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Tracking temporal and seasonal changes in nudibranch populations: citizen science data from a community aquarium

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Tracking Temporal and Seasonal Changes in Nudibranch Populations from a Small Aquarium

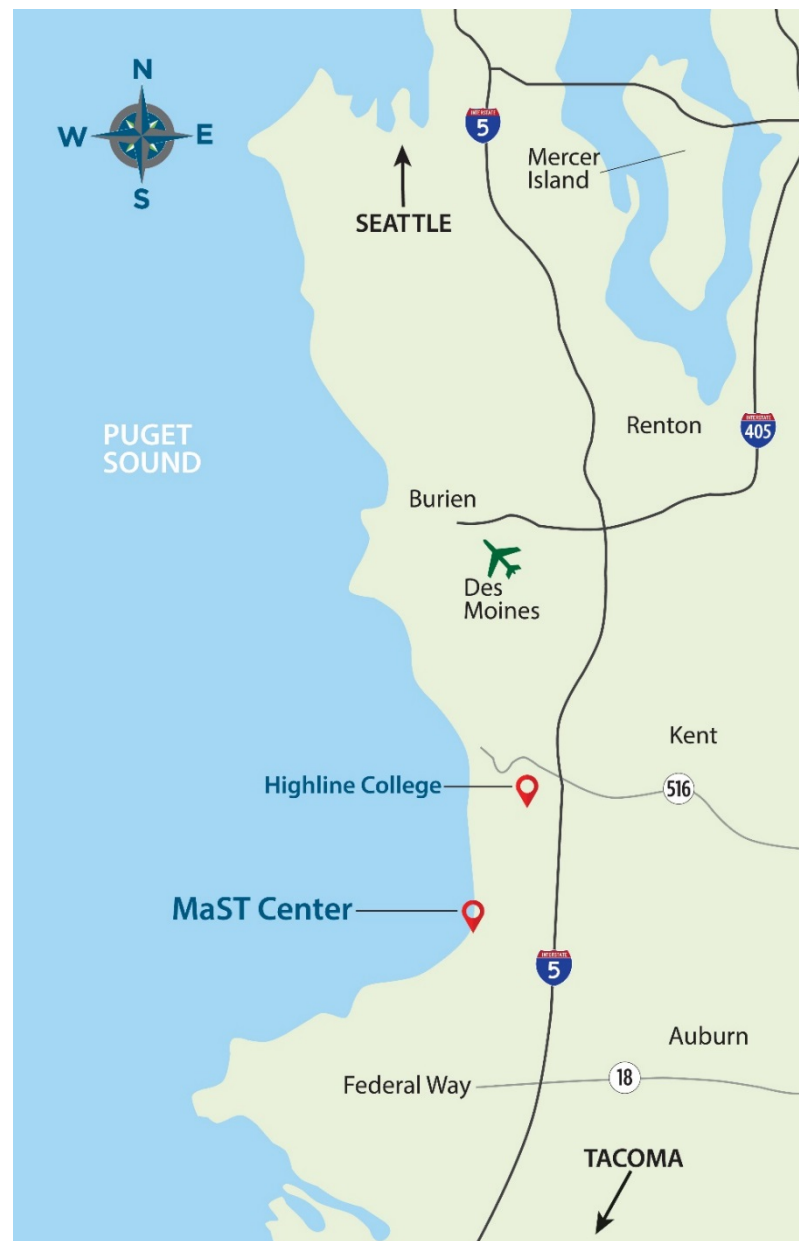


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The MaST Center

The Highline Marine Science and Technology Center (MaST) is the marine biology and aquarium facility of Highline College in Des Moines, WA, located on the South-Central Puget Sound. Dedicated to expanding knowledge about Puget Sound, a central mission of the MaST Center is fostering a culture of marine stewardship by engaging the community through interactive learning, personal relations and exploration. The efforts and successes of The Nudibranch Team exemplify citizen science achievement at the Mast.



Our Aquarium is

- An open flow system- raw seawater from the Puget Sound is pumped into the tanks, bringing a variety of planktonic organisms with it.
- A proxy for nudibranch plankton populations at Redondo Beach, Puget Sound

Methods

Training

- Volunteers ages 14 and up come for a one-on-one training session with the Citizen Science Coordinator:
 - Overview presentation of nudibranch taxonomy, anatomy, and species identification
 - Job shadow, led by team members with strong ID skills

Data Collection

- Starting in 2013
- Scan each tank with a flash light
- Tally abundance of each nudibranch species found in individual tanks; up to 20 different species found annually
- Data recorded 3-8 times a week; surveys are ~1 hour in duration

Data Analysis

- Analyzing seasonal trends for the 3 most abundant and easily identifiable species

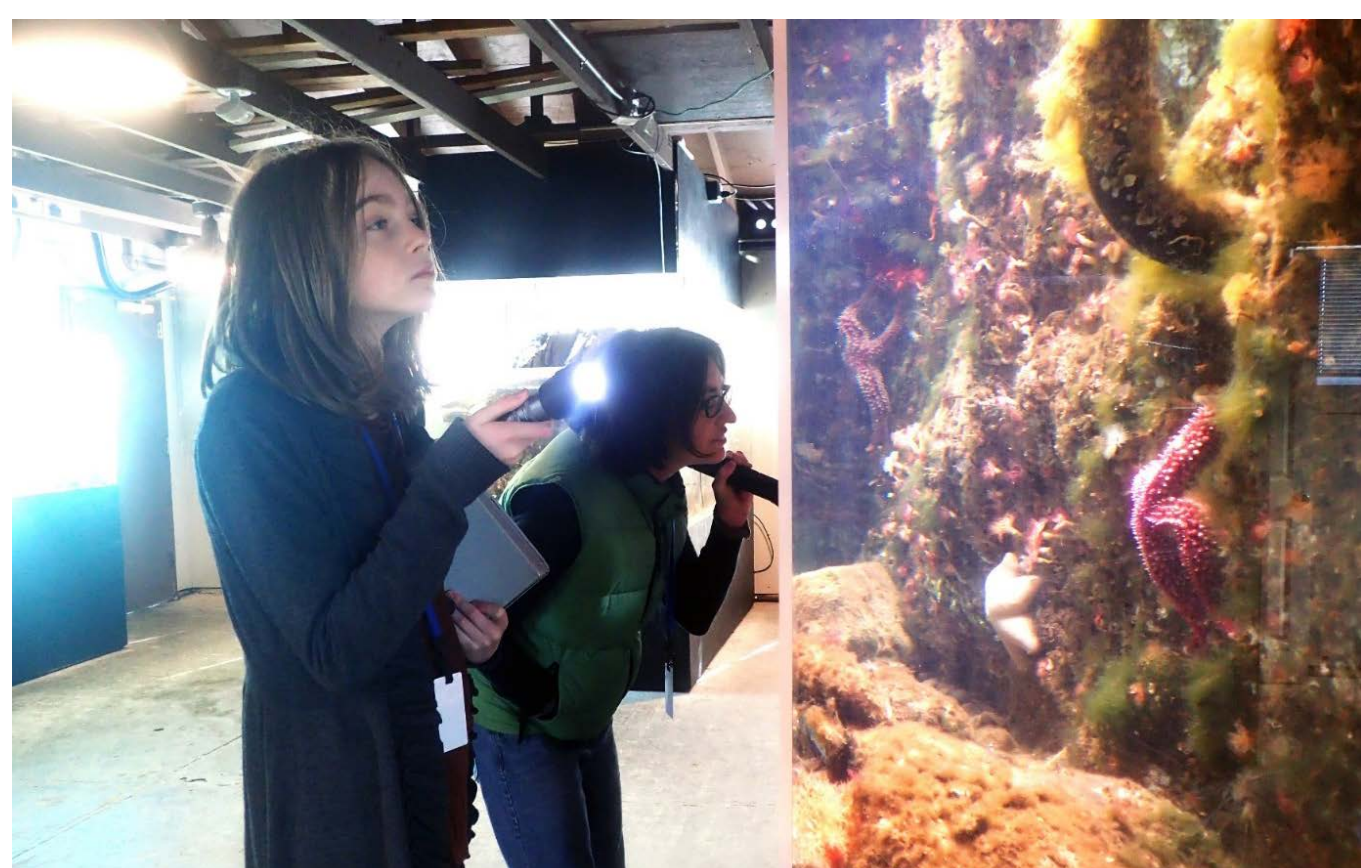


Figure 1: MaST volunteers scan the tank for nudibranchs and tally which species they find

Results

Annual trends in seasonality across the focal species

Figure 2: *Hermisenda crassicornis*

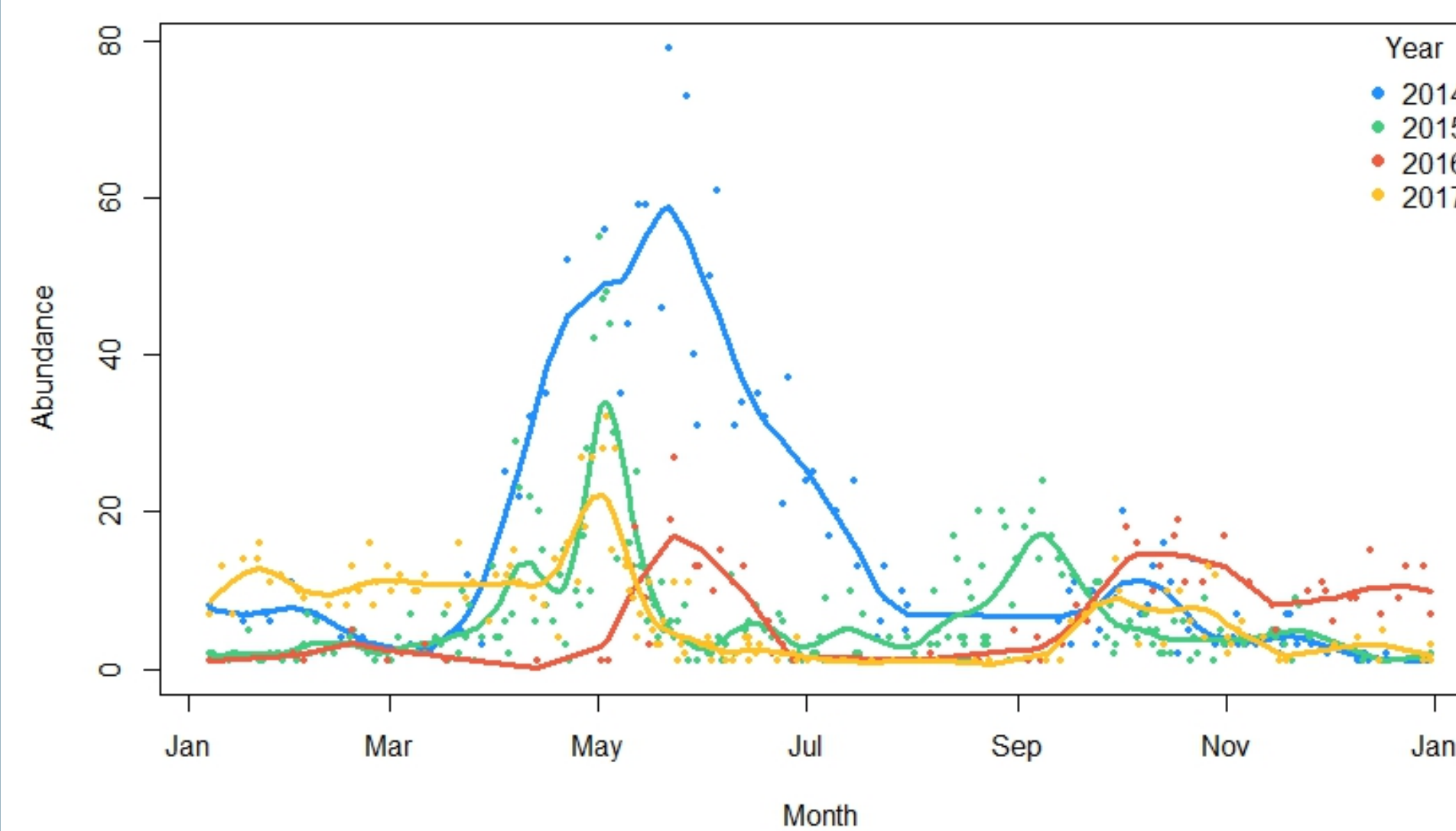


Figure 2-3: Yearly abundance of the Opalescent Nudibranch (*Hermisenda crassicornis*) in the MaST Aquarium 2014-2017

Figure 4: *Onchidoris bilamellata*

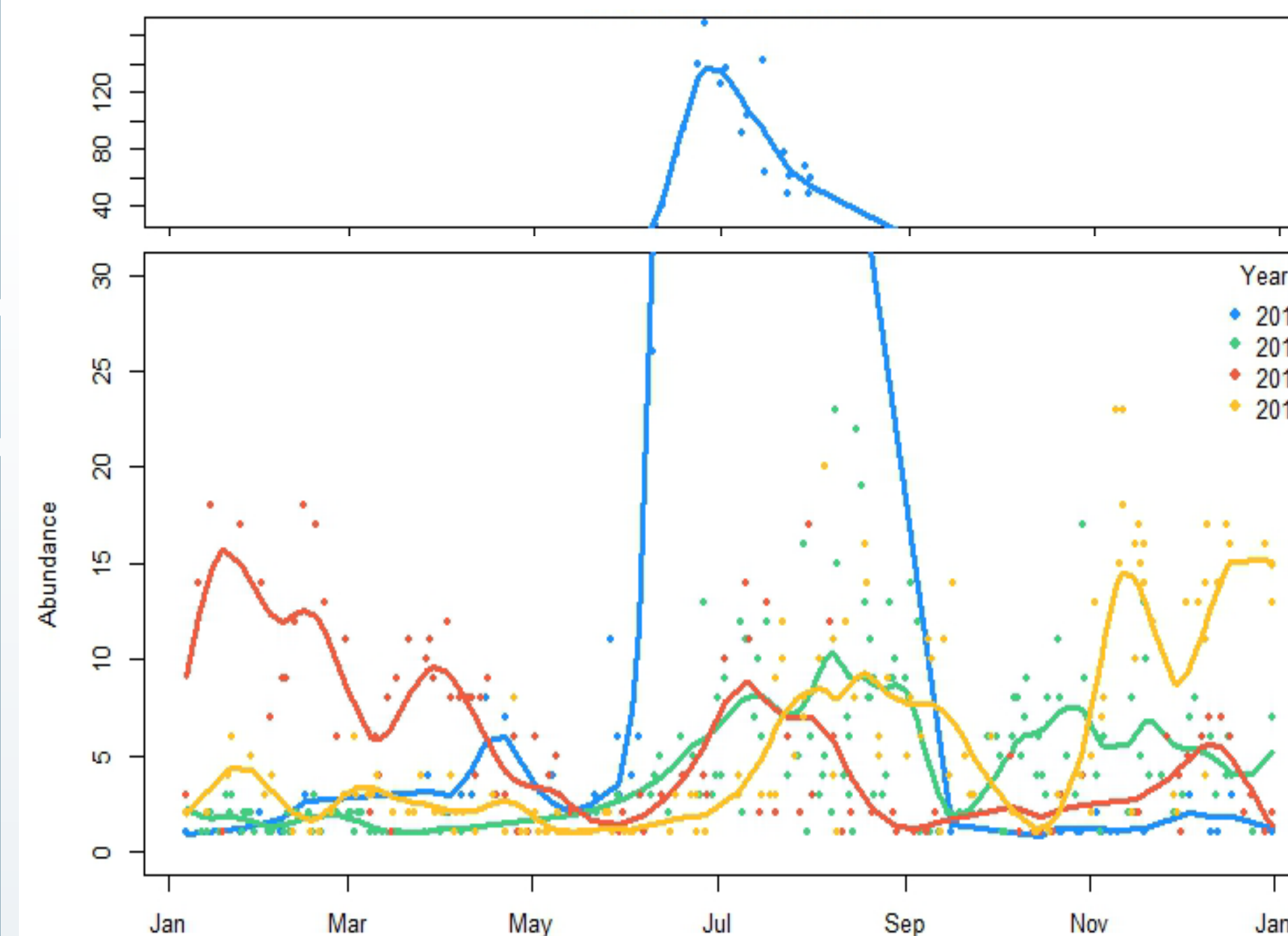


Figure 4-5: Yearly abundance of the Barnacle Eating Nudibranch (*Onchidoris bilamellata*) in the MaST Aquarium 2014-2017

Figure 6: *Aeolidia papillosa*

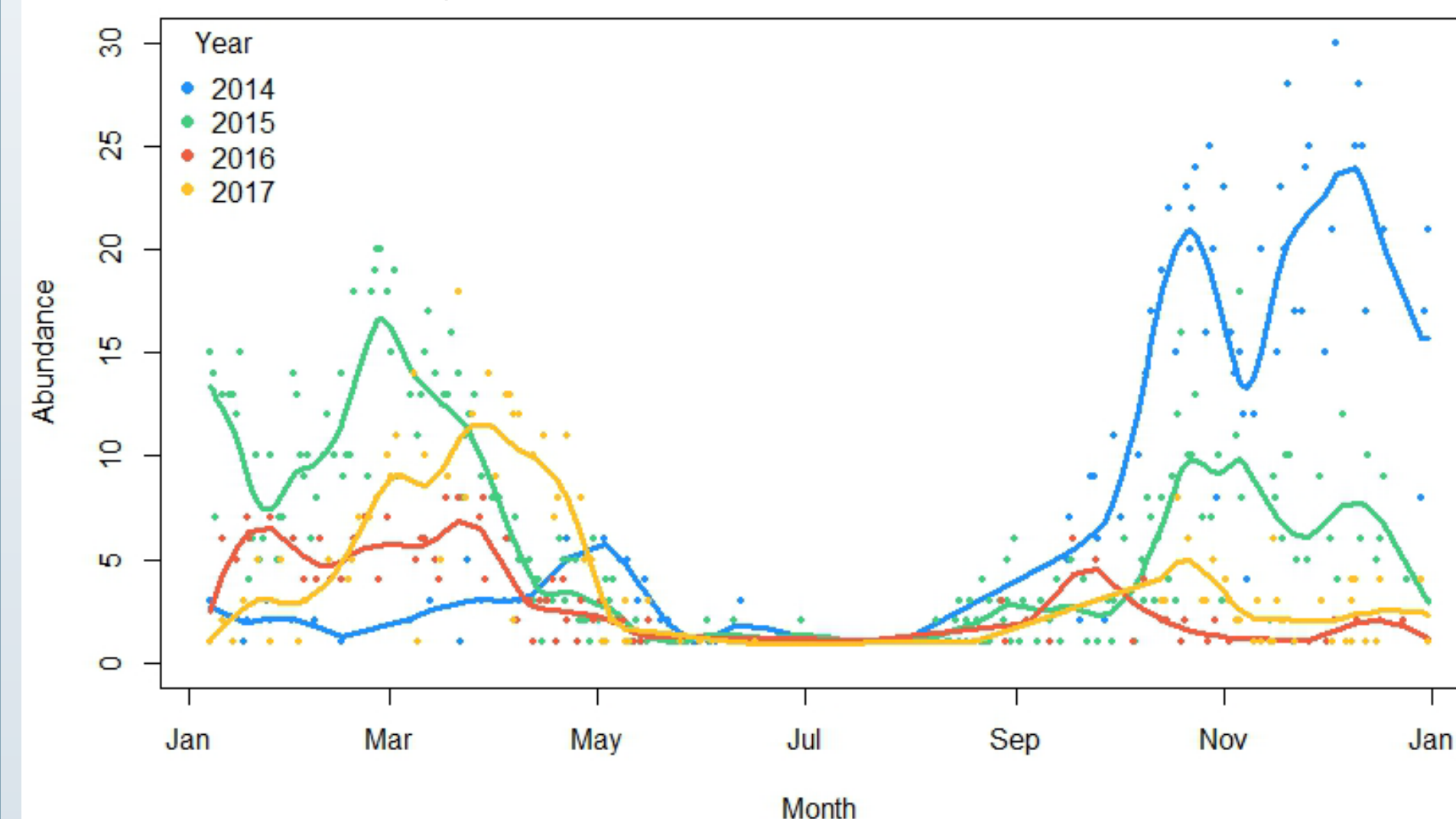


Figure 6-7: Yearly abundance of the Shaggy Mouse Nudibranch (*Aeolidia papillosa*) in the MaST Aquarium 2014-2017

Results & Discussion

Preliminary analysis

- There are trends in seasonality for all 3 focal species
- These species' abundance peaks of the year for each species and they occur as follows:
 - *Hermisenda crassicornis* are most abundant from April-June
 - *Onchidoris bilamellata* are most abundant from June-October, and November-January
 - *Aeolidia papillosa* are most abundant from October-April

Discussion

- This data provides as baseline of seasonal variability that will be necessary to track population changes
- In tracking seasonal patterns, we can better understand when their food sources, other animals not normally surveyed by scientists, such as hydroids, sponges, and bryozoans, will be in abundance.

Predator Prey Interactions

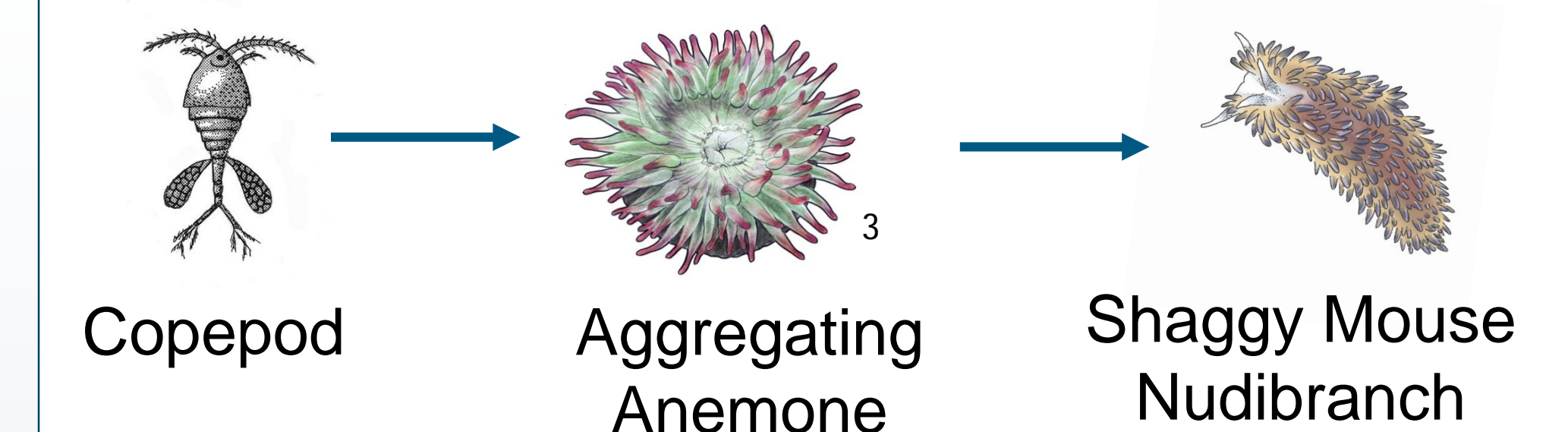


Figure 8: Shaggy mouse nudibranchs consume aggregating anemone which consume zooplankton, such as copepods. Photo courtesy of Gary Whitley Illustration and Fine Art at <http://www.gary-whitley.com/>.

Future of the Nudibranch Team

Increased Program Structure

- We hope to design a better classification system based on volunteer expertise and experience
- We are currently creating improved identification keys, that address species color variation

Data Analysis

- We are analyzing data from 2014-2017 to better understand trends in order to publish the data for public use

Other Common species



Figure 9-11: from the left, White-lined Dirona (*Dirona albolineata*), Monterey Sea Lemon (*Doris montereyensis*), Leopard Dorid (*Diapylula odonoghuei*)

Acknowledgements

We thank all current and past members of the Nudibranch Team for their dedication and time to ensure the success of the program. Thank you to Eugene Disney for creating the team in 2013, and Vanessa Hunt for providing feedback and edits. We also thank the MaST and Highline College for the financial support to further pursue our endeavors.