

Evaluation of Northern Snakehead diets in Virginia's tidal rivers and lakes

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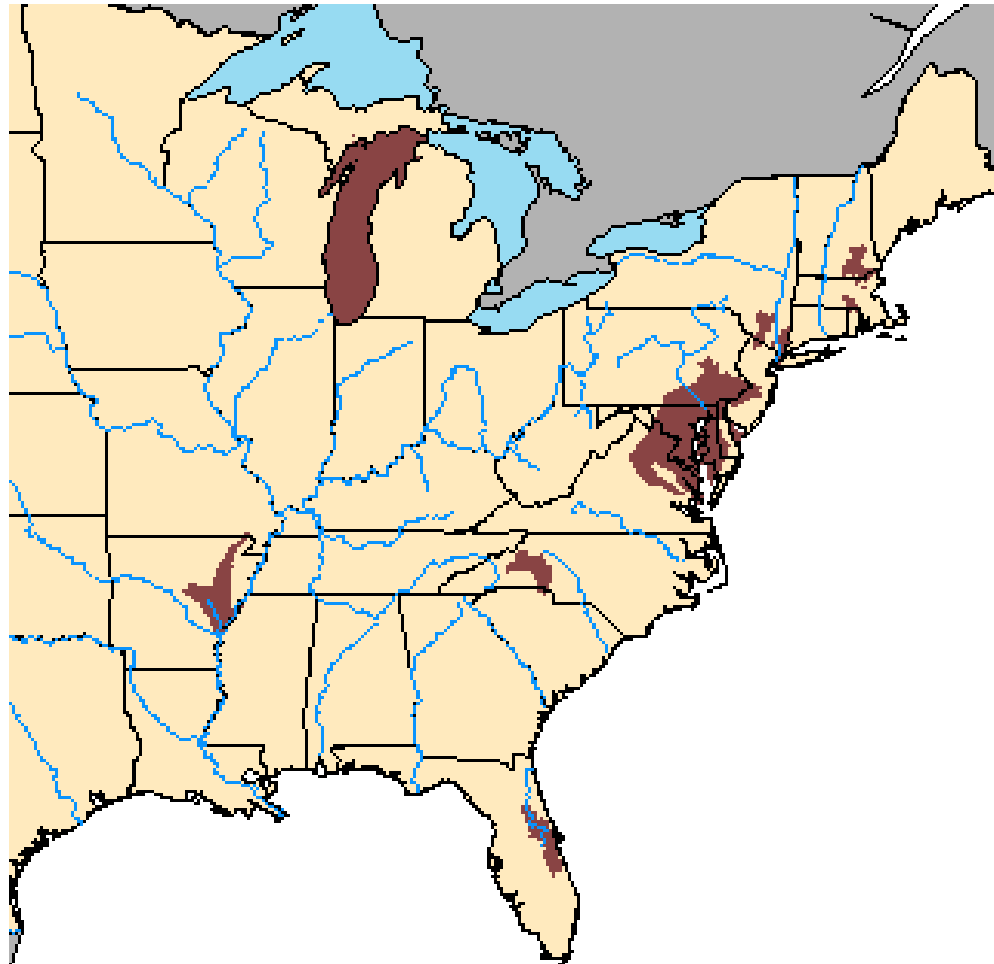
Background

- Native to Asia
- Popular in aquarium trade and as food source
- Obligate air breather, able to live in low D.O. environments
- Parents guard young = higher survival
- Prefer shallow vegetated habitat (spring to fall) but deeper water in winter, hibernate in mud
- Ambush predator
- Piscivorous at early age
- Established in mid-Atlantic region, expanding in Midwest



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Distribution



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<https://nas.er.usgs.gov/queries/factsheet.aspx?speciesid=2265>

Background - Virginia

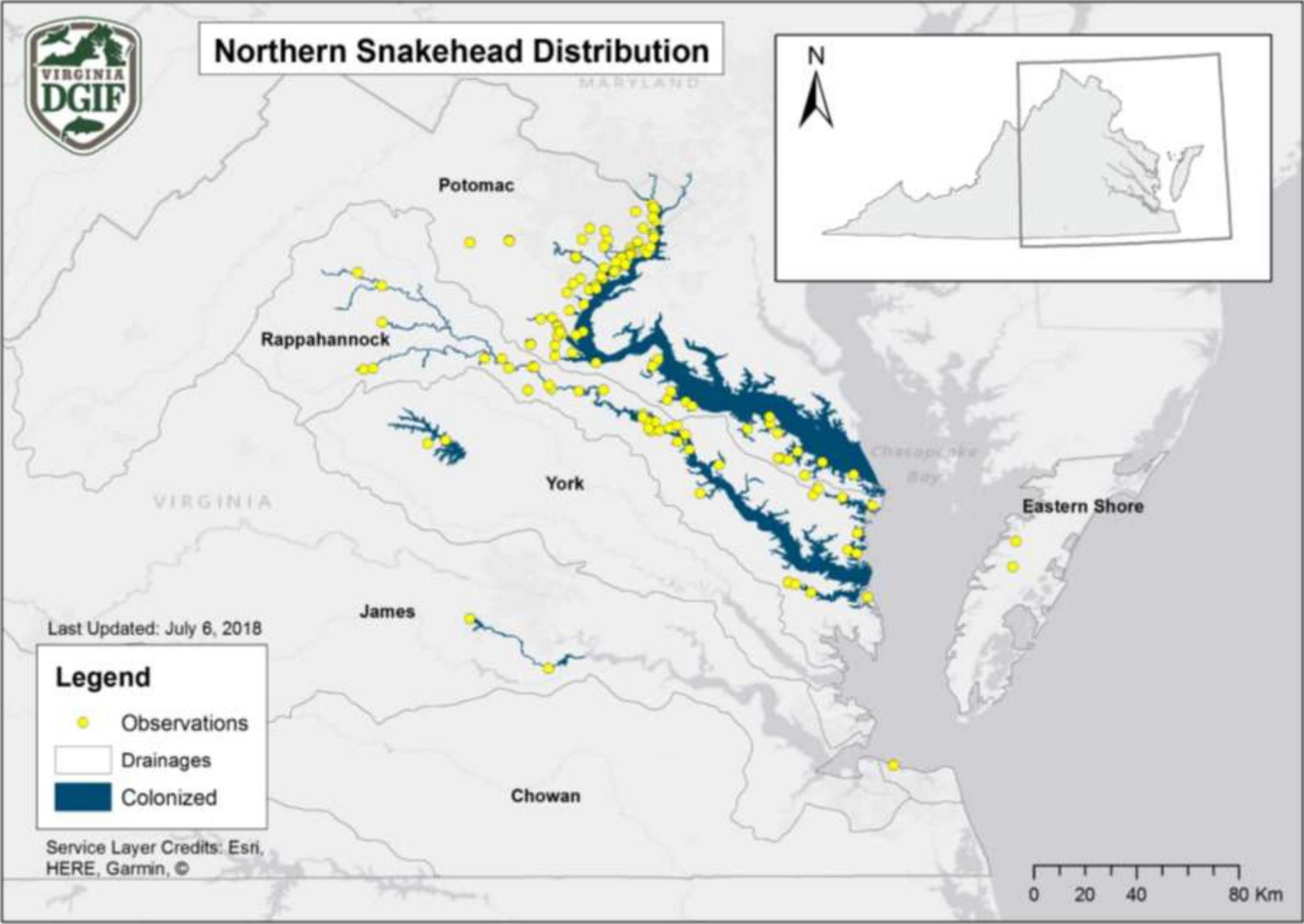
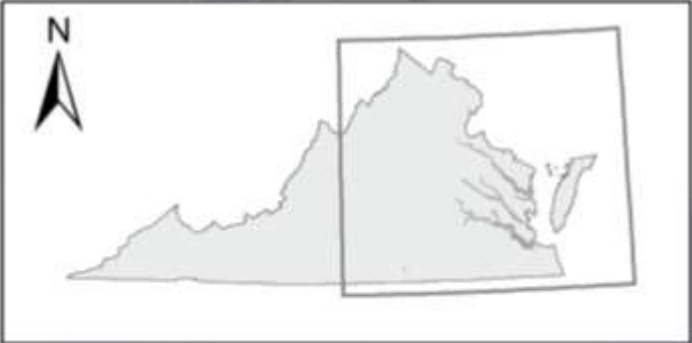
- Northern Snakehead (*Channa argus*) first documented in Potomac system in 2004
- Range in VA has expanded to other rivers and numerous impoundments
- DGIF conducts routine (2-3 times/month) EF surveys from March-October annually
- Most recently found in James drainage – April 2018



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Northern Snakehead Distribution



Last Updated: July 6, 2018

Legend

- Observations
- Drainages
- Colonized

Service Layer Credits: Esri, HERE, Garmin, ©



Methods

- Fish measured, weighed and processed
 - Otolith extraction
 - Sex/fecundity
 - Stomach content



Diet Analysis

- Over 2,200 stomachs checked since 2004
- Only identifiable food items used for analysis
- Wetted weights taken since 2014
- Frequency of occurrence (FO) and % wetted weight (WW) evaluated for tidal rivers and lakes
- Despite teeth, items always consumed whole



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Diet Items



Results - Lakes

- Data collected since 2015
- n = 203
- 76 occurrences with food items
- Identifiable food items 37% of time
- 7 different species

• Top 3 (FO)

- Bluegill – 68%
- Frog – 12%
- Yellow Perch – 11%

Top 3 (WW)

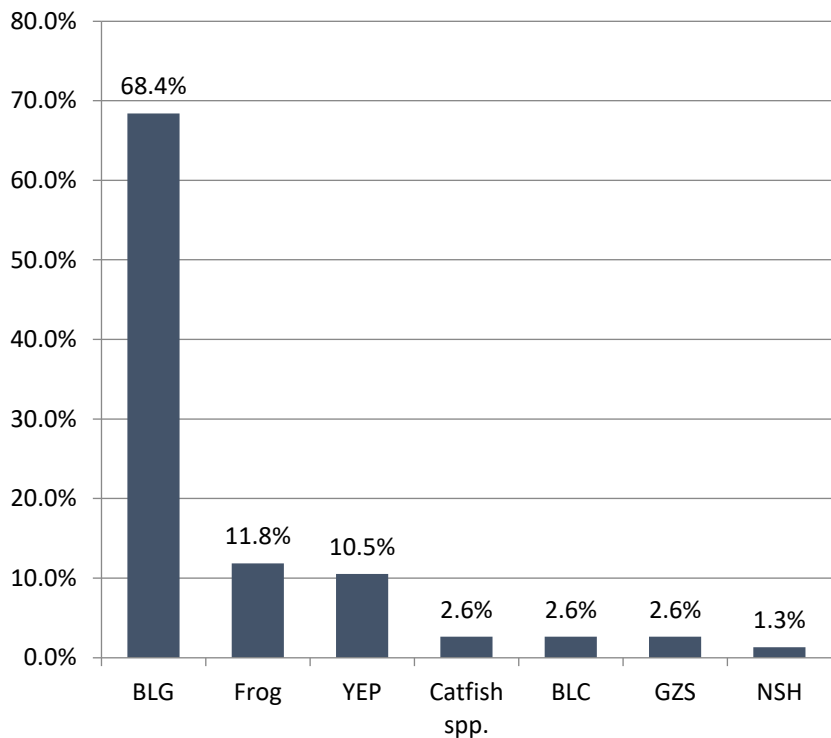
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- Yellow Perch – 12%
- Frog – 11%



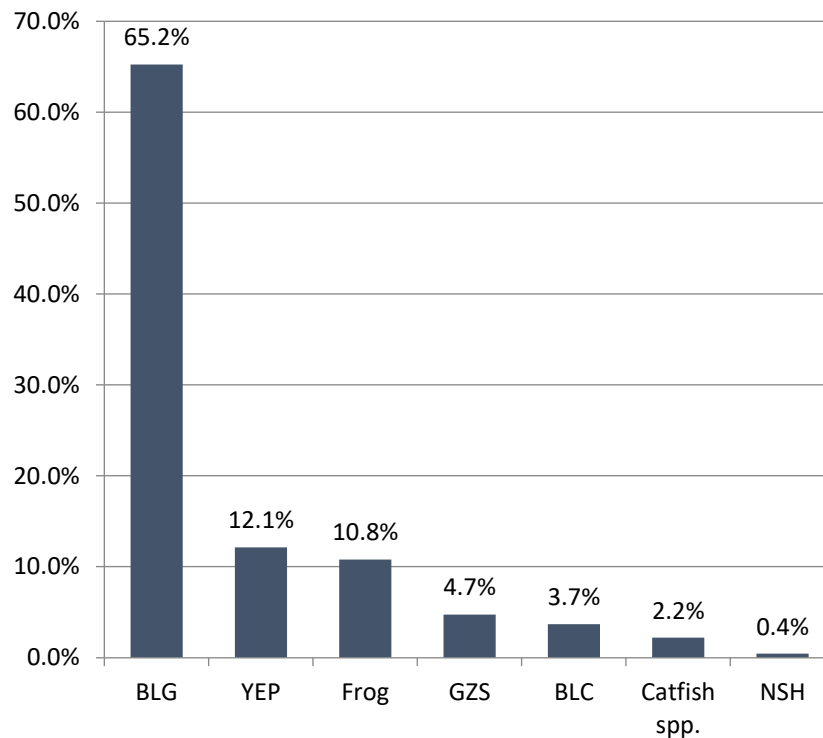
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Results - Lakes

Food Item % FO (All)



Food Item % WW (All)



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Results - Rivers

- Data collected since 2005
- n = 2,057
- 601 occurrences with food items
- Identifiable food items 29% of time
- 30 different species

- Top 3 (FO)

- Banded Killifish – 31%
- Bluegill – 31%
- Crayfish – 7%

- Top 3 (WW)

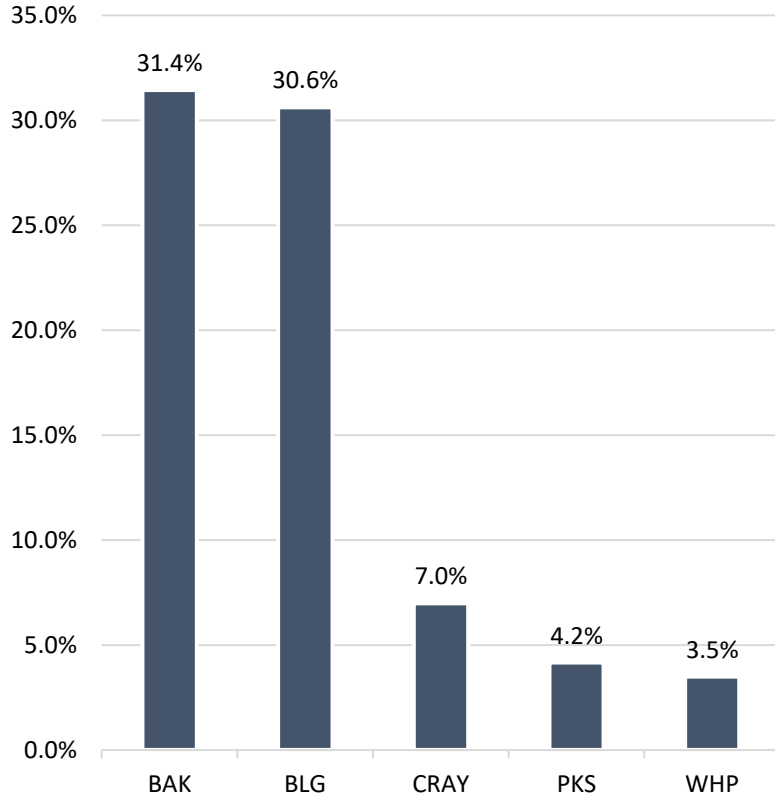
- Bluegill – 40%
- Gizzard Shad – 10%
- Banded Killifish – 8%



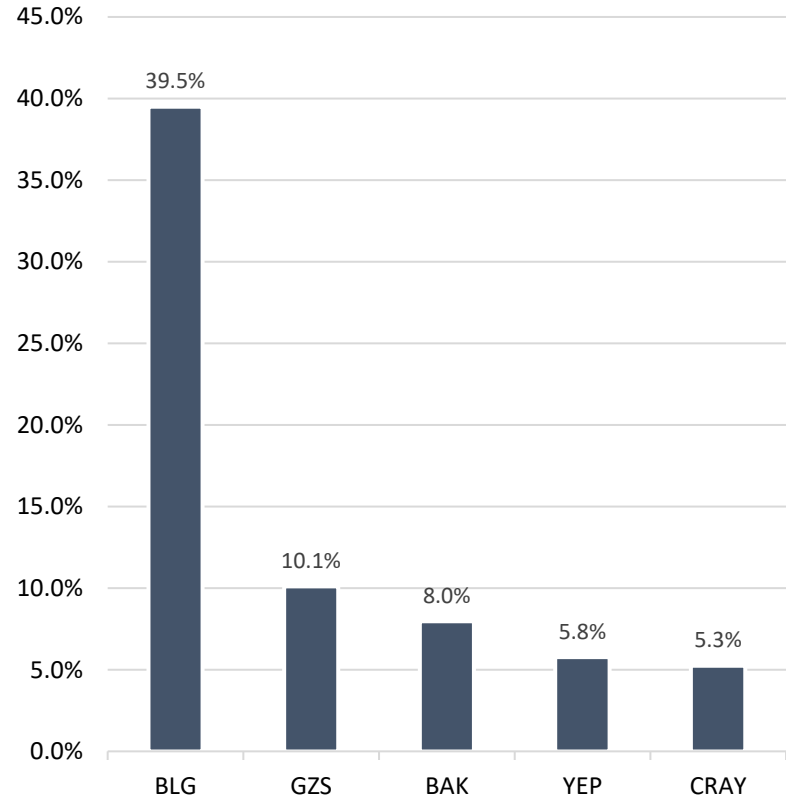
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Results - Rivers

Food Item % FO (Top 5)



Food Item % WW (Top 5)



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Rivers – All Items

	<u># Occ</u>	<u>% FO</u>	<u>% WW</u>		<u># Occ</u>	<u>% FO</u>	<u>% WW</u>
<u>Anguillidae</u>				<u>Cyprinidae</u>	34	5.7	4.3
American Eel	19	3.2	1.8	Eastern Silvery Minnow	16	2.7	2.6
				Goldfish	10	1.7	0.7
<u>Blue Crab</u>	1	0.2		Golden Shiner	5	0.8	1.0
				Spottail Shiner	2	0.3	
<u>Centrarchidae</u>	229	38.2	44.6	Bull Chub	1	0.2	
Bluegill	184	30.6	39.5				
Pumpkinseed	25	4.2	1.8	<u>Ictaluridae</u>	13	2.2	7.4
Largemouth Bass	14	2.3	2.5	Brown Bullhead	4	0.7	3.4
Redear	3	0.5	0.8	Blue Catfish	4	0.7	0.8
Redbreast	1	0.2		Channel Catfish	2	0.3	3.0
Green Sunfish	1	0.2		White Catfish	1	0.2	
Black Crappie	1	0.2		Catfish spp.	2	0.3	0.2
<u>Channidae</u>				<u>Fundulidae</u>			
Northern Snakehead	3	0.5	1.8	Banded Killifish	189	31.4	8.0
<u>Clupeidae</u>	27	4.4	16.6	<u>Moronidae</u>			
Gizzard Shad	17	2.8	10.1	White Perch	21	3.5	4.1
Alewife	2	0.3	3.7				
Blueback Herring	3	0.5	2.7	<u>Percidae</u>	23	3.9	6.0
Alosa spp.	5	0.8	0.1	Yellow Perch	13	2.2	5.8
				Tesselated Darter	9	1.5	0.2
<u>Crayfish</u>	42	7.0	5.3	Darter spp.	1	0.2	

Results - Seasonal

- Food rarely found in stomachs early Spring, followed by pre-spawn gorging
- Majority of stomachs found to be empty during spawn
- Spring (Mar-May) and Summer (June-Aug) almost 1:1 for BLG and BAK
 - BAK spawn in dense vegetation June through August
- Fall (Sept-Oct) dominated by BLG consumption by 4:1
 - Larger items to build fat reserves for winter?



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Conclusions

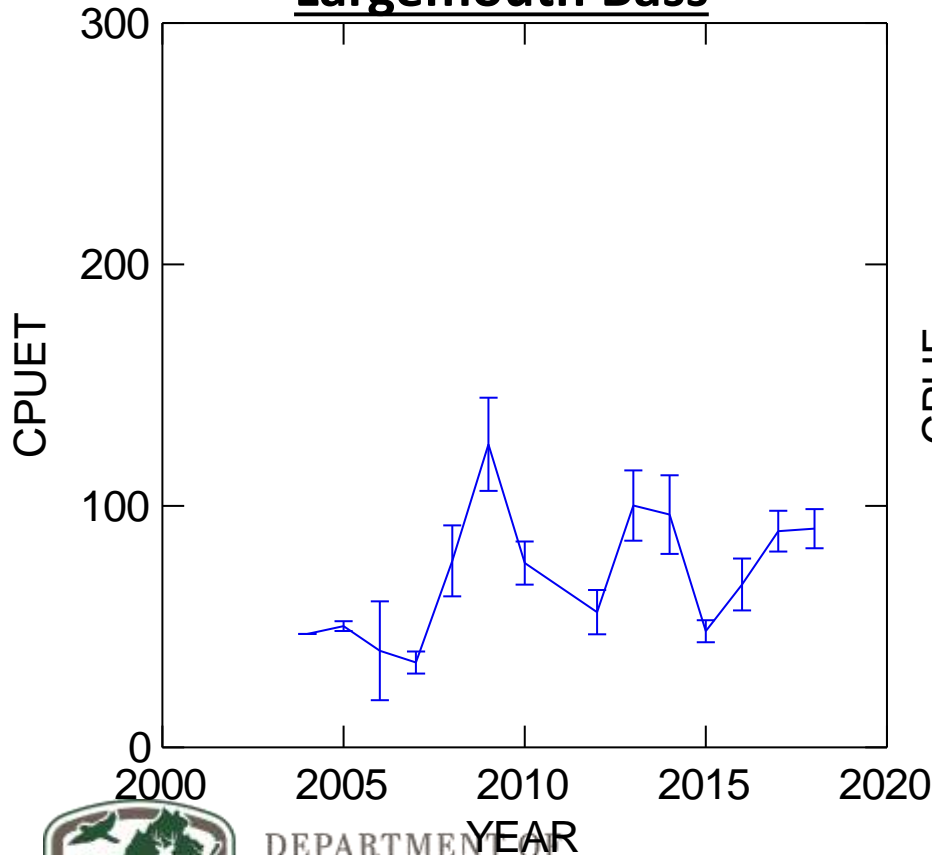
- Fish account for 98% of diet
- Bluegill (non-native) dominant food item (% FO and WW) in lakes
- Rivers more productive than lakes and offer more options
 - Banded Killifish and Bluegill almost identical in % FO (Saylor et al. 2012)
 - Bluegill largely most common food item by % WW
- So, Northern Snakeheads must be having a detrimental effect on other species through predation and competition?
 - Largemouth Bass only found in 14 of 2,260 stomachs (0.6%)



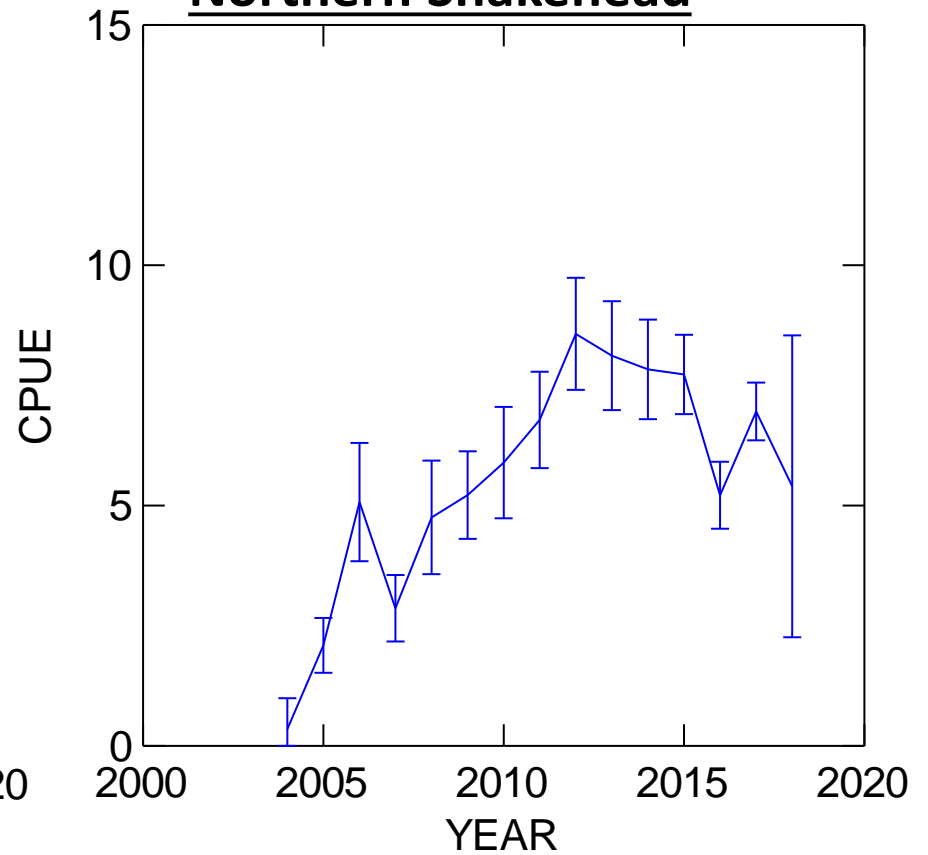
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LMB and NSH Catch Rates

Largemouth Bass



Northern Snakehead



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Discussion

- Snakeheads are opportunistic feeders
 - Wide variety of species and sizes consumed
- Majority of diet composed of few species
 - Centrarchids and Fundulids, by far, most common
- de Mutsert et al. (2017): Banded Killifish abundance has increased in Pohick Bay despite predation
- LMB catch rates ↑ while NSH ↓
- Continue annual monitoring
- Additional research needed to better understand life history components (i.e. recruitment) and assist with management decisions



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Questions ?

