Results of a Broad-scale Monitoring Survey Conducted on Martin Lake in 2011

File Report

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Martin Lake is part of the Seguin watershed and is located in Christie Township, Parry Sound District. The lake has an approximate surface area of 109 hectares with a mean depth of 4.7 meters. The maximum depth of the lake is 15.8 meters. Water clarity is moderate to low with a secchi disk reading of 2.9 meters indicating a mesotrophic lake. Access is available, with permission, through private property located at 935 Highway 518, Rosseau.

Correspondence from 1959 suggests that there were no native sport fish species present in the lake; though the report was anecdotal. A lake survey completed in 1976 indicated populations of cisco, white sucker, pumpkinseed, smallmouth bass, largemouth bass, brown bullhead, yellow perch and creek chub present in the lake (Rettie, 1976). Previous to the lake survey there was no record of stocking in the lake, however, the bass may be introduced.

A number of fish population and habitat assessments have been conducted on Martin Lake including trap netting surveys done in 1976, 1978, 1981 and 1982. Martin Lake's largemouth bass population has been used to stock other lakes including Horn Lake in Monteith Township and Santa Lake in Christie Township.

The water level in the lake is controlled by a dam at the outlet that is owned and operated by the Parry Sound PowerGen Corporation. There is very little information available on how the dam is operated or on water levels in the lake. The Seguin River Water Management Plan Scoping Report (AMEC 2005) states:

> "In early February six (6) logs are pulled lowering the water level about 2.4 m from the top of the dam. The logs are reinstalled prior to spring run-off. Water levels in the summer months vary from 0.25 m to 0.3 m below the top of the dam depending on the rainfall."

The water level rule curve in the final water management plan was classed as 'preliminary' and non-enforceable due to the lack on information on historic water levels and their impact on the lake environment (AMEC 2010). The intent is to finalize an enforceable rule curve for Martin Lake when the Plan is reviewed in five years.

A fish community assessment was completed in the fall of 2011. The purpose was to describe the current composition of the fish community and examine potential impacts of water level fluctuations on the lakes' current fish populations, predominantly cisco and largemouth bass. The results will be used to contribute to the decision making process for the finalized rule curve.

Methods

The Broad-scale Monitoring protocol was followed according to gear, fish sampling and data collection (Sandstrom et al., 2010). Gear consisted of large mesh (NA-1) and small mesh (ON-2) gill-nets. The large mesh gillnets target fish larger than 20cm in length, typically the size range of interest to anglers. The net gang is comprised of eight, 3.1 m panels which are 1.8 meters high. Two gangs are generally attached to one another to equal one strap. The mesh sizes, in inches, are 1.50", 2.00", 2.50", 3.00", 3.50", 4.00", 4.50" and 5.00". The small mesh gillnets target smaller fish. Its stretch measure, also in inches, is 0.50", 0.75", 1.00", 1.25" and 1.50". Panels are 2.5 m long.

Nets were set between September 14, 2011 and September 15, 2011. Nets followed Broad-scale protocol by being set 250 meters apart in order to limit competition between the nets. Efforts were allocated over the depth strata 1-3, 3-6, 6-12, 12-20 meters. Nets were set overnight with set durations ranging between 16-22 hours. The number of nets and allocation of depth stratum was not proportional to the area of the lake, according to Broad-scale Monitoring protocol, as efforts aimed to target cisco, the species most likely to be impacted by winter draw downs.

The fork length was measured for all captured fish and any cisco captured were submitted to full analysis including: fork length, total length, round weight, sex, gonad condition, stomach contents and ageing structures (scales and otoliths).

A temperature-dissolved oxygen profile was collected to determine how the lake was thermally stratified and the availability of oxygen.

Finally, lake bathymetric data was collected using a Garmin 430 GPSMap depth sounder.

Results

Netting occurred from September 14th to 16th 2011. Weather was fair on the first day and turned to stormy with high winds on the second day of lifting.

A total of 12 sets were completed of which 3 were in the 1-3 m stratum, 4 in the 3-6 m, 4 in the 6-12 m stratum and 1 in the 12-20 m stratum as indicated in Table 1. Eight sets used large mesh nets, and four used small mesh nets.

A total of 99 fish were caught with 76 being caught in large mesh and 23 being caught in small mesh gear. The catch, as indicated by Table 2, is broken down as follows: 25 cisco, 2 white suckers, 3 pumpkinseed, 4 smallmouth bass, 49 largemouth bass and 16 yellow perch.

Largemouth bass ranged in fork length from 153 mm to 386 mm, while cisco ranged from 103 mm to 365 mm with round weights between 10 and 680 g (Table 3, Figures 1 and 2). The cisco ranged in age from 0 to 19 years old, with 12 age classes represented (Table 4, Figure 3).

The dissolved oxygen and temperature profile is shown in Table 4 and Figure 3. The thermocline started at a depth of 4 meters and continued until an approximate depth of 8 meters. Below the thermocline oxygen levels decreased rapidly.

An updated bathymetric map is also attached as Figure 4. While conducting the shoreline cruise it was noted that a natural bedrock outcrop and beaver dam in the south west bay where water flows in from a smaller pond, defines the upstream extent of the dam influence.

Discussion

Martin Lake supports two main species of concern with regards to the management of the dam; cisco and the largemouth bass. Cisco and largemouth bass represented 75 percent of the total catch throughout the netting program.

Cisco are a cold water fish that spawns in the fall, typically when water temperature is drop below 5^{o} C (Burridge et al., 2009). Spawning usually takes place on a gravel or rocky substrate in shallow areas (1-3 m), however, spawning has occurred at any depth up to 64 m (Burridge et al., 2009). Typically, the dam has operated with winter draw-downs of up to 2.4 m which may expose a portion of the cisco spawning habitat (AMEC 2010), potentially affecting recruitment. This has been identified by the Seguin River Management Plan as an environmental issue to consider (AMEC 2010). Cisco, however, seem to be maintaining a viable, robust population as many were caught with a range of different sizes and ages. Quantitative benchmarks of cisco abundance are not yet available for the Broad-scale Monitoring protocol. Subjectively, the abundance appears to be moderately high. A total of 12 age classes were represented from a sample of only 25 fish indicating that regular recruitment is occurring in the population. The population is dominated by adults of a range of ages, indicating that the adult mortality rate is low as a result of the absence of deep water predators in the lake.

The water level management regime does not appear to be severely affecting the cisco population. With no historic information available on the exact extent of drawdown nor the location and depths of spawning areas no estimate can be made of how much tolerance there may be for fluctuations. Drawdown should be no more than the historical average, and possibly considerably less, to ensure that there is resiliency maintained for the regular recruitment of cisco.

The largemouth bass is a robust warm-water fish that spawns in the spring, usually occurring around mid June (Scott and Crossman 1973). Nest building begins by males when the mean water temperature reaches 15^{o} C and occurs on substrate including gravely sand, soft mud, bullrushes and water lilies (Scott and Crossman 1973). Changes in water level, water temperature, waves and nest desertion can limit the success of the hatch. Upon hatching, the young are 3 mm long making them susceptible to changes in water levels and current in the lake. The over winter drawdown should not have a direct impact on largemouth bass as they are mostly inactive and occupy deep water over the winter. The description of how the dam is operated indicates that major changes in level do not occur during the spawning, incubation and early nursery period; therefore direct impacts should not occur during that period either. An indirect impact may occur though if the over-winter dewatering of littoral zone areas impacts food production and physical habitat (eg. vegetation growth) in the nearshore area. Quantitative benchmarks of largemouth bass abundance are not yet available for the Broad-scale Monitoring protocol. Subjectively, the abundance appears to be reasonably high, indicating that productivity and habitat have not been severely affected. The level of detail of information available is not sufficient, nor easily attainable, to determine if minor impacts are occurring.

The bathymetric data of the lake suggests that very little littoral area exists and shorelines have a steep slope. This indicates that modest spring/summer water level fluctuations, to a certain extent, may not have a large effect on spawning areas and would be acceptable and that the winter drawdown does not dewater large areas. In the 2011 netting survey, largemouth bass were caught in a wide range of different sizes, with no gaps in the distribution, which seems to indicate that recruitment has not been largely affected by the dam management.

Compared to past surveys, fish species composition has remained relatively constant. In 2011, however, no brown bullheads or creek chub were caught. This result does not indicate that these species are not present in the lake but rather is a product of the type of gear and the amount of netting effort expended.

In summary, although healthy populations of largemouth bass and cisco seem to be present in the lake, in agreement with previous reports by Adamson (1967), large draw-downs of water should be avoided throughout the spring to avoid disruption to largemouth bass spawning activity. Furthermore, large draw-downs should also be avoided in the winter months to avoid the stranding of cisco eggs and impact on the productivity of the nearshore area.

References Cited

Adamson, M. 1967. RE: Water Levels, Seguin River Watershed. Ontario Department of Lands and Forests, Parry Sound.

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Rettie, C. 1976. Aquatic Resource Area Data Information Sheet. Ministry of Natural Resources, Parry Sound.

Sandstrom, S, M. Rawson and N. Lester. 2010. Manual of Instructions for Broad-scale Fish Community Monitoring; using Large Mesh Gillnets and Small Mesh Gillnets.Ontario Ministry of Natural Resources. Peterborough, Ontario. Version 2010.1-34 p. + appendices.

Table 1 Allocation of netting effort, by gear and depth strata, Martin Lake, 2011.

			Stratum				
Gear	Effort	. Gangs	01 - 03 m	03 - 06 m	06 - 12 m	12 - 20 m	Grand Total
Large Mesh Gillnet	1	2	1				1
	2	2				1	1
	3	2		1			1
	5	2			1		1
	7	2			1		1
	9	2		1			1
	10	2	1				1
	11	2			1		1
Total			2	2	3	1	8
Small Mesh Gillnet	4	2	1				1
	6	2		1			1
	8	2			1		1
	12	2		1			1
Total			1	2	1		4
Grand Total			3	4	4	1	12

Table 2 Summary of catch, by effort, gear, depth stratum and species, Martin Lake, 2011.

Effort	Gear	Depth Stratum	Cisco	White Sucker	Pumpkin-seed	Small-mouth Bass	Large-mouth Bass	Yellow Perch
1	large	01 - 03 m			2		4	
2	large	12 - 20 m	1					
3	large	03 - 06 m		1				1
5	large	06 - 12 m						
7	large	06 - 12 m						
9	large	03 - 06 m		1		2	28	4
10	large	01 - 03 m					11	9
11	large	06 - 12 m	12					
Total			13	2	2	2	43	14
4	small	01 - 03 m					2	2
6	small	03 - 06 m			1	2	2	
8	small	06 - 12 m	12					
12	small	03 - 06 m					2	
Total			12		1	2	6	2

Table 3 Descriptive statistics of the fork length of captured fish, by gear type, Martin Lake, 2011.

large mesh	Cisco	White Sucker	Pumpkin-seed	Small-mouth Bass	Large-mouth Bass	Yellow Perch
n	13	2	2	2	43	14
mean	326	491	162	300	298	265
min.	297	461	154	290	153	210
max.	346	520	170	310	386	298
std. dev.	16	42	11	14	53	22

small mesh	
n	12
mean	297
min.	103
max.	365
std. dev.	81

Table 4 Age distribution and mean fork length-at-age for cisco, Martin Lake, 2011.

Age	n	mean FL	S.D.
0	1	103	
2	2	210	15
4	6	306	9
7	2	327	1
8	2	340	6
9	3	335	2
10	1	325	
11	4	349	12
15	1	339	
16	1	360	
17	1	330	
19	1	356	

Table 5 Temperature and dissolved oxygen profile, Martin Lake, September 14, 2011.

Depth (m)	Temperature (ºC)	Dissolved Oxygen (ppm)
0.5	19.9	8.6
0.8	19.9	8.6
2.0	19.9	8.6
3.0	19.9	8.6
4.1	19.6	8.5
5.1	18.8	7.3
6.1	14.7	4.0
7.1	9.8	3.3
8.0	8.6	2.5
9.1	7.7	2.5
10.0	7.4	1.0
11.0	7.1	0.6
12.0	6.9	0.2

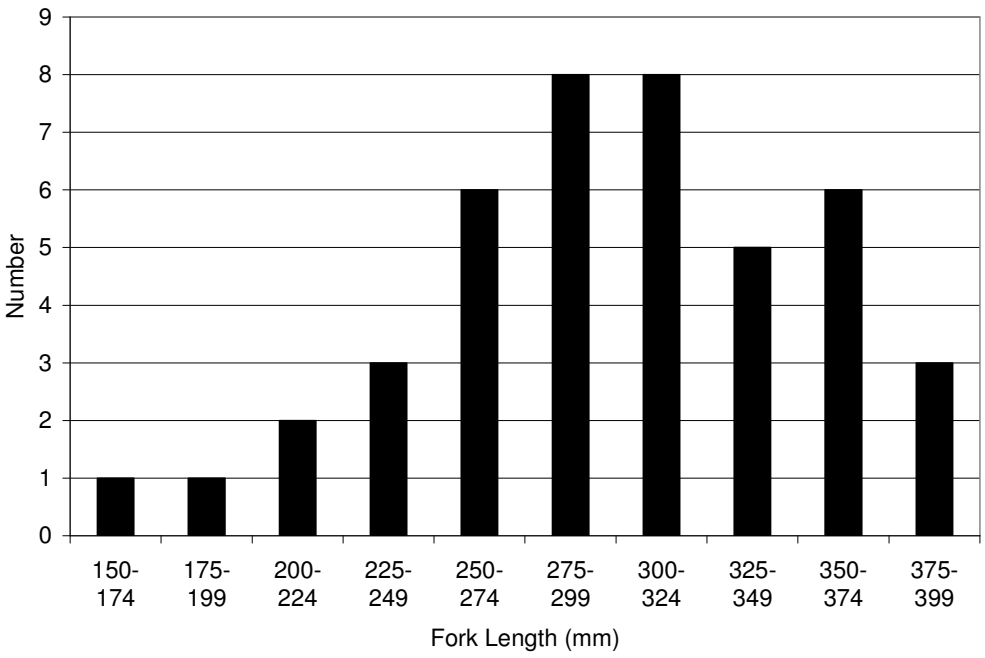


Figure 1 Largemouth Bass fork length frequency distribution, large mesh gear, Martin Lake, 2011.

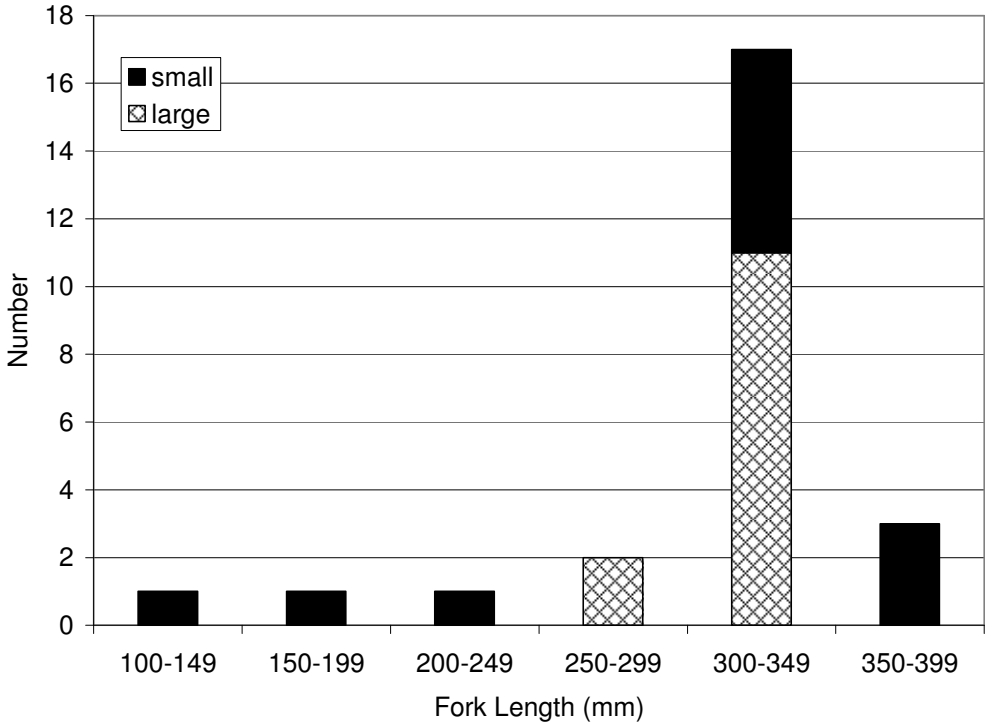


Figure 2 Cisco fork length frequency distribution, by gear type, Martin Lake, 2011.

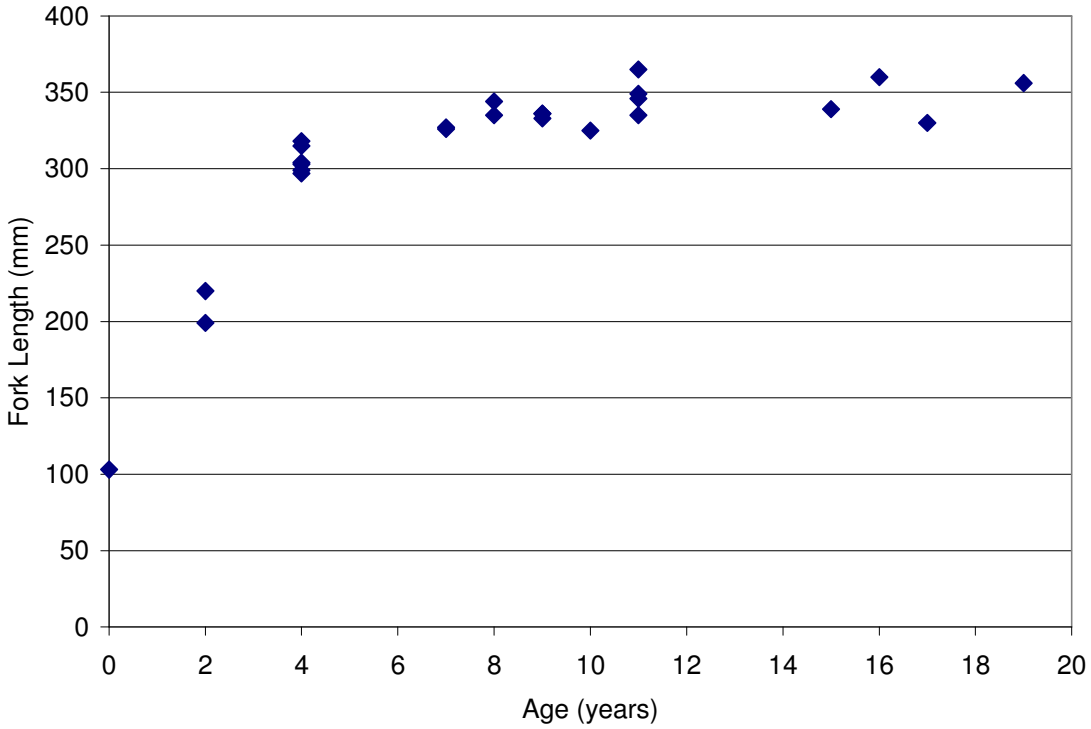


Figure 3 Age-fork length relationship for cisco caught in Martin Lake, 2011.

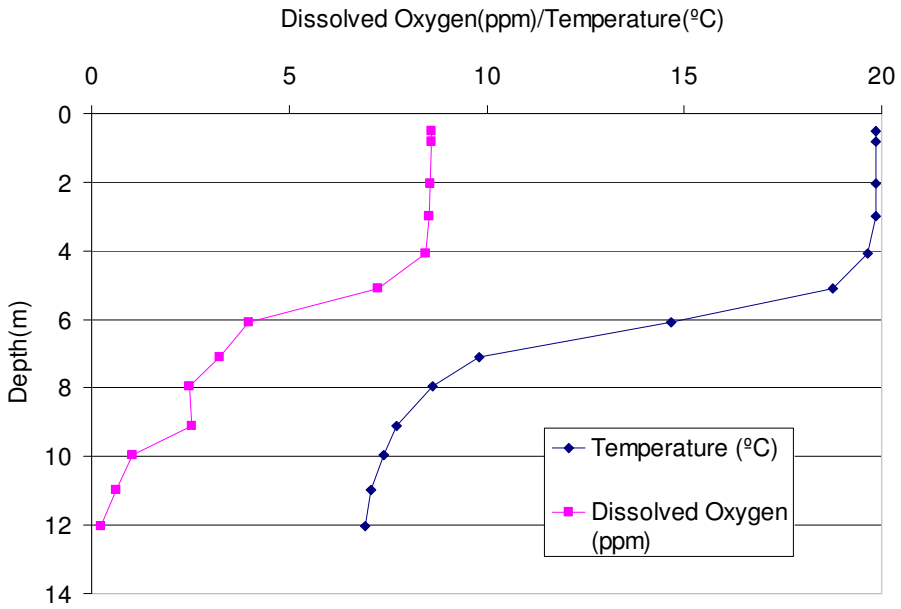


Figure 4 Temperature and dissolved oxygen profile, Martin Lake, September 14, 2011.

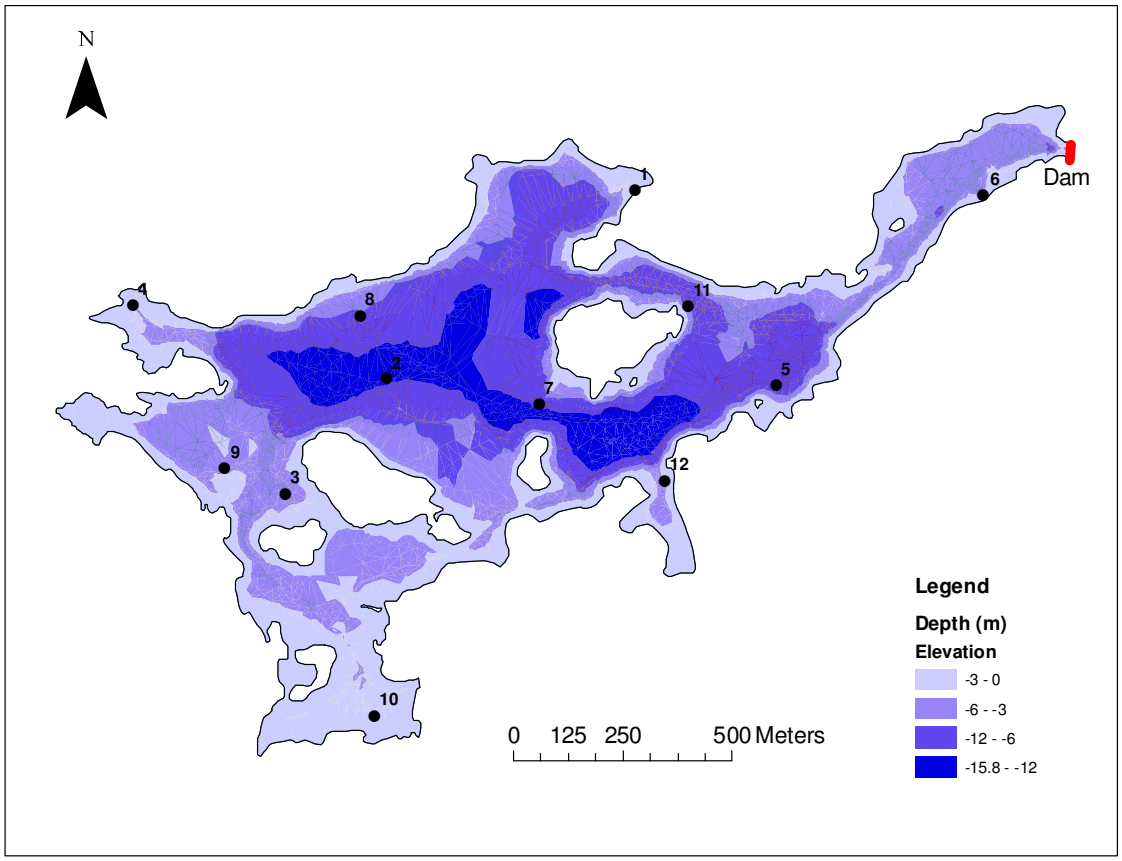


Figure 5 Updated bathymetric map of Martin Lake, Christie Township, indicating net set and dam locations.

Appendix Individual fish data, Martin Lake, 2011.

Effort	GEAR	GANG	PANEL	SPC	FISH	FATE	FLEN	TLEN	RWT	SEX	GON	AST	AGE
2	1	0	000	093	1	D	335	376	522	2	22	2	11
11	1	0	000	093	1	D	333	374	540	1	99	2A	9
11	1	0	000	093	2	D	327	362	540	1	99	2A	7
11	1	0	000	093	3	D	318	351	410	1	99	2A	4
11	1	0	000	093	4	D	299	330	400	1	99	2A	4
11	1	0	000	093	5	D	330	369	470	1	99	2A	17
11	1	0	000	093	6	D	335	369	490	1	99	2A	8
11	1	0	000	093	7	D	344	374	545	1	99	2A	8
11	1	0	000	093	8	D	339	383	500	1	99	2A	15
11	1	0	000	093	9	D	297	325	400	1	99	2A	4
11	1	0	000	093	10	D	326	363	500	1	99	2A	7
11	1	0	000	093	11	D	346	389	510	1	99	2A	11
11	1	0	000	093	12	D	304	337	395	1	99	2A	4
8	2	1	1	093	1	D	349	387	620	1	99	2A	11
8	2	1	000	093	2	D	336	372	580	2	22	2A	8
8	2	1	1.5	093	3	D	325	362	500	1	99	2A	10
8	2	1	1.00	093	4	D	356	402	520	2	22	2A	19
8	2	1	1.25	093	5	D	303	332	430	2	22	2A	4
8	2	1	1.00	093	6	D	199	219	100	2	22	2A	2
8	2	1	1.5	093	7	D	220	244	160	1	10	2A	2
8	2	1	0.75	093	8	D	103	110	10	999	99	2A	0
8	2	1	1.25	093	9	D	315	352	480	2	22	2A	4
8	2	1	1.5	093	10	D	365	400	680	1	99	2A	11
8	2	1	1.5	093	11	R	360	396	510	1	99	2A	16
8	2	1	1.00	093	12	R	336	376	570	1	99	2A	9
3	1	0	000	163	1	D	461						
9	1	0	000	163	33	D	520						
1	1	0	000	313	2	R	170						
1	1	0	000	313	4	R	154						
9	1	0	000	316	34	D	310	332	500	1	99	27	8
9	1	0	000	316	35	K	290	305	350	2	99	27	8
9	1	0	000	317	1	R	289						
1	1	0	000	317	1	R	350						
10	1	0	000	317	1	D	355						
9	1	0	000	317	2	R	238						
10	1	0	000	317	2	D	312						
10	1	0	000	317	3	D	310						
1	1	0	000	317	3	R	329						
9	1	0	000	317	3	R	343						
9	1	0	000	317	4	R	285						

Effort		GEAR	GANG	PANEL	SPC	FISH	FATE	FLEN	TLEN	RWT	SEX	GON	AST	AGE
10		1	0	000	317	4	D	386						
1		1	0	000	317	5	R	249						
9		1	0	000	317	5	R	302						
10		1	0	000	317	5	D	330						
1		1	0	000	317	6	R	193						
10		1	0	000	317	6	D	220						
9		1	0	000	317	6	R	350						
10		1	0	000	317	7	D	250						
9		1	0	000	317	7	R	370						
10		1	0	000	317	8	D	303						
9		1	0	000	317	8	R	348						
9		1	0	000	317	9	R	240						
10		1	0	000	317	9	D	300						
10		1	0	000	317	10	D	256						
9		1	0	000	317	10	R	289						
10		1	0	000	317	11	D	153						
9		1	0	000	317	11	R	273						
9		1	0	000	317	12	R	297						
9		1	0	000	317	13	R	288						
9		1	0	000	317	16	D	290						
9		1	0	000	317	17	D	380						
9		1	0	000	317	18	D	290						
9		1	0	000	317	19	D	345						
9		1	0	000	317	20	D	370						
9		1	0	000	317	21	D	285						
9		1	0	000	317	22	D	380						
9		1	0	000	317	23	D	360						
9		1	0	000	317	24	D	254						
9		1	0	000	317	25	D	320						
9		1	0	000	317	26	D	310						
9		1	0	000	317	27	D	308						
9		1	0	000	317	28	D	209						
9		1	0	000	317	29	D	255						
9		1	0	000	317	30	D	258						
6		2	1	000	317	1	D	310						
3		1	0	000	331	2	D	251						
10		1	0	000	331	12	D	287						
10		1	0	000	331	13	D	262						
9		1	0	000	331	14	R	298						
10		1	0	000	331	14	D	274						
9		1	0	000	331	15	R	291						
10		1	0	000	331	15	D	256						
10		1	0	000	331	16	D	254						
10		1	0	000	331	17	D	259						
10		1	0	000	331	18	D	263						

Effort		GEAR	GANG	PANEL	SPC	FISH	FATE	FLEN	TLEN	RWT	SEX	GON	AST	AGE
	10	1	0	000	331	19	D	276						
	10	1	0	000	331	20	D	254						
	9	1	0	000	331	31	D	270						
	9	1	0	000	331	32	D	210						