ADRIFT in the California Current: Pilot Study for Oregon

Award Number: 5300-22-12-007
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Introduction

Oregon State University ‘s Marine Mammal Institute (MMI) was contracted by The National Marine Sanctuary Foundation to collaborate with Southwest Fisheries Science Center (SWFSC) on the ADRIFT in the California Current: Pilot Study for Oregon. The project goal was to collect passive acoustic data to monitor the marine soundscape and marine mammals. These data will be useful for informing management decisions for NOAA’s National Marine Fisheries Service, Office of National Marine Sanctuaries, and the Bureau of Ocean Energy Management. This pilot study serves to inform future expansion of the ADRIFT project into Oregon, to provide increased effort along the migration route of protected species that travel beyond the boundaries set by state and federal agencies, including National Marine Sanctuaries.

Deployments

Deployments were planned for April, July, and October 2023, to coincide with pre-upwelling, upwelling, and post-upwelling periods. The team completed six successful deployments of the DASBRs spanning March, April, May, July, and August 2023. Deployments from March through May included all four hydrophones. Due to an issue with one of the hydrophones, only three drifting buoys were deployed in July and August. Each SoundTrap (ST4300HF) was deployed at 100 m and included two channels. The sample rate for all deployments was 684 kHz and sampling was continuous. All data from the instruments were sent to SWFSC for analysis.

Table 1. Deployment and recovery information for drifting buoys off Oregon, including deployment and recovery datetime, latitude and longitude, and data start and end datetime.

Deploy ID	Deployment (UTC)	Lat	Lon	Recover (UTC)	Lat	Lon	Data Start (UTC)	Data End (UTC)
ADRIFT_042	2023-03-16 19:30:00	44.60482	-124.75330	2023-03-21 00:45:00	44.60491	-124.69933	2023-03-16 19:29:00	2023-03-21 00:39:27
ADRIFT_043	2023-03-16 18:53:00	44.77817	-124.72057	2023-03-20 23:30:00	44.69511	-124.60888	2023-03-16 18:52:05	2023-03-20 08:53:16
ADRIFT_044	2023-03-16 20:10:00	44.54475	-124.65537	2023-03-21 02:10:00	44.54705	-124.51382	2023-03-16 20:14:58	2023-03-20 21:11:30
ADRIFT_045	2023-03-16 18:01:00	44.61528	-124.61868	2023-03-21 01:40:00	44.54106	-124.58160	2023-03-16 18:59:58	2023-03-20 11:40:06
ADRIFT_058	2023-04-13 07:35:00	43.81065	-124.61415	2023-04-16 17:12:00	43.26737	-124.67334	2023-04-13 07:49:25	2023-04-16 16:58:47
ADRIFT_059	2023-04-13 06:00:00	43.89408	-124.73317	2023-04-16 21:10:00	43.69092	-124.50425	2023-04-13 06:15:44	2023-04-16 18:18:58
ADRIFT_060	2023-04-13 06:45:00	43.81280	-124.74067	2023-04-16 18:28:00	43.35256	-124.56476	2023-04-13 06:58:23	2023-04-16 18:13:06
ADRIFT_061	2023-04-13 05:15:00	43.88330	-124.61603	2023-04-16 19:03:00	43.39276	-124.47833	2023-04-13 05:14:02	2023-04-16 18:56:46
ADRIFT_062	2023-04-26 03:45:00	45.07783	-124.39350	2023-04-29 05:15:00	45.15840	-124.59250	2023-04-26 03:37:21	2023-04-29 05:28:54
ADRIFT_063	2023-04-26 03:05:00	45.15817	-124.39683	2023-04-29 21:15:00	45.38500	-124.56650	2023-04-26 02:18:35	2023-04-29 03:44:57
ADRIFT_064	2023-04-26 02:25:00	45.24150	-124.39933	2023-04-29 20:35:00	45.40717	-124.49283	2023-04-26 01:43:38	2023-04-29 06:58:23
ADRIFT_065	2023-04-26 01:50:00	45.32450	-124.40200	2023-04-29 07:15:00	45.20140	-124.27833	2023-04-26 02:59:55	2023-04-29 06:44:45
ADRIFT_072	2023-05-17 18:20:00	44.61387	-124.75157	2023-05-26 05:28:00	44.20557	-124.82230	2023-05-17 18:13:55	2023-05-23 13:36:53
ADRIFT_073	2023-05-17 18:45:00	44.64125	-124.78320	2023-05-26 11:32:00	43.57674	-124.97210	05/17/202318:38:29	2023-05-21 06:28:32
ADRIFT_074	2023-05-17 19:06:00	44.61012	-124.81042	2023-05-26 11:00:00	43.60559	-125.01611	2023-05-17 18:58:58	2023-05-21 20:30:14
ADRIFT_075	2023-05-17 19:02:00	44.58300	-124.78102	2023-05-26 05:39:00	44.22705	-124.84481	2023-05-17 19:25:22	2023-05-21 09:00:04
ADRIFT_076	2023-07-17 19:05:00	44.65207	-124.65207	2023-07-21 20:15:00	44.46350	-124.94200	nd	nd
ADRIFT_077	2023-07-17 20:00:00	44.74793	-124.74793	2023-07-21 21:20:00	44.43217	-124.80833	2023-07-17 19:08:24	2023-07-21 08:34:53
ADRIFT_078	2023-07-17 18:25:00	44.73705	-124.67712	2023-07-21 21:00:00	44.45267	-124.84583	2023-07-17 20:03:06	2023-07-21 11:22:38
ADRIFT_085	2023-08-04 22:06:00	45.38242	-124.41357	2023-08-12 13:48:56	44.95337	-124.44817	2023-08-04 22:05:52	2023-08-11 02:37:32
ADRIFT_086	2023-08-04 22:39:00	45.31767	-124.41017	2023-08-12 15:48:00	44.83994	-124.47023	2023-08-04 22:41:22	2023-08-08 10:11:55
ADRIFT_087	2023-08-04 23:15:00	45.33687	-124.46508	2023-08-12 14:39:00	44.94423	-124.53973	2023-08-04 23:14:28	2023-08-08 11:44:44

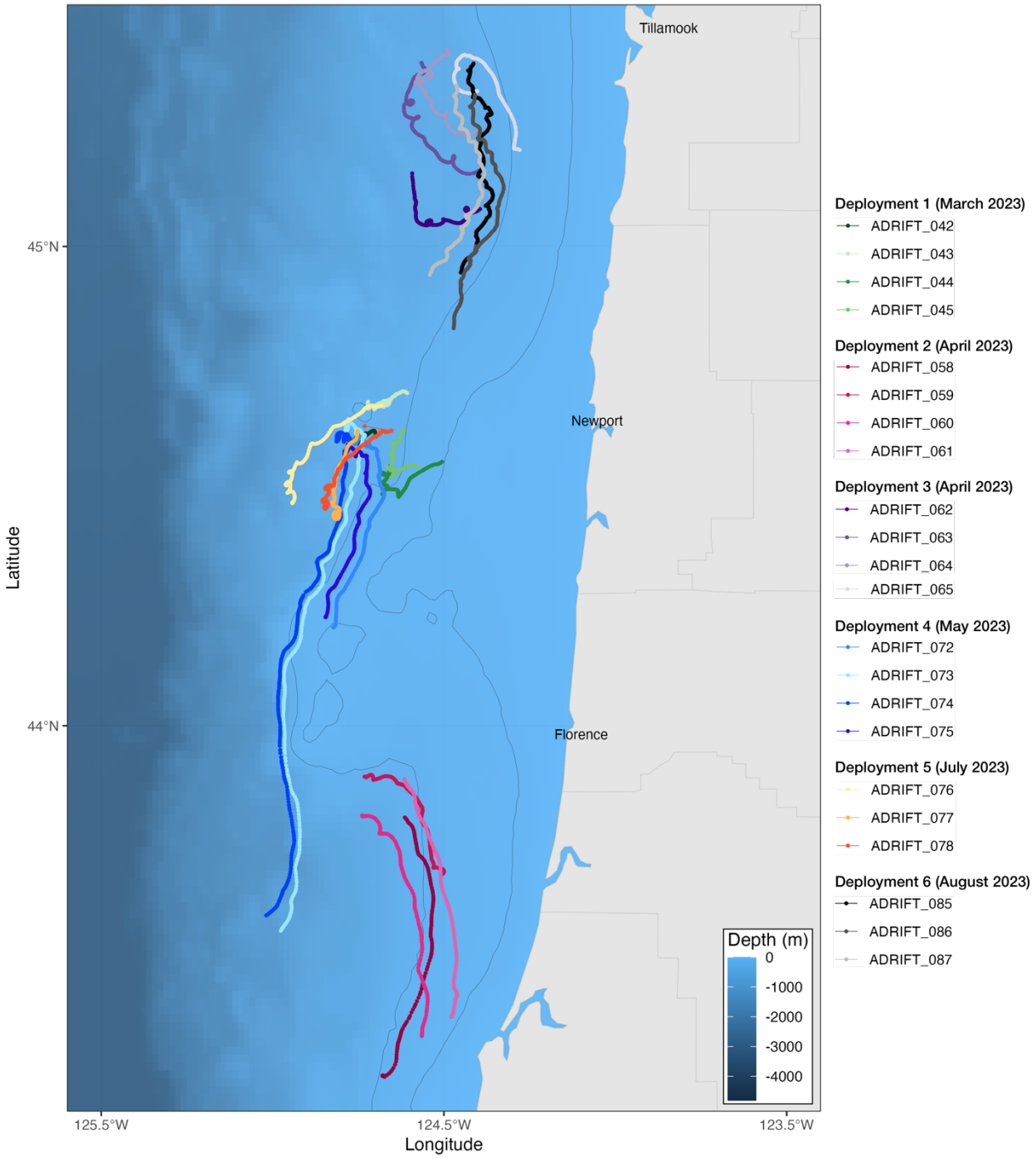

Figure 1. Tracks for each individual DASBR deployment. Colors group by deployment event.

Data collection partners

Data collection partners included research labs within the MMI, Oregon State University's Ship Operations, and the K. Lisa Yang Center for Conservation Bioacoustics at the Cornell Lab of Ornithology (PI Holger Klink). Within the MMI, fieldwork was conducted in collaboration with the Whale Habitat, Ecology & Telemetry Lab (PI Daniel Palacios) and the Geospatial Ecology of

Marine Megafauna Laboratory (PI Leigh Torres). Vessels chartered for data collection are owned by the Marine Mammal Institute' (R/V Pacific Storm) and Oregon State University's Ship Operations boat (R/V Elakha). Four deployment events occurred concurrent with the operation of existing research projects.

The first "platform of opportunity" used to deploy the drifting buoys was with the Marine Offshore Species Assessments to Inform Clean Energy (MOSAIC), a MMI project funded by the Bureau of Ocean Energy Management. The MOSAIC project included 10-20 day cruises (weather-dependent), which spanned Astoria, Oregon to Humboldt, California. The timing of the cruise allowed for the drifting buoys to be deployed at the onset of the cruise and recovered later in the cruise. There were three successful deployment and recovery events using this approach. However, MOSAIC data collection is scheduled to end October 2024 and therefore will not be available as a future "platform of opportunity". One additional deployment event was planned with the October 2023 MOASIC cruise, however, because of time constraints due to incoming bad weather, duties required to accomplish MOSAIC goals superseded the deployment of the drifting buoys.

The second "platform of opportunity" used to deploy the drifting buoys was with the Holistic Assessment of Living marine resources off the Oregon coast (HALO) project, a joint project funded by MMI's Geospatial Ecology of Marine Megafauna Laboratory the K. Lisa Yang Center for Conservation Bioacoustics. The HALO project involves quarterly (weather-permitting) one-day trips out to a specific location. Thus, this platform was only used to deploy the drifting buoys. A second vessel was needed to be chartered to recover the buoys. The HALO project samples a specific near-shore survey line each time, which means the vessel needed to divert to get to deep enough waters to deploy the drifting buoys. Additionally, the project is often delayed or canceled due to weather and can practically only participate in deployment in a specific area.

Using solely "platforms of opportunity" may not an effective method for consistent data collection. Future deployments would benefit from adopting the model employed for the Central California Collaborative Passive Acoustic Monitoring Surveys, which would involve a dedicated research vessel and timeline, allowing for more drifting acoustic recorders to be deployed and for the drifting buoys to be paired with other sampling methods, including gliders and seafloor moorings, which would provide critical real-time and long-term acoustic data and visual surveys to document marine mammal presence.

We also recommend the use of vessels that are capable of going offshore. One of the vessels that was preferred for deployment and recovery because of cost, size, and speed was limited by how far offshore it could go. This sometimes resulted in the drifting buoys being deployed very close to the 200-m isobath, which brought with it a risk of the buoys running aground. And depending on where the drifting buoys were at the time of recovery, larger, slower and costlier vessels would sometimes need to be used.

Performance of hardware

Hardware performed as expected in the region. The modular nature of the systems allowed for easy deployment and recovery with minimal field staff. The idea number of staff are three

people, one of which should be familiar with the acoustic equipment. For example, when staff involved in the deployments were not familiar with the acoustic systems, a remote control was used to start the hydrophones. In one instance, one of the hydrophones was not correctly started using the remote control. Therefore, we recommend hiring a full-time acoustician to oversee deployment, recovery, and maintenance of the acoustic recorders as well as preliminary data analysis. If more robust analysis is desired, we would recommend a full-time data analyst as well.

According to the analysists, there was strumming in some of the recordings. This was likely due to fast currents and poor weather conditions. Strumming ranged from infrequent to quite intense, which can mask other signal of interest (Fig. 2). This suggests that deployment in certain areas, times of the year, and some weather conditions do impact the quality of drifting buoy recordings and therefore could present challenges depending on the species of interest. Therefore, we recommend pairing drifting buoys with additional methods for surveying off Oregon may be needed (e.g., gliders and seafloor moorings).

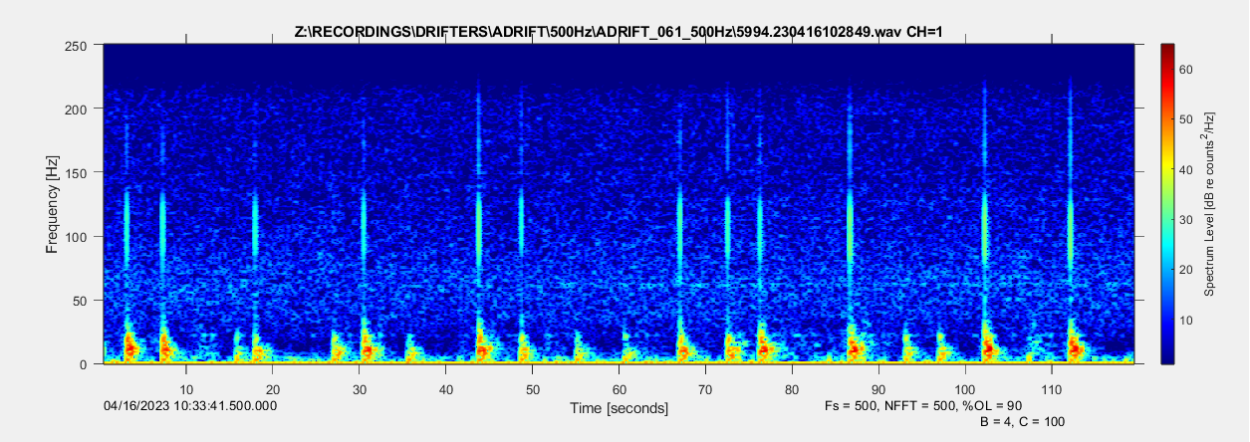

Figure 2. Example of strumming on one of the recordings. Acoustic data were decimated to 500 Hz to look for baleen whale vocalizations.

Modifications to hardware and data collection

Modifications were made to the poles to increase visibility and aid in recovery, including covering the poles with orange reflective tape and adding flags. Additional modifications may be made to the strobe flashlight attached to the top of the poles for night recovery. Where possible, vessel cruise would hope to incorporate AIS transmitters for ease of recovery. However, each recovery was extremely successful, and no problems were every encountered during recovery.

The ability to deploy the drifting buoys was strongly dependent on the time of year and weather. Offshore conditions were too rough to deploy and recover the drifting buoys from November through February. Another constraint is the current direction depending on the time of year. Currents along the shelf tend to flow in the same direction as the wind. In fall and winter, winds from the southwest force surface water northward and onshore. In the spring and summer, the winds switch direction and begin blowing north to south, which results in the southward flow of

water. Thus, care should be taken in planning the location of deployments and should include predictions of where the recorders are likely to drift and how that may impact recovery.

The ability to deploy the drifting buoys was also strongly depended on fishing activities off Oregon, which vary by time of year. For example, when long-line halibut fishing is open, there is a risk of the drifting buoys getting entangled. One deployment event was deferred a week in July 2023 due to a high-density period of longline fishing. Commercial crab fishing is greatest in the early months of the year and also pose entanglement risk for drifting buoys. Because of the extensive fishing activities that differ depending on the time of year, it will be critical for future coordinators to consult those familiar with the various fishing efforts and how they might impact entanglement risk.

Future Partners and Collaborators

Additional future collaborators might include research laboratories beyond the MMI such as other research labs conducting regular field work offshore. This may also include entities outside of OSI, including NOAA Fisheries and even vessel owners who charter their vessels. Cultivating additional collaborative partners for sampling during three periods of interest (i.e., pre-upwelling, upwelling, post-upwelling) would require more dedicated logistic support, including significant outreach. Thus, we recommend hiring a coordinator in a full time position for each region where these recorders are to be deployed.