Final Report of Fishery Resource Grant Project 2014

Conducted by George Trice

Project Title: TESTING THE APPLICABILITY OF COMMERCIAL ELECTROFISHING FOR INVASIVE CATFISH IN THE JAMES AND YORK RIVERS.

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Brief Summary

This project was conducted from May 29, 2014 to September 16, 2014. The project documented the effectiveness of commercially harvesting invasive Ictaurids in the James and York Rivers using low-frequency electrofishing. The two species harvested were blue catfish (*Ictalurus furcatus*) and flathead catfish (*Pylodictis olivaris*). Blue catfish (BCF) was the main species harvested compromising approximately 90% of weight harvested. A Smith Root 7.5KW boat mounted GPP (Generator Powered Pulsator) was used for the project. The GPP was modified by Smith Root so the output pulse frequency could not exceed 15Hz. The anode compromised of a 9m long 9.5mm diameter stainless steel cable. A 7m piece of lead core line zip tied to the cable to help keep the anode down in the water column. The boat itself was used as the cathode, no additional cathode cables were set in the water. Electrofishing settings were set based on recommendations from Smith Root and the scientific literature. The typical settings were 0.3-0.7 amps with volts from 40-60.we were successful at raising fish when the conductivity was between 125 and 550.by exposing more of the anode when the conductivity was low and putting electrical tape and shortening the bare wire when conductivity would rise. A 7mX2m Carolina Skiff was used as the chase boat to capture stunned catfish. Fish were caught using dip nets of various sizes, usually about 2.5m long with a 0.4m^2 net opening.

During the study period 70,380kg of catfish were harvested electrofishing for 5430 minutes resulting in a CPUE of 13kg per minute. No species other than catfish appeared to be effected by the equipment. Several white catfish (*Ameiurus catus*) were observed but were purposely not captured. The purpose of the project was to see if electrofishing was an effective and means of commercially harvesting invasive catfish for profit. Harvest of catfish was very easy compared to other methods of catfish harvest, i.e. gill nets and hoop nets, and there was no bycatch/unintended mortality observed. This is a highly effective/efficient fishery that can be used to help control invasive catfish populations, especially over abundant populations like in the Chesapeake Bay watershed. While considered a success there are still a lot of background work required to make this a profitable fishery. One major aspect that needs to be

addressed is how often areas can be targeted while maintaining profitable harvest numbers. The biggest challenge is to design harvesting devices that can more efficiently removed stunned catfish. Most of the time less than 5% of what was brought up was actually netted. There was one instance on the Pamunkey River when an estimated 3500kg came to the surface in a 25X25m area, yet only 225kg was netted. If equipment is designed to more efficiently harvest stunned fish there will be more opportunity to expand the fishery.

Methods

Between May 29, 2014 and September 16, 2014 electrofishing was conducted for 47 days. From May 29 to August 11 the James River was sampled 34 times (Figure 1a). From August 12 to September 16 the Pamunkey River was sampled 13 times (Figure 1b). A Smith Root 7.5KW boat mounted GPP (Generator Powered Pulsator) was used for the project. The GPP was modified by Smith Root so the output pulse frequency could not exceed 15Hz. The anode compromised of a 9m long 9.5mm diameter stainless steel cable. A 7m piece of lead core line zip tied to the cable to help keep the anode down in the water column. The anode was covered in a neoprene sleeve except for the last 0.5m. The boat itself was used as the cathode, no additional cathode cables were set in the water. Electrofishing settings were set based on recommendations from Smith Root and the scientific literature. The typical settings were 0.3-0.7 amps with volts from 40-60. Conductivity was monitored and the volts were adjusted accordingly under guidance from Smith Root. Towards the later part of the study we started to modify the amount of the anode that was exposed to the water column which helped us maintain optimal GPP settings across a wider range of conductivities. Effort was monitored by a timer on the GPP. The number of netters dipping catfish Weights were determined at the fish processing center. Also related to effort the number of people dipping catfish was 0.5 for boat drivers and one for people focused only on netting. The driver of the electrofishing boat was not factored in because they were completely focused on shocking. The fish were separated in round weights of 0-0.5kg, 0.6-1.4kg, 1.5-3.6kg, 3.7-6.8kg, and 6.9kg+. Round weight means individual fish weight was estimated and separated into the size classes.

Fish were caught using dip nets of various sizes, usually about 2.5m long with a 0.4m^2 net opening. Bigger and smaller net openings were tested and we found 0.4m^2 to be the most efficient. The number of dedicated netters varied from two to five but 80% of the time there were three. A 7mX2m Carolina Skiff was used as the chase boat to capture stunned catfish.

Results

Roughly 65 km of the James River and 38 km of the Pamunkey River was sampled (Figure 1). Sampling did not occur in all areas along the river stretches in Figure 1, usually just small patches along the rivers were sampled. A total of 73,227kg (Figure 2, Table 1) were harvested during the study period, with over 85% being fish that weighed less than 3.6kg (Figure 3). A total of 34,860kg were harvested from the James River while 38,367kg were harvested from the Pamunkey River (Figure 4). Harvest in the James River was relatively even among the various weight categories. It should be noted that a large amount of fish larger than 6.9kg in the James River were flathead catfish and not blue catfish, the actual amount is unknown because the fish house did not differentiate between the two catfish species (Table 1, Figure

4). The Pamunkey River had 71% fish between 1.5 and 3.6kg and very few flathead catfish relative to the James River. Very few large (>81cm total length) blue catfish in the Pamunkey River while several (sometimes dozens) were observed in the James River almost every day. All harvest laws were observed and many blue catfish were purposely not netted.

CPUE

The daily catch in the James River averaged about 1000kg per sampling day while the Pamunkey average 2850kg per sampling day (Figure 5). However, CPUE (kg/minute) was much closer with the James River averaging 13kg/minute (range while the Pamunkey averaged 15kg/minute (Figure 5). When you factor in the amount of fish caught (kg/minute/netter), the James River had a slightly higher CPUE. There were generally more netters during the later stages of the project in the Pamunkey River and most were on a single boat and were not very effective due to lack of movement. The CPUE (kg/minute/netter) would likely have been higher if a second chase boat were used; therefore netters would have more space. Temperature is a big factor in regards to low-frequency electrofishing. Water temperature was 24^{o}C on May 29 when the project started and 23^{o}C on September 16 when it ended. Because of the late start and early finish the effect of low water temperatures can not be determined. It can be stated that the gear is effective when water temperatures are between 23^{o}C and 30^{o}C.

One big factor that needs to be taken into consideration when discussing the "effectiveness" of the gear and CPUE. While low-frequency electrofishing the time a catfish stays "stunned" at the surface rarely exceeds 120 seconds, leaving a brief period of capture. There were periods when an area would be targeted and 250kg would be harvested in a few minutes. The factor that needs to be considered is sometimes and estimated 20% was netted while other times less than 1% was netted from an area. This fishery could be greatly improved by increasing catch efficiency. Improved catch efficiency would lead to fewer areas shocked. According to Smith-Root and the scientific literature, blue catfish become desensitized to low-frequency electrofishing and do not surface after being shocked multiple times during a certain timeframe. This timeframe is unknown. When a high-density blue catfish area is hit day after day and only a small percentage is captured the fish that are not harvested start to become desensitized after a few shocking events and no longer surface, leaving a large amount of blue catfish that do not react to shocking for an unknown period of time. When a high-density area is targeted day after day, the amount of fish brought up from an area steadily decreases and little has to do with harvest. The fish that are still there, verified with sonar, no longer react the same. If a shocking group hits multiple areas day after day and only nets a small percentage of fish, the fishery will soon become inefficient even though high amounts of blue catfish are in the area.

Because blue catfish become desensitized to low-frequency electrofishing communication between commercial fishers is critical. If multiple areas are targeted multiple times a day the fishery will be unprofitable for commercial fishers and inefficient for removing invasive blue catfish. Also take into account that in some areas blue catfish do not react at all to low-frequency electrofishing. In the James River not a single catfish was reviewed on the surface when the Appomattox River was targeted. The same occurred when areas above Dutch Gap, rkm 135 were targeted. Even though water parameters seem conducive for low-frequency electrofishing it is not known why blue catfish do not react in these areas. Until catch efficiency is increased, entry into this fishery should be limited.

Conclusions

Low-frequency electrofishing is a very profitable fishery that helps reduce invasive flathead and blue catfish from Virginia waters. There were concerns that the equipment required was too expensive for fishers to acquire and profit would not cover the cost. Over a several year period electrofishing equipment cost is likely to be less costly than what gill netters and crabbers encounter. Gill netters and crabbers deal with lost equipment and damaged equipment, most of which is out of the commercial fishers control. Maintaining an electrofishing setup is much cheaper if proper maintenance is conducted, which the commercial fisher can control. For this study enough profit was made in a four day period on the Pamunkey River to cover the cost of the electrofishing setup. The major focus for future work should be towards increasing catch efficiency.

Final Summary

Low-frequency electrofishing is an effective method for reducing invasive catfish from Virginia waters. The reduction of invasive catfish should relieve some pressure for native and other commercial species. There is enough invasive-catfish biomass and reproduction in Virginia waters to sustain commercial low-frequency for years without eradicating the targeted species. With increased harvesting efficiency of target fish there is a possibility of noticeable biomass reduction but much more research and monitoring is needed. It should be noted that the last several weeks that we fished in the James River we were confined to a small area because of VDGIF and our catch was effected resulting in a lower CPUE. For electrofishing to be productive you need to give the area around where you have shocked a five day recovery period between shockings. After moving to the Pamunkey River we found greater success when allowing for this recovery period. This year I learned a lot about the gear and how it functioned becoming more and more successful.

Signature_______________________________________Date_____________________________

Table 1. Harvest for the 2014 sampling season.

Date	0-0.5kg	0.6-1.4kg	1.5-3.6kg	3.7-6.8kg	6.9+kg	Total Weight (kg)	Effort Shocking (minutes)	CPUE (kg/minute)	Netters	CPUE kg/minute/netter	Temperature (°C)	River Targeted
5/29/2014	118	55	79	0	70	323	32	9.7	1.5	6.5	24	James
5/30/2014	202	203	162	82	421	1069	110	9.4	1.5	6.3	24	James
6/2/2014	116	627	343	40	50	1176	150	7.6	1.5	5.1	24	James
6/3/2014	227	294	358	33	142	1054	139	7.3	1.5	4.9	26	James
6/4/2014	59	91	102	52	158	461	36	12.4	1.5	8.3	25	James
6/5/2014	193	249	260	23	200	925	58	15.5	1.5	10.3	26	James
6/6/2014	159	140	140	25	71	535	46	11.4	1.5	7.6	26	James
6/9/2014	272	171	362	206	245	1256	127	9.6	2	4.8	26	James
6/10/2014	182	183	408	162	214	1149	110	10.1	1.5	10.1	28	James
6/11/2014	178	265	408	156	289	1297	107	11.8	3	3.9	28	James
6/13/2014	181	239	376	213	319	1329	122	10.5	3	3.5	27	James
6/16/2014	335	307	397	143	342	1524	145	10.2	3	3.4	27	James
6/17/2014	585	461	308	43	217	1613	143	10.9	3	3.6	29	James
6/18/2014	186	362	188	95	198	1030	92	10.8	3	3.6	30	James
6/20/2014	277	657	110	46	234	1324	68	18.9	3.5	5.4	30	James
6/24/2014	191	801	84	0	57	1133	103	10.7	3	3.6	27	James
6/25/2014	108	376	159	53	149	844	91	9.0	3	3.0	28	James
6/27/2014	52	1092	100	39	100	1382	175	7.6	2.5	3.1	29	James
6/30/2014	725	362	102	39	234	1461	119	11.9	3	4.0	28	James
7/1/2014	207	330	159	20	75	791	46	16.6	3	5.5	28	James
7/2/2014	362	362	100	39	305	1168	72	15.6	3	5.2	28	James
7/3/2014	190	193	317	77	126	903	99	8.8	2.5	3.5	30	James
7/7/2014	113	45	32	9	36	236	36	6.3	2.5	2.5	30	James
7/10/2014	170	164	68	0	10	412	53	7.6	2	3.8	29	James
7/11/2014	358	394	163	11	232	1158	69	16.3	2.5	6.5	30	James
7/21/2014	24	93	483	51	223	874	47	18.0	1.5	12.0	28	James
7/22/2014	75	385	691	0	169	1320	47	27.0	2.5	10.8	28	James
7/28/2014	250	716	123	110	321	1519	79	18.6	2.5	7.4	28	James
7/30/2014	144	566	241	82	267	1301	85	14.8	2.5	5.9	27	James
8/1/2014	446	717	289	104	139	1695	84	19.6	2.5	7.8	27	James
8/2/2014	326	605	128	30	58	1147	78	14.3	2.5	5.7	28	James
8/4/2014	32	48	24	0	0	103	5	21.6	1.5	14.4	28	James
8/5/2014	181	272	100	0	45	598	56	10.3	2.5	4.1	27	James
8/11/2014	164	239	78	106	164	752	60	12.2	1.5	8.1	27	James
8/12/2014	68	589	1903	197	43	2799	159	17.1	2.5	6.8	27	Pamunkey
8/13/2014	76	630	2483	135	112	3437	282	11.8	2.5	4.7	26	Pamunkey
8/18/2014	78	408	1861	69	24	2440	298	7.9	3.5	2.3	26	Pamunkey
8/20/2014	43	1012	2394	96	143	3687	270	13.2	3.5	3.8	26	Pamunkey
8/29/2014	17	487	1903	140	34	2580	98	25.4	3.5	7.3	26	Pamunkey
9/1/2014	11	310	747	77	28	1174	108	10.5	3	3.5	27	Pamunkey
9/2/2014	34	668	1052	68	53	1875	159	11.4	2.5	4.6	28	Pamunkey
9/3/2014	23	513	1590	131	71	2328	175	12.9	2.5	5.1	28	Pamunkey
9/4/2014	7	288	1770	380	94	2539	130	18.9	3.5	5.4	28	Pamunkey
9/5/2014	13	607	2006	148	59	2833	148	18.5	3.5	5.3	28	Pamunkey
9/8/2014	20	770	3216	227	101	4334	194	21.6	4.5	4.8	26	Pamunkey
9/9/2014	35	861	3502	93	56	4547	228	19.3	4.5	4.3	25	Pamunkey
9/16/2014	52	526	2934	235	47	3794	291	12.6	4.5	2.8	23	Pamunkey

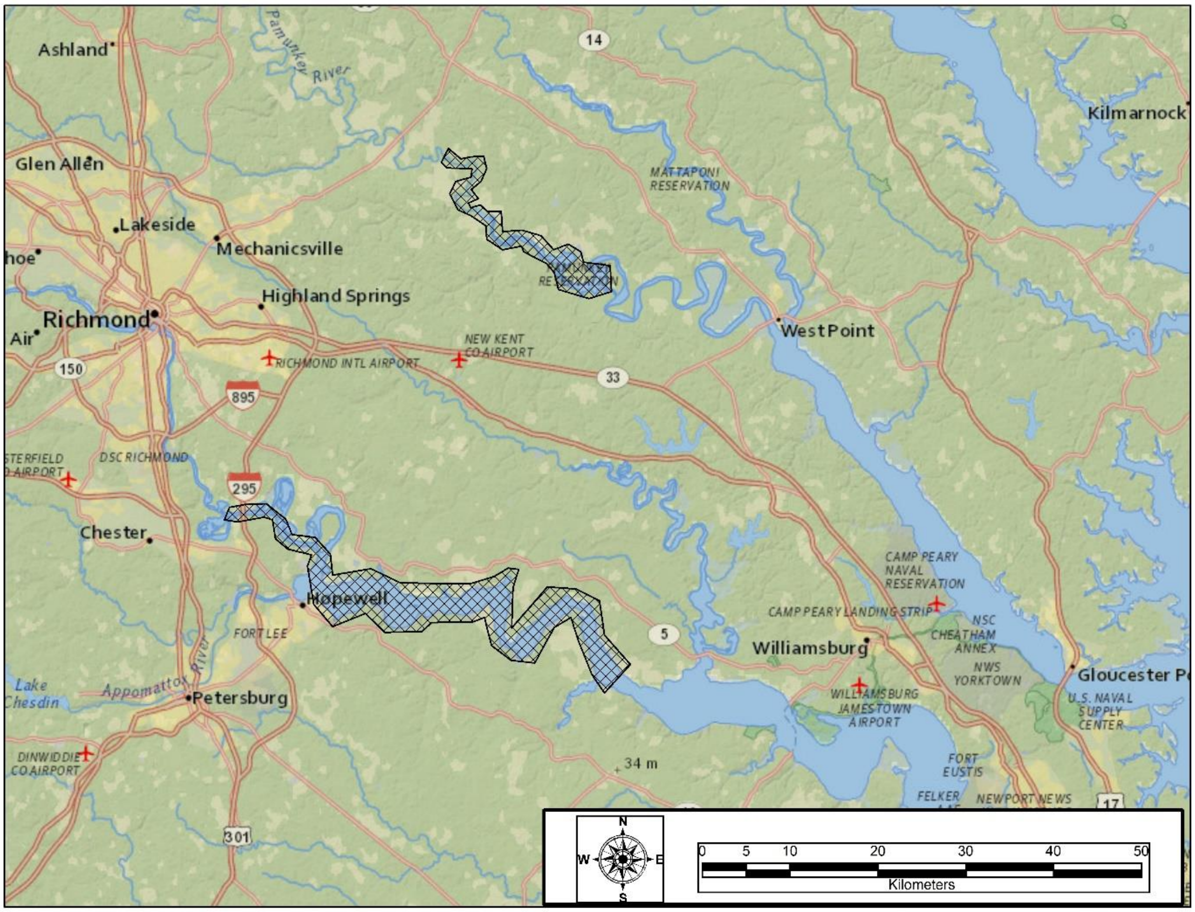

Figure 1. Map showing river stretches sampled (black grid) using low-frequency. Not all areas marked were sampled, usually just small patches in the black grid were actually sampled.

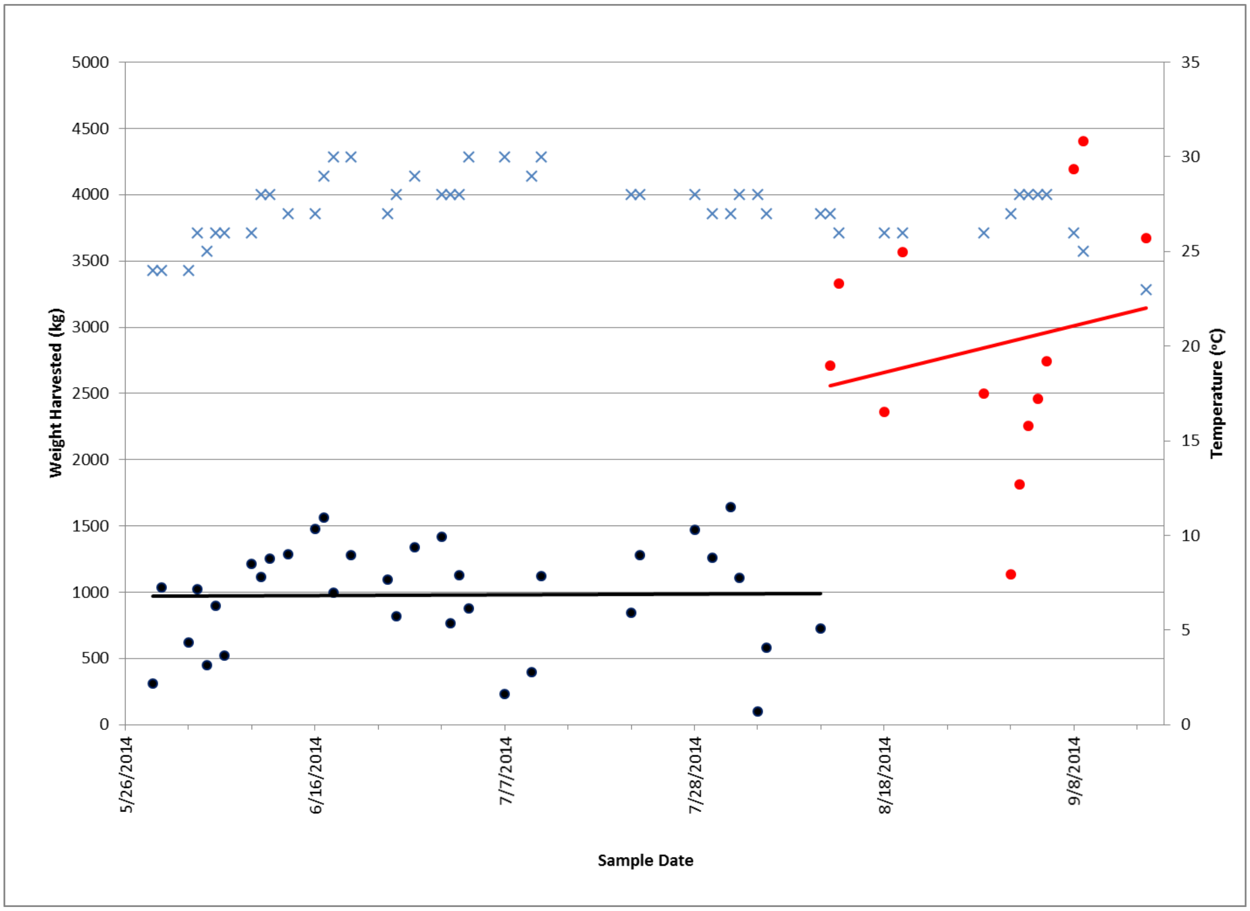

Figure 2. Black Circles total catch in James, Red circles total catch in Pamunkey. Blue Xs are water temperature.

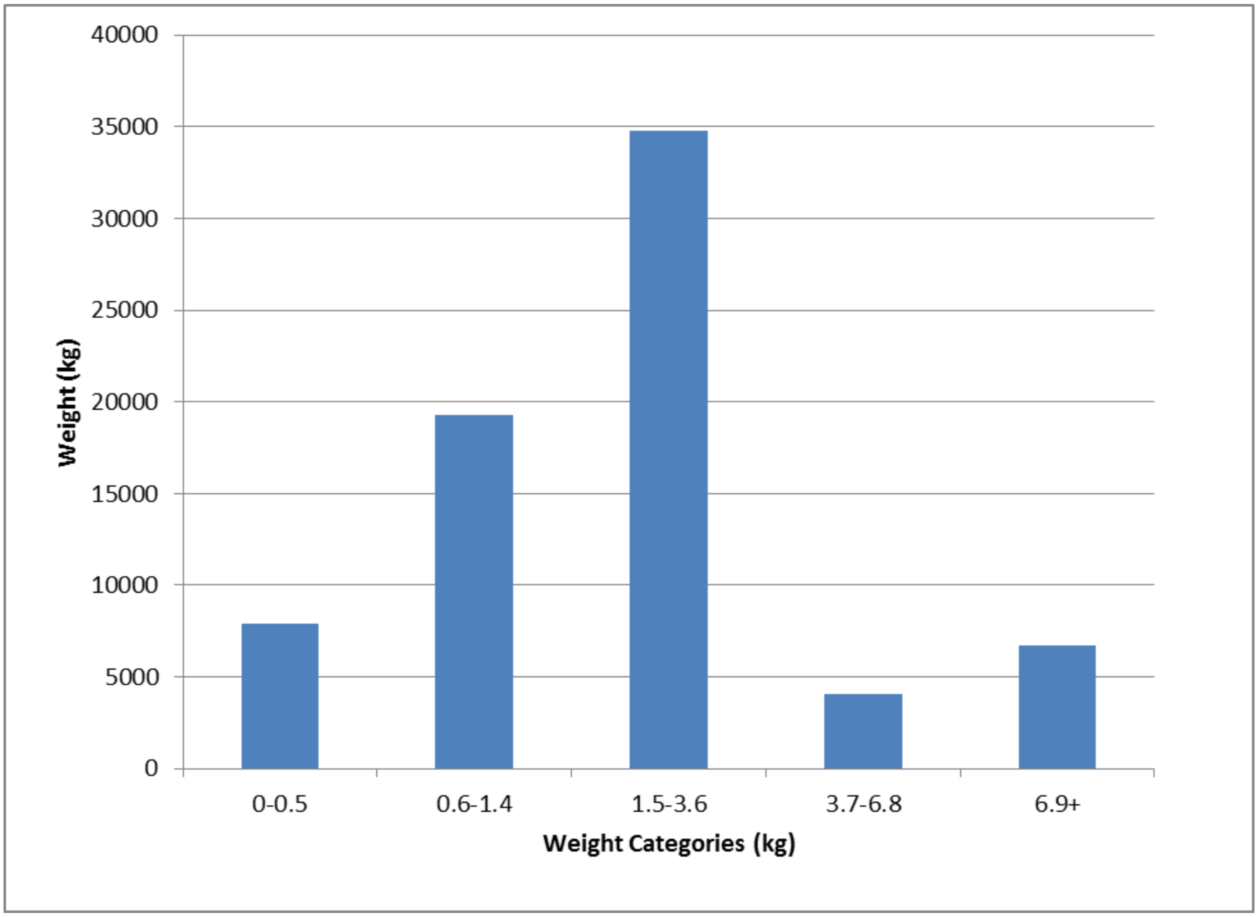

Figure 3. Total weights by category.

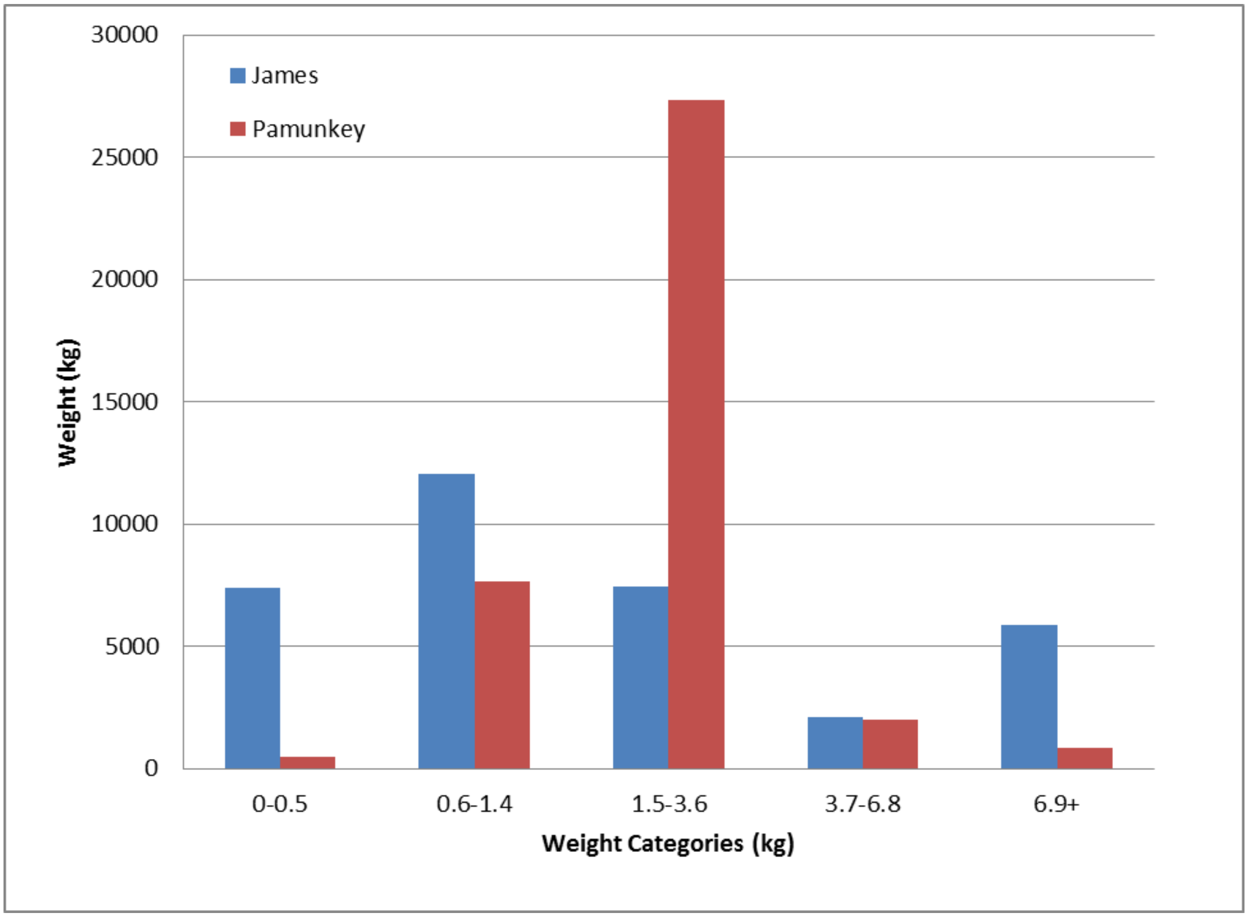

Figure 4. Total weight by category separated by river.

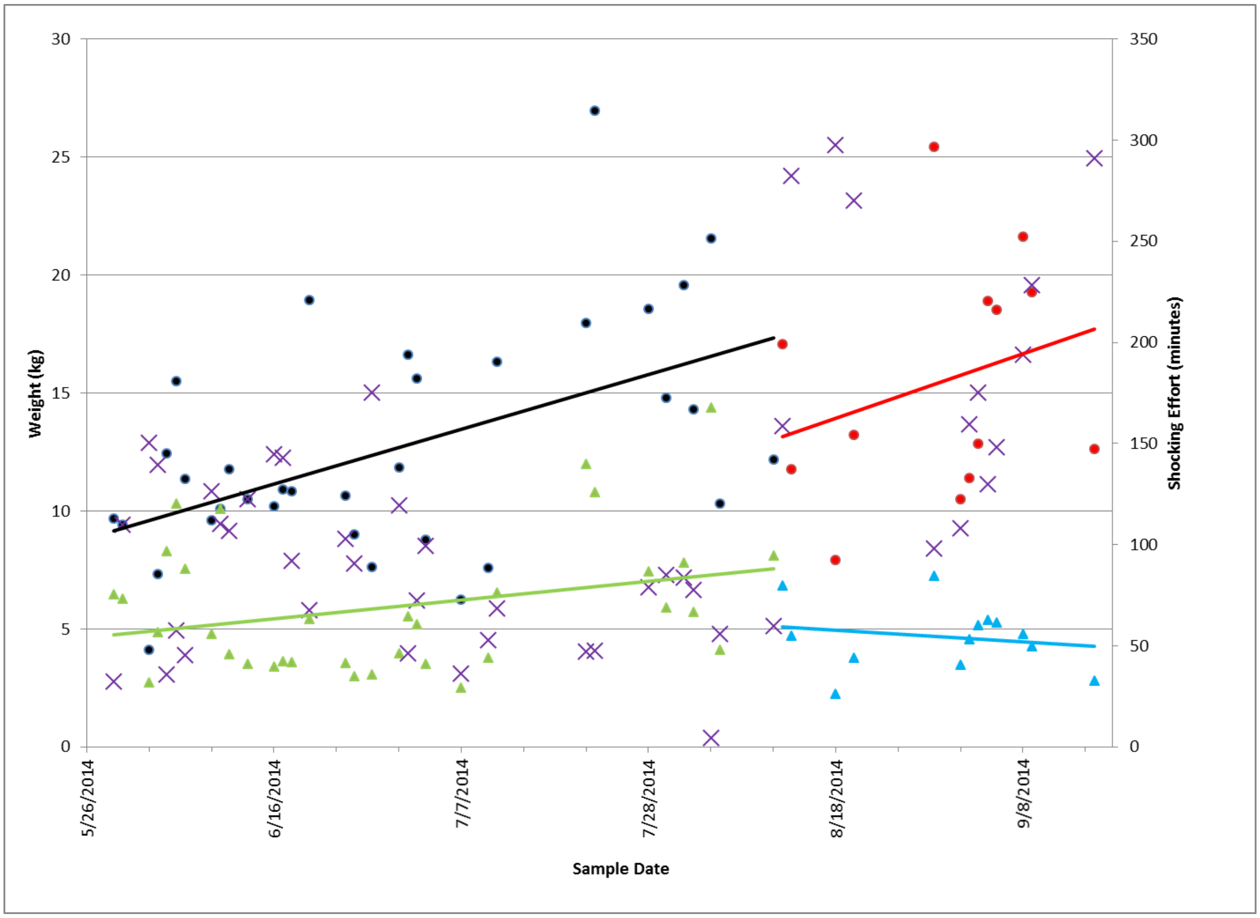

Figure 5. Black circles are James River CPUE (kg/minute), Red circles are Pamunkey River CPUE (kg/minute). The green triangles are James River CPUE (kg/minute/netter), Blue triangles are Pamunkey River CPUE (kg/minute/netter). The purple Xs are effort in minutes. Discuss trends.