Volume: #2 July 2014

Hooked on Mille Lacs Lake

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Don't look! Medusa! Related to jelly fish, these tentacular little animals growing on the pondweed are called Hydra, and they have one notable characteristic that would interest us all. They appear not to age! They also fire dart like threads to capture their prey using neuro-toxin to stun the small zooplankton. Natures very own stun gun!

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Tagging study

Dnr fisheries staff from all over the state as well as Great Lakes Indian Fish and Wildlife Commission, Fond du Lac Band DNR, and US Fish and Wildlife staff cooperated to tag over 14,000 walleye and 3,600 northern pike this spring. This was no minor accomplishment. Late ice-off conditions once again resulted in a real waiting game for fisheries staff.

While we were waiting to get to in-lake spawning areas for both walleye and northern pike we did manage to tag a significant number of stream and Rum River northern pike. These fish usually run earlier than the lake spawning fish and are less affected by lake ice conditions.

Then by the first week of May the main lake ice began to move. This opened up shoreline areas for us to both trap and electrofish for pike and walleye. The peak catch rates of about 400/crew, and likely peak of walleye spawning occurred around May 7th, and by the 14th catches diminished to around 40 fish per crew signaling the end of the spawning run, and the end of tagging walleye.

One important component to the

Spawner female walleye tagged during electrofishing operations in early May, 2014

mark/recapture study is the mixing of the stock between the marking and recapture phases of the project. In order to get a good estimate of population size, either the marking phase or the recapture phase needs to be randomized. Since its easier to capture walleye during spawning than it is afterwards, we tried to maximize the number of fish we tagged, and then built the randomization into the recapture portion of the study. This phase used short term gill net sets to catch fish all over the lake. General locations on the lake were identified and then crews were randomly assigned zones in which to catch fish. This phase of the project began with some training runs May 21-23, and then began full force on May 26. The delay between the tagging and recapture phases is to allow for marked and unmarked fish to mix throughout the lake, which also helps to reduce bias in

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Current Mille Lacs Fishing Regulations:
http://www.dnr.state.mn.us/fishing/millelacs.html

Muskellunge

In the week of May 15th we were able to conduct another muskellunge assessment. Timing on this project couldn't have been better. We set in on May 15 and lifted 141 trap nets over the next five days. We captured 245 musky, ranging from 34.8 to 55.7 inches. Additionally we captured some fish that still had tags from the 1990s. Those fish were aged when they were tagged and are now 22 to 29 years old. Wow! Most of our temporary staff this spring were younger than that! One of the females with a tag had grown from 36.8 inches in 1997, to 51.2 inches this spring. Males don't grow nearly so well. The oldest tagged fish was a male that measured 39.2 inches in 1996. It measured only 40.3 inches this spring. Scale samples were collected from all muskellunge and will be sent to the U of M for genetic identification. With this information, we will be able to estimate the population size and identify the strain of each fish, which helps determine the extent of natural reproduction.

Fisheries specialists Justin Carney and Ethan Puttonen hold one of the bigger specimens.

Tagging Study *cont'd from pg 1*

the estimates.

Recapture netting involves setting a series of gill nets and then lifting them almost immediately after the last one is set. After the first net had "soaked" about half an hour it is lifted. The short duration ensures high survival for released fish. Catches in these nets can vary tremendously, but often they have no fish at all, or just one or two fish. The average number of walleye in the recapture nets was about 1.5 fish, so it took an awful lot of effort to catch almost 4,000 walleye and 1,300 pike. Of these, about 600 were killed for identifying the sex and for the diet study, and were ultimately donated to various charities. The rest of the fish were released unharmed.

Area Fisheries Supervisor Rick Bruesewitz (left) finishes the retrieval of a gill net set for about half an hour, while Fisheries Specialist Greg Berg untangles a big walleye from the net.

Multiple fish roll over in front of the active electrofisher. These were walleyes captured early in the evening near a spawning stream.

Overall, the tagging work went much better this year than it did last spring. Hopefully, when all is said and done, it should help us a better understand the dynamics in the population.

Field work in 2014

- Spring trap-netting and electrofishing for northern pike, walleye, musky and smallmouth bass—in that order. *Done*
- Continued monthly collection of samples for bioenergetics/diet study (pike, bass, and walleye). *In Progress*
- Tribal harvest monitoring *Done*
- Short-term gill-netting in May and early June to look for recaptures of fish marked or tagged in spring. *Done*
- Angler creel survey beginning on the season opener. *In Progress*
- Bi-weekly and monthly water and zooplankton/veliger sampling May thru September. *In Progress*
- August diving to sample zebra mussels (in cooperation with DNR Ecological & Water Resources).
- Fall large lake fish sampling (electrofish, trawl, forage gill nets, standard and pike gill nets.)
- **NEW** - ***Hooked on Mille Lacs Lake: On the Road!*** Presentations by field staff in the Mille Lacs area beginning August 21.

The Bite

A nice walleye from early summer, with its stomach packed with yearling perch. Having lots to eat generally means a bigger challenge to anglers, and this has been the case since last summer.

Spring 2014 came late once again, and based on the rain gauge and thermometer it sure seems to still be hanging on yet in July.

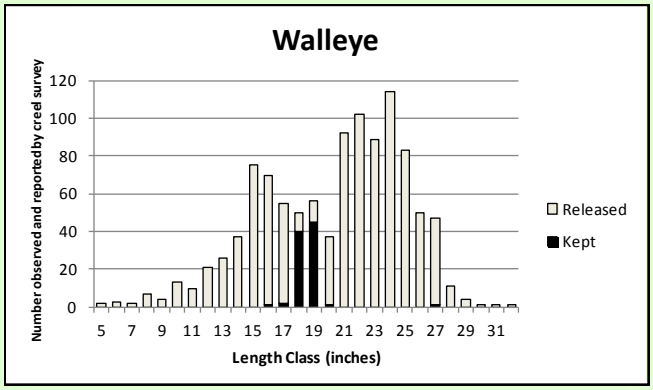
While late ice-outs often result in cooler than normal fishing, the high forage made things even tougher on anglers. Catch rates were pretty much what we expected. Lots of yearling perch were still available to the walleye and so biting anglers' baits was a little more infrequent. This low bite was forecasted last fall and winter when angling catch rates plummeted to near all-time lows, however we were unsure about how long the forage base would hold out. Obviously it appears to still be pretty strong. Therefore we recommended relaxing the night fishing closure for the remainder of the year. With this change, we expect effort to increase slightly, although we expect catch rates to remain pretty low this summer. Later on, in late September and October, even if catch rates increase appreciably, hooking mortality will still be low just because of the cooler temperatures at that time of year. This ensures that we will stay within our allocation for the season.

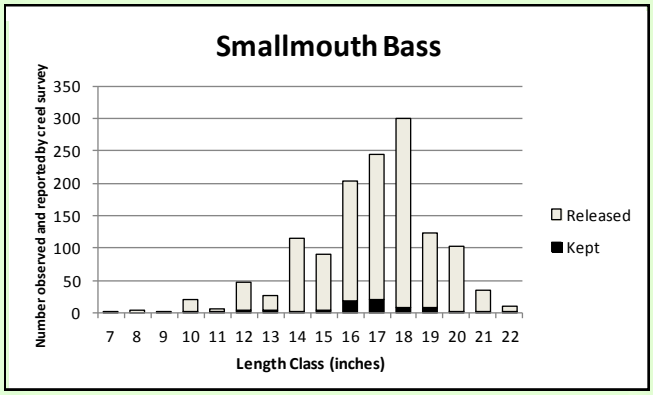
The bite for a couple of the other species has been pretty good overall. Northern pike have been taken at levels higher than we've seen for many years. Since opener anglers harvested over 6,500 lbs of northern pike. Most of those fish have been under 30 inches, which is where we have a large surplus of pike right now. It's good to see the continued release of the larger pike.

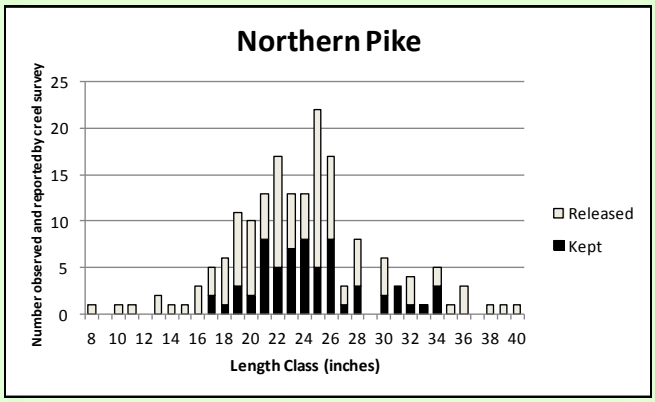
While a number of pike have been harvested, most bass are still being released. This voluntary release ethic is the primary reason we felt comfortable that we could relax the regulations on bass, allow for some harvest, and still maintain a quality fishery.

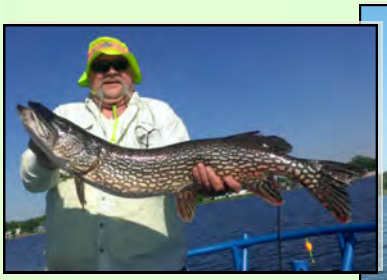
One species notably absent in catches are larger perch. They too eat young perch. Expect more catch of perch as the 2013 year class of perch grows to larger sizes.

Length distribution charts of harvested and released walleye, smallmouth bass, and northern pike caught by anglers and observed by, or reported to our creel clerks between Opener and June 30.

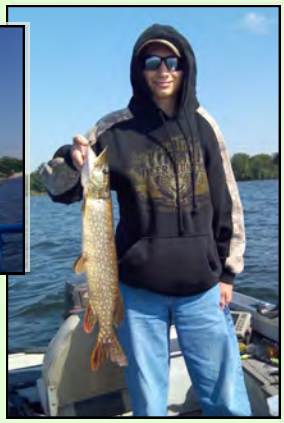








Above: Photo courtesy of Garrison Sports.



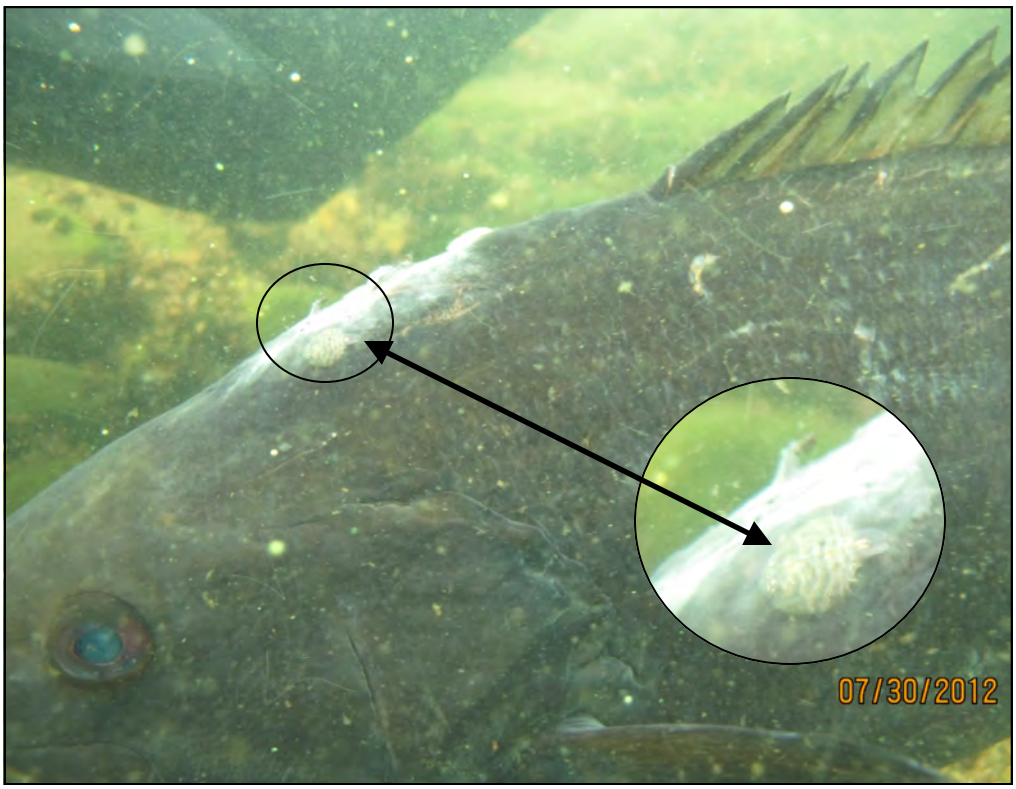
One for the memory books and another for the grill. Above: A happy launch customer with a trophy pike caught and released on Mille Lacs this summer. Right: Another happy angler with supper.

Myths and Facts surrounding Mille Lacs

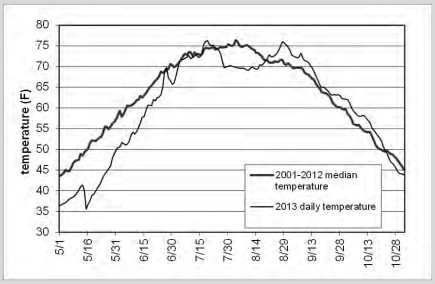
Myth 3: Over the last ten years or so we have been getting a number of complaints and inquiries regarding the scarred up smallmouth bass people were catching on Mille Lacs Lake. The most common belief among anglers was that these sores were caused by the bass rooting around in the rocks for crayfish, and then getting cut up by the sharp zebra mussels.

Fact 3: Smallmouth bass are a common host for fish lice. Argulus is a crustacean that is known to be an ectoparasite on fish (meaning it lives on the outside of another organism) . They have piercing sucking mouth parts that can inject an enzyme that helps with digestion. Basically, these creatures grab on to a fish, crawl to a spot where scales are smallest, pierce the skin with their mouth part, inject an enzyme to start digestion, and then suck out the liquefied flesh. Not cool, if you're the bass. Argulus have been in Mille Lacs for decades (notes in our files date back to the 1950s). Amazingly, the wounds, which appear open often have the skin still intact. We found this out when we sent a badly scarred fish to our pathology lab for examination. The skin of the fish was still intact, yet the flesh was clearly visible. No other secondary infections were present.

An example of a bass from Mille Lacs with large wound on back of head (right). Below is photo of another smallmouth bass taken by DNR staff Tom Jones while conducting a zebra mussel SCUBA survey. The insert shows a blow-up of one of the Argulus attached to this fish.



Water Temperature



2013 water temperature profile at Mille Lacs in comparison to the median temperature from 2001 to 2012. Overall, 2013 was cooler than normal for the first half of the season, and then warmer than normal from mid-August to mid-October.

The water in Mille Lacs is usually well mixed throughout the open water season, which means the water temperature usually is similar from top to bottom. However, some minor amount of temperature difference from surface to bottom, which is called thermal stratification, occurs in periods of warm and calm weather. Usually this happens in mid-summer, but this year we had very little wind from ice-out through early June. This resulted in thermal stratification throughout the main lake. While the inshore and surface water temperatures were in the upper 50s to low 60 degree range, some of the deep offshore areas were still in the 40s.

Next issue (October):

- More Myths and Facts
- Fall Assessment preliminary results
- Population estimates from spring work
- Winter prognostications
- Water birds (sorry we didn't get to these this issue)

Please send your suggested topics for future issues to:

aitkin.fisheries@state.mn.us

Fishery *"model"*?

No, its not just our Large Lake Specialist looking good in his personal protective gear and cool sunglasses. Fishery models are nothing more than mathematical representations of various characteristics of fish populations or communities.

One of the most basic models is simply the length –weight relationship. To avoid having to weigh individual fish in our creel survey, we "model" the relationship between length and weight and only need to measure the length (which is more practical in the field) in order to determine the weight of a given fish. While any individual weight may be off slightly (fat vs skinny fish), when grouped together we get a good representation of the population. In the chart to the right, each point represents the weight of a fish of a given length as measured in our survey. The line then represents the "model" of the population based on the mathematical relationship (equation on the chart) describing essentially the average for each length.

Another type of fishery model is one used to determine the number of fish in a population. The basic concept is this:

The number alive at a particular time (N_t) is equal to the number alive in an earlier (N_{t-1}) time minus any deaths (D), plus any births (B), minus any emigration (E), and plus any immigration (I). Or in mathematical format it might look like this:

$$N_t=N_{t-1}-D+B-E+I$$

(don't worry, there won't be a test)

At Mille Lacs, nearly all the changes that occur in the population are related to births and deaths. Births are related to the number of young-of-the-year fish we see in our surveys, while deaths are related to angler and tribal harvest, hooking mortality, and natural mortality.

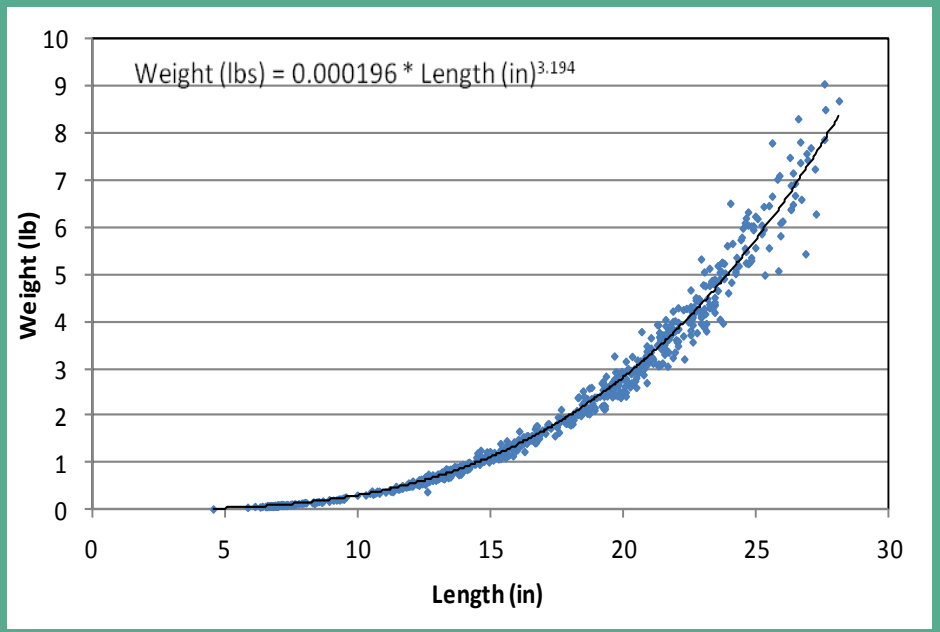
To estimate the population size of walleye in Mille Lacs we incorporate these various concepts into a rather complex model called a "statistical catch at age analysis". Basically it accounts for the fish that died and those that entered the population, and the more information we have for any one year class of fish, the better the model performs. Ultimately, what the model does is incorporates all the data we have on walleye into many different, but related mathematical equations.

Here is a list of the information from our assessments that go into that model:

- Walleye gill net catches by age, length and sex for inshore and offshore gill net surveys.
- Electrofishing catches for walleye young-of-the-year and yearlings.
- Angler harvest of walleye by length and age.
- Angler releases of walleye by length and age.
- Tribal harvest of walleye by length. age and sex.
- Water temperature .
- Maturity of walleye by length, age and sex.
- Angling effort for openwater and winter.
- Tribal effort spring and fall.
- Walleye growth rates and condition
- Population estimates from spring tagging studies

Ultimately, what comes out of the model is the number and weight of the population of each age and sex of walleye for each year. And then, other statistical methods are used to determine how precise the estimates are.

For more information on ***fishery models*** do an internet search with those same key words.



An example of the length-weight relationship "model" for walleye commonly used in fishery science.

Predator Diets A to Z

In 2013, our research staff began a project to look at predator diets and to estimate consumption by each species using a technique called bioenergetics modeling. Basically, what they are trying to do is to determine the amount of pressure on the forage resource that is being exhibited by each of the top three predators. Since they are in the middle of this project, we don't have any final results, but we can give you some tid-bits of information. This is a table of diet items (in alphabetical order "A-Z") that were observed in each of the three species. Note that some diet items *(italicized in table)* were likely not eaten intentionally (*rock, vegetation, zebra mussel etc*), but were likely ingested while eating other prey species. The primary prey species for each predator is highlighted. Also note that part of the reason the walleye diet is broader, is because we have been sampling them for more years.

Main predator and main prey fish in Mille Lacs. From top and in early July: Yearling walleye, two young-of-the year walleye, tullibee yearling, tullibee young-of-the-year, yellow perch yearling, and perch young-of-the-year.

	Predator Species		
Diet Item	**Walleye**	**Northern Pike**	**Smallmouth Bass**
Amphipod (scud)	X	X	X
Artificial lure	X	X	
Black crappie	X	X	
Bluegill	X	X	
Bullhead	X	X	
Blacknose dace	X		
Bluntnose minnow	X	X	
Aquatic beetle	X		X
Burbot	X	X	X
Caddisfly	X		
Chironomid (midge)	X	X	X
Clam	X		
Central mudminnow		X	
Crayfish	X	X	X
Empty	X	X	X
Frog	X		
Golden shiner	X		
Invertebrate -unkown	X		X
Iowa darter	X	X	
Isopod (pill bug)	X	X	
Johnny darter	X	X	X
Leech	X	X	X
Logperch	X	X	X
Largemouth bass	X	X	
Longnose dace		X	
Madtom	X	X	X
Mayfly	X	X	X
Mimic shiner	X	X	
Northern pike	X	X	
Odonate (dragon fly)	X		X
Rock bass	X	X	
Rock	X	X	X
Sculpin	X	X	X
Smallmouth bass	X	X	
Snail	X	X	X
Spottail shiner	X	X	
Cisco (tullibee)	X	X	
Trout-perch	X		
Unknown fish	X	X	X
Vegetation	X	X	X
Walleye	X	X	X
White sucker	X	X	X
Yellow perch	**X**	X	X
Zebra mussel	X	X	X