Integrative Assessment of the Quality of Shallow Tributary Forage Habitats for Striped Bass in Chesapeake Bay

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Environmental Research Center

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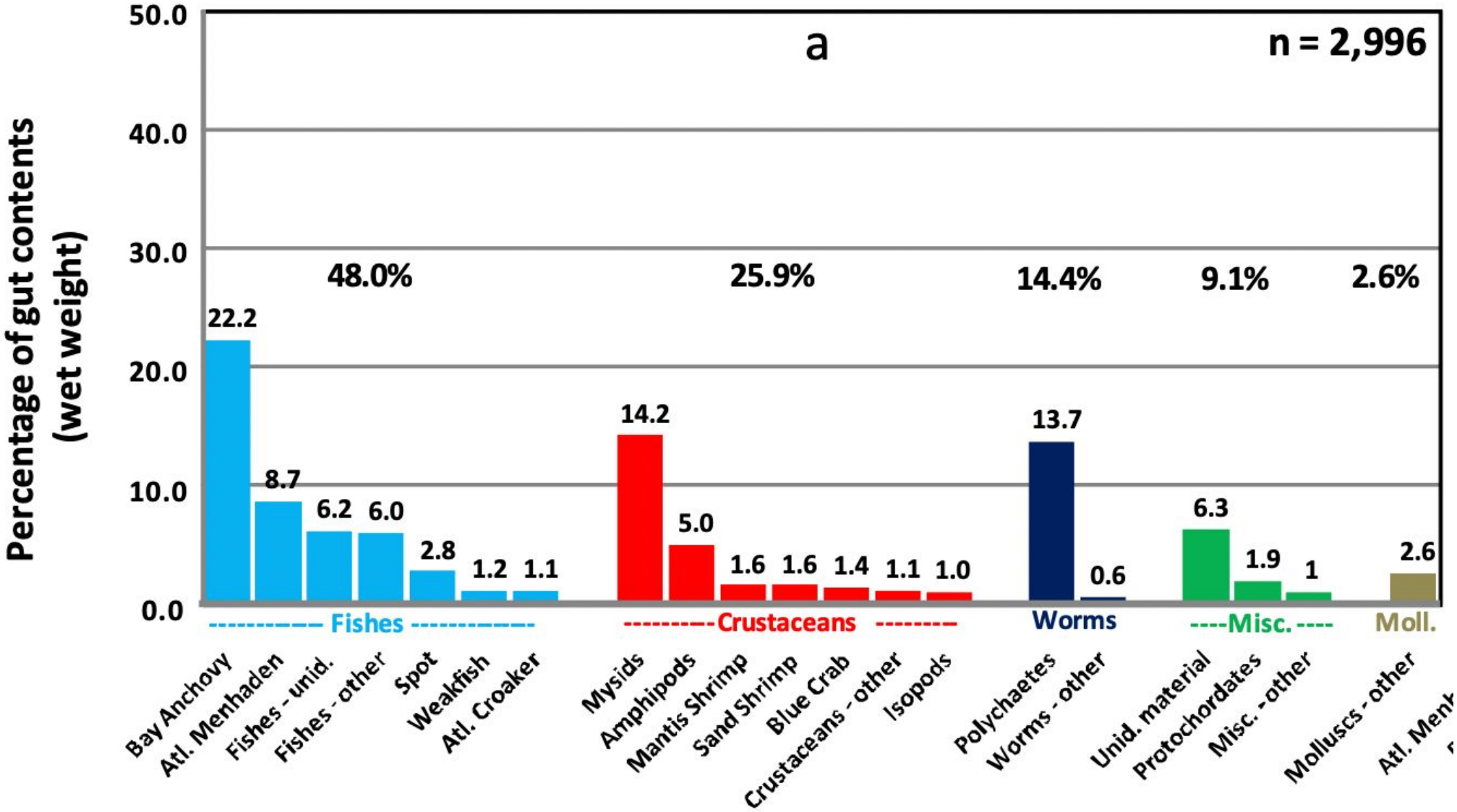
Forage report: Key forage taxa

A Key taxa or species (in order of importance)	*b* Additional important taxa or species (alphabetical)	*c* Additional important taxa or species identified by participants as under-represented in diet analysis
Bay Anchovy	Atlantic Menhaden	American Shad & river herrings
Polychaetes	Atlantic Rock Crab	Mummichog & Killifishes
Mysids	Blackcheek Tonguefish	Gizzard Shad
Amphipods and Isopods	Blue Crab*	Atlantic Silverside
Mantis Shrimp	Flatfishes	Small Bivalves**
Spot	Kingfish	
Weakfish	Lady Crab	
Sand shrimp	*Macoma* clams	
Atlantic Croaker	Mud crab	
Razor Clams	Spotted Hake	

Forage report: Striped bass diet from ChesMMAP



Research questions

1. Are the important forage taxa similar in shallow tributary habitats?

2. Do forage and nutrition differ…
   a) among age classes?
   b) among tributaries?
   c) with salinity?

Project approach

Young-of-year (YOY): 9 tributaries using seine nets

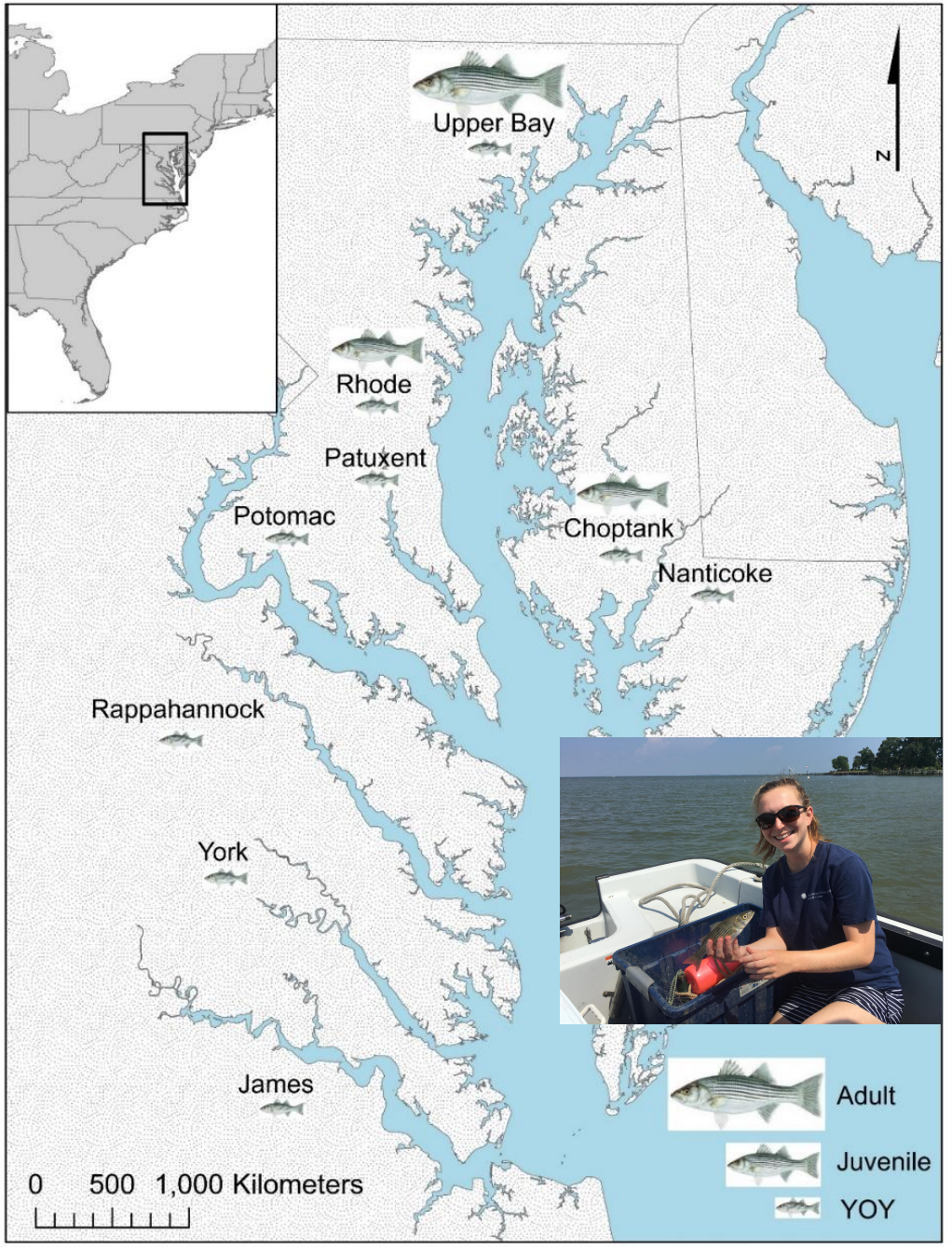
- Gut contents via genetic barcoding (COI + 18S)
- Gut contents via morphology
- Muscle tissue C and N stable isotopes

Age 1-4 fish: Rhode and Choptank rivers using gill nets

- Gut contents via genetic barcoding (COI + 18S)
- Muscle tissue C and N stable isotopes

Adult fish: Upper Bay only (Maryland Striped Bass Spawning Survey)

- Muscle tissue C and N stable isotopes



Chesapeake Bay Barcode Initiative

https://serc.si.edu/projects/species-diversity-chesapeake-bay

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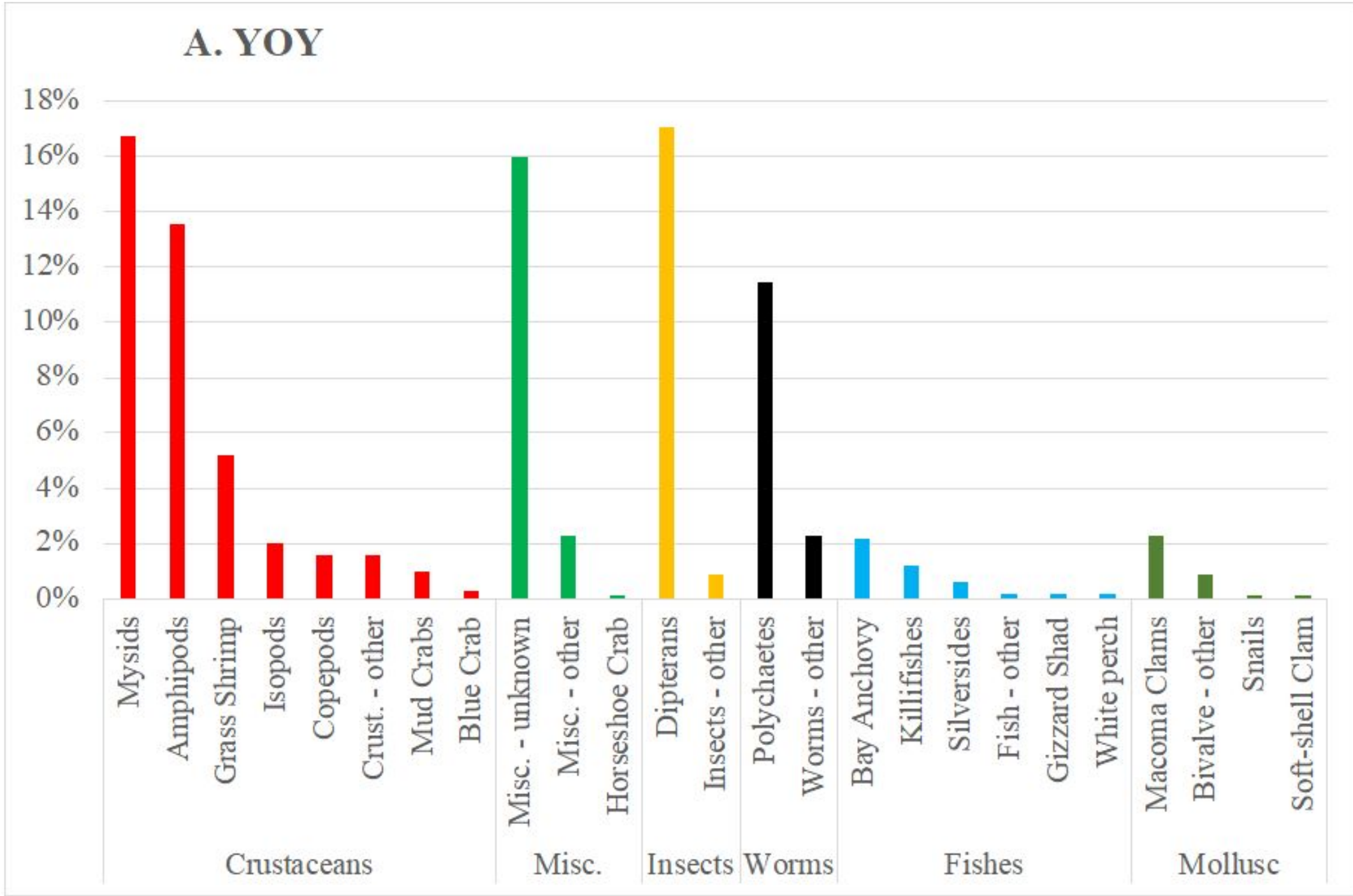
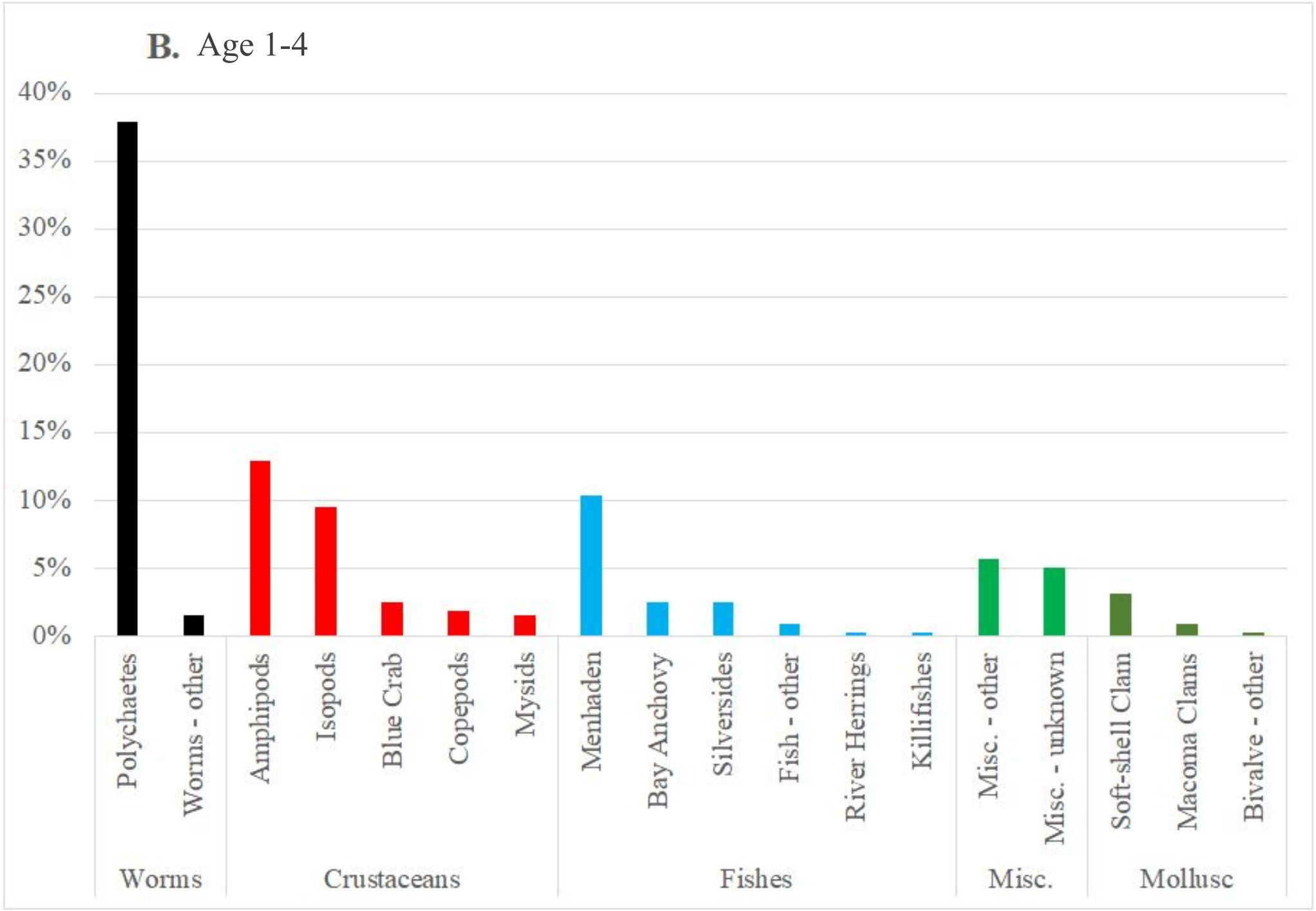

A. YOY
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
Mysids
Amphipods
Grass Shrimp
Isopods
Copepods
Crust. - other
Mud Crabs
Blue Crab
Misc. - unknown
Misc. - other
Horseshoe Crab
Dipterans
Insects - other
Polychaetes
Worms - other
Bay Anchovy
Killifishes
Silversides
Fish - other
Gizzard Shad
White perch
Macoma Clams
Bivalve - other
Snails
Soft-shell Clam
Crustaceans
Misc.
Insects
Worms
Fishes
Mollusc


B. Age 1-4
40%
35%
30%
25%
20%
15%
10%
5%
0%
Polychaetes
Worms - other
Amphipods
Isopods
Blue Crab
Copepods
Mysids
Menhaden
Bay Anchovy
Silversides
Fish - other
River Herrings
Killifishes
Misc. - other
Misc. - unknown
Soft-shell Clam
Macoma Clams
Bivalve - other
Worms
Crustaceans
Fishes
Misc.
Mollusc

Young of year

A Key taxa by abundance	b Additional key taxa	c Additional key taxa
Americamysis bigelowi	*Amphibalanus improvisus*	
Cyathura polita	*Hexagenia limbata*	
Apocorophium lacustre	*Heteromastus filiformis*	
Dipterans	*Gammarus tigrinus*	
Anchoa mitchilli	*Menidia beryllina*	
Marenzelleria neglecta	*Platorchestia platensis*	
Laeonereis culveri	*Palaemon pugio*	
Leptocheirus plumulosus	*Grandidierella japonica*	
Fundulus diaphanus		
Rhithropanopeus harrisii		

Age 1-4

A Key taxa by abundance	b Additional key taxa	c Additional key taxa
Brevoortia tyrannus	*Alitta succinea*	
Cyathura polita	*Callinectes sapidus*	
Heteromastus filiformis	*Menidia menidia*	
Mya arenaria	*Laeonereis culveri*	
Marenzelleria neglecta	*Chasmodes bosquianus*	
Leptocheirus plumulosus	*Anchoa mitchilli*	
	Fundulus heteroclitus	
	Menidia beryllina	
	Erichsonella attenuata	

Forage report annotated

A **Key taxa or species (in order of importance)**	*b* **Additional important taxa or species (alphabetical)**	*c* **Additional important taxa or species identified by participants as under-represented in diet analysis**
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Polychaetes	Atlantic Rock Crab	Mummichog & Killifishes
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Amphipods and Isopods	Blue Crab*	Atlantic Silverside
Mantis Shrimp	Flatfishes	Small Bivalves**
Spot	Kingfish	Insects
Weakfish	Lady Crab	Soft clams
Sand shrimp	*Macoma* clams	Grass shrimp
Atlantic Croaker	Mud crab	Striped blenny
Razor Clams	Spotted Hake	

Research questions

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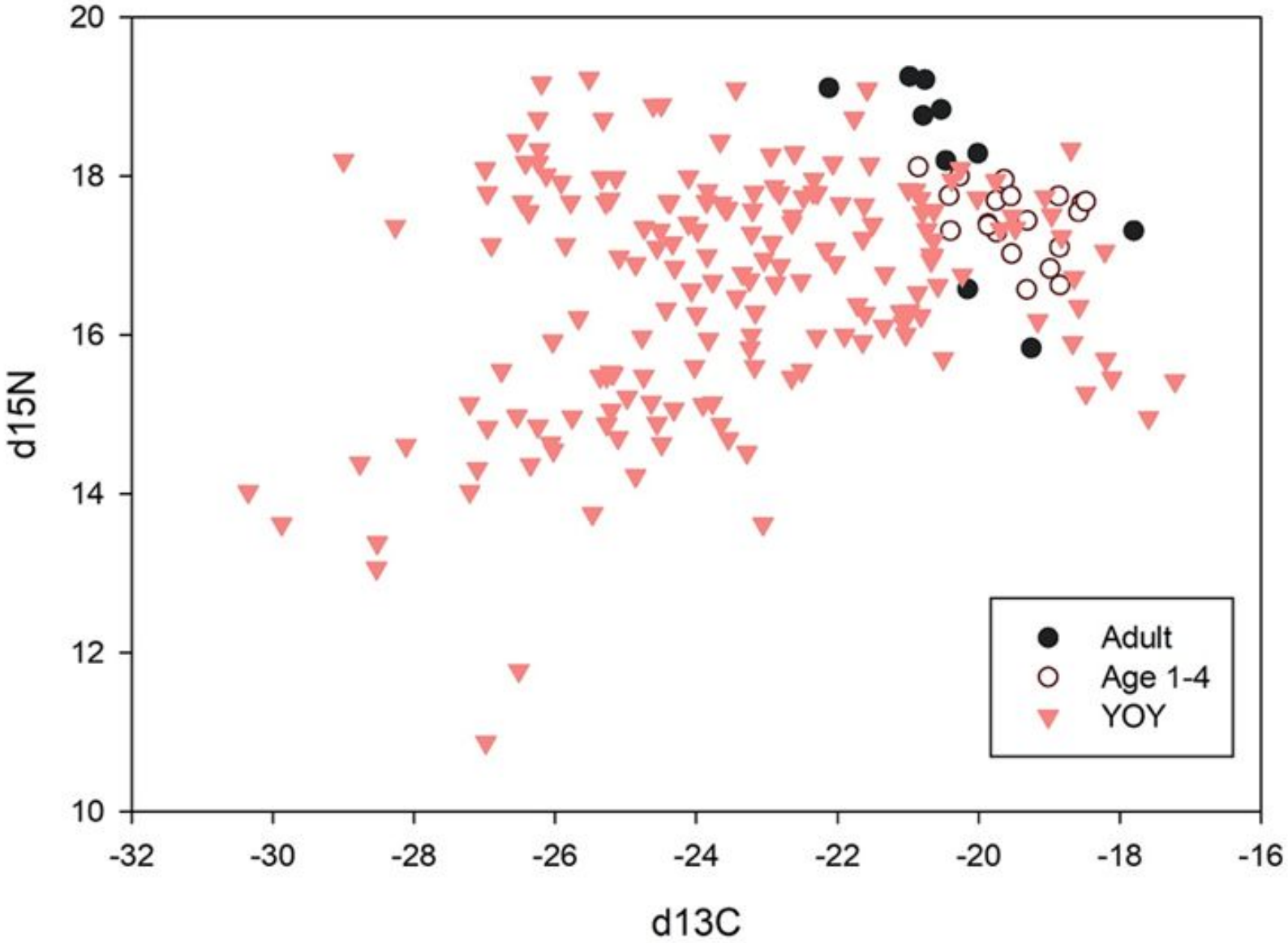
Stable isotopes: Age class



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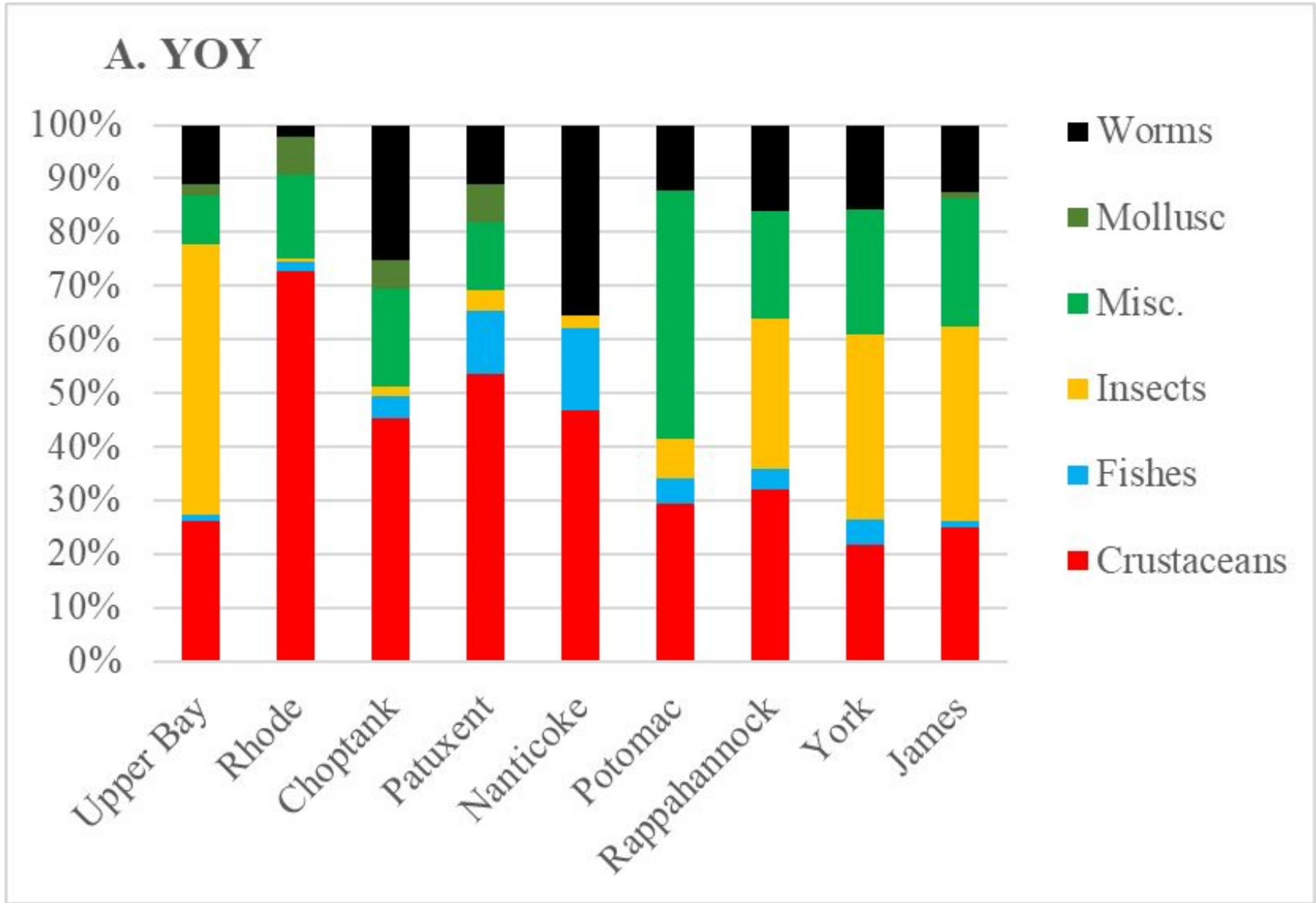
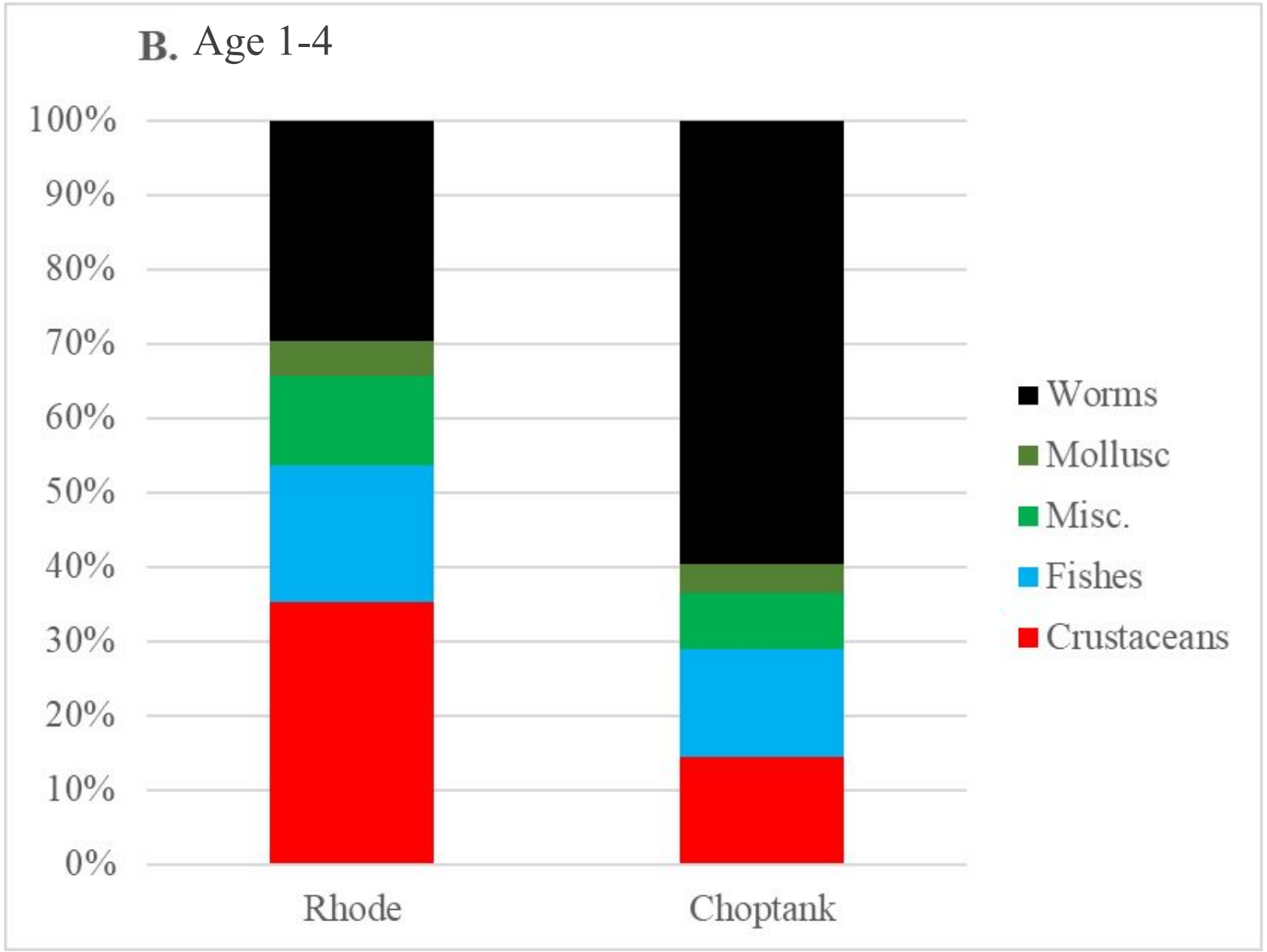

A. YOY
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Upper Bay
Rhode
Choptank
Patuxent
Nanticoke
Potomac
Rappahannock
York
James
Worms
Mollusc
Misc.
Insects
Fishes
Crustaceans


B. Age 1-4
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Rhode
Choptank
Worms
Mollusc
Misc.
Fishes
Crustaceans

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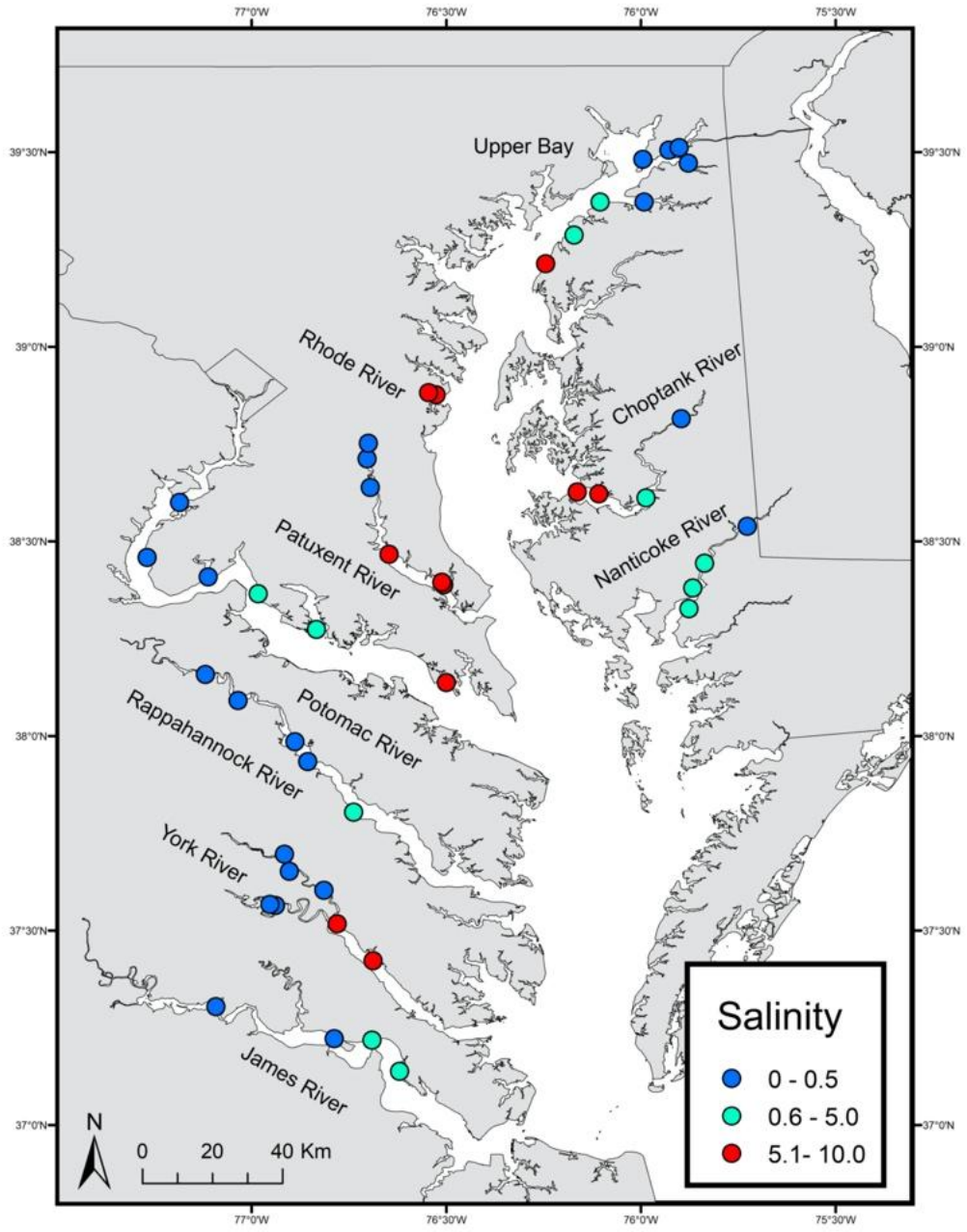
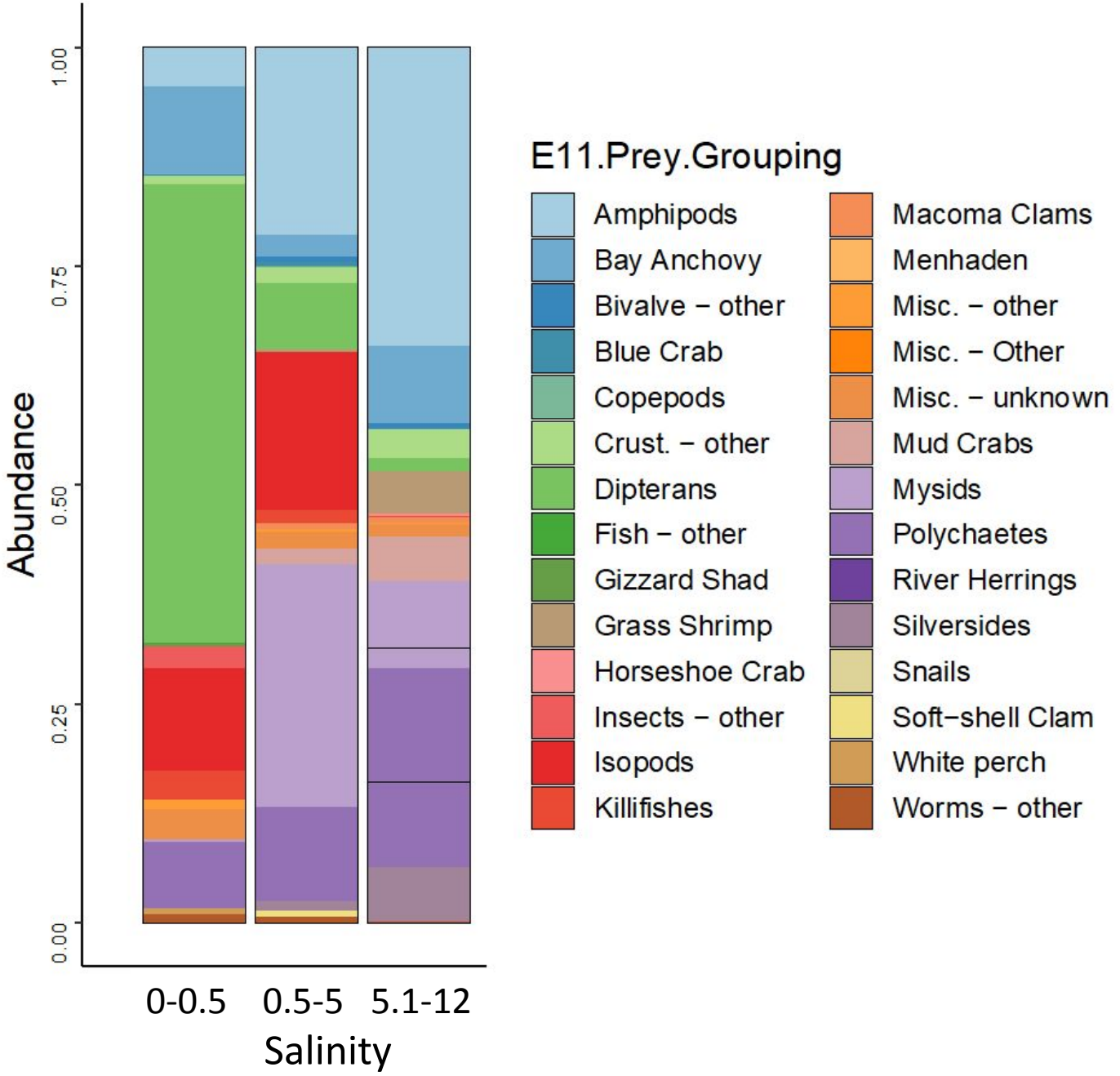
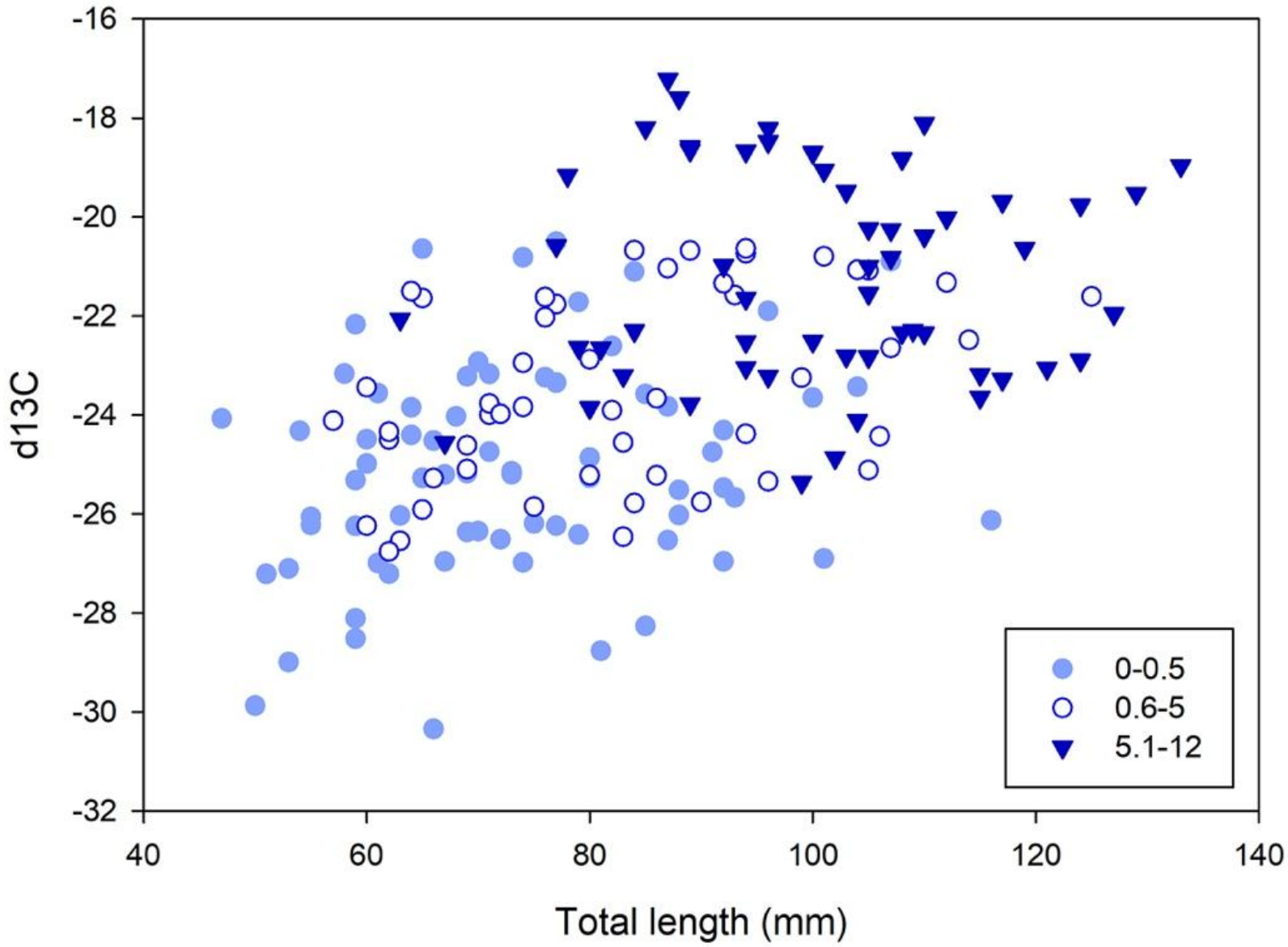

77°0'W
76°30'W
76°0'W
75°30'W
39°30'N
39°0'N
38°30'N
38°0'N
37°30'N
37°0'N
Upper Bay
Rhode River
Choptank River
Patuxent River
Nanticoke River
Potomac River
Rappahannock River
York River
James River
N
0 20 40 Km
Salinity
0 - 0.5
0.6 - 5.0
5.1- 10.0


Abundance
0.00
0.25
0.50
0.75
1.00
0-0.5
0.5-5
5.1-12
Salinity
E11.Prey.Grouping
Amphipods
Bay Anchovy
Bivalve − other
Blue Crab
Copepods
Crust. − other
Dipterans
Fish − other
Gizzard Shad
Grass Shrimp
Horseshoe Crab
Insects − other
Isopods
Killifishes
Macoma Clams
Menhaden
Misc. − other
Misc. − Other
Misc. − unknown
Mud Crabs
Mysids
Polychaetes
River Herrings
Silversides
Snails
Soft−shell Clam
White perch
Worms − other

Stable isotopes: Carbon source, size and salinity



Implications for management

1. Confirmed importance of forage species underrepresented in ChesMMAP data: Mummichogs/killifish, Atlantic/inland silversides

2. Added key forage species: **Insects**, grass shrimp, soft clam, striped blenny

3. Documented substantial variation in key forage species by age, tributary, and salinity zone

4. Genetic barcoding provided species-level identifications for many forage taxa

Acknowledgements

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U.S. DEPARTMENT OF COMMERCE