HART-MILLER ISLAND SOUTH CELL

FISH COMMUNITY CHARACTERIZATION

FINAL REPORT

Prepared by:

John W. Gill

And

Ashlee N. Horne

Under Supervision of:

Steve P. Minkkinen, Project Leader

U.S. Fish and Wildlife Service

Maryland Fishery Resources Office

177 Admiral Cochrane Drive

Annapolis, MD 21401

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1.0 BACKGROUND

Baltimore District, U.S Army Corps of Engineers (USACE), in partnership with Maryland Environmental Service (MES) and other partners, developed the "Hart-Miller Island South Cell Environmental Restoration Project (HMI SCERP) Monitoring Plan", dated September 2005. The purpose of this plan was to provide an adaptable, multi-disciplinary monitoring framework to document habitat creation and meet the regulatory and construction compliance requirements for the HMI SCERP. Monitoring elements included an evaluation of the aquatic community in the interior of HMI with respect to the fish species that would be expected in a created habitat of this type, and to verify the establishment of the community. HMI South Cell is a unique environment in the Chesapeake Bay Region, in that it is an elevated, brackish water system which is not connected to the bay by tidal hydrology. In support of the HMI Monitoring Plan fish community evaluation, the U.S. Fish and Wildlife Service's Maryland Fishery Resources Office (MFRO) conducted fish sampling of the South Cell in the summer and fall of 2007, 2008, and 2009. This report presents the findings of those sampling efforts.

2.0 INTRODUCTION

MES has operated the HMI Dredged Material Containment Facility (DMFC) for the Maryland Port Administration (MPA) since 1984. HMI was created to provide a material placement and containment location for dredged sediments generated by navigation projects. The facilities deposition area is approximately 1140 acres, which is divided by a cross-dike, thereby creating two containment cells; the North Cell and the South Cell. The South Cell, approximately 300 acres in size, received dredged material between 1984 and 1990. Since completion, the cell has been managed to further dewater and consolidate the dredged material. The ultimate goal for the South Cell is to restore/create fish and wildlife habitats, and manage the island as a passive recreation area. These goals are outlined in a Section 1135 Environmental Assessment by the Baltimore District, USACE. A majority of the habitat features have been initiated, with construction completed in the summer of 2005. Such features include upland grasses and shrubs, emergent and submergent wetland vegetation, mudflat, and shallow water. The adjacent Chesapeake Bay is the source of water used to maintain salinities and depths targeted for. In so doing, a brackish environment has been established.

As outlined in the HMI SCERP Monitoring Plan, before the area is transferred to the Maryland Department of Natural Resources (DNR), it is necessary that the facility meets all applicable environmental regulatory requirements. A project team consisting of state and federal regulatory and resource agencies identified monitoring needs and elements. Elements included:

- Interior Soil and Sediment Quality
- Exterior Soil and Sediment Quality
- Wetland and Upland Vegetation Community
- Wetland and Upland Vegetation Tissue
- Interior Submerged Aquatic Vegetation (SAV)
- Interior Water Quality
- Fish Community
- Fish Tissue
- Wetland, Upland, and Mudflat Use by Wildlife
- Avian/Wildlife Tissue
- Benthic Community and Tissue

This report covers the Fish Community monitoring element.

3.0 STUDY AREA

Fish sampling occurred throughout portions of the South Cell wetland, mudflat, and 15 acre pond areas (Appendix, Figure 1) that were flooded during sampling. This encompassed approximately 122 acres of the South Cell. Water depths were homogenously shallow (including the pond area), with depths varying from 0.2 to 1.0 meters during sampling events. Salinity range (as measured by a YSI – Yellow Springs Instruments, Inc.) was between 2.57 and 7.60 parts per thousand (ppt). Most shallow water areas lacking emergent wetland vegetation did support SAV, which was heavily dominated by Eurasian watermilfoil (*Myriophyllum spicatum*). Emergent wetland areas characteristically supported narrow-leaved cattail (*Typha angustifolia*), Phragmites (*Phragmites australis*), swithchgrass (*Panicum virgatum*), and smartweed (*Polygonum* sp.). Smartweed areas were ephemeral, with this species disappearing during flooding by higher salinities.

4.0 METHODS

During each seasonal sampling period, two sites were sampled (Appendix, Figure 1). Sampling sites were chosen based on water depth (e.g. enough to adequately immerse net or trap), and wind direction. Wind direction facilitated deploying gear from the front of an airboat (airboats do not have a reverse capability), as the wind pushed the boat in an offshore direction. The airboat was supplied by MES (Appendix, Photo 1). During the three years of the study, sites were selected in order to cover as much of the South Cell as possible (e.g. N, S, W, E shorelines, and the middle).

At each sampling location, fish and non-targeted herpetofauna were collected using a single fyke net (Appendix, Photos 2 and 3) and clover trap (Appendix, Photo 4), which were set for approximately 24 hours. Gear was set in the morning of the first day, and fished the morning of the second.

Fyke nets were deployed with the lead line staked to an existing shoreline (marsh or upland edge), oriented perpendicular to the shoreline, with the cod end of the net staked offshore in deeper water. The nets used in the study had a mouth opening of 91.44 X 121.92 cm, with 2.5 cm mesh throughout and a 15.2 m single lead. Prior to nets being deployed, a bullet float was placed in the cod end of the net to provide an air pocket. The air pocket prevented inadvertent killing of non-target species, such as turtles. Fishing depths ranged 0.2 to 1.0 m. When retrieving the net, each fish or turtle was identified to species, counted, and released. For each fish species encountered, 10 individuals were measured for total length (mm).

Clover traps were placed approximately 10 m offshore of the cod end of the fyke net. Clover traps used in the study were triangular in shape, 3 m wide at the corners, and had a depth of 40.01 cm. Traps were constructed of galvanized 5 mm square steel wire mesh, and as such, were able to catch smaller fish than fyke nets. Each trap was baited with cat food. The same data was collected as with the fyke nets.

5.0 RESULTS

Two sites were sampled (1 fyke net and 1 clover trap/site, 24 hour sets) in the summer and fall of 2007, 2008, and 2009, for a total of 288 sampling hours. Collections over the three year period captured 7 vertebrate species, including:

Pumpkinseed (*Lepomis gibbosus*)

Banded Killifish (*Fundulus diaphanous*)

White Perch (*Morone americana*)

Mummichog (*Fundulus heteroclitus*)

Yellow Perch (*Perca flavescens*)

Bluegill (*Lepomis macrochirus*)

Painted Turtle (*Chrysemys picta*)

Only 1 individual painted turtle was caught (in the summer of 2009). Fish collections over the three year period included the six species listed above, and encompassed 5,756 individuals (Appendix, Table 1).

Appendix, Table 2 represents total number of species caught by gear type (fyke net vs. clover trap) by seasonal sampling period. When the study began, sampling the first time, summer 2007 (6/20/07), data was recorded as total catch of both gear types, and this sampling period is not represented in the Table. Data was recorded by gear type during the fall 2007 through fall 2009 sampling periods.

Appendix, Figures 2, 3, and 4, respectively, represent numbers and percentage of each species caught in 2007, 2008, and 2009 for both gear types. For most sampling periods, banded killifish were the most numerous. Figure 5 shows total numbers and percentage of each species caught during the entire three year study period for both gear types. In order of occurrence (most caught to least caught) banded killifish were the most numerous (2649 individuals), followed by pumpkinseed (1715), white perch (977), mummichog (353), bluegill (53), and yellow perch (9).

Appendix, Figure 6 represents length (total) frequency data for the 3 year study period. These numbers were generated by randomly measuring 10 individuals for each fish species encountered.

6.0 DISCUSSION

Referring to length frequency data presented in Appendix, Figure 6, five of the six species have an expected and what appears to be stable range of lengths (and therefore age classes) that would suggest recruitment of the species. Icthyoplankton was not sampled, therefore reproduction is assumed by the presence of young individuals. South cell species having young age classes present include white perch, pumpkinseed, banded killifish, mummichog, and bluegill. These species have a relatively wide range of tolerance to salinity; 0 – 18 ppt (Murdy et al. 1997), and, assuming reproduction is occurring, spring rains must be adequate to freshen the South Cell enough for successful spawning by the semi-

anadromous white perch, at least during some years. The SAV beds in the South Cell also provide adequate food, cover, and spawning habitats for these five species.

By contrast, only larger (older) individuals of yellow perch were collected (Appendix, Figure 6). Yellow perch is also a semi- anadromous species. However, In Chesapeake Bay, yellow perch typically migrate from river mouths far upstream to non-tidal, flowing portions of tributaries to spawn. These waters typically exhibit 0.0 ppt salinity. White perch, in comparison, can spawn in low salinities (Murdy et al. 1997).

Referring to Appendix, Table 1, number of individual species collected per sampling period, with the exception of collections on 10/30/2007, ranged from 623 – 1,671. The low numbers encountered on 10/30/07 are a result, in part, of the trap door on the clover trap being inadvertently left open. This resulted in no fish captures for that trap. However, numbers for that sampling period (fall 2007) were still lower than other years and seasons for the nets and trap that were fishing.

Somewhat surprisingly, no mosquito fish (*Gambusia holbrooki*) were collected in the South Cell. This may be a function of the mesh sizes deployed being too large to capture this species by fyke net. Maximum adult size of mosquito fish is 6.3 cm for total length (Murdy et al. 1997). Mosquito fish are also surface dwellers, which could avoid a clover trap submerged beneath the surface.

The existing species, and populations of those species (with the exception of yellow perch) found in the South Cell appears stable. Numbers of individuals collected suggest the South Cell provides a good forage base for piscivorous (fish eating) birds feeding on the island. The present lack of freshwater does limit expanding the existing, self sustaining, species assemblage observed. A more diverse bathymetry (e.g. providing deeper waters then presently exists), and the addition of structure such as large woody debris, would diversify the habitats available.

7.0 ACKNOWLEDGEMENTS

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Fred Pinkney of the U.S. Fish and Wildlife Service, Chesapeake Bay Field Office

Beth Versak of the DNR

8.0 REFERENCES

Murdy, E. O., R. S. Birdsong, and J. A. Musick. 1997. Fishes of Chesapeake Bay. Smithsonian Institution Press, Washington, DC, USA.

APPENDIX:

FIGURES, PHOTOS, AND TABLES

Figure 1: Aerial View of Hart-Miller Island South Cell Showing Sampling Locations by Date

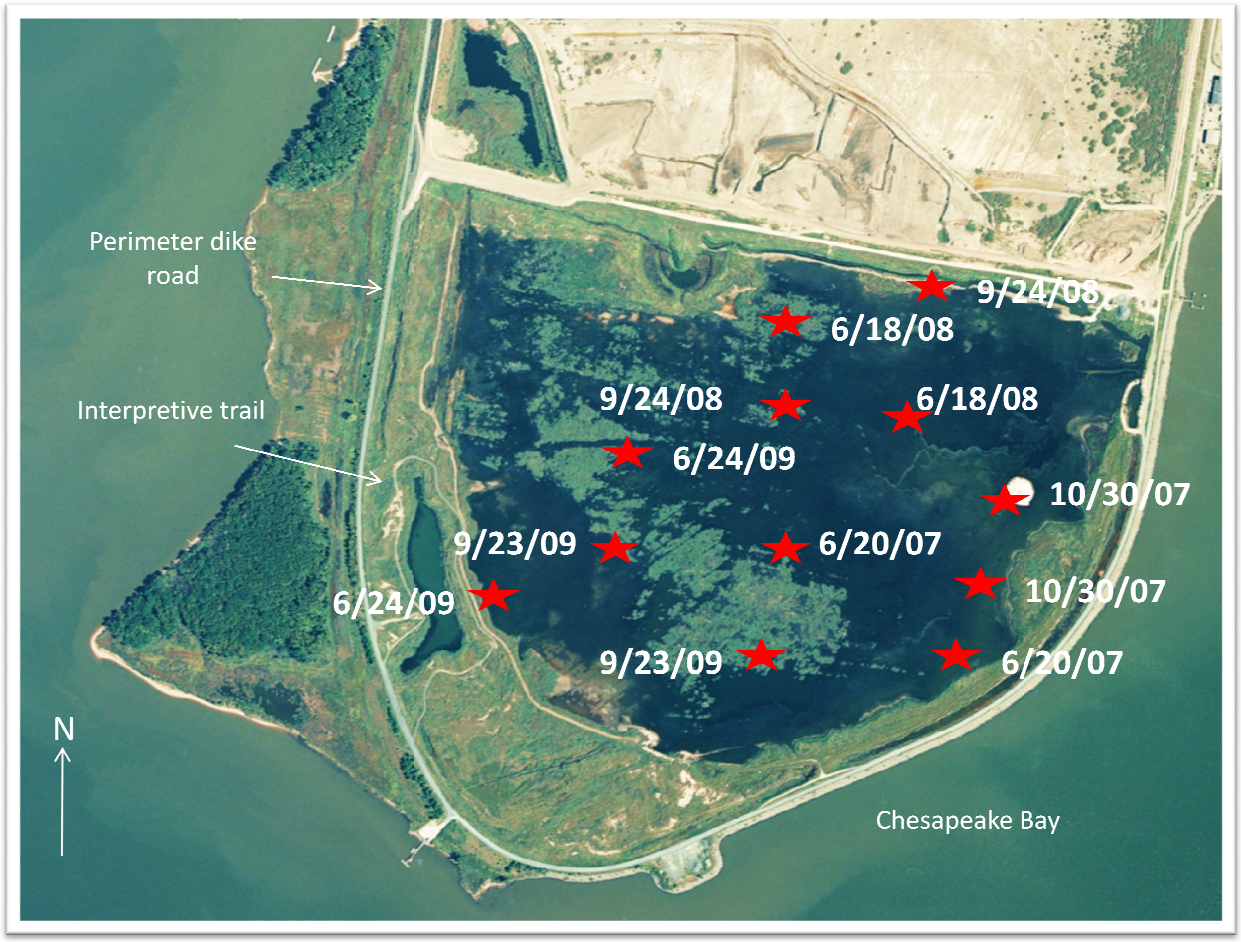


PHOTO 1: MES Airboat in Use

Photo 2: Fyke Net on Land

PHOTO 3: Fyke Net Set in Water (Little Blackwater River, MD)

PHOTO 4: Clover Trap on Land

TABLE 1: Total Fish Species and Number Collected by Fyke Net and Clover Trap for all Sampling Events

Species	6/20/2007	10/30/2007	6/18/2008	9/24/2008	6/24/2009	9/23/2009	Total
pumpkinseed	505	32	170	730	234	44	1715
banded killifish	518	6	72	326	492	1235	2649
white perch	6	10	323	548	75	15	977
mummichog	9	1	13	67	215	48	353
yellow perch	0	8	1	0	0	0	9
bluegill	0	0	44	0	0	9	53
painted turtle	0	0	0	0	1	0	1
Total	1038	57	623	1671	1017	1351	5757

TABLE 2: Total Fish Species and Number Collected by Gear Type

Species	10/30/2007		6/18/2008		9/24/2008		6/24/2009		9/23/2009	
	Fyke Net	Clover Trap	Fyke Net	Clover Trap	Fyke Net	Clover Trap	Fyke Net	Clover Trap	Fyke Net	Clover Trap
pumpkinseed	32	0	115	55	601	129	33	201	42	3
banded killifish	0	6	37	35	55	271	9	483	32	1203
white perch	10	0	261	62	508	40	31	44	14	1
mummichog	0	1	13	0	44	23	5	290	9	39
yellow perch	8	0	1	0	0	0	0	0	0	0
bluegill	0	0	13	31	0	0	0	0	0	9
painted turtle	0	0	0	0	0	0	1	0	0	0
Total	50	7	440	183	1208	463	79	1018	97	1255

Note: Individual gear data is not available for 6/20/2007.

Figure 2: Total Species Abundance 2007 Collected by Fyke Net and Clover Trap

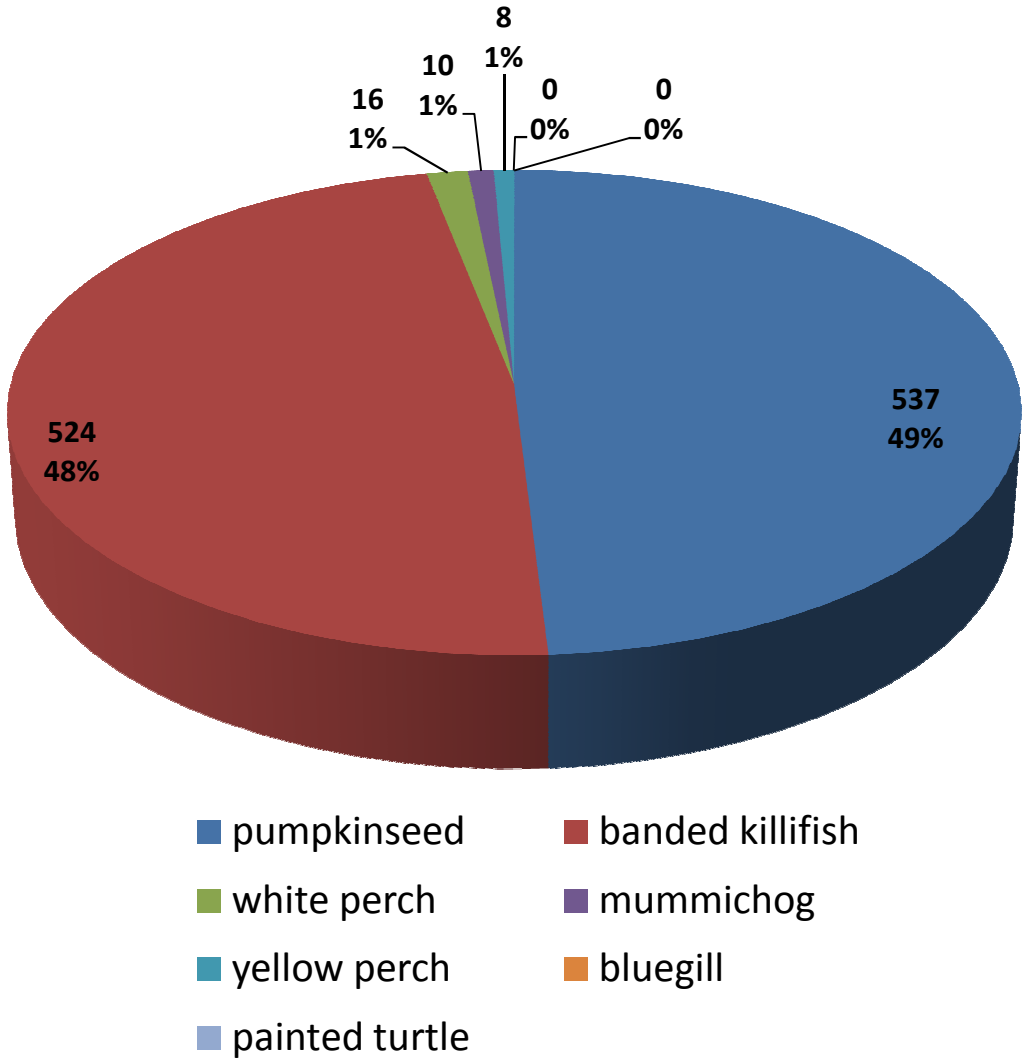


Figure 3: Total Species Abundance 2008 Collected by Fyke Net and Clover Trap

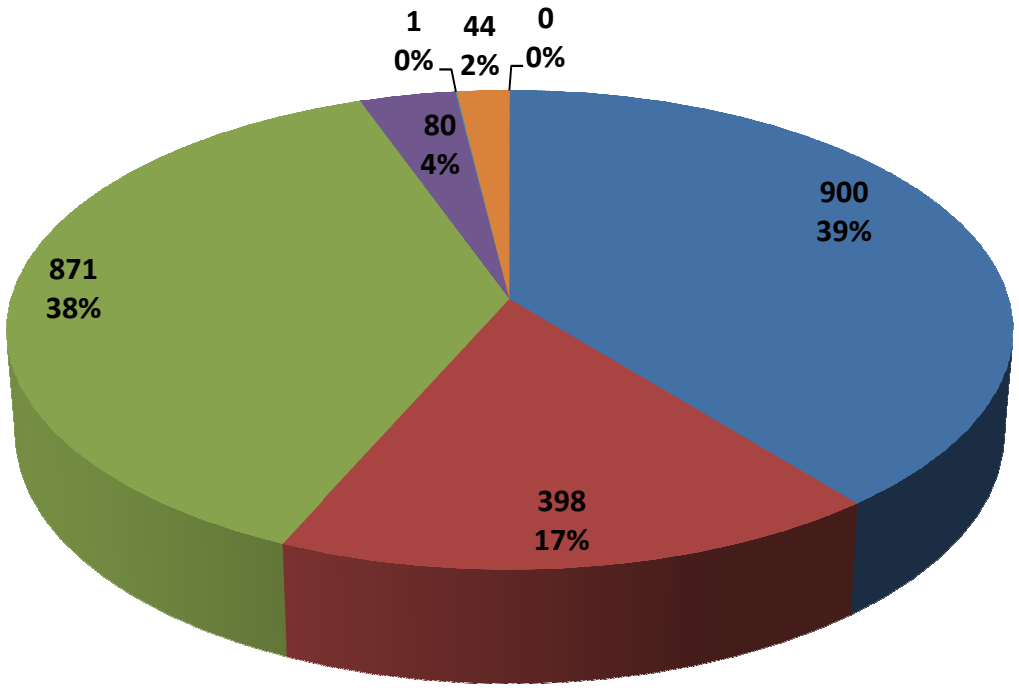


Figure 4: Total Species Abundance 2009 Collected by Fyke Net and Clover Trap

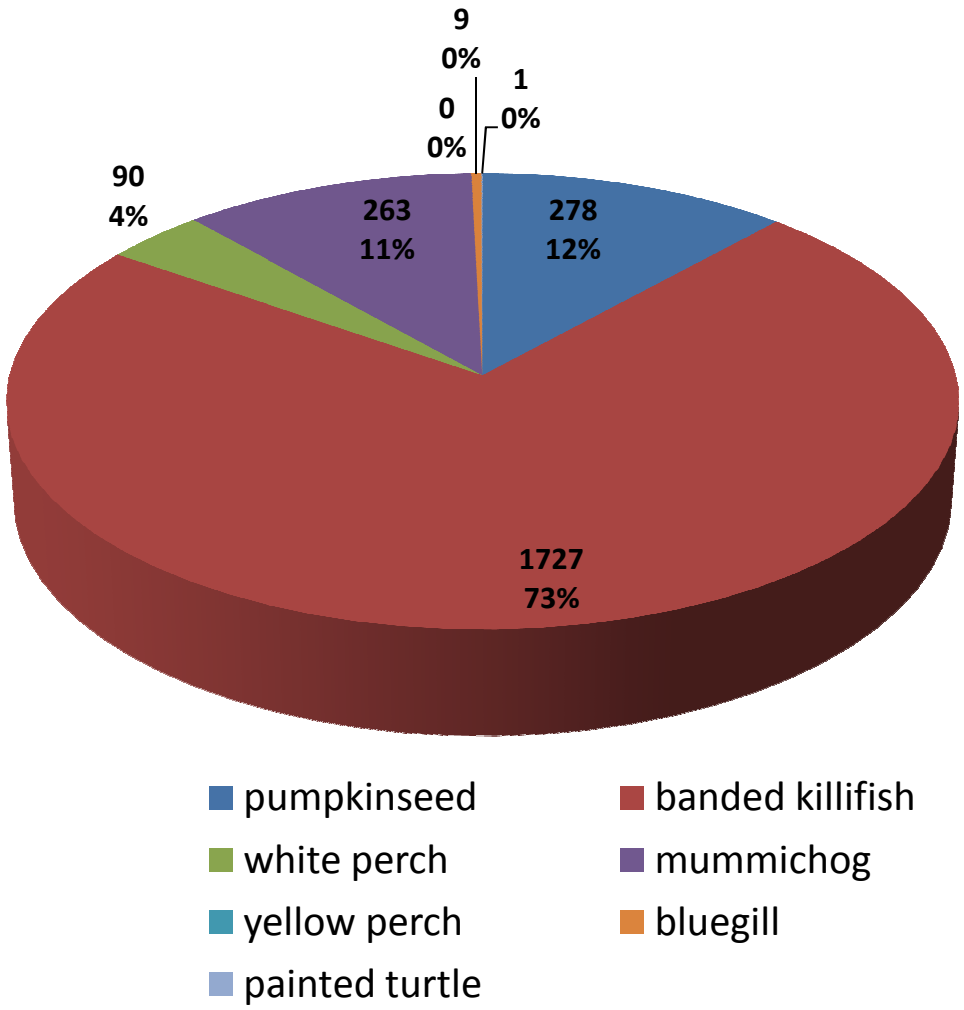
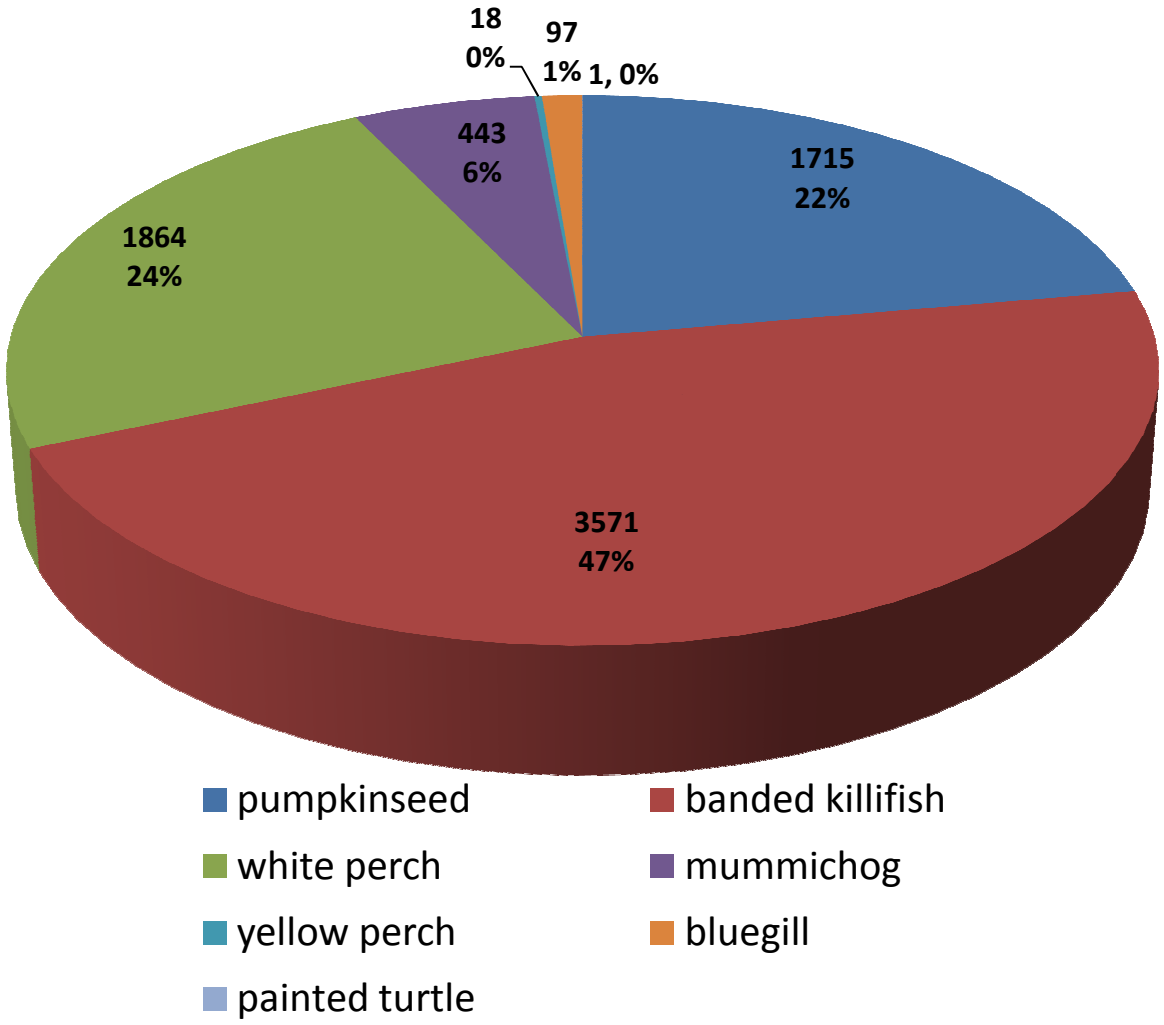


Figure 5: Total Species Abundance 2007-2009 Collected by Fyke Net and Clover Trap



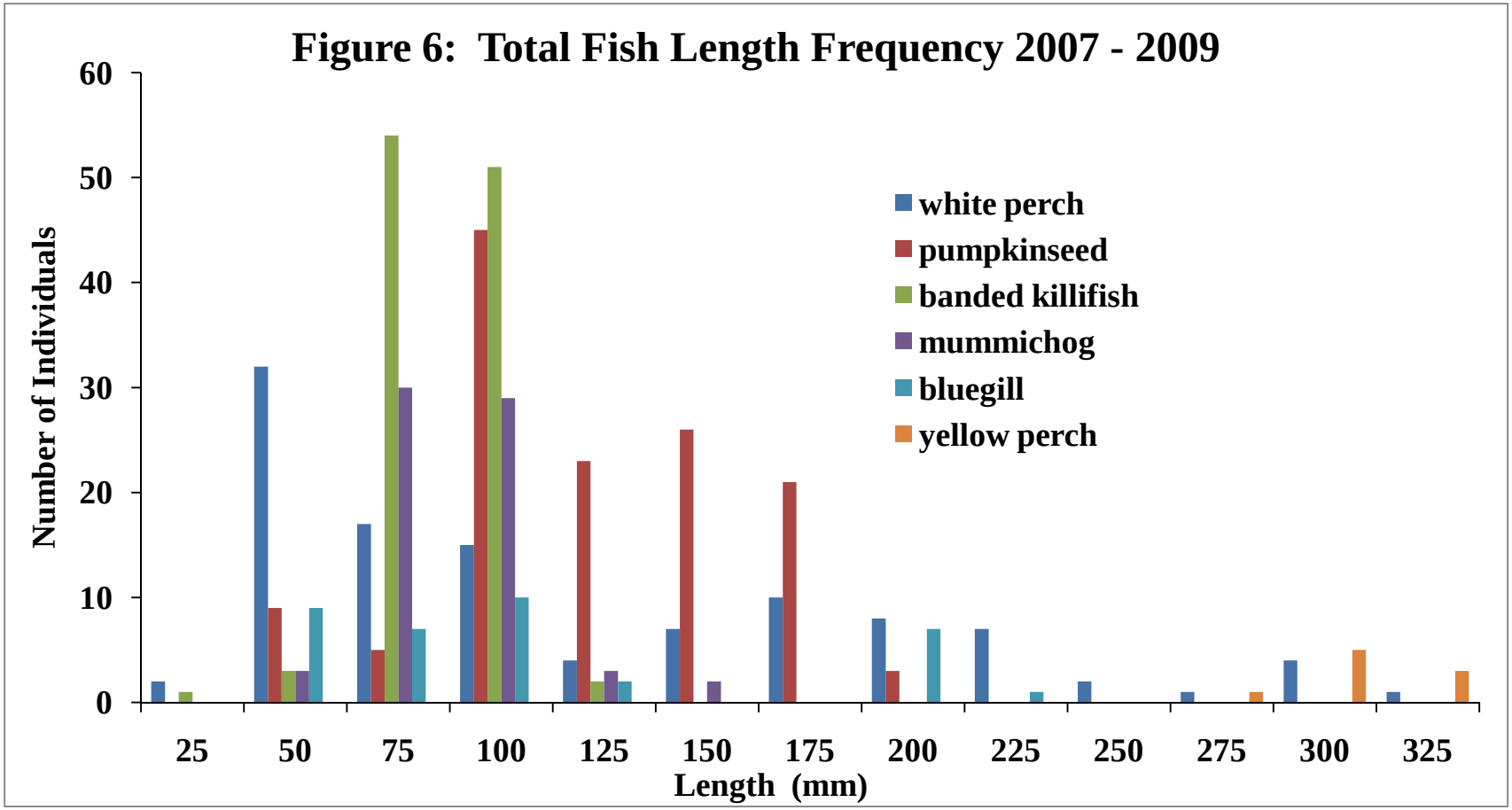


Figure 6: Total Fish Length Frequency 2007 - 2009
Number of Individuals
60
50
40
30
20
10
0
25
50
75
100
125
150
175
200
225
250
275
300
325
Length (mm)
white perch
pumpkinseed
banded killifish
mummichog
bluegill
yellow perch

PHOTO 5: Yellow Perch

PHOTO 6: White Perch

PHOTO 7: Pumpkinseed

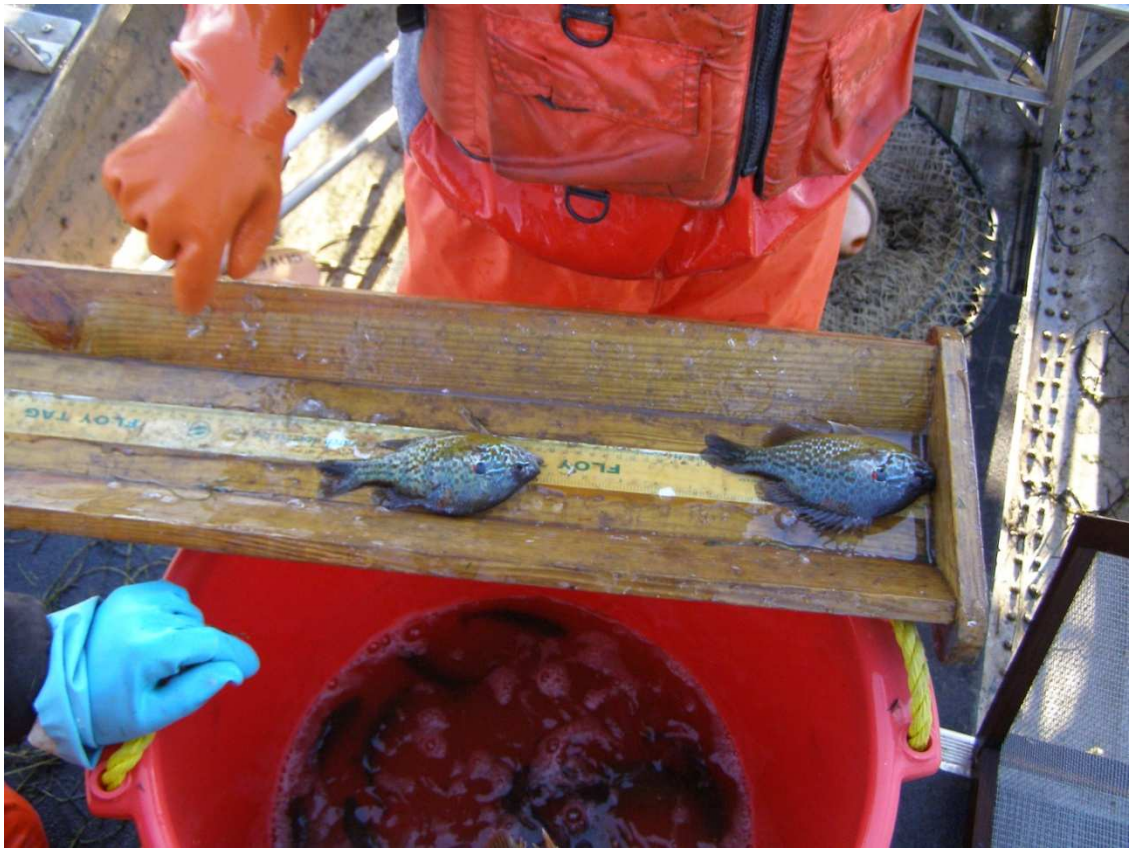


Photo 8: Bluegill

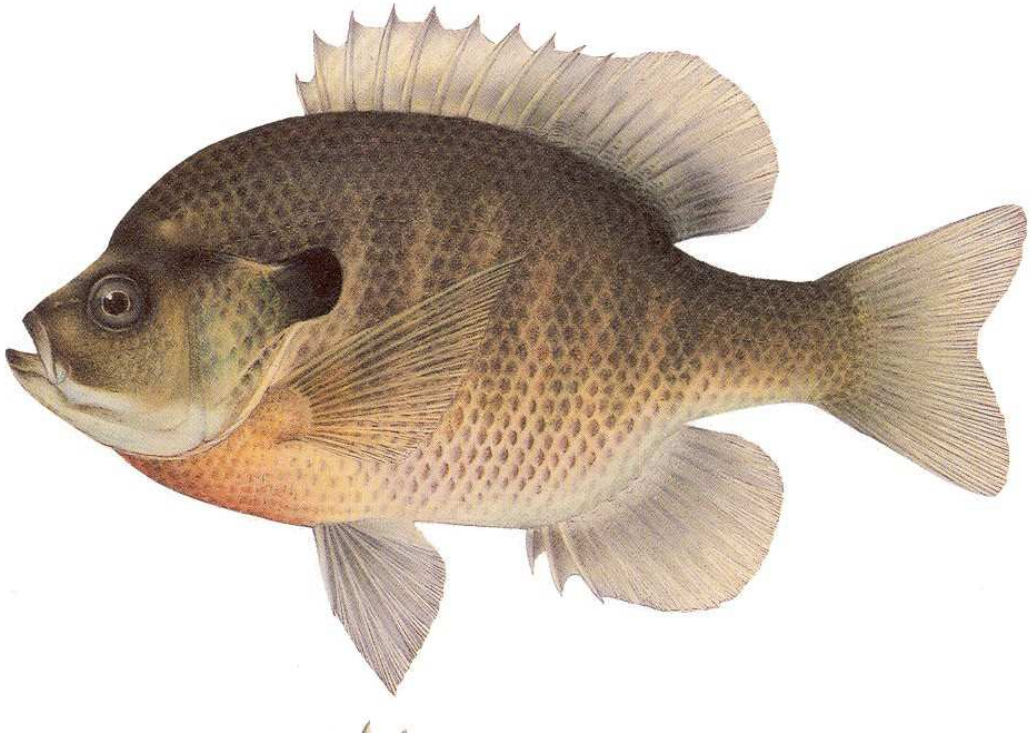


PHOTO 9: Mummichog (Photo credit Maryland DNR)

PHOTO 10: Banded Killifish (Photo credit Maryland DNR)

PHOTO 11: Painted Turtle