Analysis of Burbot Mark-Recapture Dataset

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1. Introduction

This report will estimate the abundance (and other population parameters such as survival) on Moyie Lake, British Columbia based on a mark-recapture program conducted between 2006 and 2018.

Briefly, there were two classes of sampling events for this study. In 2007 and earlier, cod traps were used to catch fish and haul them to the surface for tagging. These took place in the spring and fall in the North and South Basins (inconsistent between Basins). In 2009 and later, with the exception of two fall cod trap sampling sessions in 2013 and 2014, fish were captured using angling on spawning grounds near Cotton Creek in the North Basin. The angling only occurred in the February spawn season. Note that no sampling took place in 2008. Figure 1 shows the timing of the surveys.

Data was provided as an Access database. The database contains a *FishId* field which is the unique fish identification number even when tags are replaced through a fish's lifetime. Consequently, no special processing is required to deal with replacement tags.

A summary of the number of times a fish was captured is found in Table 1. Most fish were captured only once, but about 10% were captured more than once. Similarly, a tabulation of the number of years a fish was captured (Table 2) also shows that most fish are only captured in one year with about 10% captured in more than one year. This will make model fitting using capture-recapture challenging for two reasons. First, recaptures of previously marked animals enable estimation of survival probabilities and recapture probabilities. The latter in turn enables estimation of recruitment (new animals entering the population) and abundance. Few recaptures imply that estimates of survival and recapture will have poor precision (large standard errors) which will in turn imply that estimates of recruitment and abundance will also have poor precision. Second, estimates of abundance are very sensitive to heterogeneity in catchability and can be severely biased. With small numbers of recaptures, it is very difficult to detect if heterogeneity exists in the catchability and so difficult to know if estimates of abundance have serious bias.

The distribution of the number of times a fish is recaptured within a year (Table 3) shows that for most years, few fish are recaptured within a year making the use of a robust design capture-recapture model (or even a simple Petersen in each year) to estimate abundance problematic. Again, the two issues are precision (few recaptures within a year imply that estimates will have poor precision) and heterogeneity in catchability (potential bias). The problem of heterogeneity is a particular concern within a year because of the short time span over which sampling took place in the later years – this could greatly violate the assumption of mixing within a year (i.e. fish are not very mobile so it may take several days/weeks for marked fish to mix with the entire population) which can severely bias estimates of abundance.

The distribution by Basin of sampling is shown in Table 4 and shows that most of the effort is taking place in the North Basin with the South Basin only being sampled in 2005 to 2007.

Telemetry data suggests good mixing throughout the year, other than at spawn timing, and that the captures in the South Basin were outside the spawn season. Consequently, captures from the South Basin will be included.

The *SexAndMaturityCode* field of the database contains information on the sex of each fish. There were some fish no sex assignment; the majority of the fish with unknown sex were captured in 2006 to 2009. If a fish was classified as unknown sex in one year, but sex assigned in other years, we used the sex assigned in the later years to replace the unknown. Of fish captured in 2009 onwards, there were a few fish which were classified as both male and female through the years (n=15; Appendix A). A summary of the number of captures by sex and year is presented in Table 5. The database still contains several fish whose sex could not be determined. It does not seem possible to use Length or Weight to classify fish by sex as there a large overlap in the distributions of each variable (likely due to fish of different ages) as shown in Figure 2.

2. Tag loss

A key assumption in capture-recapture studies is that tag loss is minimal.

Just under 520 fish were double tagged with Floy and PIT tags. The capture data was matched against the list of fish with double tags. The date of application of the PIT tag was computed by the date when the *PIT_NewToday* field took the value of "yes". Captures prior to this date were discarded. When a PIT tag was applied to a fish it is assumed that that a Floy tag was already present or was added at the same time.

Unfortunately, scanning for PIT tags was not consistently done. Consequently, if a capture is missing the PIT tag number it is NOT a definitive indication that the PIT tag was missing. Nevertheless, by conditioning on the presence of a PIT tag number, the tag loss rate for Floy tags can still be estimated.

The loss of a Floy tag was imputed by looking at the *FloyTag1_NewToday* field. If this has the value of "yes", it is assumed that the initial Floy tag was missing.

The days at large for the Floy tag was computed as the date of the capture of a fish and the date the PIT tag was applied. This will underestimate the days at large for a fish that was a recapture and already had a Floy tag prior to when a PIT tag as applied.

There were 53 captures of fish where a PIT tag was read and so we are "certain" that these fish had a Floy tag. Of these 53 recaptures, 5 had a missing Floy tag after 370, 733, 737, 1097 and 1936 days at large. A logistic regression was used to estimate the Floy tag retention probability as a function of days at large. There was no evidence that the tag retention probability varied as a function of days at large (p = .90) – however, with only 5 lost Floy tags in 53 records, the power to detect a relationship is low. A plot of the fitted curve is shown in Figure 3. The model is consistent with an initial tag loss of .09 (SE .07), a high rate, perhaps due to handling effects, but the estimate is very imprecise (95% confidence interval ranges from .03 to 0.21).

3. Estimating population sizes using capture-recapture

The population dynamics of the burbot population in Moyie Lake are uncertain, but based on fish taken from Moyie Lake and transplanted to the Kootenay River, males spawn as early as 2 years of age and females from 3-4 years of age. Hence fish of age 4+ are considered as mature adults.

A Jolly-Seber capture-recapture model will be used to estimate the spawning (mature) population size (and other parameters such as survival) for each sex.

No fish tagged in 2005 or 2006 were recaptured prior to 2009. Consequently, there is no useful information in these capture-records and they are not used. Capture records only from 2009 onwards will be used. Because all fish from 2009 onwards were captured on the spawning grounds, the target population will be spawning fish, presumably mature fish. Immature fish will not be captured on the spawning grounds and so abundance estimates will not include immature fish. It is assumed that senescence in older fish is low.

Fish whose sex remains undetermined were removed prior to fitting the capture-recapture models. This will reduce the estimates of the probability of capture (it will now represent the product of the probability of catching a fish and its sex being determined) but will not introduce bias into the population estimates. For example, an experiment where 10% of fish are recaptured each year but only ½ of fish can have sex determined will have identical properties to an experiment where 5% of fish are recaptured each year and all fish have their sex determined. The impact of not being able to sex all fish to reduce the number of usable recaptures which affects the precision (standard errors) but not the bias of the estimates.

A capture history for each fish was created on a yearly basis from 2009 to 2018. For each year, the value of the capture history is 0 (fish not seen), 1 (fish captured). If a fish is captured more than once in a year, duplicate captures are treated as a single capture for that year. If the mortality flag was set to yes, then this fish is treated as a loss on capture and is no longer available in the population in later years. There were only a few known mortalities in 2009 onwards as shown in Table 6. A field for the sex of the fish was also included with the capture histories.

The matrix of release/recaptures (the *M* array in capture-recapture models) for all fish captured in 2009 onwards is shown in Tables 7a and 7b. There is a wide spread of recaptures after release indicating that the fish are relatively long lived. Many more males were captured than females. This may be an artifact of the sampling process on the spawning ground (males may tend to remaining the spawning grounds while females spawn and exit) or may indicate different population sizes by sex.

No adjustment will be made for tag loss given the very sparse data collected to estimate the loss rate.

The *RMark* package (Laake, 2013) was used to fit several Jolly-Seber capture-recapture models to the capture histories. The Jolly-Seber models are parameterized by the catchability in each year (the parameter p_t); the survival probability from year t to year $t+1$ denoted as Phi_t; and the recruitment pattern denoted by the $pent_t$ being the proportion of total recruitment that took place in year t. A total of 32 models were considered being all possible combination of models for:

- catchability (constant over time and sex denoted as p(.); constant over time but different for each sex denoted a p(sex); differing over years but equal for both sexes denoted p(time); and different over years and among sexes denoted as p(time*sex). A total of 4 choices
- survival a similar set of 4 choices for the yearly survivals denoted as Phi(.), Phi(time), Phi(sex), and PhI(time*sex)
- recruitment (different over time but “equal” for males and females denoted as pent(year); and different recruitment patterns for males and females denoted as pent(year*sex). Here recruitment is the proportion of total new animals over the entire study period that recruit in year and so could be the same for males and females even though their population sizes differ. It is NOT proportional to population abundance (i.e. is NOT like a fecundity parameter). A total of 2 choices for this parameter.

The models were fit using maximum likelihood and ranked using Akaikie’s Information Criteria (AIC) which measures a tradeoff between fit and complexity. Models with the lower values of AIC (relative to the models in the set) are a better tradeoff in terms of fit and complexity than models with higher AICs.

The AIC table showed strong support for one single model and little support for any other model as shown in Table 8. Under the top ranked model, yearly survival is the same for male and female across all years; catchability varies by sex and year; and the pattern of recruitment is the same for males and females.

The model-averaged estimates of abundances are presented in Table 9 and Figure 4. The population of females appears to be relatively constant over time with fluctuations in the population of males over time. How can this pattern arise if the *pent*s are equal between males and females? The model estimated a total of 2400 and 8400 total recruits for females and males respectively. So if a particular year has a value of *pent* of .08, this implies that 2400(.08)=192 females and 8400 (.08)= 672 males recruits to the study population in that year. If the yearly survival rate is about .83 then the population of females could go from say 1200 to 1200(.83)+192 = 1188 (i.e. a slight decrease), but the population of males could go from 3000 to 3000(.83)+672= 3200 (i.e. a slight increase). So the observable pattern is consistent with the highest ranked model.

There are several features of the estimates of abundance that raise questions. For example, why is the sex ratio not closer to 50:50? The estimated survival rates for females are about 0.80/year so the recruitment of females tended to balance the mortalities but then what happened in 2013-2014 where the population appeared to suddenly decline and then again remained stable?

The population of females appears to be relatively stable until 2013-2014 when they apparently decreased but then remained relatively constant afterwards. This pattern matches the number of female fish captured as shown in Table 5. The primary sampling site occurred at the top end of Cotton Creek in the north basin but was shifted in 2013 to a secondary site further south, back to the original site in 2014, and then again to the secondary site from 2015 onwards. Similarly, why has the population of males tended to increase since 2012 without a corresponding increase in the females. Again, this matches the pattern of recaptures seen in Table 5.

The model-averaged estimates of survival are presented in Table 10 and Figure 5 and the model averaged estimates of catchability are presented in Table 11 and Figure 6. It is unclear why males appear to be suddenly more catchable than females in 2016 and 2017. A review of field notes, showed that sampling occurred at the Cotton Creek area from 2009-2012, and due to ice conditions sampling moved to the secondary siteat the south end of North Basin in 2013 (continued at the south end until 2018, except for 2015). Ice conditions in 2017 and 2018 were suitable for sampling at the Cotton Creek site, but scouting crews saw more burbot (2018) at the secondary sampling site and with access restrictions in 2017, sampling remained at the secondary site (South end of North Basin). If efficiency of angling is high, more fish would have been captured as seen in Table 5.

4. Length and Weight

A preliminary plot of weight vs. length (Appendix B) showed 3 outliers as listed in Appendix B. The weight and length measurements for these outliers was set to missing. The standardized weight (Ws) was computed using equation (1) of Fisher, Willis, and Pope (1996).

Figure 7 presents the estimate mean weight, mean length, and mean Ws over time for each sex. The confidence intervals for the means for females are much wider because of the smaller sample sizes captured. A formal analysis of variance failed to show any evidence of non-parallelism ($p = .40$ for Length; $p = 0.20$ for Weight; $p = 0.12$ for Ws). The estimated difference between females and males in the means is 46 (SE 3) mm for length; 340 (SE 22) g for weight; and 323 (SE 23) for Ws (Female mean – male mean).

There was evidence ($p < .0001$ for all variables) that the mean weight/length/W differed among years (e.g. compare the mean of these variables in 2014 vs. the means in 2018 in Figure 7), but this is a secondary effect and was not unexpected.

The decline in mean body length, mean body mass, and mean Ws since 2014 may represent density dependent effects of the increasing population of males + female.

Fisher, Willis and Pope (1996) also provide cutpoints to categorize the standardized length into classes (Stock, Quality, Preferred, Memorable, Trophy). A plot of the proportion of captured fish in each category is shown in Figure 8. There appears to be a decline in the proportion of captured fish in the Trophy category, but this may be an artifact of the sampling procedures if for example, catchability has changed among the categories over time because of changes in gear etc.

5. Results from reward tag studies

It is difficult to estimate angler harvest based on reporting of tagged fish because not all anglers report tags recovered. Reward tag studies are often used to estimate reporting rates assuming that the value of the reward tags is sufficiently high to achieve a 100% reporting rate.

In both fall 2013 and 2014, 15 reward tags were released into the population (total of 30 reward tags).

In fall/winter of 2013/2014, 2 of the 15 reward tags available were reported for an estimated catch proportion of 0.13 (95% ci from .02 to .40). Not all fish were harvested with 1 fish retained and 1 fish released.

This leaves 15 – 2 = 13 reward tags from fall 2013 at large of which, assuming an 80% survival rate therefore ten (13*0.80 = 10) reward tags are still active in winter 2014/2015 from the releases in fall 2013. To this, an additional 15 new reward tags were added in fall 2014, implying that 25 reward tags were at large in winter 2014/2015. In winter 2014/2015, 3 reward tags were returned (with two tags seen in the sampling program and 1 from an angler). The two reward tags found in the sampling program would imply a capture probability of 2/25=.08 which is comparable to that seen in Figure 6.

No reward tagged fish were reported captured in 2016 or 2017.

In 2018, two reward tagged burbot were captured by angler and captured. Again based on an 80% survival probability, about 12 reward tags were expected to be at large in 2018. The angler catch proportion is the 2/12 = .16 (95% ci from .02 to 0.48).

Unfortunately, the small sample sizes give estimates with very wide confidence limits.

6. Summary and Discussion

The estimated pattern of abundance is rather puzzling and may be an artifact of the sampling protocol and biology of burbot. For example, if female fish exhibit strong site fidelity to spawning areas, the study population of females may only consist of those females that spawn in the sample spawning grounds. If this site is "full", then the number of females at this site may remain relatively fixed over time. However, if males tend to migrate among the spawning grounds and mix more thoroughly with themselves, then the estimates of male abundance may represent a larger population than those at the single spawning site.

Capture-recapture analyzes make a number of assumptions. In particular:

- Sex is correctly identified for each fish. We have a number of instances where the sex of a fish cannot be determined. This will tend to reduce the precision of the estimates but unless this problem is related to survival or catchability, should not introduce any serious bias.
- Complete mixing of tagged and untagged fish. This mixing should occur within and between Basins. Passive acoustic telemetry studies have shown that fish from both basins mix well during the spawning period (i.e. fish sonically tagged in the south basin appeared to also use the spawning areas in the north basin; Schwarz, 2018). When comparing mixing between the north basin known spawning areas, there was evidence in one year that fish tend to spend more time at a particular spawning site in a year rather than moving equally between two spawning sites in a year, but the differences in time spent at the two sites in a year were small and most fish visited both spawning sites in a particular year. The telemetry study data was too sparse to see if fish were faithful to a particular spawning ground across years. If fish are highly faithful to spawning locations across years, then the study population may NOT include all spawning fish. For example, it would exclude fish that never spawn at the sampled spawning locations – but the telemetry data seems to indicate that this did not happen.
- Homogeneity of catchability within sexes. It is assumed that all fish within each sex are equally catchable (but the catchability of females and males may differ). Pure heterogeneity (e.g. related to body size) typically results in a negative bias to estimates

of abundance. Site fidelity where some fish have a 0 probability of being sampled on that particular spawning site may also lead to negative estimates of abundance. Behaviour-based heterogeneity (e.g. newly tagged fish are less/more likely to be captured then untagged fish) can lead to positive/negative biases in abundance. Unfortunately, the current study does not have sufficient recaptures of fish to enable a test for behaviour-based heterogeneity.

There is no obvious violation of assumptions that would lead to the pattern of abundance seen in Figure 4 and the cause of the pattern is unknown.

References

Fisher, S.J., Willis, D.W. and Pope, K.L. (1996). An assessment of burbot (*Lota lota)* weight-length data from North American populations. Canadian Journal of Zoology, 74, 570-575.

Laake, J.L. (2013). RMark: An R Interface for Analysis of Capture-Recapture Data with MARK. AFSC Processed. Rep 2013-01, 25p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Schwarz, C. J. (2018). Analysis of telemetry data from burbot on Moyie Lake. Unpublished report. 2018-11-20.

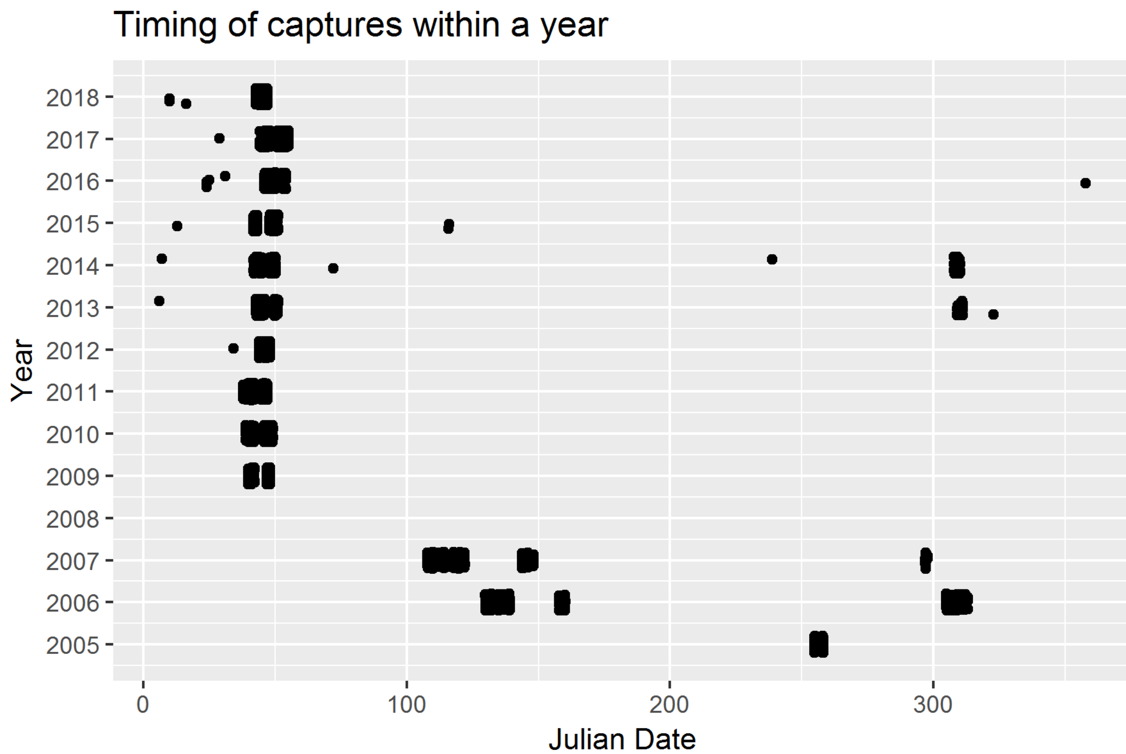

Figure 1. Plot of times of sampling events in the burbot study. Julian date is measured from 1 January of each year. The individual points are returns/sightings by the general public. The secondary sampling in late 2013/2014 are from using cod traps to capture burbot for a telemetry study.

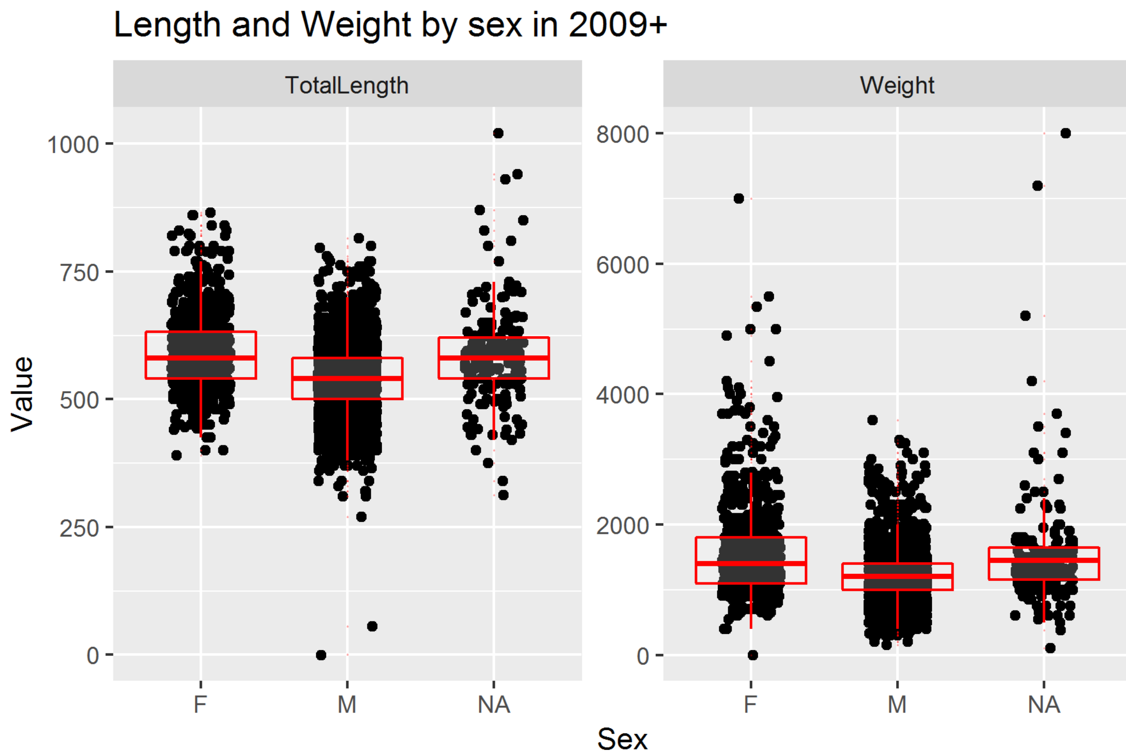

Figure 2. Distribution of weight and length by sex over all years (2009 and later). Points jittered to reduce overplotting. NA is unknown sex.

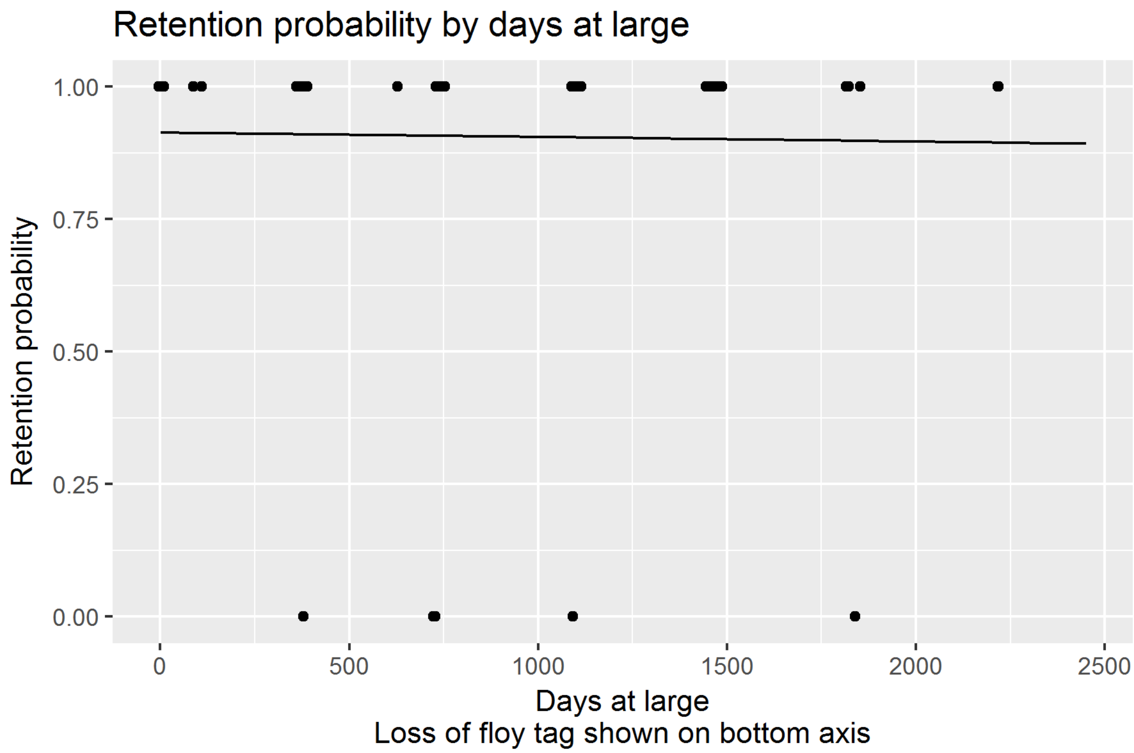

Figure 3. Estimated tag-retention probability for Floy tag as a function of days at large estimated using logistic regression. The dots at 1.0 and 0.0 represent when fish were captured with a PIT-tag present with a Floy tag present (top) or missing (bottom).

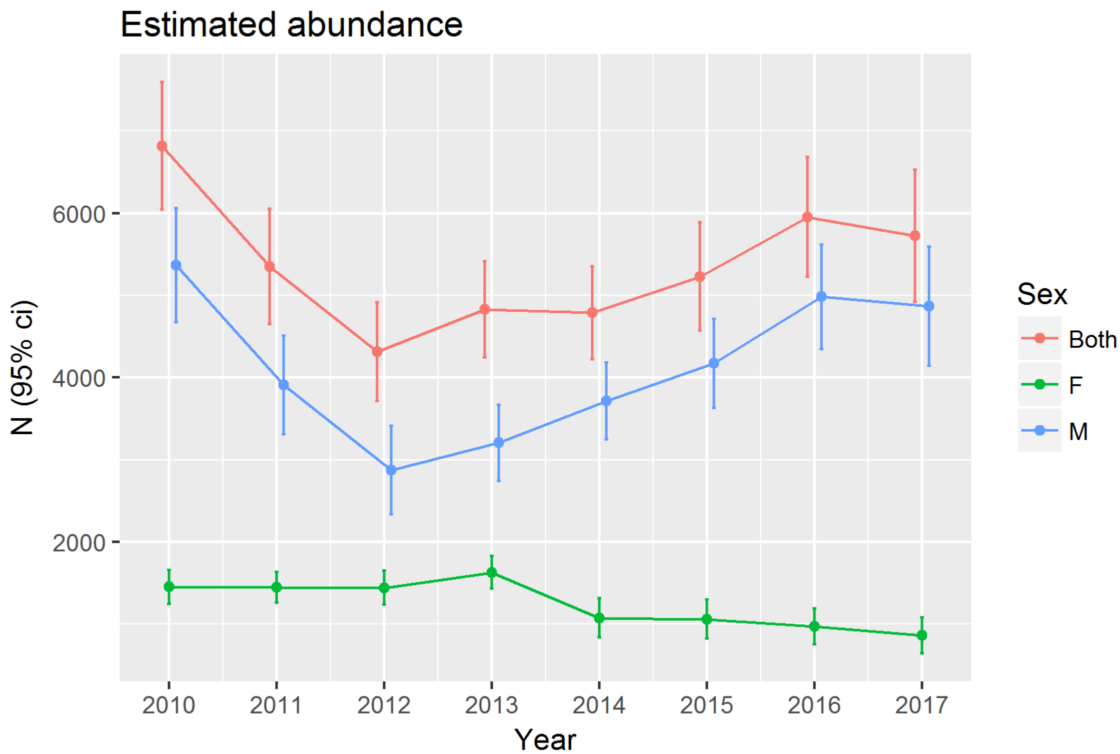

Figure 4. Model averaged estimates of abundance from Table 9. Note that estimates of abundance are not available for the first year (2009) or last year (2018) of the years used in the capture-recapture analysis.

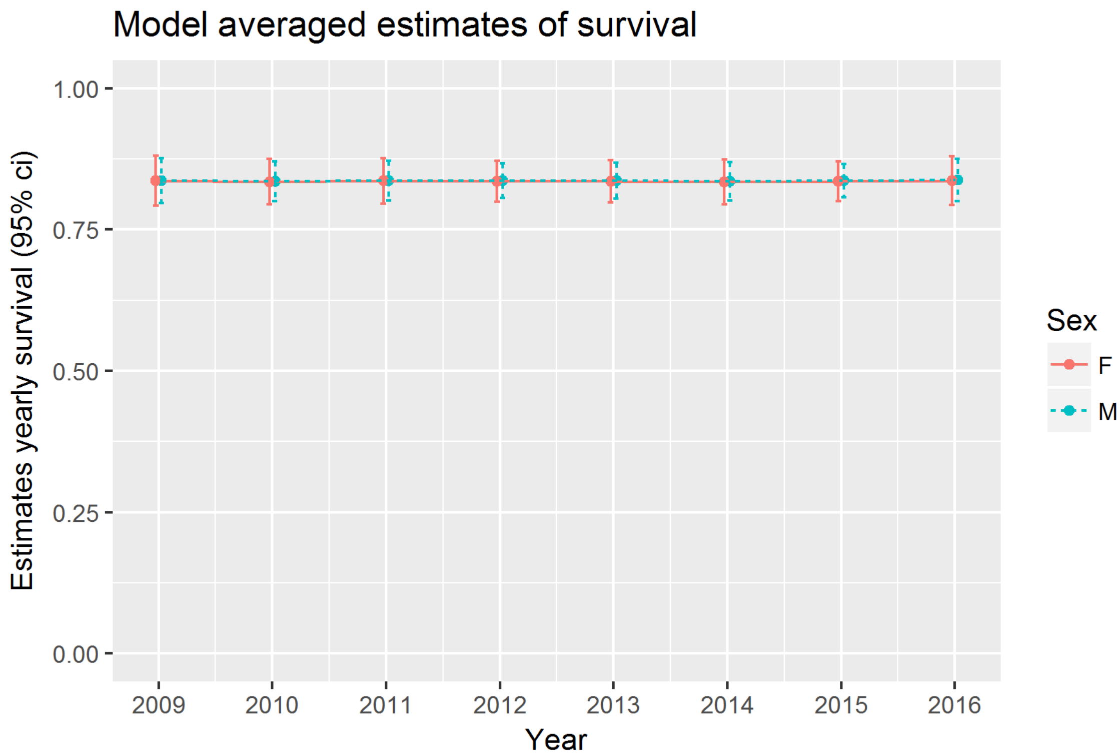

Figure 5. Model averaged estimates of survival. Estimates of survival are not available for the last year of the study.

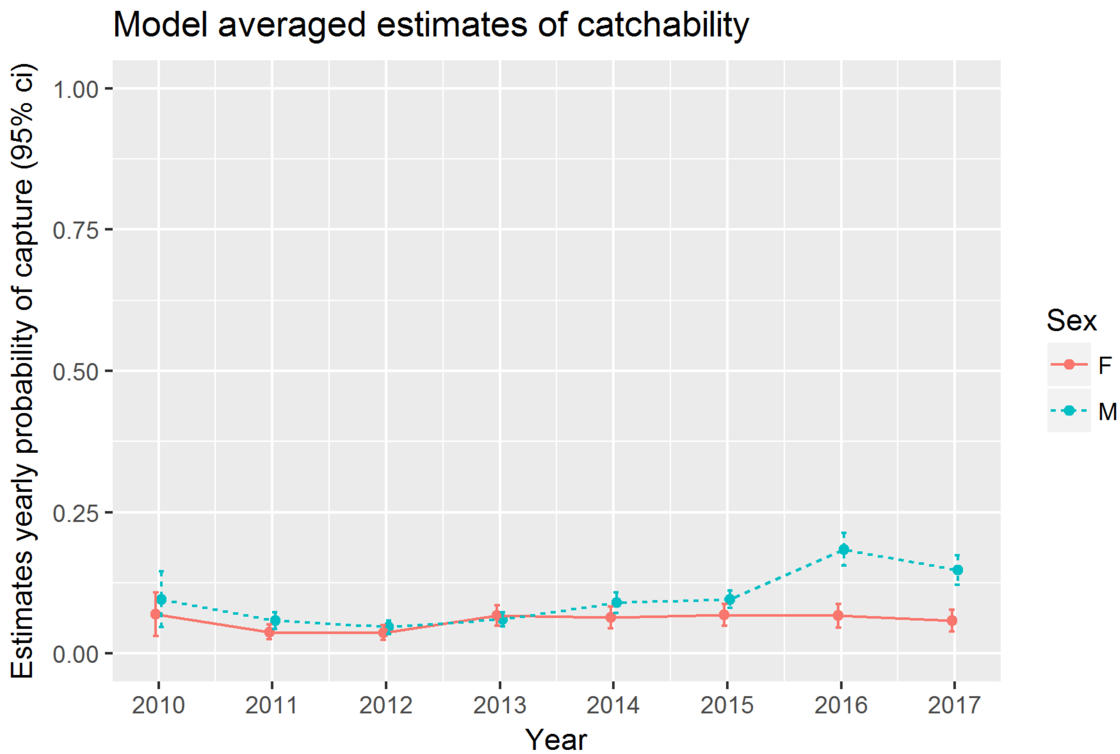

Figure 6. Model averaged estimates of catchability. Note that estimates of catchability are not available for the first year (2009) or last year (2018) of the years used in the capture-recapture analysis.

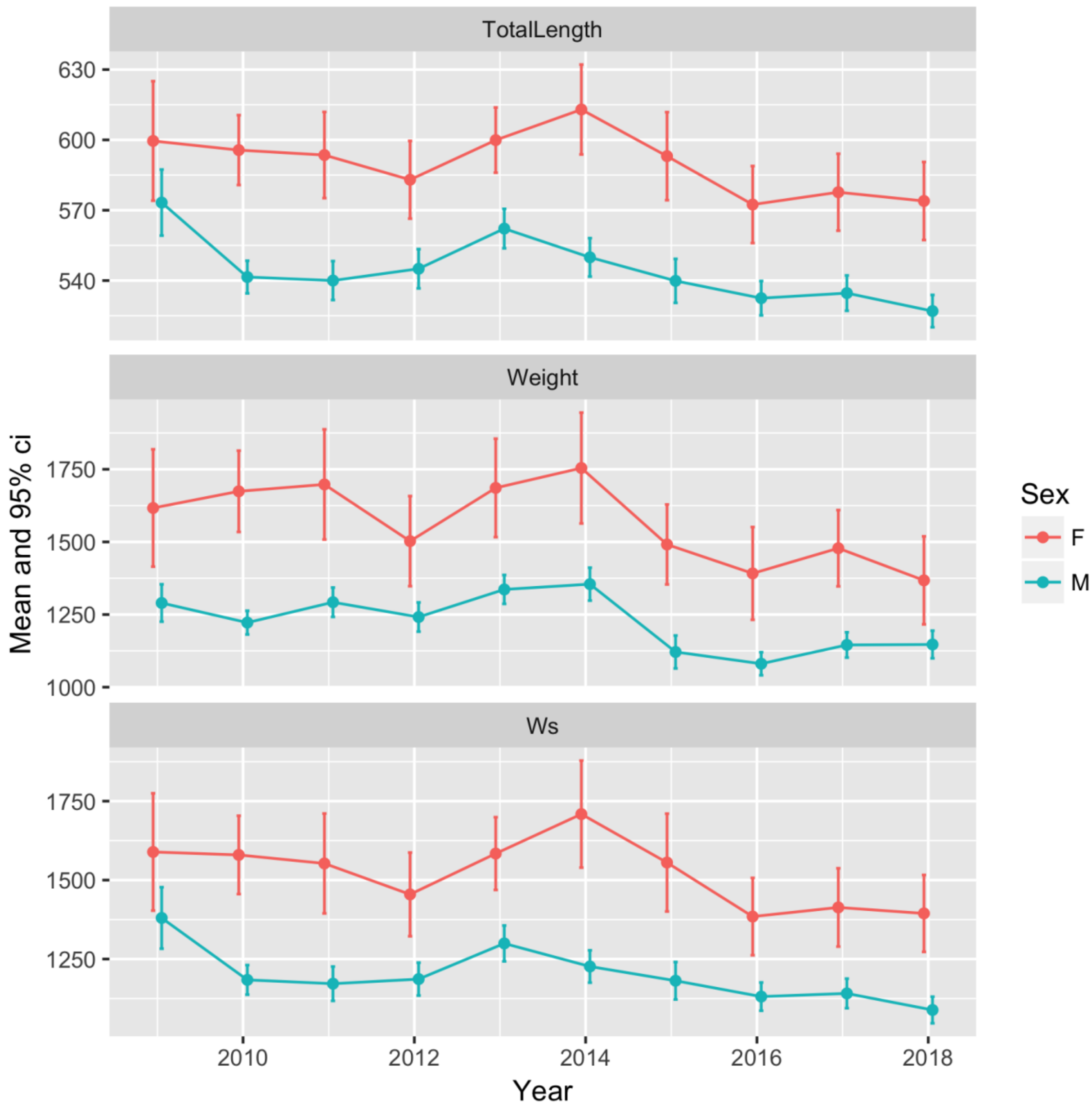

Figure 7. Estimated mean weight, length, and standardized weight (Ws) by sex and by year assuming that sampled fish are a random sample from the population.

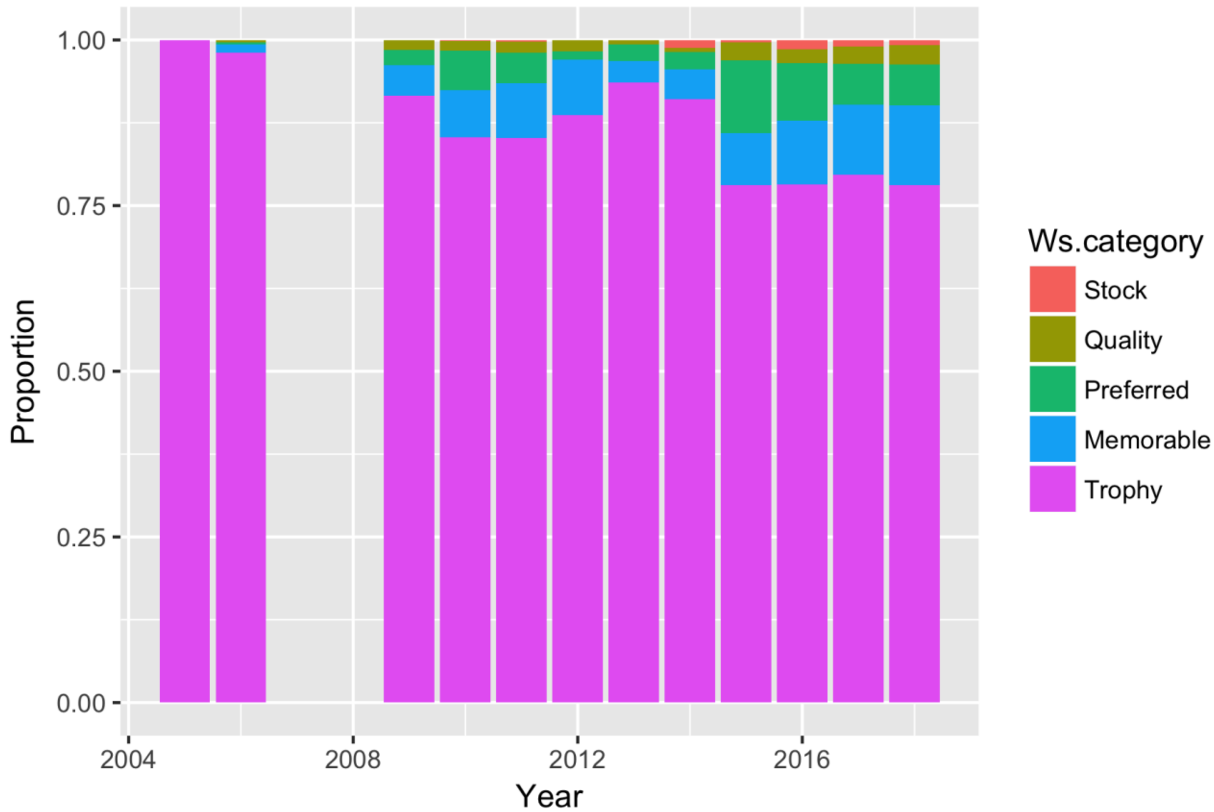

Figure 8. Proportion of fish in standardized weight categories (Fisher, Willis, Pope, 1996) by year of capture.

Table 1. Summary of the number of times a fish is captured (including recaptures within a year) during the study.

Number of Captures	Number of fish
1	3353
2	418
3	67
4	1
5	2

Table 2. Summary of the number of years a fish is captured during the study. Multiple captures of a fish within a year are treated as one "capture" for that year.

Number of years captured	Number of fish
1	3432
2	370
3	38
4	1

Table 3. Distribution of number of times a fish is captured within each year.

	Number of captures within each year			
Year	1	2	3	4
2005	125	0	0	0
2006	434	3	0	0
2007	234	2	0	0
2009	179	1	0	0
2010	524	15	0	0
2011	354	10	0	1
2012	237	1	0	0
2013	312	3	1	0
2014	328	6	0	0
2015	310	10	0	0
2016	389	28	0	1
2017	358	15	1	0
2018	399	8	1	0

Table 4. Distribution of number of times a fish is captured in each Basin within each year.

	Basin		
	North	South	Unknown
2005	66	59	0
2006	227	213	0
2007	222	16	0
2009	181	0	0
2010	554	0	0
2011	378	0	0
2012	239	0	0
2013	313	8	0
2014	331	7	2
2015	327	0	3
2016	445	0	4
2017	391	0	0
2018	418	0	0

Table 5. Distribution of number of times a fish captured by sex in each year after attempting to correct the recorded sex for fish with multiple sexes recorded in the database.

	Sex		
Year	F	M	Unknown
2005	0	3	122
2006	7	14	419
2007	6	19	213
2009	47	107	27
2010	130	387	37
2011	76	262	40
2012	63	169	7
2013	104	192	25
2014	75	231	34
2015	77	244	9
2016	70	374	5
2017	61	323	7
2018	71	334	13

Table 6. Number of known mortalities by year.

	Mortality field in the data base		
Year	No	Yes	Missing
2005	0	1	124
2006	0	47	393
2007	0	16	222
2009	1	0	180
2010	2	0	552
2011	0	0	378
2012	0	1	238
2013	320	1	0
2014	337	3	0
2015	326	3	1
2016	444	5	0
2017	390	1	0
2018	415	3	0

Table 7a. Summary of releases and recaptures for **FEMALES**.

		Recaptured									
Year	Released	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
2009	48	0	3	0	0	0	0	0	0	0	3
2010	143	0	7	4	0	6	7	0	0	0	24
2011	91	0	0	5	8	2	2	2	0	0	19
2012	72	0	0	0	2	7	2	0	0	4	15
2013	117	0	0	0	0	0	6	5	2	4	17
2014	93	0	0	0	0	0	7	6	3	2	18
2015	95	0	0	0	0	0	0	8	6	4	18
2016	76	0	0	0	0	0	0	0	4	2	6
2017	69	0	0	0	0	0	0	0	0	2	2

Note that a fish that is captured multiple times is "double counted" in this table. For example, a fish captured and released in 2009 and recaptured in 2010, would then be counted as a release in 2010, etc.

Table 7b. Summary of releases and recaptures for **MALES**.

		Recaptured									
Year	Released	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
2009	140	14	9	4	0	6	4	8	2	0	47
2010	467	0	12	10	15	25	20	17	7	8	114
2011	328	0	0	17	8	34	6	21	11	0	97
2012	219	0	0	0	10	8	2	21	19	2	62
2013	252	0	0	0	0	11	14	35	15	4	79
2014	312	0	0	0	0	0	12	25	27	20	84
2015	317	0	0	0	0	0	0	57	13	27	97
2016	510	0	0	0	0	0	0	0	62	53	115
2017	416	0	0	0	0	0	0	0	0	43	43

Note that a fish that is captured multiple times is "double counted" in this table. For example, a fish captured and released in 2009 and recaptured in 2010, would then be counted as a release in 2010, etc.

Table 8. Model selection table.

Model	# parameters	AICc	Delta AICc	Model Weight
Phi(~1)p(~time * Sex)pent(~time)N(~Sex)	32	6560.2	0.0	0.98
Phi(~time)p(~time * Sex)pent(~time)N(~Sex)	40	6569.9	9.7	0.01
Phi(~Sex)p(~time)pent(~time * Sex)N(~Sex)	32	6570.8	10.6	0.00
Phi(~1)p(~time * Sex)pent(~time * Sex)N(~Sex)	41	6572.0	11.9	0.00
… remaining models not shown …				

Table 9. Model averaged estimates of abundance.

	Female		Male		Both	
Year	N	se	N	se	N	se
2010	1452	105	5367	356	6819	395
2011	1445	96	3907	307	5352	359
2012	1441	105	2871	274	4312	306
2013	1626	101	3204	235	4831	299
2014	1075	121	3712	239	4787	290
2015	1059	122	4170	277	5229	336
2016	974	111	4981	324	5955	372
2017	861	110	4865	370	5727	410

Note that estimates of abundance are not available for the first year (2009) or last year (2018) of the years used in the capture-recapture analysis.

Table 10. Model averaged estimates of survival.

	Male		Female	
Year	estimate	se	estimate	se
2009	0.836	0.022	0.837	0.020
2010	0.834	0.020	0.835	0.018
2011	0.836	0.020	0.837	0.018
2012	0.835	0.018	0.836	0.015
2013	0.836	0.019	0.837	0.016
2014	0.835	0.020	0.835	0.017
2015	0.836	0.018	0.836	0.015
2016	0.837	0.021	0.837	0.019
2017	0.830	0.066	0.831	0.065

Note that estimates of survival are not available for the last year (2018) of the years used in the capture-recapture analysis.

Table 11. Model averaged estimates of catchability

	Female		Male	
Year	estimate	se	estimate	se
2010	0.070	0.019	0.096	0.025
2011	0.038	0.006	0.058	0.007
2012	0.037	0.007	0.046	0.006
2013	0.067	0.009	0.060	0.006
2014	0.064	0.010	0.089	0.009
2015	0.068	0.010	0.096	0.008
2016	0.067	0.010	0.184	0.015
2017	0.058	0.010	0.147	0.013

Note that estimates of catchability are not available for the first year (2009) or last year (2018) of the years used in the capture-recapture analysis.

Appendix A. Fish classified as both male and female through the study.

FishID	F	M	U
2009-819	1	1	NA
2009-893	1	1	NA
2010-1083	1	1	NA
2010-1091	1	1	NA
2010-1269	1	1	NA
2010-1462	1	2	NA
2011-1560	1	2	NA
2011-1777	1	1	NA
2012-1955	1	1	NA
2013-2432	1	1	NA
2014-2601	1	1	NA
2015-3121	1	1	NA
2016-3225	1	2	NA
2016-3273	1	1	NA
2017-4060	1	2	NA

Appendix B. Weight vs Length and anomalous values

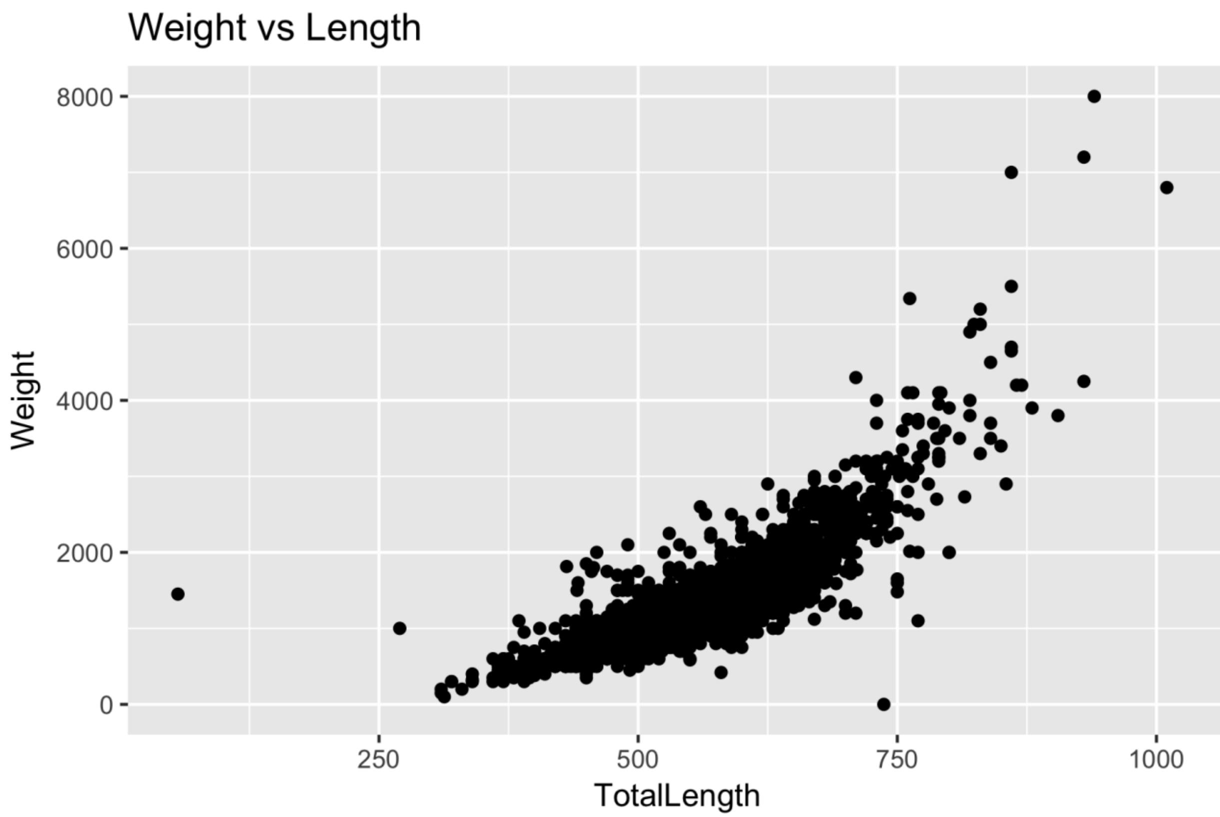

Figure B.1. Weight vs length for burbot.

Anomalous values are:

	FishID	Year	TotalLength	Weight
2424	2013-2242	2018	56	1451
2551	2013-2361	2013	270	1000
3002	2014-2827	2018	737	0