Construction of Lagrangian Drifters for Larval Connectivity Analysis

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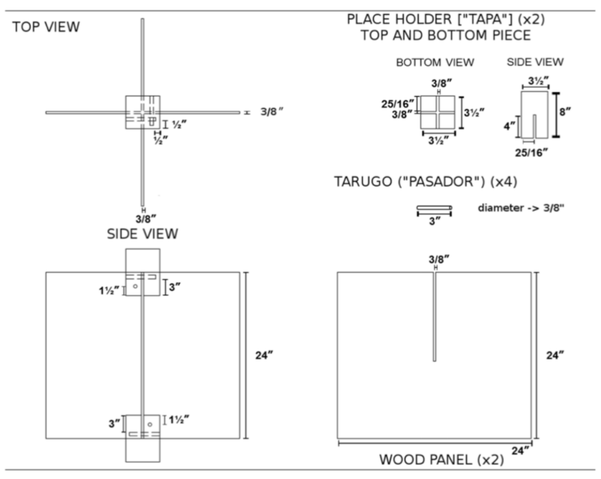
Introductions

Lagrangian drifters are defined as surface-drifting buoys, equipped with GPS, that track data of path dispersal by dominant currents in the open ocean. Their trajectories allow for the data collection of position and velocity at high spatial and temporal rates, in which they serve to be prominent in the study of upper ocean dynamics.

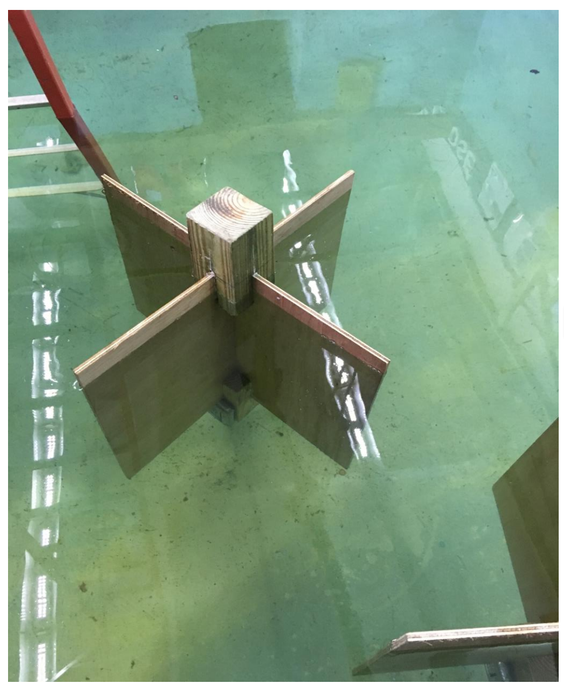
The main objective of this study is to construct several eco-friendly Lagrangian drifters, that will be launched in a triangular deployment model at the Hind Bank Marine Conservation District. These deployments will provide observational trajectories of the drifters over time representing the main oceanographic pathways that lead to the dispersal of fish eggs from Hind Bank, a marine protected area off the southwestern U.S. Virgin Islands. From this data we will acquire a better understanding as to where the fish egg and larvae from networked MPAs are transported, as well as determine the best sites to protect in order to enhance recruitment in most favorable areas.

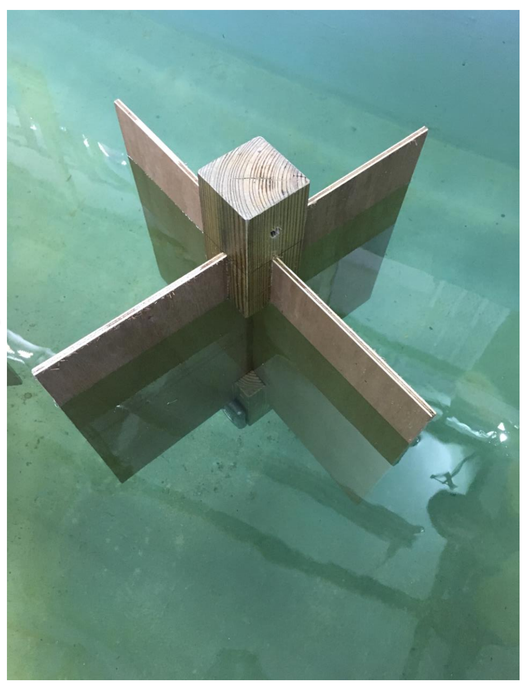
Drifter Production

The drifters were constructed out of bio-degradable materials for it to have the least harmful environmental impact on the ocean.



Water Tank Tests in Lab

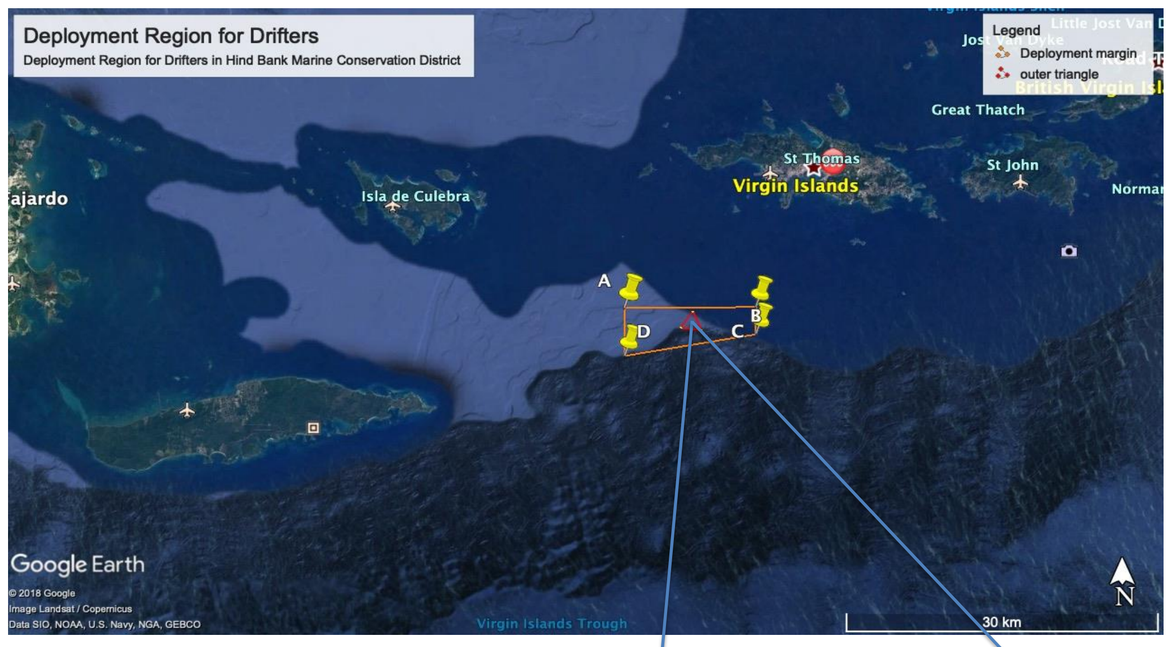


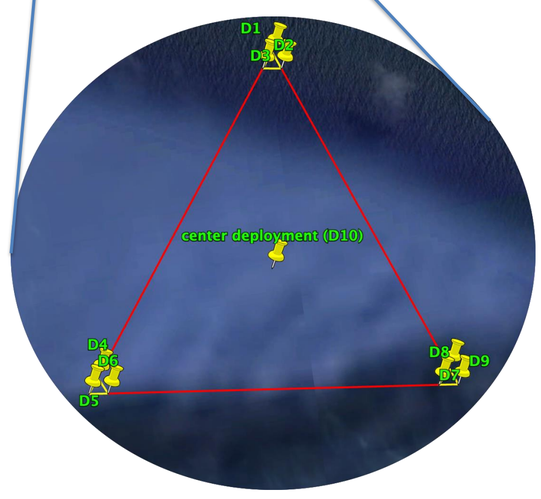


Stabilization weight: 7-lbs ***Stabilization weight: 6-lbs***

Drifters were left floating in saline water for 4 days to simulate their physical behavior in the ocean. The chosen weight was 6 lbs to avoid possible tipping by wave action in the open ocean.

Launch Lay-out





Drifter	Longitude	Latitude
D1	65° 2'19.61"W	18°13'3.75"N
D2	65° 2'21.63"W	18°13'1.14"N
D3	65° 2'18.33"W	18°13'0.66"N
D4	65° 2'58.98"W	18°12'13.01"N
D5	65° 3'0.95"W	18°12'10.40"
D6	65° 2'57.56"W	18°12'10.02"N
D7	65° 1'56.22"W	18°12'5.90"N
D8	65° 1'58.44"W	18°12'3.37"N
D9	65° 1'55.03"W	18°12'2.97"N
D10	65° 2'25.11"W	18°12'27.15"N

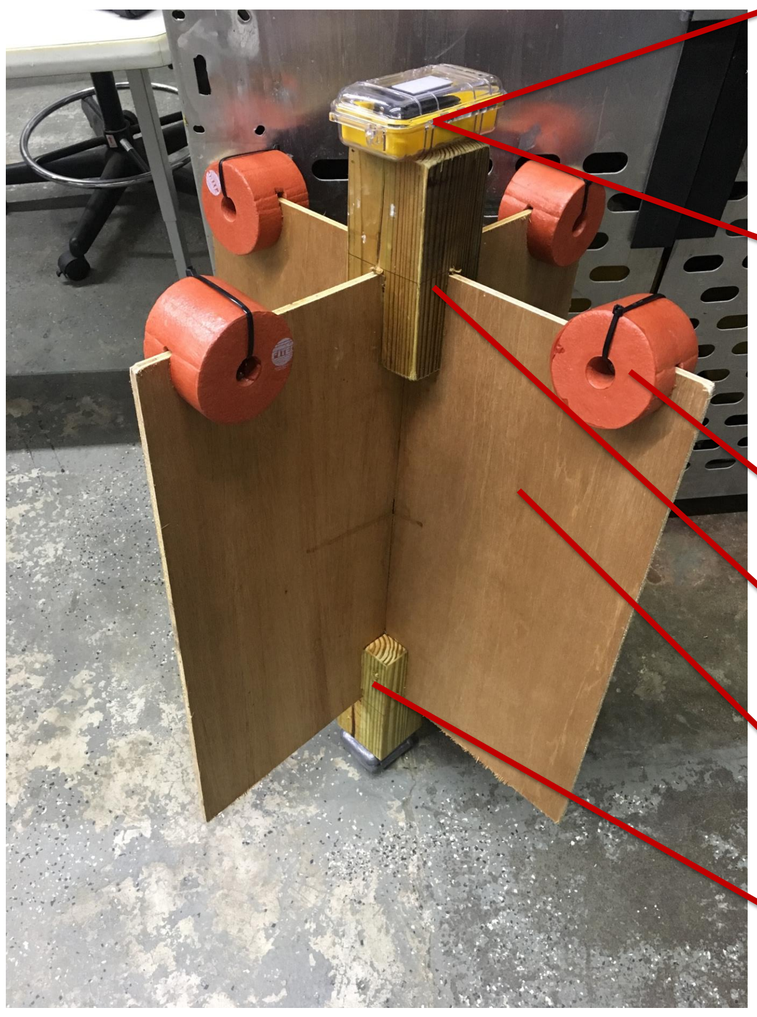
Center Point: (Longitude[P], Latitude[P]):

$$Latitude(P): \frac{Lat\ (A) + Lat\ (B) + Lat(C) + Lat(D)}{4}$$

$$Longitude(P): \frac{Lon(A) + Lon(B) + Lon(C) + Lon(D)}{4}$$

- ***Outer Triangle: Vertices are 2km apart from each other***
- ***Inner triangles: drifters are 100m apart from each other***

Drifter Structures



-GPS sealed in plastic wrap; inside 7x4 waterproof pelican case to assure max protection

-Foam Rollers for wave stabilization

-Pressure Treated Wax-Resin pine Wood, 4x4 8"

-Pressure treated, Wax-Resin Okoume Planer wood (24''x24'')

-6lbs lead plate for drifter stabilization

References

- Wilson Jr, T.C. & Barth, J.A. & Pierce, Stephen & Kosro, P.M. & Waldorf, B.W.. (1996). *A Lagrangian drifter with inexpensive wide area differential GPS positioning*. 851 - 856 vol.2. 10.1109/OCEANS.1996.568340.
- Hu, Jian-Hwa & You, J.W. & Lee, I-Huan & Huang, C.-Y & Ou, C.-H. (1995). *The development and application of GPS drifter for ocean current measurement*. 169 - 176. 10.1109/CCM.1995.516169.

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