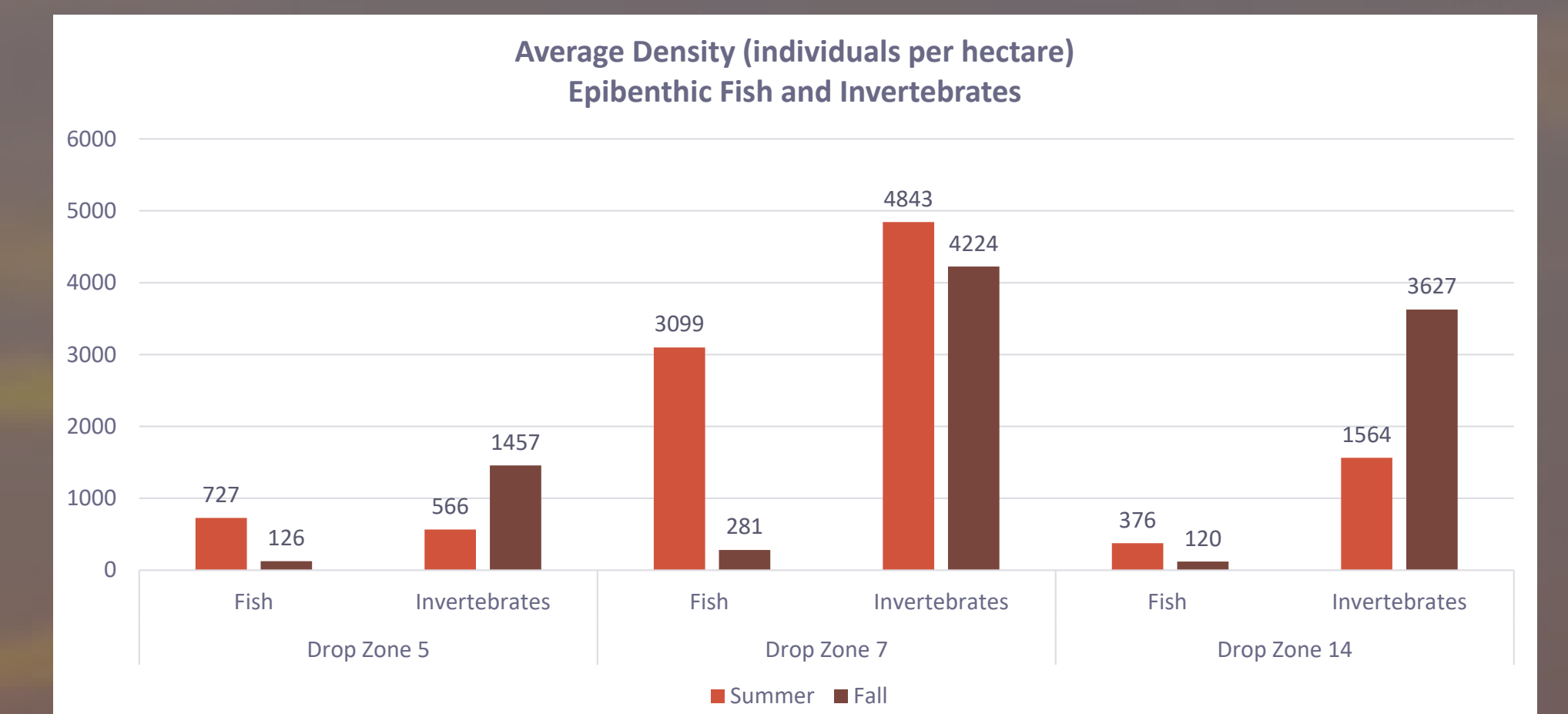
In DZs 5, 6, and 7 and their corresponding reference areas, an increase in infaunal density was observed between the summer and fall. However, infaunal density in DZ 14 decreased between summer and fall; this was likely due to dredged material disposal in DZ 14 that commenced ~6 weeks prior to the fall sampling event and continued during sampling.

RESULTS

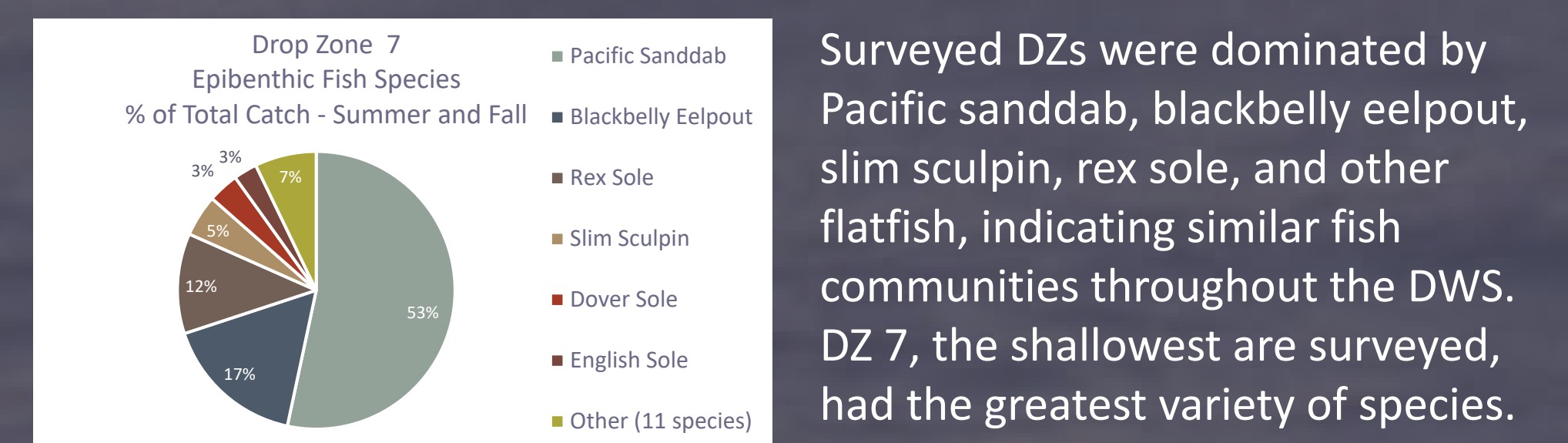
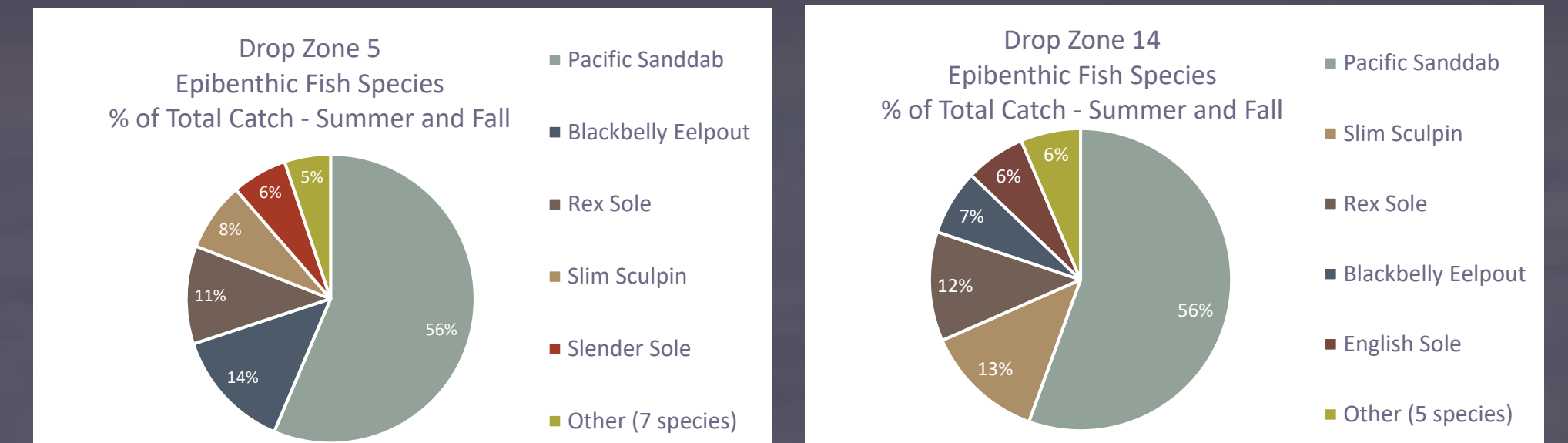
EPIBENTHIC FAUNA TRAWLS (DEEP WATER SITE ONLY)



Trawled epifauna were separated by taxonomic group into seawater-filled bins to facilitate rapid ID and measurement and to maximize survival upon release.



Between summer and fall, invertebrate densities increased in DZs 5 and 14, but decreased slightly in DZ 7. Fish densities decreased from summer to fall in all drop zones. The USACE began disposing dredged material in DZ 14 ~6 weeks prior to and during the fall sampling event, but disposal did not appear to affect epifaunal densities, at least in the short-term.



Surveyed DZs were dominated by Pacific sanddab, blackbelly eelpout, slim sculpin, rex sole, and other flatfish, indicating similar fish communities throughout the DWS. DZ 7, the shallowest are surveyed, had the greatest variety of species.

CONCLUSIONS

EPA's 2014 survey confirmed that USACE's dredged material disposal operations do not cause an unacceptable adverse effect to the benthic infaunal and epibenthic communities at the Shallow Water Site and Deep Water Site. Trends in benthic and epibenthic faunal densities between summer and fall were observed throughout the Deep Water Site, independent of disposal activities. Dredged material disposal likely causes immediate, localized responses in the benthic infauna. Further investigation is needed to discern the degree of impact that dredged material disposal has on benthic communities.