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MICROPLASTICS ECOLOGICAL RISK ASSESSMENT: Primary vectors to YOY Striped BAss

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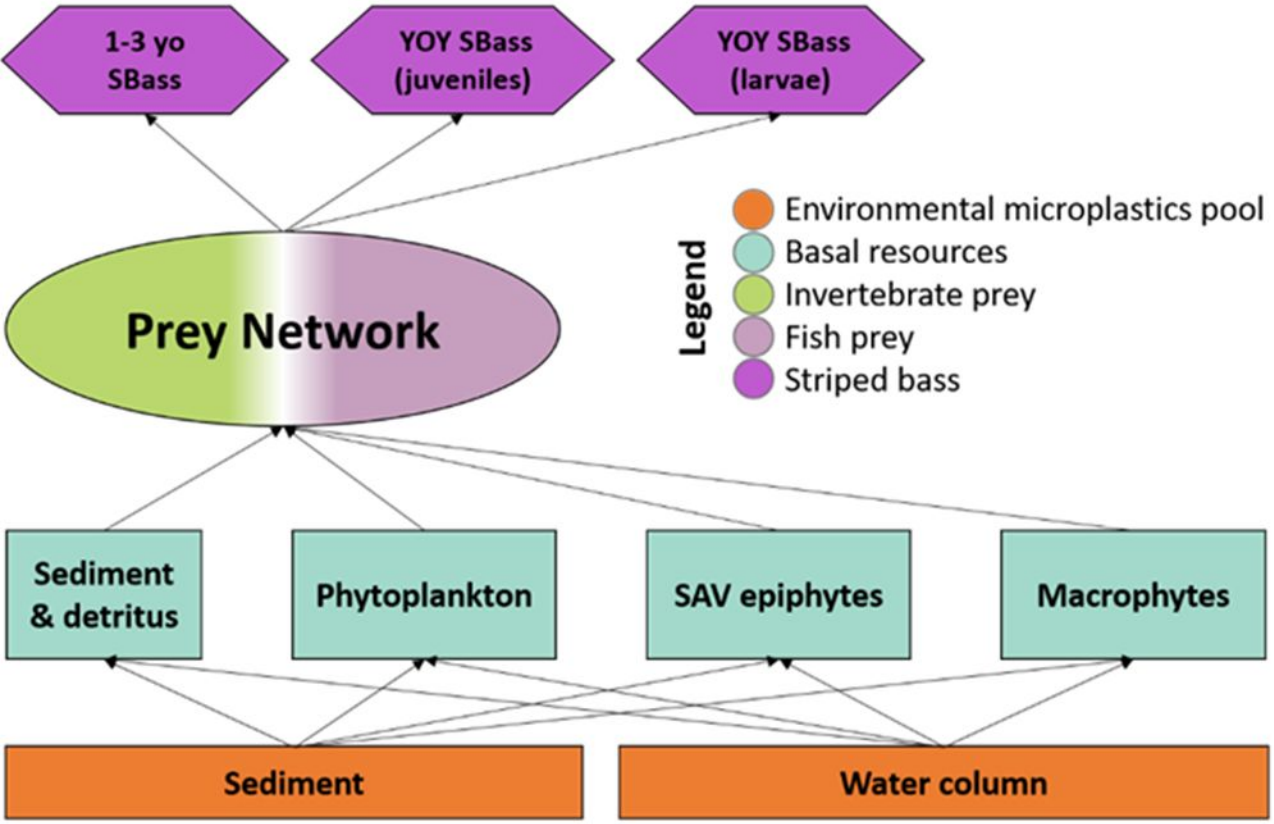
Striped Bass ERA Recap



Potential Assessment Endpoints

Individual Assessment Endpoints

- Growth rates
- Fecundity
- Predator susceptibility
- Direct mortality
- Physiological condition
- Behavior change

Population Assessment Endpoints

- Catch-per-unit-effort
- Size-at-age
- Age-structure
- Mortality
- Spawning stock biomass

Model Input and Criteria for Inclusion
Potomac River Striped Bass YOY

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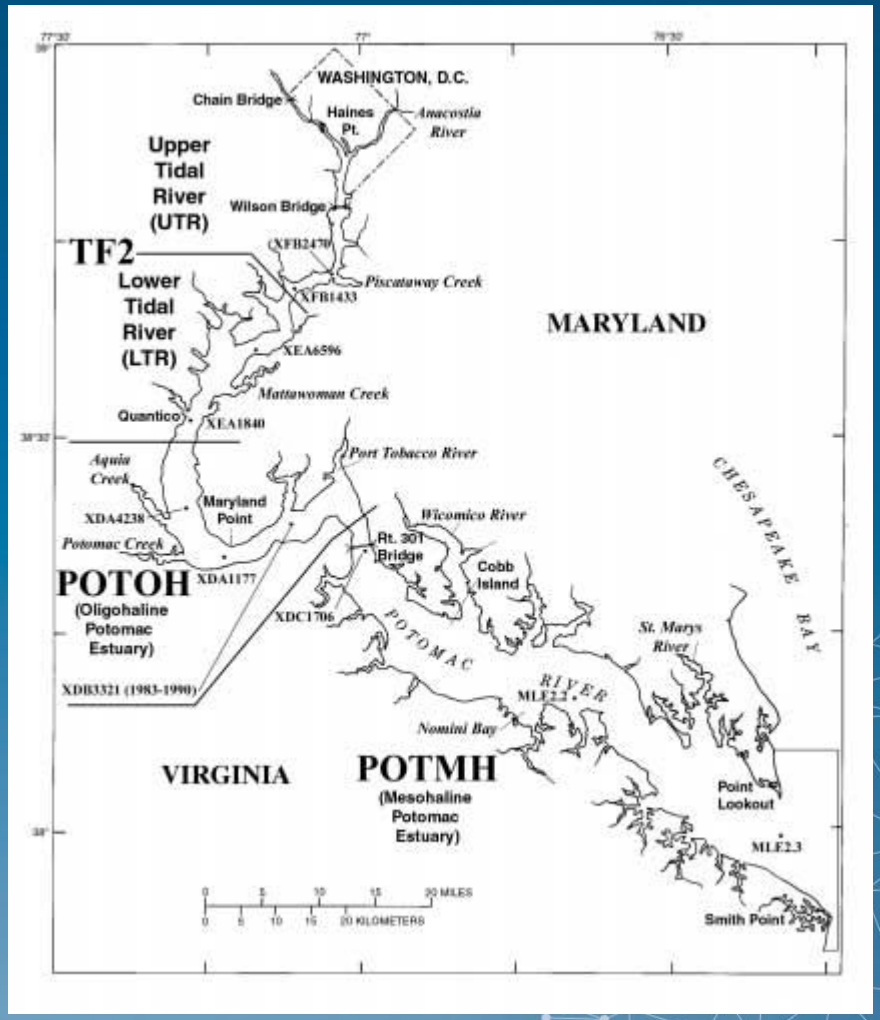
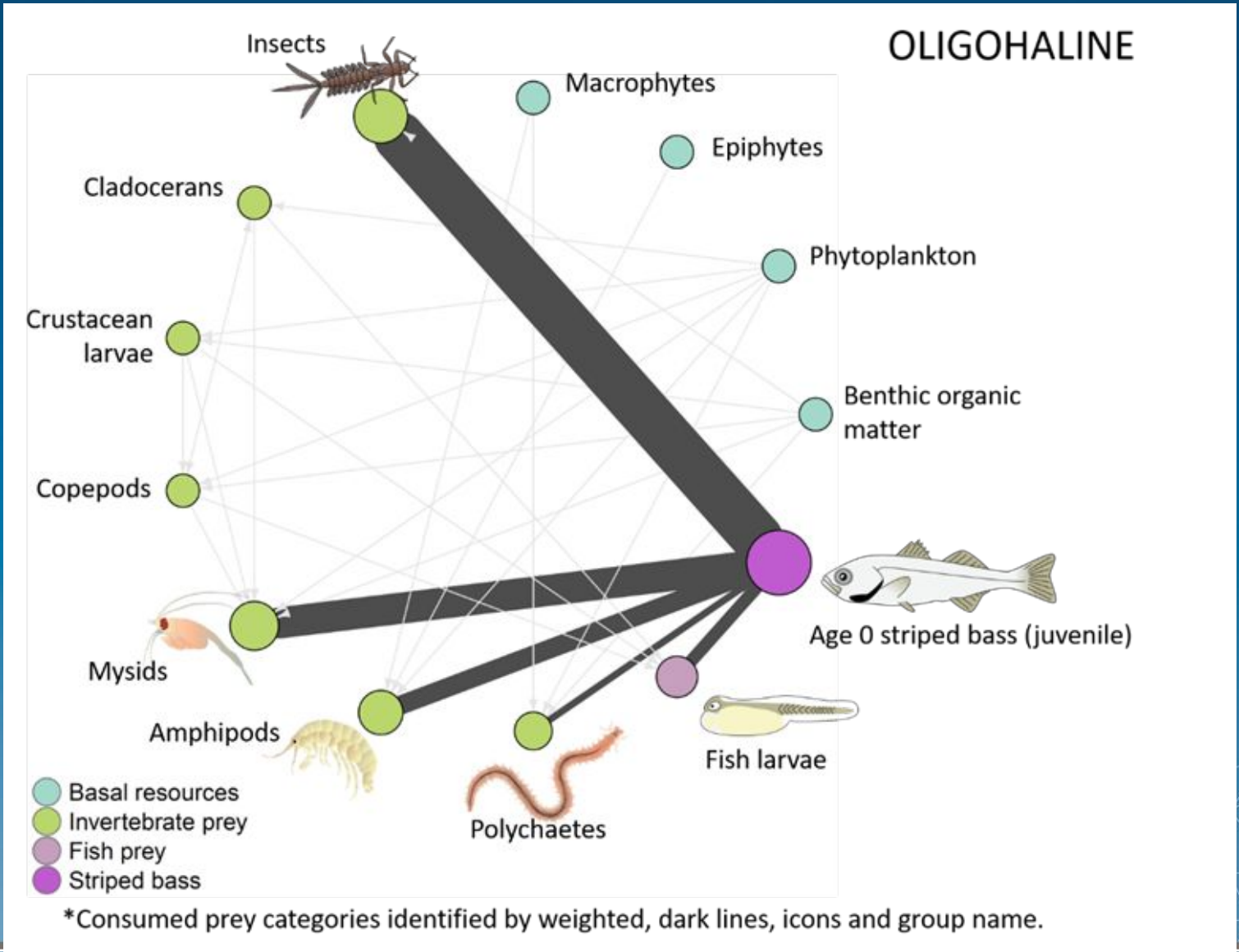
Literature Review

1. Potomac River data
2. Chesapeake Bay/other tributary studies
3. Other Atlantic Coast
4. Global

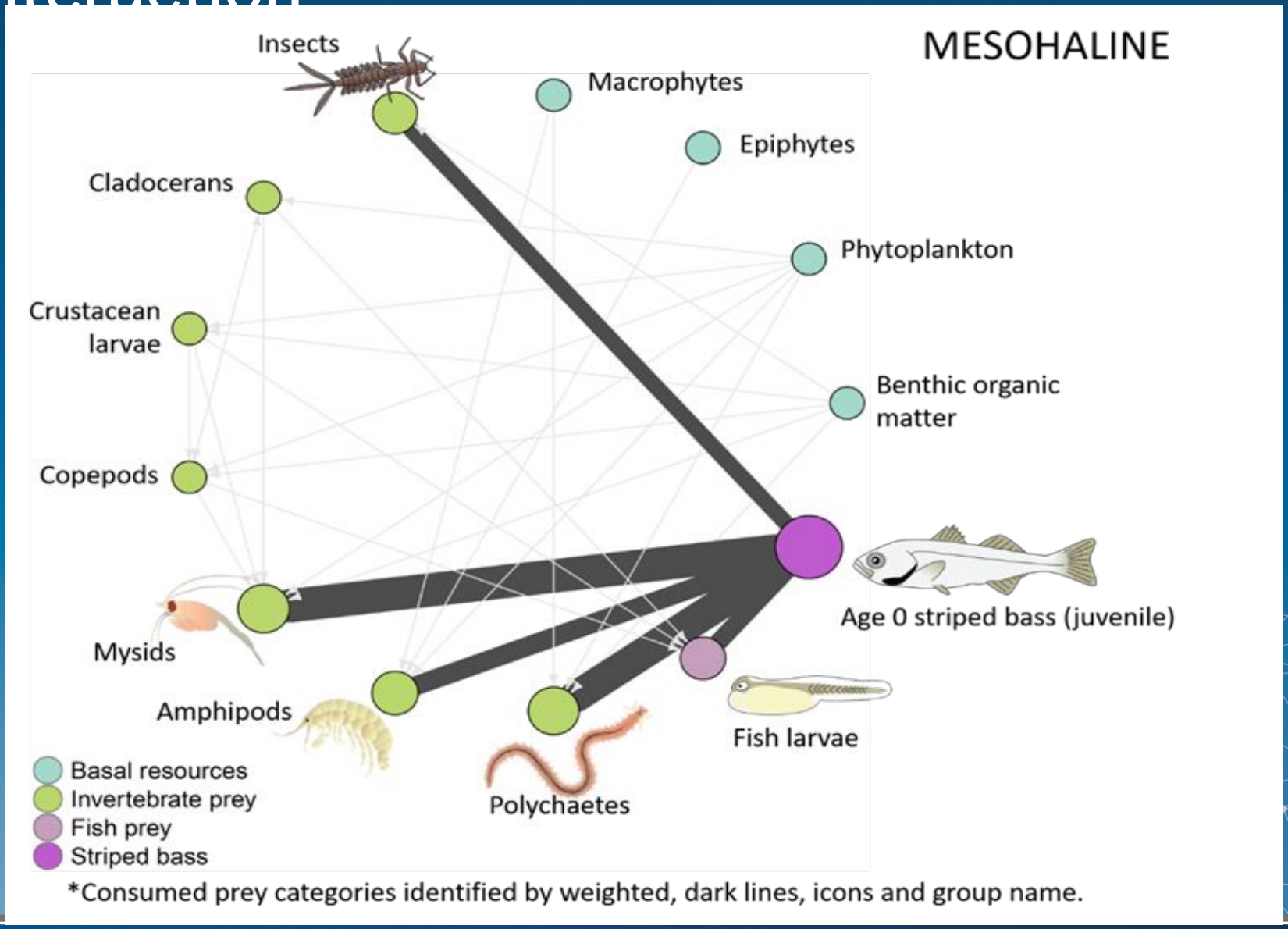


Semi-quantitative food web interaction



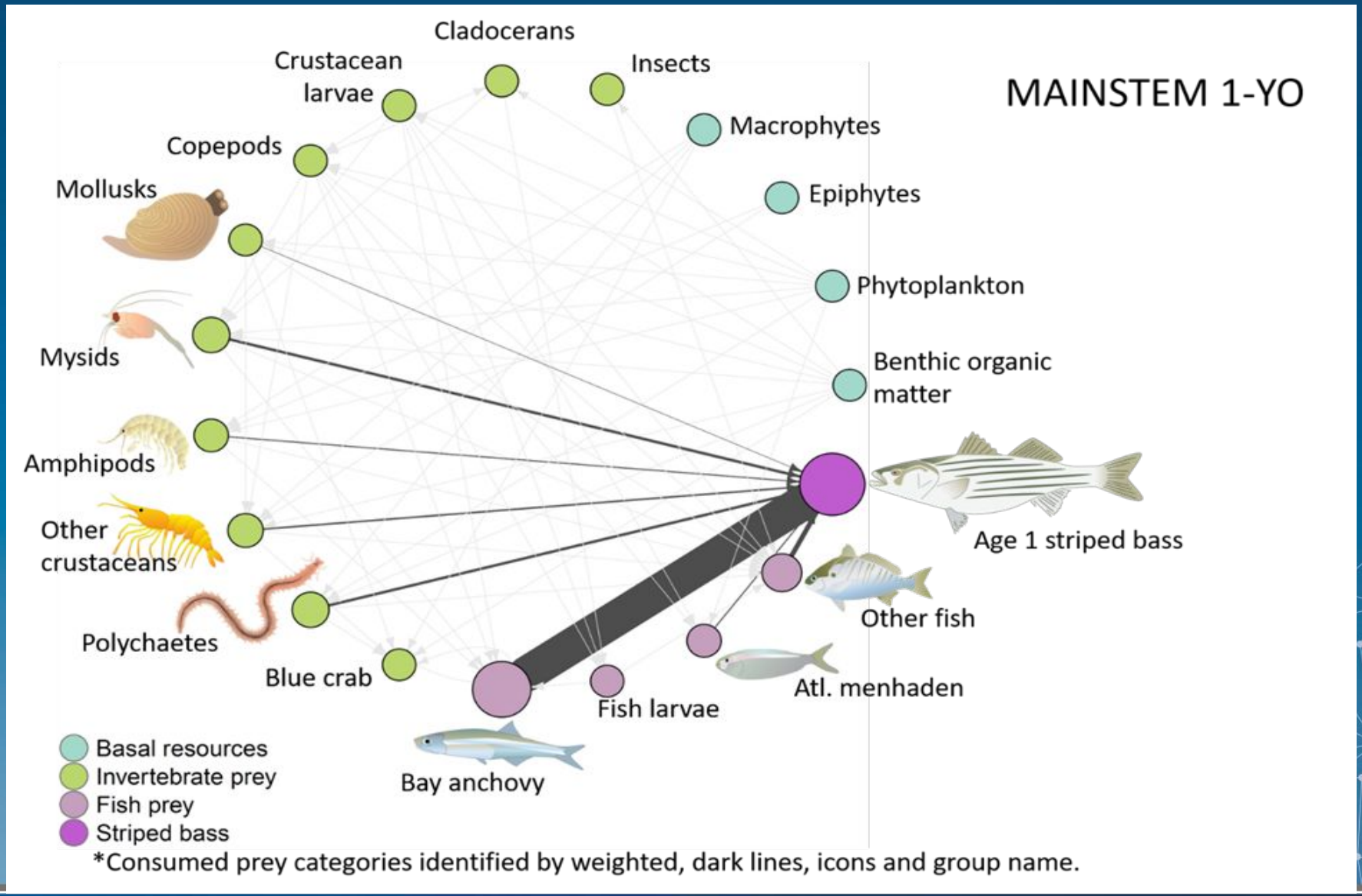
Data from Boynton et al 1981

Semi-quantitative food web interaction



Data from Boynton et al 1981

Baywide diet: 1YO



Data from Ihde et al, 2015

Priority Prey Items

Prey category	OLIGO	TF	OLIGO	MESO	MAIN	MAIN	Priority-level
Insects		47.5	40	12.5			
Cladocerans	26.2						
Larval zooplankton	1						
Adult copepods	40.3						
Bivalves					0.9	1.2	
Mysids		0	24.5	27	4.5	21	
Amphipods		1.5	15	15.5	1.9	5	
Other crustaceans					2.8	4	
Polychaetes		12	5.5	25	4.4	9.4	
Bay Anchovy					57.8	15.6	
Fish larvae		35.5	10	14			
Atl. Menhaden					1.9	17.9	
Other fish					7.6	8	

Updating the ERA Model

- Potential regime shift in the zooplankton community;
- Incorporate ongoing research into contemporary Striped Bass diet e.g. SERC)
- Focus on Mysids, Amphipods, and Bay Anchovy
- Include research on similar taxa from elsewhere around the globe

Microplastic pathways

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Major Taxa	Confirmed MP presence or consumption? (Y/N)	Location	Citation	Notes
Habitat				
Macrophytes (includes SAV and wetlands)	Y	(SAV) Caribbean; UK, Korea; Washington, DC; (wetlands)South Africa; multiple	(Goss et al. 2018, Reynolds and Ryan 2018, Murphy 2019, Townsend et al. 2019, Cozzolino et al. 2020, Huang et al. 2020, Jones et al. 2020)	Macrophytes include a combination of SAV and wetlands given similar roles for microplastic adherence
Epiphytes	Y	Caribbean;	(Goss et al. 2018, Seng et al. 2020)	Found in epiphytes on seagrass
Benthic organic matter	Y	St. Lawrence River; Washington DC;	(Castaneda et al. 2014, Murphy 2020)	
Phytoplankton	Y	Laboratory;	(Long et al. 2015, Shiu et al. 2020)	Diatoms; aggregation of cells on MPs
Invertebrate Prey				
Insects	Y			
Crustacean larvae	Y	Laboratory	(Jemec et al. 2016, Gambardella et al. 2017, Woods et al. 2020)	Lobsters; barnacle nauplii;
Cladocerans	Y	Laboratory	(Martins and Guilhermino 2018, Jaikumar et al. 2019, Woods et al. 2020)	Freshwater regions
Copepods	Y	Laboratory; Pacific Ocean	(Cole et al. 2015, Desforges et al. 2015)	
Amphipods	Y	Laboratory	(Jeong et al. 2017, Mateos Cárdenas et al. 2019)	Jeong et al proposed an adverse outcome pathway for microplastic exposure that covers molecular and individual levels.

Literature Review

- Extracted loadings for amphipods, mysid shrimp, and bay anchovy
- Primarily laboratory-derived (may not reflect environmental levels
- Anchovy (Engraulid) studies were largely environmental samples

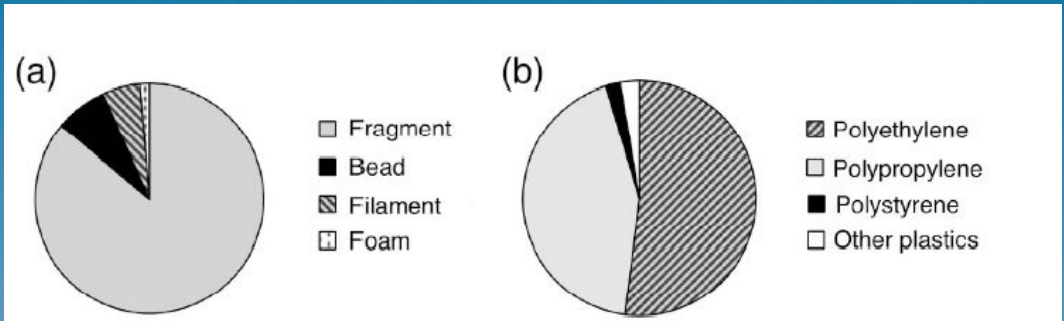


Figure 3. Types of plastics recovered from digestive tracts of Japanese anchovy (*Engraulis japonicus*). (a) Percentage by shape. (b) Percentage by polymer.

Tanaka & Takada 2016

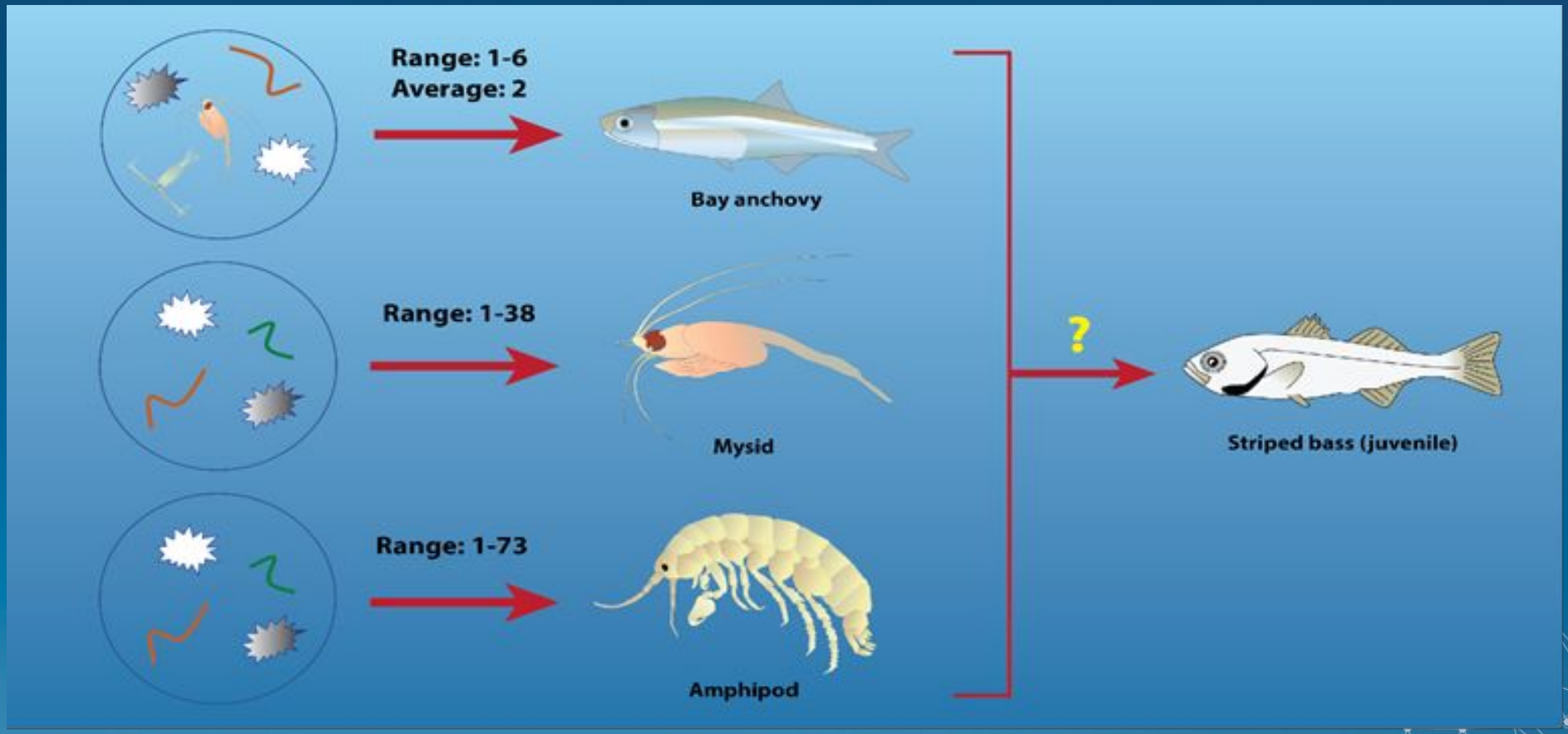


Figure 1. Estimated potential quantities of microplastic particles per individual for each of three common taxa (Bay Anchovy, Mysid, Amphipoda) reaching an individual feeding juvenile striped bass. Sources of microplastics for each taxa are displayed on the left, with most of it free-floating plastic particles, with the exception of mysid shrimp in bay anchovy diet (described in the text).

Next steps

Combination field and laboratory studies that will:

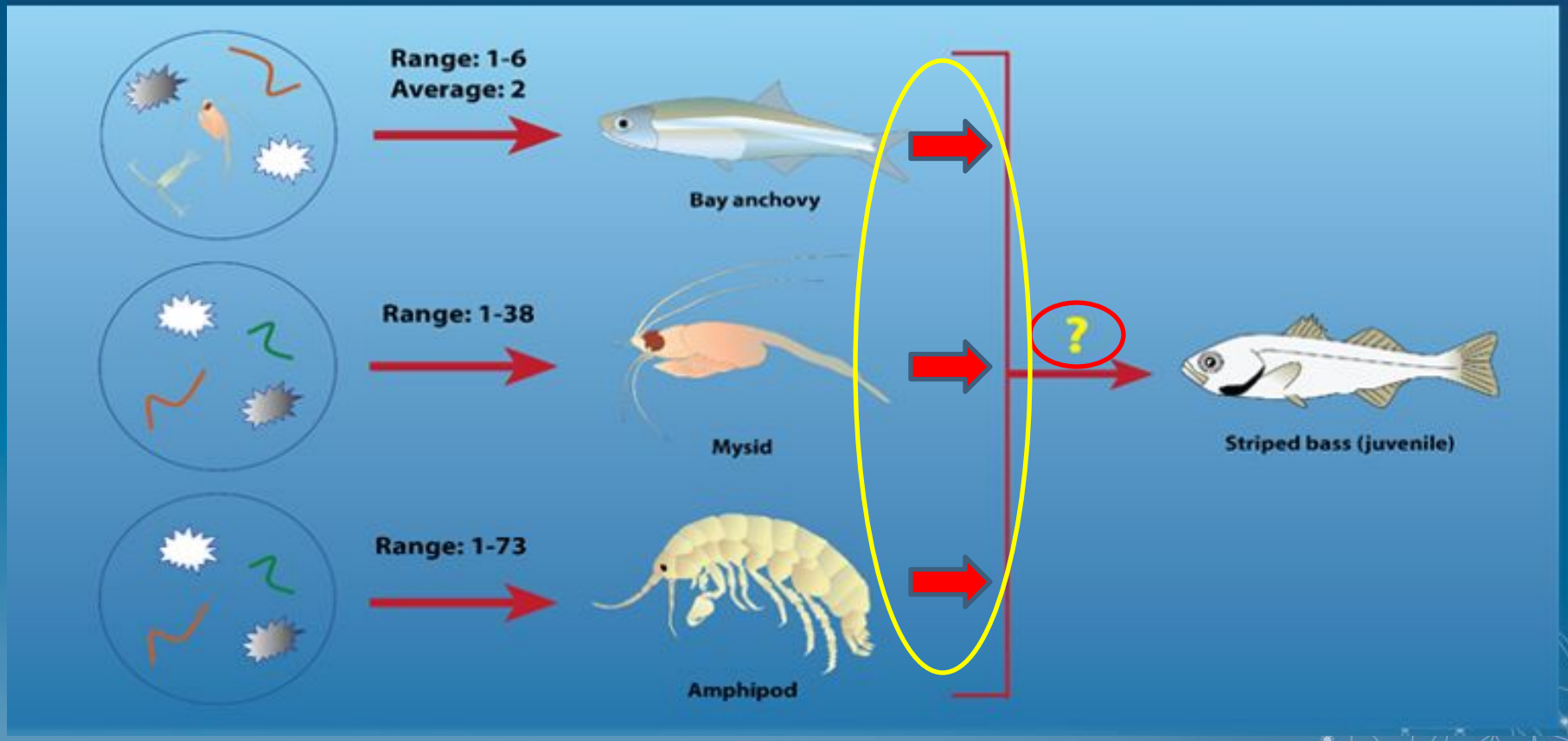
1) elucidate the loadings of microplastics within the prey community;

2) measure uptake of microplastics in these taxa;

3) conduct behavioral studies of prey taxa after microplastic consumption;

4) assess trophic transfer to YOY striped bass.

Trophic Transfer



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Questions