



THE GREAT LAKES SPORT FISHING NEWS

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Color, Size, and Profile for Steelhead

By Roger Hinchcliff

In 1972 Johnny Nash wrote a song "I can see clearly now" and many anglers need to remember that lyric when chasing any fish. If you have ever read any books or articles from some of the world's greatest fishermen be it in the Bass, Walleye and Musky World you will hear a common theme. Color, Size, and Profile.

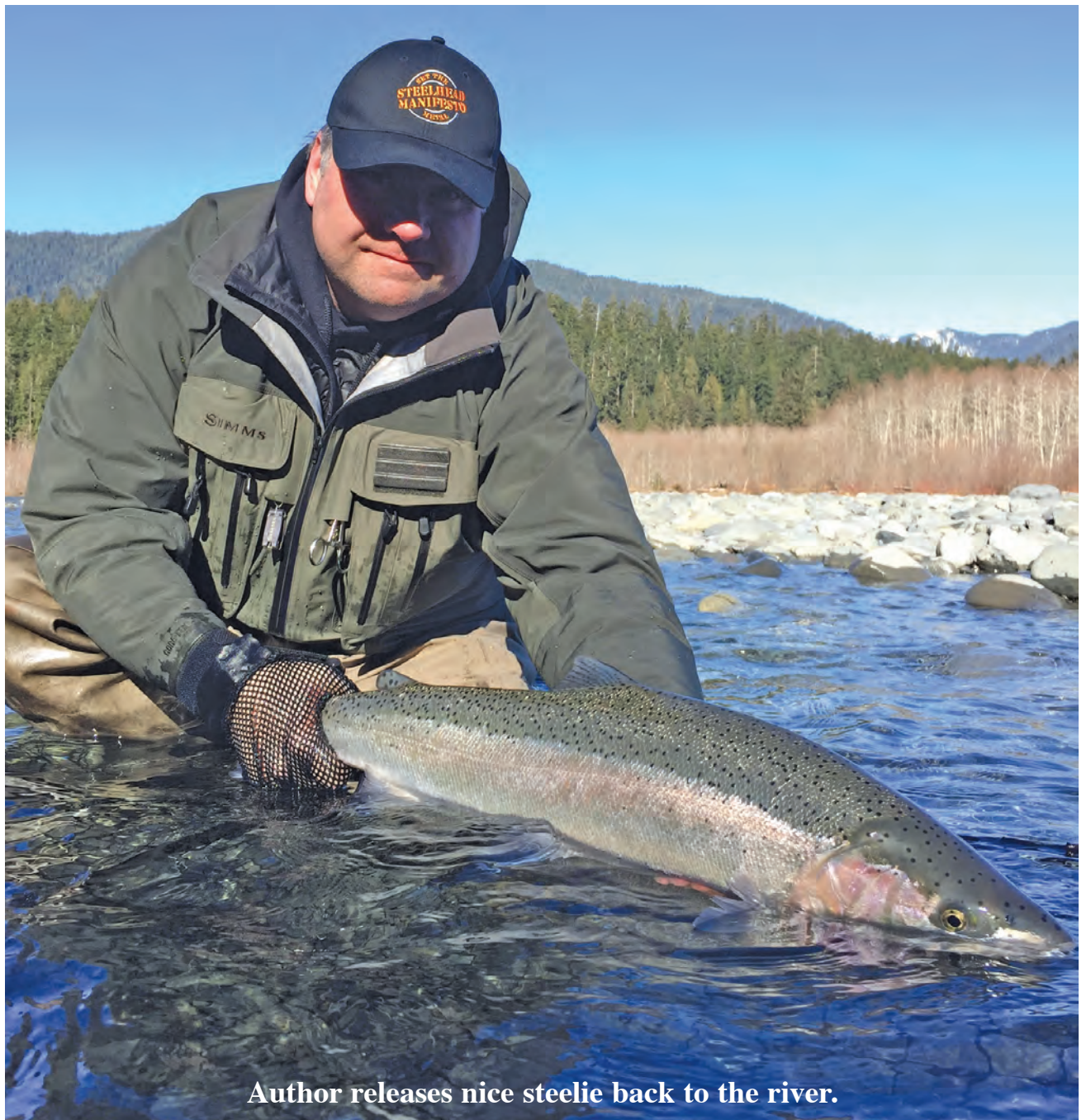
Let me first start by saying I agree with them and this article is just an opinion, which I have formed through thousands of hours on the water and with research myself on this very subject. But in the Steelhead World, you don't hear it mentioned as much and so many anglers choose to ignore this while fishing for the world's greatest fish, the Steelhead.

Now let me stress I believe in K.I.S.S. (Keep it simple stupid!) No need to make fishing complicated but in this article, I will point out where a fish's eyesight, mood and angling pressure can affect your fishing. Once you learn about these things and if you pay attention to the river and light conditions it can pay big dividends on getting bit. For those anglers who learn these three important rules on Color, Size, Profile their landing nets will always be heavy.

COLOR

If you want to catch a fish, the fish must first see your offering. Most fish in the world can see in color and a fish's eye contains rods and cones, which are used at different times of the day to see and hunt. Cones are used for daylight vision and those cells can decipher actual color. The rods are used for night vision, at night, they can't see colors as well but they can see light and profiles.

But compared to humans, they still have a higher proportion of rod cells in their eyes, so they can still see better than us in low light and worse (less color distinction) in bright light. Hence why many steelhead anglers don't like bright sunny days for fishing. It's not that the steelhead won't bite it's because many times they can't see a lure as easy due to the bright sun. Through my research, day feeding fish like Bass, Trout and Salmon can be more sensitive to color than walleyes who feed at night. Not to say, Bass, Trout, and Salmon don't feed at night but Walleyes can see better at that time. The amount of light as it passes through the water column starts to scatter. The intensity and how much it scatters is due to suspended algae, and matter in



Author releases nice steelie back to the river.

the river. Also, the color of the actual river bottom, skylight, and water clarity plays a huge role on how well a

fish can see based on the conditions and the current background.

In water depths past 15

feet reflective light falls off sharply, but most steelhead are caught in 4-8 foot of water 90% of the time. Thus,

"Profile"
Cont'd on page 3

Searching for young lake sturgeon near Detroit-area spawning reefs

Construction crews recently deposited 25,000 tons of limestone blocks on the bottom of the Detroit River in the latest phase of a decade-plus effort to lure lake sturgeon to rock spawning reefs and help restore severely depleted populations of the once-common Great Lakes giants.

The latest reef project, completed last month, added 4 acres of high-quality spawning habitat just upstream of Belle Isle, bringing the total to 16.6 acres at six locations in the Detroit and St. Clair rivers.

Researchers know the reefs work because they've collected sturgeon eggs there and have underwater video showing the huge fish



A museum specimen of a baby lake sturgeon. This individual would have been several months old. Lake sturgeon this size are rarely found in the Detroit and St. Clair rivers. Image credit: Austin Thomason, Michigan Photography

spawning. But where do the baby fish go after they hatch and leave the shelter of the rock reefs? Researchers have spent years searching for those youngsters, with-

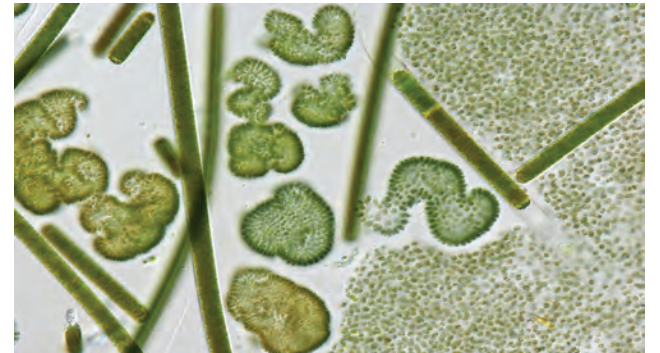
out much to show for their efforts.

Now a study of the St. Clair River by two University of Michigan researchers is "spawning reefs"
Cont'd on page 14

Microcystis Rising: Why Phosphorus Reduction Isn't Enough to Stop CyanoHABs

At Stone Laboratory, Ohio State University's island research station in western Lake Erie, a series of otherworldly life forms parades across a video monitor. Stars, double-sided combs, a web of green hexagons, triangles merged with translucent rays that form a living mandala: These are the lake's phytoplankton seen under high magnification. Microcystis, the organism that dominates the harmful algal blooms (HABs) that plague Lake Erie each summer, shows up onscreen as clumps of spherical cells.

For the people who live on Lake Erie's shores, Microcystis made its presence most acutely known in August 2014, when a bright



In this micrograph, Microcystis aeruginosa cells appear on the right as tiny green dots. Other bloom-forming cyanobacteria include Woronichinia naegeliana (the darker colonies shown in the center and left) and Limnoraphis birgei (long filaments composed of a series of cells within sheaths). John D. Wehr/Fordham University

green patch of bloom-impacted water spread from Maumee Bay along the Ohio shoreline of western Lake Erie. Fueled by an overload of nutrients running off farm fields in the

"Microcystis"
Cont'd on page 12



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The Quality of Fishing Reflects the Quality of Living!

VARIOUS FISH THROUGH THE ICE

By Bob Jensen

Boy oh boy what an ice-fishing season it's been across the Midwest, and it's not done yet. There is still lots of time to go fishing and lots of fish are still out there waiting to be caught. This is the time of year though, when it pays to be flexible in your fishing. In some areas the season for keeping walleyes is over or winding down. And, some species have been fished pretty hard in some places, so the remaining fish can get finicky. This doesn't mean we can't catch 'em, we can. Lot's of them, and big ones as well. We just need to adjust a bit to continue to experience fishing success through the ice.

One of the keys we might need to adjust is the species we're after. For instance, if you are a walleye enthusiast, and if the lake you fish is in one of those areas where walleyes go off-limits, you're going to need to adjust to another species. That's not a bad

thing. Many walleye lakes that you fish also have outstanding perch populations. Perch are fun to catch and they're great on the table: Just as good as walleyes.

To be successful with perch, you will need to size your bait down a bit and go to lighter line. P-Line Floroice in four pound test is very good: Easy to manage and nearly invisible, which is good for finicky perch.

Also scale down your lure size for perch. When they're aggressive an eighth ounce Buck-Shot Rattle Spoon will catch 'em good, but when they get a bit funky, a bait in the sixteenth ounce size will almost always get a few to bite. If you see fish come in and look at your bait but not eat it, try holding it as still as possible. That will also usually turn lookers into eaters.

Get away from the crowds. Abandon the spots that everyone knows about and see if you can find some fish that haven't been pressured all winter. Sometimes

it works to just drill a bunch of holes out in the basin of the lake and move from hole to hole. In this case you're not fishing a particular structure or spot, you're just looking for a school of fish that are moving from one area to another.

If you know of a landowner that has a pond on their land, and if that pond has fish in it, see if you can get permission to fish. Many ponds get minimal pressure, and sometimes the pond-owners would like to see a few fish taken out. You can catch crappies, bluegills, bass, and more often than you might think, catfish in these small but productive bodies of water.

Last of all, you might want to get after the exotics. In some parts of ice-country, whitefish are a popular quarry from under the ice. In other places, eelpot, also known as burbot or freshwater cod are caught regularly. Whitefish and 'pout are both willing biters, strong fighters, and when



This walleye took a liking to John Peterson's Buck-Shot Rattle Spoon.

prepared properly, very good species, more 'pout but still table fare. I've caught both quite a few whitefish, and it's

just a good time, and that's why I go fishing.

And, as most knowledgeable ice-anglers will suggest, keep an eye on your sonar and do what it tells you to do. It's important to know that there are fish in the area, but it's also very important to know how the fish are responding to your lure. Lure selection and presentation can be critical. If you see fish looking at your lure but not eating it, you need to make some changes. I've been using a Vexilar FLX28 the past couple of years. I don't know how anyone can make a better sonar. It truly will help you catch more fish from under the ice.

Sometimes the walleyes want a lure worked aggressively, sometimes they prefer a more subtle presentation. This is when you really need to pay attention to what you're doing.

Let's say you're working the lure very aggressively, snapping it up and down quickly. You see several fish come in and look, but they don't eat. Try working the lure slower. Don't change to another lure or another color or another size, just slow down. Show the fish a slower presentation. If they keep looking but not eating, then go ahead and change lure size or color.

It's also important that you know the fish are seeing the lure. The bottom of the lake is just like the ground that we walk on: There are high and low points. It could be that there is a rise in the lake bottom between your bait and the fish. The walleye is just a few feet away from your bait but can't see it because there's something in between the fish and the lure. Be sure to lift your bait a couple feet off the bottom every now and then to increase the odds of the fish seeing your lure.

Later in the ice season, the walleyes have seen it all. Try showing them something they haven't seen for awhile. When the fish are really selective, go to a Stand-up Fire-Ball jig. Drop the jig to the bottom and let it rest there. We're using the stand-up Fire-Ball because, due to its design, the minnow stands up off the bottom. Bounce it up and down on the bottom a few times, then let it sit still. The jig bouncing off the bottom will create a small dust cloud and will attract the walleyes. When they come over to see what's going on, they'll see that minnow wiggling and will hopefully eat it.

Late season is a great time to be on the ice. If you can get out, and if walleye season is still open where you live, take advantage of it. If walleye season isn't still open, you should consider traveling somewhere where it is open. The action can be good enough to justify a little extra effort to get in on it.



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"Profile"**Cont'd from page 1**

tage when fishing reflective flash lures or fluorescent colors. In most cases, they can be seen because these fish are in the rivers and not the deep lake or ocean. Another point is the amount of skylight throughout the day can change all day long. So as the amount of light changes throughout the day so does what a fish can see. Refer to "What Fish See" by Colin Kageyama.

In my opinion, fluorescent colors work very well for steelhead and salmon. They simply stand out better against any background or conditions based on your given fishing day. Now I'm not saying because they work so well that you should use nothing but fluorescent colors while fishing but also consider other colors that can work just as well.

Most anglers know how a Natural and Neutral colors can play a role in a good day of fishing. Whether it's because your matching the hatch, or its angling pressure or the water is gin clear. Let's take a look at a natural color like Black.

The color black can work on certain days. Not just in dirty water but in clear water as well. Yet so many float fishermen ignore a black spawn bag with one pink or orange floater ball for contrast. There have been times I have railed on fish with them. I believe black works so well due to its strong silhouette in the water. The color black absorbs color and really stands out. Where the color white doesn't and it absorbs light. If the color choice stands out and they can see it, they just might bite it.

After reading that it's not that simple as just fish fluorescent or natural colors steelhead can be the most color conscious fish on

earth. For Example, the color Chartreuse doesn't work all the time. Sometimes it can be way too bright in low clear water during the winter. This color is a better option in low light at dawn and dusk. But I never say never in the Steelhead game, some days my best color can be a chartreuse spawn bag all day long. If I have great conditions I opt for more natural subtle tones and colors. Such as white, olive and black. Bottom line tone down the color the clearer the water. The color you think will work doesn't and the one you thought wouldn't go will get bit! That's the allure of these amazing game fish.

A highly overlooked color option by anglers during low clear water periods in the Great Lakes is the color red. I also love Hot Pinks, Purples and Oranges these are staples of the steelhead world under an overcast sky but my most favorite colors for steelhead are cerise and nail polish pink.

Another color that gets no respect these days is the color Yellow. Ask any diehard Rainbow Trout Fishermen about how well Yellow works? I have found in Rivers with a tannic stain to the water which is most in the Great Lakes. Anything Yellow like a bead, sack, or worm is a dynamite choice.

So, remember color choices can change throughout the course of a day. I have seen color choices change by the hour. So just because one color was working in the morning doesn't mean mid-day that's going to work. Steelhead are very particular some days about color. If bite slows just changing the color of your offering can make all the difference in the world. If you're fishing a run that has fish do not leave the run until

you've tried different colors before moving on, you might be glad you did.

Size and Profile

When it comes to size and profile this is an area that a lot of folks ignore and they really shouldn't. Size and Profile can also help the fish see your bait but when it comes to this side of the equation. First, we discussed how fish see with their rods and cones and the background color and light can change a baits appearance in the water.

Many fishermen have seen a smaller size and profile offering, hammer fish by going smaller in the winter-time for steelhead. For example, a 1/64 oz. jig tipped with a wax worm. These fish are cold blooded creatures and their metabolism slows to a crawl when the water gets cold you're matching the bait to the mood of the fish is important. With that being said, I believe there is something on how a fish perceives a bait when they see it.

Whether it's an impulse or their genetic response to kill or simply attack it, I feel the fish's mood can dictate how they react; be it metabolism or a cold-water environment. So, fish react differently to baits under different circumstances is what I'm pointing out. Figuring out the best size and profile is the most difficult part of this game. I have had days where I was fishing low clear water and for pressured

fish and a large choker, spawn bag is all they wanted. A huge spawn sack is not what you think based on those conditions.

Here are some tips to cracking this code. Match the hatch so to speak. Example: spring spawning steelhead on the reds are depositing eggs for the spawn. Drop back steelhead are dropping back to the Great Lakes or Ocean after they spawn. At this time mother nature tells them it's time to feed and replenish energy and fat. On their way, back, they feast on many things including their own eggs floating down the river. Ever seen a 10mm egg from a spawning steelhead? No, either have I, but I have caught many steelhead on 10 mm beads at that time of year.

My favorite hard bead company is Great Lakes Steelhead Company www.glsteelheadco.com. They have the most colors and sizes I like to use. Try colors like green Steelhead Snot or Honey. For Soft beads my go choice is candy chains by www.lickemlures.com. My favorite colors by them are the Double Natural and Seven Sisters Glow.

Most days during the Spring Steelhead Spawn when fishing for drop backs I opt for a 4, 5 or 6mm custom bead instead so I match the steelhead eggs that are in the river at that time. But many days an 8 or 10mm can't be beaten. Size and Profile with color plays a

role without a doubt. You must experiment and find a pattern.

One of my most Favorite baits for Spring Steelhead are the WFO Worms at www.wfoworms.com. They have the most amazing worm color palate I have ever seen in the industry and the worms come in many different sizes and can be easily trimmed down to match conditions. These worms are absolutely deadly on Spring Steelhead.

Does a Fish have a Memory?

The answer to that question may raise some eyebrows to some, but I believe it wholeheartedly that a fish can get conditioned to being caught and if released. Here are some examples: We have proven animals can be conditioned to remember things and react out of reflex. Don't believe me? Visit a hatchery when the food pellets hit the water on a trout or catfish farm. The water just boils because they know it's time to eat. How about a dog trainer when he makes the collar beep or sends a shock to the dog, the animal quickly learns not to do that anymore? I believe fish are adaptive and learn like other animals.

Research has shown in Atlantic Salmon they have memories and its based on their metabolism and that determines how long that memory is. Rainbow Trout can be trained to press a bar to get food, and they can

remember this three months after last seeing the bar. Ever caught a fish and released it and then an hour later you catch it again? That was a high metabolism fish and they have the shortest memory span and are the easiest to catch. But the subject of metabolisms is another article for another day.

Now size and profile may help the fish see the bait in different water and light situations as well as color. But the point here is fish can get conditioned to seeing a pink spawn bag go by them all day every day. Especially if they have been caught before and released.

So, the angler who experiments with different sizes and colors and chooses the right lure, fly or bait based on the fish's attraction threshold will catch more fish. Fishing is a lifelong journey and I'm constantly experimenting with different lures and baits to catch them. So, matching the hatch so to speak is not always about color but also about profile and size.

I really hope that I have inspired you to try experimenting with the size and profile of your baits and lures. And pay attention to your light conditions along with color and this year could be the best steelhead season ever. For questions or comments visit Rogers website at www.steelhead-manifesto.com. Tight Lines and Screaming Drags!

2017 Tentative Print Schedule

Issue	Deadline	Print Date
1	12/30/2016	1/6/2017
2	2/17/2017	2/24/2017
3	4/21/2017	4/28/2017
4	6/23/2017	6/30/2017
5	8/25/2017	9/1/2017
6	10/20/2017	10/27/2017

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The Michigan Steelhead and Salmon Fishermen's Association (MSSFA) is a multi-state, non-profit organization dedicated to educating the general public on improving, preserving and promoting sport fishing, the Great Lakes and their tributary streams and in rivers. Commonly referred to as The Michigan Steelheaders, or simply Steelheaders. MSSFA represents sport fishing families in the Great Lakes region. MSSFA encourages the strictest observances of sport fishing laws and ethical fishing practices.

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MSSFA President Dr. Ken Merckel

With the arrival of alewife in Lake Huron, Saginaw Bay became the nursery for this exotic species. The alewife population quickly increased and acted as a buffer against yellow perch predation. To take advantage of the new forage base, the MDNR planted Pacific

salmon in Lake Huron as well as walleye in Saginaw Bay. It established both a World Class walleye fishery and Pacific salmon fishery in Lake Huron.

Walleye plants were discontinued in 2005 because walleye became self-sustaining through natural reproduc-

tion. With the collapse of the alewife population in 2002, the Lake Huron Citizens Fishery Advisory Committee began requesting that herring or Cisco be planted for both forage for salmon and as a sport fish for anglers. The hope was to replace alewife as the exclusive prey fish for

Chinook salmon and to protect young of the year (YOY) yellow perch from predation. The DNR provided a myriad of reasons why this initiative was not a viable option at the time.

Working with the Great Lakes Science Center, we were able to get a diet study

undertaken over the next few years culminating in 2012. Stomachs from sport fish catches were obtained and analyzed. The results confirmed that walleye in Saginaw Bay were predominately feeding on YOY yellow perch.

In 2015 the walleye regulations were altered on Saginaw Bay (MH4) and portions of the Saginaw River to allow for a daily catch limit of eight walleye in possession with a thirteen inch minimum length. Due to mild winters the last three years, ice cover has been limited resulting in reduced catch rates for walleye in comparison to other years.

With the completion of

the alterations to the Jordan River Hatchery, we will have the capacity to raise up to 2 million Cisco for restoration purposes in Saginaw Bay. Cisco and walleye occupy different positions on the food web. Walleye are top predators, and Cisco are primarily prey or forage fish. The Cisco restoration is an effort to restore a former pelagic prey base in the main basin for salmon, steelhead and lake trout. Cisco, if they become established, may become what walleye eat instead of young perch. This program could successfully reestablish both a vibrant perch and Cisco fishery.

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**Dennis Eade, Executive Director
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After successfully forestalling the passage of net-pen aquaculture enabling bills in the Michigan House of Representatives and Senate during the lame duck session, MSSFA remains engaged with our coalition partners (MUCC, Trout Unlimited and the Michigan Environmental Council) to ensure these bills are not reintroduced in Michigan's new 99th Legislature. We received a big lift this past summer when the three Quality of Life Agencies (MDNR, MDEQ, and MDARD) recommended against pursuing commercial fish farming in the Great Lakes. The agencies concluded that such facilities pose significant environmental risks, are not legally authorized and would generate little revenue for the state, creating only 17 new jobs. Then at the end of last year, Sen. Wayne Schmidt, R- Traverse City, asked Attorney General Bill Schuette to issue a formal opinion on the legality of aquaculture. On Jan. 4, Schuette issued his opinion: It is not. Concurring with the earlier agency report reaching the same conclusions. Schuette noted that fish farming in the Great Lakes does not fall within the definition of aquaculture facility under the state aquaculture law, because the definition only allows fish farms in privately controlled waters.

So we reached out to U.S. Sen. Daniel Kildee (D, Dist. 5), whose legislative aide, Jordon Dickinson met with us and crafted federal legislation to prohibit aquaculture in the Great Lakes and prohibit operation of aquaculture facilities that contribute to pollution of wild and scenic rivers (as defined in section 16(a) of the Wild and Scenic Rivers Act (33 U.S.C. 1362(6)). The bills were introduced on February 6th in the

House of Representatives. I am confident these bills will hold up to scrutiny and I'm optimistic that with enough bipartisan support they have a good chance of passing.

MSSFA has also registered opposition to the Little River Band of Ottawa Indians (LRBOI) proposal to install a weir to conduct research on the Sturgeon River. This comes at a time when anglers are concerned we might be losing Chinook salmon and preservation of steelhead trout populations is paramount for maintaining a "silver fish fishery" in Lake Michigan. A letter was sent to Jon Thompson, U.S. Forest Service ranger responsible for considering the tribe's request for a special use permit. MSSFA also contacted Sen. Debbie Stabenow's office in Traverse City, formally requesting a complete and thorough review of the U.S. Forest Services handling of this request to by-pass the need for an environmental impact study. Sen. Stabenow responded to our request and has contacted the U.S. Forest Service on our behalf. I have it on good authority that our objections and those of other groups like T.U. and the Manistee County Sport Fishing Association have effectively delayed the permitting process for this year. It is expected that the U.S. Forest Service will require an environmental impact study before moving on the LRBOI request.

MSSFA also attended a public meeting in Empire, MI on December 7, 2016 in support of restoring the Platte River mouth and installing a boat access at Tiesma Road on Platte Bay. The National Park Service is deliberating on one of three proposals to dredge, or not to dredge, and develop, or not develop, a boat launch on Platte Bay.

MSSFA.org debuted in

Great Lakes net-pen fish farming not allowed

Michigan Attorney General Bill Schuette says state law doesn't allow for net-like commercial fishing enclosures in the Great Lakes. In an opinion released January 17, Schuette said net-pen aquaculture operators would have to register with the state, and laws related to aquaculture don't permit registration of such facilities in Michigan's Great Lakes waters. Schuette says raising fish

for commercial purposes is permitted in private waters, but the Great Lakes are part of the "public trust." State agencies last year recommended against net-pen aquaculture, saying it would pose risks to the environment, recreation and tourism. Michigan has received aquaculture proposals. There are no net-pen fish farms in U.S. Great Lakes waters.

MSSFA Executive Director Dennis Eade



November and we continue to add content to the new website. Please contact me with ideas or suggestions to make it more engaging. We also transferred the michigansteelheaders.org domain name to the new site so visitors can land on the site using the former domain name as well.

Ludington Regional Fishery Workshop was held on January 14th at West Shore Community College. The take away from the meeting include: A continuing plankton problem in the lake; Quagga mussels are moving deeper in the waters but seem to be stabilizing somewhat; phosphorus level is decreasing in offshore waters. If we had no mussels in the lake, we would have a vibrant nearshore chlorophyll load. Energy is being trapped in the bottom layers. Quagga shells are burying phosphorus in the bottom of the lake. Not enough productivity in the lake to allow the biomass to

recover. Angler catch reports indicate that 2016 was better than 2015. Wisconsin, Illinois and Indiana enjoyed the biggest resurgence in angler success. 2017 is projected to be similar to 2016. 86% of the wild fish in Lake Michigan are coming from rivers and streams in Michigan. Lake trout consumption predator/prey model discussion led me to conclude we need a lake wide diet study of what fish are consuming and how much. Stomach collections and analysis is going to be critical to knowing how to manage stocking and regulation going forward. We just do not know how many alewife are being consumed by the various predators and its impact on the ecosystem.

The Michigan Legislative Sportsmen Caucus Advisory Council (MLSCAC) held a briefing for all incoming representatives on January 31st followed by a reception at Troppo's restaurant in Lansing. The briefing drew mem-

bers from 11 Senate offices and 37 House offices, and some offices had multiple staffers there along with our stakeholder groups, totaling about 90 people altogether. I presented "the economic impact hunting and fishing has on Michigan's economy" at the briefing and both Dr. Merkel and I visited with legislators at the reception. It was a great way to engage legislators on our issues and establish credibility when considering legislation that affects our fisheries and Michigan's natural resources.

The Strategic Planning Committee has identified areas of prioritization for this coming year which will be reported at the board meeting. Please invite your members to attend the Presidents' Meeting (I need a list) on March 25, 2017. Mark your calendars and plan to attend this important event at the Michigan Historical Library and Museum in Lansing from 10AM until 3:00 PM. Hope to see you at the Grand Rapids Ultimate Sport Show on March 16th.



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Professional Tournament Fish Care

By Scott Stankowski

With any fishing tournament during the summer months, locals are always concerned with the amount of pressure put on the fish. On a catch and release tournament where the fish are brought into a weigh in the anxiety increases.

With the Bassmasters college national circuit

rolling into town and fishing on the DuBay flowage those not in the know where quick to speculate, including me. Instead of rolling my eyes and making assumptions I dug deeper to find out what goes on behind the scenes to bring this exclusive article to you. I am going to take you from hook to live well, to weigh

in and back into the lake with plenty of information to put your mind at ease.

The first question was why? Certainly the fish could have been weighed at the Tiki Bar on Lake Dubay. Yes it could have, but after what I saw there was no difference. Second, how is it legal to transport live fish in the state when I privately

cannot? This is a tough one tied up in some gritty political bs. The guys working for Bassmasters and tending the fish did not know we had that rule and it is the only time that they had ever heard of such. Bottom line is, if it involves money and the DNR, all bets are off.

Russ Bradshaw a CTA which is a private contractor for BASS took plenty of time with me to show me the ins and outs. Russ is a retired carpenter from Tennessee. The crew he worked with helped set everything up from microphones to stage to weigh ins and everything in between. They not only take care of the fish but everything to run this very efficient tournament made for national tv.

Russ told me that this venue was a piece of cake. The cold water of Wisconsin was a blessing compared to what he sometimes has to deal with. In the summer months in southern states water temperatures are warmer and the days are hot. Holding tank water needs to constantly be iced to keep a steady temperature in line with the lake water.

In addition those lakes hold fish in deeper colder water. Those fish when brought up often times have air bladder problems. Russ then has to 'fizz' them. This

means he takes a hypodermic needle and inserts it into the fish to remove the air, remove too much he says and the fish will die. It is a delicate procedure that he says every southern fisherman should have. I thought it would be a good thing for ice fisherman in deep lakes of Wisconsin that want to catch and release.

As the fisherman took off they were required to show proof that their live well was operational. As they caught fish and added them to the live well they had to make sure the fish stayed alive, a dead fish was penalized at weigh in. Fisherman constantly recirculated their water and added ice as the day proceeded. Once the boats came off the water, there was an official that looked in each live well to make sure the fish were legal by the BASS golden ruler. He also made sure the fish were alive. They checked the fisherman in and sent a message to the base camp at UW - Stevens Point.

Upon arrival the fisherman put their fish in provided Trilene mesh bags and transported them into holding tanks under a shaded tent. These holding tanks were plastic and had tap water. They were treated with chemicals to get rid of any chlorine, and another

chemical was added to aid the fish. Much like what a person would add to their aquarium to protect the fish including their important slime coat. The teams would wait in line for their turn to go on stage for weigh in. The tanks were oxygenated with air to keep the fish lively.

The only significant time out of the water was weigh in. If participants had big fish they held them up to the audience and they were really lively and colorful. Russ mentioned that the college participants take great care in what they are doing and help protect the fish, as you move up to the level of some of the elite fisherman that is lost in translation. Money talks.

After weigh in the fish go to Russ. He sits atop a huge pontoon boat parked back stage. This is where I got to see first-hand what occurred on the rig. Russ is a busy man, the tri-axle trailer had three bum tires that needed replacing during the tournament this day, so he had to be on his toes.

The boat has four huge holding tanks and depending on preliminary estimates he decides how many tanks to fill based off of total weight of fish. The tanks are filled with lake water and treated with a

"Fish Care"
Cont'd on page 7

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Re: Special Use Permit for Manistee Sturgeon Weir

January 13, 2017

Dear Brandon,

The Manistee River receives more angler hours than any other stream in the entire state. During the busiest time on the river for steelhead, the Little River Band of Ottawa Indians (LRBOI) is proposing installing a weir to conduct research on the Sturgeon population in the river. This comes at a time when anglers are concerned we might be losing Chinook salmon and preservation of steelhead trout populations is paramount for maintaining a "silver fish fishery" in Lake Michigan.

Sturgeon need to be protected, and populations enhanced and understood. However, organizations like MSSFA, Trout Unlimited, the Manistee County Sport Fishing Association and the many fishing guides who earn their living guiding anglers safely along the Manistee River need to be assured that all the alternatives have been properly vetted before we suspend the rules and permit activity that may have a detrimental environmental impact.

We are concerned about the integrity of this structure when logs, debris, and periodically shelf ice flows come down river. Can these plastic conduit tubes withstand the forces that will rampage the weir? What about boating access? How deep will this "boat chute" sit below the water surface? Enough for a long shaft outboard? Enough for an inboard jet? How strong is the structural plan for the "chute" portion? What about drop back steelhead, post-spawn? Will we see photos of dozens to hundreds of dead steelhead spawned out and laying atop of the "grates" of this weir late this spring? How are they to navigate downstream? Are they expected to find the boat chute? If so, what naturally directs them to the chute? (During upstream migration the river current will always funnel to the exit or holding tank, what about downstream?) What about Steelhead and other non-target species handling? With the thousands of fish migrating upstream in the spring, is the holding tank size actually feasible?

These are all legitimate concerns that need to be thoroughly understood before a special use permit is considered for this project. The members of the Michigan Steelhead and Salmon Fishermen's Association are troubled by the LRBOI request for a special use permit. It is a threat to the fishery that is not justified. There are rules in place to insure actions like this do not create a negative environmental impact. Let's abide by the rules and exercise sound judgement before moving forward. The National Forest Service should not grant a special use permit for this project. We ask that Senator Stabenow request a thorough review by the National Forest Service before any action is taken regarding this special use permit.

Sincerely,

"Fish Care"
Cont'd from page 6
chemical again to help with the stress and slime coat. The chemical contains a dye so that officials know the water had been treated, it looked like that pond water you see at fancy golf courses a brilliant turquoise color.

The holding tanks have a bubbling stone on the bottom that is connected to pure oxygen tanks. Russ monitors the amount of oxygen going into each tank and scientifically determines whether he needs to add more or less depending on the load.

As the fish come in he dumps them into the tank. The fish immediately swim to the bottom and cannot be seen. As I sat there with him and he kept loading fish in, there was one smallmouth bass in particular that would always rise and hang out near the surface but upon putting more fish in would

dive back down.

As soon as weigh in was over, Russ and a couple of others would drive the pontoon back to the original lake and not necessarily the same boat landing. They would then drive the pontoon out into the lake and pull a lever. This opened up a hole in the bottom of the holding tank. Much like flushing a toilet the water and fish would be swept back into the lake. The boat was shut off for this portion and the crew would spend about five minutes watching for floating fish.

At this tournament they did not lose a fish. One fish came into the registration dead and it was donated to the University for studies. Russ said in many tournaments they give the fish to bank fisherman nearby. You could tell he takes great pride in ensuring the survivability of the fish.

The fishery did not get hammered; for instance

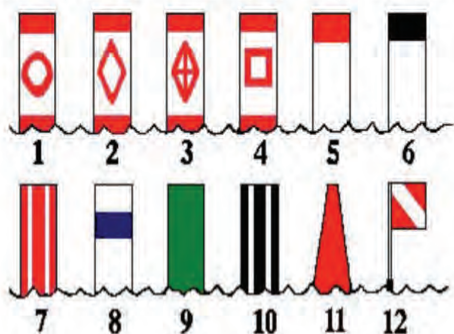
only 75 fish were registered on day 2 and 4 were registered for day three.

The final three days were held on the Stevens Point flowage with weigh in at Bukolt park. It provided a much less shorter drive for the crew but the same procedures would be followed, seeing as there were only 8 competitors the maximum number of fish each day would only be 24. Piece of cake for Russ and the crew, at some tournaments weigh-ins are over 30 miles from the lake and they use the equivalent of a gas station ice container to keep the water at a cool temperature.

I for one am glad BASS allowed me the exclusive behind the scenes tribute to the care of our local fishery. There is no doubt in my mind that their professionalism in fish care was second to none.

Buoys & Markers

The traffic signs of the water, buoys and markers, are important information for the boater. These waterway signs help the boat operator identify danger areas and restricted zones.



1. Controlled Area
2. Danger
3. Boats Keep Out
4. Information
5. Navigate to South or West
6. Navigate to North or East
7. Do Not Pass Between Shore and Buoy
8. Anchor Buoy
9. Navigate to Starboard Facing Upstream
10. Mid Channel
11. Navigat to Port Facing Upstream
12. Diver Below

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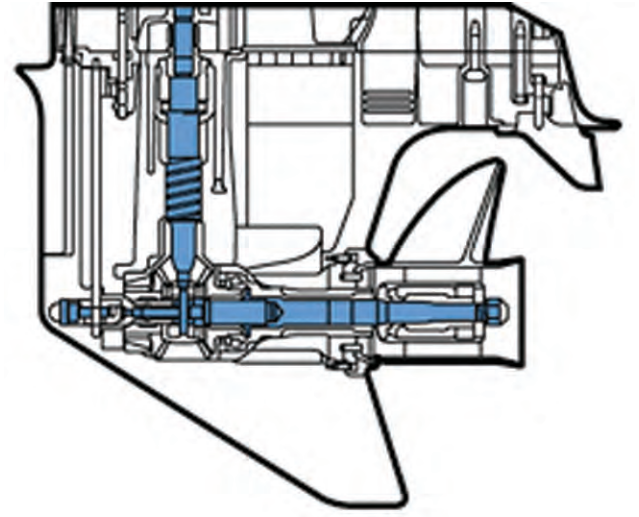
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Picking The Right Propeller

Gear Case Quite often, boating enthusiasts neglect to consider the importance of the propeller they have on their boat. The propeller is the final link in the boats drive train. It is the piece of the puzzle that connects the horsepower to the water. Having the correct propeller on a boater's specific application is like using the correct tires on ones vehicle. An off road Baja racer certainly wouldn't use slick drag racing tires. Likewise, the quarter mile drag racer doesn't need 33 inch mudgers. This same thought processes apply to picking out the perfect propeller.

Shape and Size

Propellers come in a wide variety of shapes and sizes. Those sizes are



referred to as diameter and pitch. The first and most important decision when picking a propeller is to match the propeller pitch to the engine manufacturers recommended WOT (wide

open throttle) range. This means it is important to be able to turn the minimum rpm the engine was designed for with the throttle fully advanced. As a propellers pitch rises, it creates a larger weight or restriction for the engine to spool up to higher rpm's. A 50 horsepower engine may only be able to turn a 15-pitch propeller where as a 750 horsepower off shore race engine may be able to turn 30 plus inches of pitch. Once the correct pitch is determined, the plot thickens...

Diameter

Diameter too can affect both rpm capabilities and a number of other boat and hull personalities. Many of the diameter choices have

"Right Propeller"
Cont'd on page 11




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Lake Michigan Chinook Salmon proposed Stocking Numbers by site

Following recommendations by the Lake Michigan Committee, Michigan DNR will stock 330,000 Chinook salmon starting in 2017. The Lake Michigan Basin Team (LMBT), which is made up of DNR fisheries personnel devel-

Criteria for Stocking Number

1. Maintain egg take operations.
2. Overcome predator threshold to increase survival.
3. Efficiency and effectiveness of net pen operation.

Manistee Weir for egg take operations to continuing some level of stocking at most of our existing stocking sites. These options were presented to the Lake Michigan Citizen's Fishery Advisory Committee. Most members preferred an

to provide feedback. The LMBT agreed to the following stocking proposal using the site criteria and stocking a minimum of

33,000 per site to increase survival potential. The every other year stocking strategy will provide stocking to more sites while

maintaining fisheries as Chinook salmon typically return between ages 2 and 4. Stocking reviews will be conducted annually.

Port	2016 Stocking	2017 Stocking	2018 Stocking	Site Selection Criteria Number Achieved
Escanaba	12,000			
Manistique	34,000		33,334	2, 4, 5
Medusa	72,000	50,000		
Boardman	60,000		50,000	2, 4, 5
Manistee River	22,000			
Little Manistee River	150,000	180,000	180,000	1, 4, 5,
Big Sable River	38,000			
Muskegon River	18,000			
Grand Haven	59,000	50,000		2, 3, 4, 5
Holland	15,000			
Black River	15,000		33,333	2, 3, 4, 5
Saugatuck	16,000		33,333	2, 3, 4, 5
St. Joseph	48,000	50,000		2, 3, 4, 5
Total	559,000	330,000	330,000	

oped criteria for site selection and numbers of fish per site as shown below:

Criteria for Stocking Site Selection

1. Maintain egg take operations.
2. Not near known natural reproducing river system.
3. Known to contribute to lake-wide fishery based on tagging studies.
4. Potential for a return fall fishery to a popular port, river with good public access or river with good connectivity (no dam or has fish ladders).
5. Important imprinting net pen partnerships.

4. Maximize number of sites while considering the site selection criteria.

The LMBT developed options that ranged from only stocking the Little

option that would ensure a sufficient egg take and provide the greatest opportunity for a lake and fall return fishery to popular ports and rivers. Members were asked



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About Us...

MSSFA was organized in 1971 by a handful of individuals who knew that Michigan's newly formed trout and salmon fishery was something worth working to protect. They were a small group who wanted to not only protect their fishery, but learn how to catch their elusive prey and tell fishing stories.

MSSFA chapters have membership meetings with guest speakers to learn about all the aspects of sport fishing. MSSFA chapters also sponsor fishing clinics, seminars, sport-fishing shows, derbies and tournaments. And are active sponsors for fishing outings for kids, seniors, veterans and our handicapped.

For those who love to fish but have no means, MSSFA chapters sponsor a "Crews" program that allows a sign up as a crewmember for a day of fishing.

With a common goal, and a close working partner with the Michigan Department of Natural Resources, MSSFA helps to enhance the resource and sport fishing in our rivers, streams, inland lakes, and of course the mighty Great Lakes. MSSFA is a front-runner at all levels of the legislature and in courtrooms and has spent countless hours working behind the scenes and attending hearings.

So why join the *Steelheaders*....Got kids, love fishing. **JOIN NOW!** And become a member of the largest organized group of fishermen in the Midwest. There are chapters throughout the entire state. You too can help protect and preserve this world-class sport fishery for you, your children, and generations to come.

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This paper has no paid writers and has a grass roots style. Its writers are the every day fishermen who share their techniques and fishing adventures. And has become well renown for it's *January Special Edition* or "*Show Edition*" that is seen at all the spring expos and sport, boat and fishing shows throughout the Great Lakes.

Information in the paper covers the entire Great Lakes Basin region from Minnesota to New York including all five of the Great Lakes and their tributary streams.

Chapter members receive the paper as part of their membership. And because of the diversity of fishing in the Great Lakes, the information covers everything from river fishing, big lake fishing to inland lake fishing. The paper also offers a direct route to all the new products and techniques on the market through our advertisers.

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August 22, 2017	7:00 PM Tuesday	MUCC	(4th Tues)
September 27, 2017	7:00 PM Wednesday	MUCC	(4th Wed)
November 08, 2017	7:00 PM Wednesday	MUCC	(2nd Wed)

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Revised: 3-4-17 djs

The Michigan Steelhead and Salmon Fishermen's Association

Provide leadership and input into the following DNR committees:

- Lake Erie/Lake St. Claire Citizens Fishery Advisory Committee
- Lake Huron Citizens Fishery Advisory Committee
- Lake Michigan Citizens Fishery Advisory Committee
- Cold Water Resources Advisory Committee
- Warm Water Resources Advisory Committee

"Right Propeller" Cont'd from page 8

been pre-determined for the consumer by the propeller manufacturer. In most non-high performance applications, this works quite fine. However, fine tuning diameter can greatly improve overall performance. Adding diameter will typically decrease rpm while reducing diameter will raise the rpm. Diameter adjustments will also change the hulls running attitude. Changing the diameter is not always necessary since the stock diameters can be matched to the type of propeller a person is buying. To be more specific, we can look at the basic Bass boat propeller Picking the Right Propeller being made available to the general public in 13 1/2 inches to 14 3/4 inches. While standard stern drive boats have diameters starting in the 14 inch realm and extending to the 15 1/2 inch diameter. Large "go fast" boats with special stern drives can use propeller diameters ranging from 15 inches to 18+ inches. House boats and slow moving non-planning hulls may use diameters well into the 20 and 30 inch areas.

Number Of Blades

The number of blades on a propeller also affects the consumer's decision when shopping for a new propeller. In theory, the least amount of blades will offer the best top speeds. The reasoning behind this derives from the fact that more blades create more

metal in the water therefore more drag. However, if a boat is running inefficiently, more blades could become a positive since the additional blade area may give the boat better ability to "hook up" and perform better though out the torque band. The particular application the boat is being used in will help the operator to determine the number of blades needed to gain the best results.

Picking the right propeller can be confusing. There are many other considerations besides those which we've discussed here that can come into play. Speaking to a trained professional is the best way to get the most out of your boat, engine, and propeller set up. Most of the time, a boat will come with some type of propeller or propellers that will suffice to get you from point A to point B. True dialing in of your propellers should start with your dealer and can end with a reputable propeller specific shop or business. The most important starting point is to know the engine or engines capabilities. Prop the boat to run some where within the recommended wide open throttle range. Once this is done, the engine package can not be damaged from improper rpm due to propping. From this point the consumer can decide if he or she wants to take it to the next level of performance.

MSSFA Pays to Belong

	Name	Address	City	State	Zip	Discount Type
1	AJ's Automotive	13711 Ironwood NW	Walker	MI	49544	Member Rates
2	AI & Bob's Sports	3100 S. Davison	Wyoming	MI	49548	10% Discount with AI & Bob's Card
3	All Auto Care	1234 Ball Ave. NE	Grand Rapids	MI	49505	Member Rates
4	Alpine Rent-All & Sales	1452 Alpine Ave NW	Grand Rapids	MI	49504	10% on Stihl & Toro Parts. Www.alpinerent-all.com info@alpinerent-all.com
5	Ann's Custom Canvas	4414 Remembrance Rd	Walker	MI	49544	10% Discount, not valid on specials. Mention steelheaders before ordering
6	Art Van Furniture	Statewide				Friends and Family Sales only (need special coupon)
7	Auto Owners Insurance	303 E. Monroe	Durand	MI	48429	Rowe Agent Group #486
8	Batteries Plus	2061 N-139 Suite B	Benton Harbor	MI	49022	10% & Member Discount 269-925-7374 www.batteriesplus.com
9	Batteries Plus	386 Bay Park Dr, Suite B	Holland	MI	49424	10% & Member Discount 616-396-9914 www.batteriesplus.com
10	Batteries Plus	5228 S. Westnedge Ave	Kalamazoo	MI	49002	10% & Member Discount 269-553-2355 www.batteriesplus.com
11	Batteries Plus	3031 28th Street SE	Kentwood	MI	49512	10% & Member Discount 616-575-0500 www.batteriesplus.com
12	Batteries Plus	5839 Hrvey Street, Suite 6	Norton Shores	MI	49444	10% & Member Discount 231-747-9168 www.batteriesplus.com
13	Berkfield & Co LTD	2625 Pontiac Lake Road	Waterford	MI	48328	5% Great Lake Sportsmens Program on personal Insurance, on home/auto.
14	Big Lake Outfitters of Saugatuck	640 Water St	Saugatuck	MI	49453	10% on fishing tackle (retail store) with membership card 269-857-4762
15	Big Papa Sportfishing	50642 Oregon Ave.	Novi	MI	48374	10% except on equipment
16	Black Dog Outfitters	4444 14 Mile Rd	Rockford	MI	49341	10% Discount on fly tying materials, hooks & lines. www.blackdog-outfitters.com
17	BoatU.S.	Statewide				\$15 Annual Membership Dues - Use Membership # GA83723B
18	Bob's Outdoors	Statewide	www.bobsoutdoors.com			10% Discount (www.bobsoutdoors.com)
19	Dayton, Rick R, DDS	169 Louis Campau Promenade Ste 2A	Grand Rapids	MI	49503	20% off all services (616)458-2545
20	Cascade Capital Funding	4251 Cascade Rd. SE	Grand Rapids	MI	49546	Free appraisal up to \$300.00
23	Dockside Marine, Inc	4320 State Rd	Glennie	MI	48737	15% Off Parts & Accessories (Excludes Electronics)
24	Dunham's Sports	Statewide				10% Discount # 50050/3
25	Firestone - Metro 25	19268 Middlebelt	Livonia	MI	48152	\$20 off on \$200 or more on service www.metro25firestone.com
26	Fish with Jim Outfitters	http://www.fishwithjimoutfitters.com/	248-252-1277			Discount \$50.00 off the total trip price.
27	Glacier Corporation	1021 Fuller St.	Santa Ana	CA	92701	Aquarium Chillers for "salmon in classroom" \$625 + 60 (s&h) = \$685
28	Gold Coast Outfitters LLC	6755 Butternut Dr	Port Sheldon	MI	49460	10% Discount www.goldcoastoutfitters.com
29	Great Lakes Angler Magazine		www.glangler.com			Use promo code MCLUB10 1yr/\$13, 2yr/\$25, 3yr/\$36
30	Health First Chiropractic Clinic	2526 Woodmeadow Dr SE	Grand Rapids	MI	49546	First Visit Free
31	Homestead Resort on Betsie River	2399 Dam Rd	Benzonia	MI	49616	10% In Season, 25% Off Season (homestead@crystal-rentals.com)
32	Insta-Launch Campground	20 Park Ave	Manistee	MI	49660	Member Discount
33	Insurance Shop/Fremont Ins.	824 Water St.	East Jordan	MI	49727	10% Discount off insurance for MSSFA Group Members
34	Jim Waldron Pontiac, Buick, GMC	1146 S. State Rd	Davison	MI	48423	Contact Nick Russiol for Sales, 10% off all parts not to exceed \$100.00
35	J Smith Custom Tackle	1136 E Hughes Lake Road	Rose City	MI	48654	15% - 20% off depending on rod. Customrodsbyjsmith.com 989-685-2819
36	K & M Marine	14990 Telegraph Rd	Redford	MI	48239	10% off merchandise except sale items (www.kandmmarine.com)
37	Kamp Oil Inc	6467 Manistee St	Fredric	MI	49733	Citgo Sea & Snow 4-1 gal case 13.50/gal = 54/case, other disc avail.
38	Kamp Oil Inc	3650 Eastern Ave SE	Grand Rapids	MI	49508	Citgo Sea & Snow 4-1 gal case 13.50/gal = 54/case, other disc avail.
39	Beebe Oil Co (aka Kamp Oil)	4999 22 Mile Rd	Utica	MI	48317	Citgo Sea & Snow 4-1 gal case 13.50/gal = 54/case, other disc avail.
40	Lapeer Boat Service	3556 Fort Knox Dr	Lapeer	MI	48446	10% off parts and labor (810-245-6038)
41	Liberty Tax Service	544 E. 8th St.	Holland	MI	49423	\$20.00 Discount on tax service
42	Life Family Chiropractic Centres	5795 Balsam Dr	Hudsonville	MI	49426	Complimentary 1st visit (excludes medicare) 50% off 1st massage
43	Linwood Beach Marina & Campground	135 S. Linwood Beach	Linwood	MI	48634	10% off service work
44	Logan's Run Muskegon River Cottage Rental	1648 Gardner St	Newaygo	MI	49337	10% Discount www.logansrun.us 616-485-4501
45	Mark's Sport Shop	11530 Mason Dr	Grant	MI	49327	Member Discount
46	MC Sports	Major Locations				Member Rates with MC Sports Card
47	MUCC	2101 Wood Street	Lansing	MI	48912	\$18.00 Membership Dues
48	Racks Taxidermy	13662 Cleveland	Nunica	MI	49448	10% Discount 616-844-4495
49	Ramada Lighthouse Inn	1555 Phoenix Rd.	South Haven	MI	49090	20% Discount 269-639-9900
8	Red Sky Outfitters	5234 Plainfield Ave NE	Grand Rapids	MI	49525	10% www.redskyoutfitters.com 616-719-3074
50	Richfield RV	Statewide				10% Discount
51	River Raisin Marina & Campground	2502 E. Elm Avenue	Monroe	MI	48161	Buy 1 get 1 free - call 313-575-4367 (www.riverraisinmarina.com)
52	RX Optical	Statewide				Plan 308
53	Slamco	Internet Sales	www.slammertipup.com			10% Discount
54	Sonus	3535 Parks St, Suite 108	Muskegon Heights	MI	49444	10% Discount. 231-737-4570 laura.szot@americanhearingsonus.com
55	Sun Coast Marine	1172 68th Street	South Haven	MI		Member discount
56	The Angling Outpost	2480 Duck Lane Rd	Whitehall	MI	49461	www.anglingoutpost.com 5% use coupon "steelheader" for online purchases
58	Tuffy Muffler	435 N. Beacon	Grand Rapids	MI	49417	10% off parts and labor
59	Tuffy Muffler	4384 Kalamazoo SE	Grand Rapids	MI	48512	10% off parts and labor
60	Tuffy Muffler	610 28th St SE	Grand Rapids	MI	49507	10% off parts and labor
61	Tuffy Muffler	4315 Clyde Park SW	Wyoming	MI	49509	10% off parts and labor
62	Van's Sport Center	1855 Alpine Ave.	Walker	MI	49544	10% Discount
63	Warrior Lures	5915 Lillian La	Traverse City	MI	49684	10% Discount on all product ordered (www.warriorlures.com)
64	West Michigan Propeller	847 Ionia Ave. NW	Grand Rapids	MI	49503	10% Discount
65	WG Grinders	5769 28th St. SE	Grand Rapids	MI	49512	10% Discount dine in/carry out (catering discounts available)

Revised:12/26/16

michigansteelheaders.org

Contact Renee Davis 616-363-3564

"Microcystis"

Cont'd from page 1

Maumee watershed, the bloom flowed over the water intake for the city of Toledo. Elevated levels of microcystins, liver toxins produced by Microcystis, forced city officials to distribute a "do not drink" advisory for nearly 500,000 resi-

dents. Stores ran out of bottled water, and residents fled Toledo.

Even more widespread and longer-lasting Microcystis blooms occurred in Lake Erie in 2011 and 2015 following intense spring rains that washed phosphorus and nitrogen into the lake, although those blooms

that an excess of another nutrient, nitrogen, shifts the balance in favor of Microcystis rather than other HAB-forming cyanobacteria, diatoms, or green algae.

"Microcystis relies on nitrogen from the watershed," says Hans Paerl, a microbial ecologist at the University of North Carolina

runoff, and atmospheric pollution. Nitrogen is the new part of the story."

Microcystis on Top

Although cyanobacteria are often referred to as "blue-green algae," they are not, in fact, algae. Similarly, although blooms of Microcystis and other cyanobacteria species may be lumped in

Zebra mussels are filter feeders that devour algae, and by 1996 they had drastically reduced most phytoplankton populations to 20% of their pre-invasion biovolume (the abundance of cells in an amount of water). Zebra mussels spit Microcystis cells back into the water undigested, however,

them to wither away and decompose. As algal cells died, they sank to the bottom, where they too decomposed. Decomposition takes up oxygen, and the result of the blooms was a dead zone, a span of water so depleted of oxygen that no fish, and few invertebrates, could survive. This phenomenon,



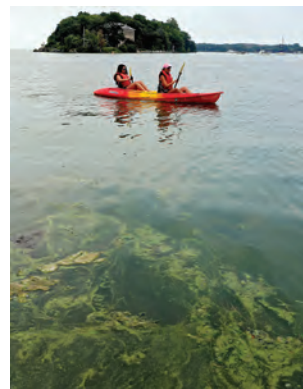
Toxic Microcystis blooms have become a regular summertime event on Lake Erie; this 2011 bloom was particularly bad. Microcystis is well adapted to the high nutrient loads that affect Erie and other lakes and estuaries. Researchers are studying the role of nitrogen in controlling the growth and toxin production of this hardy cyanobacterium. Image courtesy of NASA



In 2013 Hans Paerl and Chinese colleagues conducted bioassays at Lake Taihu to assess the impact of nutrient enrichment on cyanobacterial blooms. The containers were filled with lake water treated with various concentrations of nitrogen and phosphorus to show how the nutrients affected the lake's natural algal community. Hans Paerl/University of North Carolina at Chapel Hill



The researchers lowered the bioassay containers into Lake Taihu in frames and left them to incubate under natural light and temperature conditions for up to 4 days. Each day they measured the algal growth response. © Hans Paerl/University of North Carolina at Chapel Hill



These kayakers paddled on Lake Erie in late July 2015 at the start of what would become the largest Microcystis bloom ever documented there. Exposure to Microcystis toxins through drinking contaminated water, skin contact, and inhalation can be dangerous, potentially resulting in liver or kidney disease. Eric Albrecht/The Columbus Dispatch via AP

did not affect drinking water. Any warming in temperature or increase in heavy spring rains in the Great Lakes region would be a recipe for more frequent and larger algal blooms, but of all HAB-forming species Microcystis would likely benefit the most.

Traditional approaches to managing HABs have focused on controlling phosphorus levels in water. However, new insights into Microcystis ecology challenge long-standing ideas about how best to control these particular blooms. Human-generated phosphorus loads do fuel HABs in Lake Erie and elsewhere, but researchers now understand



This worker tried to clean up Microcystis near a water intake during a major 2007 bloom on Lake Taihu, which shut down the water supply for the city of Wuxi for a week. The lake endures blooms for 9 months out of the year, although not every bloom produces the same amount of toxin. © AFP Photo/Liu Jin



Buffers of undisturbed vegetation along streams and canals are one way to absorb excess pollutants from runoff before they reach larger water bodies, where they contribute to blooms. © Carlos Castilla/Shutterstock

at Chapel Hill. "Many lakes that have Microcystis blooms are receiving increasing loads of nitrogen from synthetic fertilizers, urban

with other HABs, they are more properly known as cyanobacterial HABs, or cyanoHABs.

Cyanobacteria are actually far more ancient than algae, having appeared more than 2.5-3 billion years ago. They were the first organisms to evolve photosynthesis, and their proliferation and release of great volumes of oxygen are believed to have profoundly changed the chemical makeup of Earth's atmosphere. "Cyanobacteria have been through extreme geochemical and climate changes," notes Paerl. "Their playbook is very deep. They've adapted to many of the extremes we're seeing in the Anthropocene—excessive nutrient loads, global warming, record droughts, and extremely heavy rainfall events."

Microcystis has the ability to outcompete other kinds of phytoplankton. It appears immune to predation by the planktonic crustaceans, such as Daphnia, that usually control populations of green algae and diatoms. These "grazers" avoid Microcystis cells, perhaps because they are less able to devour the clumps of cells. In experiments, daphnids seem unaffected by microcystins, which are deadly to vertebrates, but grazers may be put off by other chemicals produced by Microcystis, including protease inhibitors that can halt digestion.

Microcystis is also rejected by zebra mussels, which rapidly spread throughout Lake Erie after they were inadvertently introduced in the 1980s via ballast water.

thereby conferring a survival advantage to the hardy cyanobacterium.

Other factors that favor dominance by Microcystis include the cells' ability to inflate their gas vesicles to rise to the surface of turbid water, where there is plenty of light for photosynthesis. If a cell is running low on phosphorus, its gas vesicles collapse, and it sinks to the bottom where it scavenges this nutrient from the sediments. Other kinds of phytoplankton lack this ability.

Microcystin toxins act by bonding with protein phosphatase enzymes, especially in liver cells, causing cell damage. The toxins can cause liver and kidney disease in humans who have been exposed through drinking or swimming in contaminated water. In some cases people have been poisoned via inhalation of microcystins near a major bloom. In 1996, when a bloom of Microcystis poisoned the water supply of a dialysis clinic in Brazil, 56 people died of liver failure. Blooms producing microcystins have also caused severe and often fatal poisonings of livestock, pets, and wildlife.

An Initial Focus on Phosphorus

In the 1960s, Lake Erie was choking on excess phosphorus and nitrogen released in poorly treated sewage, industrial waste, and runoff from farm fields and city streets. Diatoms and multiple species of cyanobacteria absorbed the nutrients and flourished; they formed floating mats that shaded underwater plants, inhibiting photosynthesis and causing

called eutrophication, occurs on every continent except Antarctica. Lake ecologists searched for the key nutrient controlling the growth of HAB-forming species. "Building any living organism is like building a house," explains Steven Wilhelm, a professor of microbial ecology at the University of Tennessee. "A house needs support beams, doors, and windows. Algae need carbon, nitrogen, and phosphorus. If you don't have enough of one nutrient, the growth of the algal community is constrained."

By the late 1960s, researchers suspected that phosphorus was the key nutrient in freshwater blooms. Later, pioneering experiments led by David Schindler at the Experimental Lakes Area in Canada showed that adding a combination of phosphorus and nitrogen could quickly turn a pristine lake into a green soup, while the addition of carbon showed no effect. The blooms in the fertilized lakes Schindler studied were dominated by the cyanobacteria Anabaena and Aphanizomenon. These organisms are capable of converting nitrogen gas to bioavailable ammonia, a process called fixation. Schindler concluded that controlling nitrogen levels in water would not affect the growth of the blooms, since the species involved could take as much nitrogen as they needed out of the air. His work seemed to prove that phosphorus alone was the nutrient of concern.

"Microcystis" Cont'd on page 13

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"Microcystis"

Cont'd from page 12

A ban on phosphate detergents, combined with phosphorus removal programs at wastewater treatment plants, brought a dramatic improvement in Lake Erie's water quality. In the late 1980s and early 1990s, HABs faded and populations of walleye and other game fish rebounded. But the lake has since slid backward, once again showing signs of chronic nutrient pollution.

An emerging body of research suggests that a failure to control growing loads of both dissolved reactive phosphorus and reactive nitrogen in agricultural and urban runoff has changed the makeup of the HABs that occur there. Microcystis—which lacks the ability to fix nitrogen—was present in the twentieth-century lake but was relatively scarce. Today, however, it dominates HABs not only in Lake Erie but in polluted waters around the world, including Florida's Lake Okeechobee, the Baltic Sea, Lake Taihu in China, and Lake Ohnuma in Japan.

The first extensive bloom of Microcystis in western Lake Erie occurred in 1995, and major blooms have since become a predictable summertime event. Today the nutrient overload primarily comes from agricultural runoff, but urban runoff can also play a role. Both are hard-to-control "non-point" sources of pollution, meaning their release does not come from a specific source, such as a factory. In 2016 the United States and Canada agreed to a new target of a 40% reduction in Lake Erie's phosphorus loads compared with 2008 levels, aimed at controlling the annual blooms. But researchers delving into the ecology of Microcystis now argue that the traditional approach of focusing on managing loads of total phosphorus ignores the shifting ecology of modern lakes and estuaries.

Nitrogen: The New Part of the Story

In the 1970s, water quality managers believed that phosphorus ran off agricultural land only in particulate form, attached to bits of sediment. A shift toward no-till farming has succeeded in reducing soil erosion and the release of particulate phosphorus, but has been accompanied by a dramatic rise in dissolved reactive phosphorus, because fertilizer is spread on the surface of the soil without being tilled under.

Nitrogen also plays a critical role, allowing Microcystis to dominate a community of phytoplankton and fueling its production of toxins. The Haber-Bosch process, which uses a catalyst to transform atmospheric nitrogen into bioavailable ammonia, was developed early in the twentieth century. This process enabled mass production of synthetic fertilizers and transformed the global nitrogen cycle. Large regions of the world now receive nitrogen loads more than an order of magnitude

higher than natural rates. Combustion of fossil fuels also creates significant amounts of bioavailable nitrogen, which settles out of the air into watersheds.

The amount of nitrogen now flowing into many lakes is much greater than it was in the 1970s, when the phosphorus-only paradigm of eutrophication control emerged. In many watersheds, the focus on phosphorus control means that phosphorus levels have stabilized while nitrogen loading continues. The end result is that the balance of nutrients has shifted in many aquatic ecosystems. In addition, since the 1960s synthetic nitrogen fertilizers in the United States have been based less on ammonium nitrate and more on urea, an organic nitrogen compound that can upregulate microcystin production.

Experiments conducted by Justin Chaffin, Stone Laboratory's research coordinator, have shown that Microcystis blooms begin when the waters are high in nitrogen. Toxin production occurs early in a bloom; later on, the massive population of cyanobacteria has taken up all the available nitrogen—there's not enough left to use in producing microcystins, which are nitrogen-rich peptides. But Microcystis is able to maintain high biomass after water levels of nitrogen have been depleted, Chaffin adds, because it is highly competitive for low levels of bioavailable ammonia.

In Lake Erie, the size of each summer's HAB reflects phosphorus concentrations at the time. But high levels of nitrogen favor dominance of those blooms by Microcystis, and the more nitrogen, the more toxin the bloom will produce. In other words, reducing phosphorus levels in Lake Erie will reduce the size of any HAB but not necessarily the amount of toxin produced by Microcystis cyanobacteria.

Lake Taihu, in China's rapidly developing Yangtze River Delta, suffers thick blooms of Microcystis from March through November. More than 40 million people live in Taihu's watershed, and 10 million rely on the lake for their drinking water.

Thirty years ago the lake was relatively clean, its phytoplankton community dominated by benign diatoms. Today Taihu is highly eutrophic. In 2007 the water supply for the lakeside city of Wuxi, then home to more than 2 million people, was disrupted for a full week because of microcystin contamination.

In Taihu, the same problems that affect Lake Erie are magnified because a much larger human population is polluting a shallower, warmer body of water. Microcystis thrives in these conditions. Lake Taihu's blooms of Microcystis can be intense and at times can cover the entire lake. "It forms a paint-like, iridescent green scum covering the surface," says Paerl. "It looks like guacamole with a crust."

That same description has been used in press reports of recent intense Microcystis blooms on Lake Okeechobee in Florida, which receives polluted farm and urban runoff, and on the St. Lucie Estuary, where Okeechobee's waters were diverted after unusually heavy rains beginning in the winter of 2015–2016. In Okeechobee, as well as Lake Erie, the interaction between nutrient pollution, increased precipitation, and warmer temperature seems to favor the proliferation of Microcystis.

Shifts in Strategy

In China, as in the United States and other nations, runoff from farm fields is a major driver of eutrophication. "In the watersheds of both Lake Erie and Taihu, steps are being taken to retain fertilizer on the land," says Paerl. Strategies include the creation of vegetated buffers at the edge of farm ditches and constructed wetlands that filter nutrients from runoff.

These techniques can capture both nitrogen and phosphorus, but to solve the problem of non-point nutrient pollution, they may have to be deployed on a large scale that would cover a significant fraction of the landscape. In 2005 William Mitsch, who is eminent scholar and director of the Everglades Wetland Research Park, estimated that 22,000 square kilometers of land would need to be restored to wetland in the Mississippi River Basin to remove 40% of the nitrogen flowing to the Gulf of Mexico. In Midwest farmlands, he says today, 7–10% of the landscape would need to be restored to wetlands to capture nutrients flowing off the remaining 90–93%.

Davis notes that regulators are beginning to come to grips with the role of nitrogen in eutrophic lakes. Researchers who guide updates to the Great Lakes Water Quality Agreement, a pact between the United States and Canada, are preparing a report on the need to increase the understanding of nitrogen pollution and cycling in Erie and the other Great Lakes.

In 2015 the U.S. Environmental Protection Agency published a report on the need to consider both nitrogen and phosphorus in water

quality regulations. That report noted that a focus on phosphorus control has not resolved problems in many freshwater bodies, that marine habitats are impacted by heavy loads of nitrogen flowing downstream, and that the relationship between bioavailable nitrogen and cyanobacteria is far more complex than was recognized in the 1970s. "The weight of scientific evidence," the authors concluded, "supports the development of nutrient criteria for both [nitrogen and phosphorus]."

If the rise of Microcystis highlights the long-ignored role of nitrogen in eutrophication of fresh waters, it also underscores the difficulty of controlling non-point source water pollution, a task cur-

rently managed by each state. Multiple scientists and farmers interviewed for this story indicate that the task of managing non-point source pollution is complicated, because many landowners resent government prescriptions as to how they manage their farms—particularly if they are required to take cropland out of production to create vegetated buffer zones or restore wetlands.

Federal programs offer subsidies to farmers who voluntarily create buffer strips or constructed wetlands on their property. A recent modeling study by University of Michigan researchers suggests, however, that reaching the goal of a 40% reduction in Lake Erie's phosphorus load will take more widespread use

and strategic placement of nutrient capture strategies. At this point, little is known about the patterns of nitrogen cycling in the Lake Erie watershed.

Major cleanup efforts of point sources of pollution have, in many cases, achieved only a short intermission in the ongoing process of eutrophication. Humanity continues to alter nutrient cycles in ways that affect aquatic habitats worldwide. Rescuing lakes and estuaries from non-point source nutrient pollution will be a long, complex struggle—and success will depend on our awareness of such mundane acts as dropping fertilizer onto soil, as well as our understanding of tiny but powerful organisms like Microcystis.

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"spawning reefs"
Cont'd from page 1

sity of Michigan scientists suggests the experts may have been looking in the wrong place all along. The U-M researchers show that despite river-current speeds of more than 3 feet per second, some recently hatched lake sturgeon manage to remain in the St. Clair's North Channel, a surprising finding with implications for the siting of future spawning reefs.

"Our work showed that

these very young sturgeon stay in the channel instead of going downstream into the river delta or to Lake St. Clair, as people had assumed," said U-M doctoral candidate Joseph Krieger, first author of a paper published online Dec. 1 in the Canadian Journal of Fisheries and Aquatic Sciences.

The St. Clair River is about 40 miles long and drains waters from Lake Huron into Lake St. Clair. The Detroit River drains Lake St. Clair into Lake

Erie. Beginning in the early 1900s, both rivers were straightened, widened and deepened to create shipping canals for large freighters. The construction stripped away much of the rocky habitat that sturgeon and other native fish used for spawning.

Today, the St. Clair River averages 43 to 49 feet in depth and moves more than 175,000 cubic feet of water per second—more than the Missouri, Arkansas and Illinois rivers com-

bined.

"There's no way these tiny sturgeon larvae have the strength to swim against that current," Krieger said. "The only way for them to stay in the river channel is to burrow into the sediment

ment. He is expected to graduate in April.

The Canadian Journal article is based on his dissertation work on the St. Clair River and is co-authored by his doctoral adviser, U-M fishery biolo-

gists Jim Diana. A paper summarizing his findings from the Detroit River will be submitted for publication in a peer-reviewed journal later this year.

gists Jim Diana. A paper summarizing his findings from the Detroit River will be submitted for publication in a peer-reviewed journal later this year. vice and the Michigan Department of Natural Resources. A big part of the project by Krieger and Diana involved creating computer

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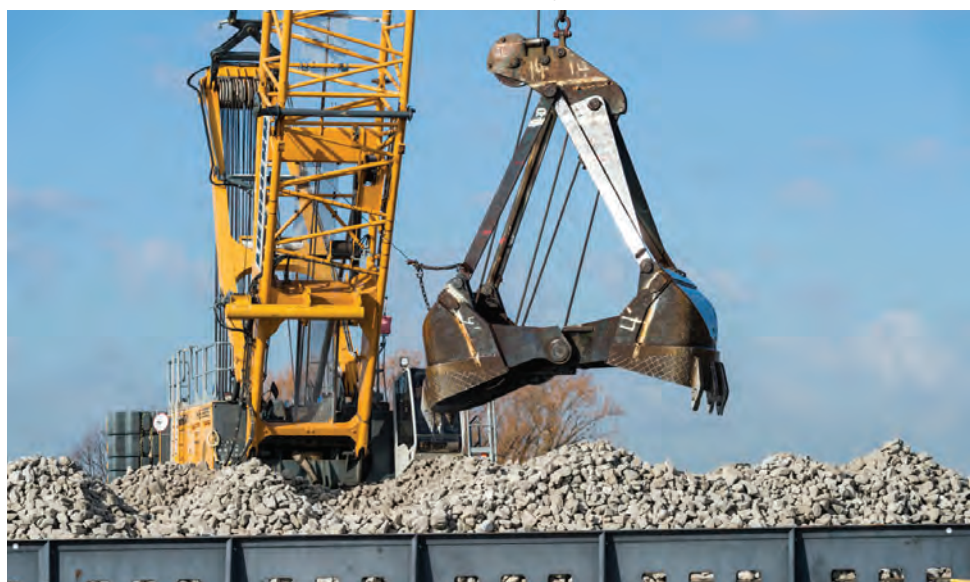
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The latest spawning reefs in the Detroit River, near Belle Isle, were built from blocks of broken limestone 4 to 8 inches in diameter. Loads of rock were placed directly on the river bottom using a crane with a clamshell bucket mounted on a barge in the river. Image credit: Austin Thomason, Michigan Photography

on the bottom or to hide behind small rocks. And that's exactly what we think they are doing."

Krieger spent three summers doing fieldwork

on the St. Clair and Detroit rivers to collect data for his doctoral dissertation at the U-M School of Natural Resources and Environ-

ment. He is expected to graduate in April.

gists Jim Diana. A paper summarizing his findings from the Detroit River will be submitted for publication in a peer-reviewed journal later this year.



Loaded buckets were lowered to the river bottom before the rock was released. The latest Belle Isle reefs are located in water that is 18 to 22 feet deep, and they rise about 2 feet above the river bottom. About 4 acres of new rock reefs were created and are located outside commercial shipping channels. Image credit: Austin Thomason, Michigan Photography

ment. He is expected to graduate in April.

The fieldwork involved placing drift nets on the bottom of the river channels, at various distances downstream from artificial

models to evaluate the amount, quality and spatial distribution of different habitat types used by young lake sturgeon in the St. Clair and Detroit rivers. The researchers then tested their habitat suitability model by comparing its predictions to field observations.

In the St. Clair River, 91 percent of the 283 larval sturgeon netted by Krieger were clustered at three North Channel locations no more than 1.2 miles downstream from Maslinka Reef, a known sturgeon-spawning site formed in the early 1900s when steamships dumped coal cinders into the river.

Most of the larvae were taken in areas designated as high-quality habitat by the computer model. No larvae were found exiting the North Channel into Lake St. Clair.

The three North Channel clusters were at river bends where the bottom is a mix of sand and silt and contains moderate densities of the larval insects that baby sturgeon eat. The current speeds in these sections

"spawning reefs"
Cont'd on page 15

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“spawning reefs”
 Cont'd from page 14
 of the river are highly variable, and water depths typically exceed 30 feet.

Larval sturgeon were collected at these locations up to four weeks after the eggs hatched on Maslinka Reef, meaning the baby fish were not swept downstream into Lake St. Clair as soon as they hatched—as the experts had long believed. Instead, they remained in the swiftly moving channel.

“We had thought that these little fish couldn't fight the current and within a day they'd be out in Lake St. Clair,” said Diana, who is a professor at U-M's School of Natural Resources and Environment and director of Michigan Sea Grant, a federally funded collaboration between U-M and Michigan State University.

“But it looks like they can manage to stay in place against the current by burrowing into the bottom, and that was a surprise. For a little fish that's an inch long at most, in a current that's a meter per second, that was unexpected.”

Diana has been involved in sturgeon research on the St. Clair River system since the early 1990s and has had five other U-M graduate students who worked on some aspect of the spawning reefs and sturgeon populations.

The population of adult lake sturgeon in Lake St. Clair and the St. Clair River is estimated at around 10,000, according to Diana. The estimates are based on sturgeon tagged by the Michigan Department of Natural Resources.

Roughly 90 percent of those adult sturgeon are believed to be in Lake St. Clair, rather than the river,



Diana said. They move into the lake when they are 5 to 10 years old after spending their first years in “nursery habitat.”

Researchers had assumed the nursery for St. Clair sturgeon was the shallow delta wetlands, filled with cattails

and phragmites reeds, where the river empties into the lake. But the new study shows that there is “an abundance of suitable nursery habitat” further upstream, within the North Channel.

When considering possible spawning reef sites in

the future, the habitat suitability model could help identify high-quality nursery habitat, then reef sites could be selected a short distance upstream from those locations, Krieger and Diana wrote.

“Linking future reef

placement in proximity to high-quality habitat for young fish should improve success and aid in future habitat restoration efforts,” they wrote.

Jennifer Read, director of the U-M Water Center and lead investigator for the reef project, said the new research helps address “a big gap in our knowledge.”

“Once the larvae leave the reef, where do they go?” Read said. “This study's results will help inform our siting decisions so that we spend management dollars in the most effective way possible.”

The U.S. government has provided about \$10 million for a series of reef projects in the St. Clair and Detroit rivers, much of it through the Great Lakes Restoration Initiative, with additional support from cooperating agencies and private sector partners.

The Detroit-area restoration effort began in 2004 with completion of 0.28 acres of reefs in the Detroit River near Belle Isle. The approaches and techniques for siting and reef construction are updated as new information comes in, Read said.

For example, a recent U-M hydrodynamics study helped the restoration team identify locations and reef shapes that would minimize silting on the new Belle Isle rock structures.

“We learn as we go, and we make changes,” Read said.

Lake sturgeon are considered threatened or endangered in seven of the eight Great Lakes states. Their current population is estimated to be about 1 percent of what it once was.

They are the largest fish in the Great Lakes can grow

to 7 feet in length, weighing up to 300 pounds. Female sturgeon live 80 to 150 years, while males live an average of 55 years, according to Michigan Sea Grant.

Females take 20 to 25 years to reach reproductive age, while males take 15 years. Because it takes so long for lake sturgeon to reach sexual maturity, it will also take years to know whether the reef-building project is significantly boosting the sturgeon population, said Gregory Kennedy, a fishery biologist with the U.S. Geological Survey.

If success means bringing egg deposition to the reefs, then most of these reefs are pretty successful,” Kennedy said last month during a tour of the Belle Isle reef-construction site. He began studying Detroit-area sturgeon in the late 1990s.

“But are we improving recruitment? Are we adding new young to the population?” he said. “It could be 20 or 30 years before we get any real feel for that.”

The restoration team includes scientists from the U-M Water Center, Michigan Sea Grant, U-M School of Natural Resources and Environment, U.S. Geological Survey, U.S. Fish and Wildlife Service, Michigan Department of Natural Resources, SmithGroup JJR, and DTE Energy. The contractor for the latest Belle Isle reef project was Durocher Marine.

“We're restoring a wild fish population inside the city of Detroit, and it's going to take some time,” U-M's Read said during the Detroit River tour. “The destruction of this habitat took several decades, and so will the restoration.”

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March Madness Starts with Cohos

By Dave Mull

Here are some interesting things I learned recently about coho salmon, those delectable delights that swarm the waters of southern Lake Michigan throughout the winter and offer great targets for early spring trolling.

First, everyone always assumed that the coho came to the southern end of Lake Michigan's warmer waters during the winter and made a gradual migration to the west, from Indiana waters and up through Illinois and then staying for the summer in the cooler waters of Wisconsin. Apparently, that might not be true. They do indeed spend the winter in the southern tip of the lake, but currents move them to the east and up through the Michigan waters outside of New Buffalo, all the way to St. Joseph/Benton Harbor and some years farther north to South Haven and beyond. Then, instead of migrating along the shoreline back south and to the

west, the current actually carries them across the lake into Illinois and Wisconsin water. So that means, when those fish show up in the shallows around St. Joe and the mouth of the St. Joe River, provide great action for several days and disappear, we might be able to keep having great fishing if we follow them out into deeper water.

Here's another bit of information. Anglers heading into the offshore waters out of New Buffalo last fall were getting quick limits of fat cohos. That good portend of a productive spring has panned out as anglers in Indiana waters have been getting good catches of cohos since late February.

I love catching cohos because it's a great way to "blow off the stink" of winter and a terrific reason to get out into the frosty lake and do some real fishing—no more staring at a hole in the ice. Over the years, coho fishing on the second day of March Madness, the NCAA



Shannon and MacKenzie Smith pose with a double of cohos that hit a Rattling ThinFin and a Fuzzy Bear Magnum Hot Pants spoon. Young MacKenzie is doing her best to smile despite being quite chilled by the early spring weather.

Tournament, became a tradition. I can remember several years when we headed out of Portage Indiana (which has a very nice municipal launching facility) and had to keep a wary eye on ice flows, making sure that if the wind shifted to the north, we could get back up the lovely waterway (being sarcastic here) known as Burns Ditch before the wind formed a solid ice field at the mouth.

My favorite coho port is New Buffalo, though. Not only is it Michigan water, but the ramp is nice and close to the lake—there isn't a long idle down the Galien River before you can start fishing.

Cohos have the reputation of being crazed aggressors or anything that moves, and sometimes they are. Lots of times, though, they can be real finicky about what they'll hit. While old standbys such as Storm Rattling ThinFins in orange and gold patterns still catch fish, sometimes they much

prefer something different. One year, water was cloudy and stained but full of fish, and they showed a marked preference for Rapala Tail-dancers, a balsa lure in a sort of pearl color. I bought five of them, and caught plenty of fish on them that spring, and they still have their days.

Cohos provide great sport for the small boaters who might not fish Lake Michigan much. Of course you must watch the weather and make sure your boat is in perfect shape—bilge and motor both in superb operating condition. But since cohos are often aggressive, you can probably catch them on lures you already have in your tacklebox for bass and other species. Any small hardbody crankbait that looks like a smelt or alewife works. Often, so does any lure that's orange. We've scored a lot of these silver salmon on lipless rattle baits such as Bill Lewis Rat-L-Traps. Spinners, such as the inline Mepps, are another good option for slow trolling.

One of my best, go-to, almost-never-fail coho lures season after season has been a Reef Runner Little Ripper, especially one in the Copperhead color pattern. For some reason it occurred to me to remove both stock hooks, which are smallish No. 4s and put one No. 2 Gamakatsu Extra Wide Gap Treble on the tail split ring. This changes the action a bit, but boy does it catch fish. I like fishing it behind a Dipsy Diver or a Lurk Disco Diver disk just 25 feet or so from the boat.

That might seem awfully close to a running outboard, but the boat and turbulence often seems to attract cohos. Not only do we often run our divers close to the side of the boat, but we also put lines out on online planer boards just outside of the divers. I believe packs of coho come in and swirl around in the disturbance the boat causes, and the more lures you have in the vicinity, the more likely you are to contact fish.

Another setup well worth running for cohos is "the propwash rod." This is a lure let back to where the prop of your motor is causing bubbles—crankbaits such as Rat-L-Traps and Lindy River Rockers are especially good back here. One year a lad accompanying us asked if he could use his push-button spincast rod from our 30-footer geared to the nines with all sorts of fancy combos. Of course it would be fine with me so I clipped on a chrome and blue Rat-L-Trap and instructed him to hold the rod and let the lure swim just at the end of the bubbles from the big Evinrude outboard. He did as instructed—and caught the first three cohos of the day.

This year for early action, it might be tough to beat trolling for coho at the southern end of Lake Michigan.

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Michigan Department of Natural Resources Consumers Energy Foundation awards grant to support Michigan Arctic Grayling Initiative



The Michigan Department of Natural Resources, the Little River Band of

Resources Department, Frank Beaver. "It's so exciting to see so many partners working in

knowledge gaps and to discuss management and stocking strategies and public outreach.

selecting appropriate reintroduction sites. Consumers Energy has supported this initiative through funding and as a participant during two partners meetings.

a public-private partnership to help bring native Arctic grayling back to our home waters," said David Mengel, president of the Consumers Energy Foundation. "We are confident by combining forces with the other stewards of our land, air, water and wildlife involved

in the Michigan Arctic Grayling Initiative that this swimming icon of clean waterways will again flourish in Michigan rivers.



Ottawa Indians and Michigan Technological University have received a Consumers Energy Foundation grant of \$117,175 to support efforts to bring back the extirpated Arctic grayling to Michigan waters.

parallel with our goals to try and bring back this significant species."

Members of Michigan's Arctic Grayling Initiative have met twice to identify

Michigan's Arctic Grayling Initiative was announced in June 2016 and consists of 32 organizations that are partnering together to reintroduce this culturally significant species.

The Consumers Energy Foundation grant will fund work during 2017 to address two immediate needs for a



successful reintroduction. The first is the collection of habitat and fish community data in the upper Big Manistee River. This waterbody historically was a premier Arctic grayling river and is believed to hold high-quality habitats for this species. The second is to create an outreach plan to engage Michigan citizens in the reintroduction efforts and to once again make Arctic grayling an important part of Michigan's heritage.

"The contributions from Consumers Energy Foundation will be extremely helpful as we move forward with this unique initiative," said DNR Fisheries Division Chief Jim Dexter. "The partnerships cultivated throughout the course of the Michigan Arctic Grayling Initiative are critical to meeting our goals and seeing success."

The Arctic grayling is an iconic and treasured part of Michigan's history, and was the only abundant stream salmonid in the Lower Peninsula. It has not been present in Michigan since the 1930s.

"The Little River Band of Ottawa Indians is thrilled by the support to continue this historical initiative we launched in 2010," said the director of the band's Natural

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Fishing for Answers: How you can Help Great Lakes Fisheries

Michigan Sea Grant is offering anglers a variety of ways to contribute information to scientists in 2017.

By Dan O'Keefe

Michigan State University Extension, Michigan Sea Grant, okeefed@msu.edu

Anyone who fishes the Great Lakes regularly can tell you that the only constant is change. Fish are here today and gone tomorrow. Being successful requires adaptability, patience, and the ability to anticipate how fish will react to changes in their environment.

To make things even more complicated, a long list of non-native species has invaded the lakes. Quagga mussels filter the water, leaving open water clear and sterile while fouling the bottom of the lakes with their waste. Round gobies eat the quagga mussels and are, in turn, eaten by predatory fish. Spiny water fleas kill and consume native plankton, but are also eaten by some plankton-eating fish.

Scientists are working hard to understand how economically valuable salmon, trout, walleye, and other species are adapting to these conditions and anglers can also pitch in to do their part. Michigan Sea Grant and partner groups including Wisconsin Sea Grant and Michigan State University Extension are offering a variety of citizen science programs that anglers can contribute to during the 2017 fishing season.

The Great Lakes Angler Diary App

The Great Lakes Angler Diary is a web-based app that can be accessed from any computer or mobile device at www.GLanglerdiary.org. The app can be used to record information from fishing trips and share that information with Michigan Sea Grant. You can participate by taking the following steps.

*Sign-up for the program by e-mailing GLanglerdiary@gmail.com.

*Receive a unique Volunteer Number via e-mail.

*Register online at www.GLanglerdiary.org using your Volunteer Number.

*Record as much, or as little, information as you would like during the fishing season.

*Answer a short survey at the end of the year.

The survey will be used to help scientists determine how your information will be used. The more information you record, the more useful your data set will be. The app allows you to record data on all salmon and trout species, cisco, walleye, musky, and lake sturgeon.

Salmon Ambassadors: Where are the wild salmon?

Since 2013, volunteers have been measuring Chinook salmon and checking for adipose fin clips that indicate stocked fish. These Salmon Ambassadors have committed to collecting data on each and every Chinook salmon caught from their boat during the fishing season. Data sheets for pen-and-paper recording, along with full instructions, are available at:

www.misegrant.umich.edu/salmon-ambassadors/.

To date, over 8,000 Chinook salmon have been logged by Salmon Ambassadors around Lake Michigan and in northern Lake Huron. Data on angler satisfaction and the prevalence of wild and stocked salmon are shared with partner groups including U.S. Fish & Wildlife Service and DNRs in Michigan, Wisconsin, Illinois, and Indiana. In 2017, anglers will be able to use the Great Lakes Angler Diary to enter all of the data required on Chinook salmon for the Salmon Ambassadors program.

Huron-Michigan Diet Study: What are fish eating?

With all of the changes due to invasive species, predatory are changing their feeding habits. Following the success of a similar project in Lake Huron in 2009-2011, this project enlists anglers to contribute stomachs from all types of predatory fish in Lake Huron and Lake Michigan.

Many stomachs will be collected by technicians working for the U.S. Fish & Wildlife Service or state agencies, but anglers are also able to collect stomachs on their own. This is particularly important because technicians typically focus on collection of fish at tournaments and peak seasons for each port. If you fish early or late in the year, late at night, or in places that are away from the crowds your contribution may be especially useful.

To avoid bias, it is important to collect stomachs from all fish caught during the trip. Even empty stomachs are very important because a high percentage of empty stomachs means that fish are having trouble finding food. If you decide not to collect

"Answers"

Cont'd on next page

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Tackle Haven.....	741 Riverview Drive.....	Benton Harbor, MI 49022.....	269-925-0341

“Answers”

Cont'd from previous page fish stomachs after a trip that is fine, but if you collect one stomach you should collect all of them by doing the following.

*Cut the esophagus and cut the intestine to remove stomach.

*Place stomach and all contents into plastic freezer bag.

*Write all required data on a data tag.

*Place the tag into the bag with the corresponding stomach.

*Seal the bag carefully to prevent spilling.

Place the bag in one of the freezers located at access sites in Michigan and Wisconsin.

Lists of freezer locations are available from Michigan DNR and Wisconsin DNR, and volunteers from Michigan Steelheaders will be maintaining stomach collection supplies at many Michigan ports. Other partner groups include Michigan State University and U.S. Geological Survey.

Fish Finders: Where's the bait?

Long-term monitoring of baitfish in Lake Michigan has shown dramatic declines in overall availability of baitfish in open water. The decline of alewife has been particularly important to the salmon fishery because Chinook salmon rely almost entirely on alewife for food. Anglers who fish for salmon are very good at finding alewife. Find the alewife and you find the salmon.

Biologists with U.S. Geological Survey and other agencies monitor baitfish using trawls and very sophisticated hydroacoustic “fish finders.” Anglers can now submit bait ball images from their own fish finders by e-mailing them to GLanglerdiary@gmail.com or recording them using the Great Lakes Angler Diary app. Just be sure to include the following on your screen display in each bait ball image.

- *Date
- *Time
- *Depth

*Latitude and longitude

Fish finder sensitivity should be set so that you are certain marks do not represent clouds of plankton or suspended debris. Images should clearly depict large schools of bait fish, as opposed to images of scattered bait or individual large fish. These images may be useful in helping biologists determine where and when alewife and other baitfish are most abundant.

Support for citizen science on the Great Lakes

In addition to all of the agency and fishing organizations mentioned above, two additional groups have been tremendously supportive of citizen science. Programming for the Great Lakes Angler Diary app was funded exclusively by Detroit Area Steelheaders donations and in-kind support from Brenton Consulting, LLC. Citizen science would not be possible without the contributions of anglers at every step of the way.

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LURING SPRING STEELHEAD

By *Jim Bedford*

There was still ice in my guides but the rising late February sun was already making the morning feel warmer. My silver spinner swept across the current and just as it arrived in front of the submerged boulder something tried to wrench the rod from my hand. The

hefty fish surged downstream and I followed as best I could. Several times the red-sided fish rolled on the surface but it never did leap clear of the river.

Gradually, the steelhead's runs shortened and I was able to get below the fish. I lifted the fish with my rod and allowed the cur-

rent to carry the 11 pounder into my net. Now it was excitement and adrenaline, rather than the rising sun, which warmed my bones.

This was the first of several dark steelhead that attacked my spinner as I waded about a mile of Michigan's Grand River. Steelhead rarely feed



Author with a spring steelhead on a plug.

actively during their river migration and seem especially uninterested in eating in late winter and spring. I

plugs and other lures. Not only are plugs, spinners, and bright streamers effective, their use eliminates the

course, these offerings can also be presented in more than one way.

TOSSING METAL

Casting weighted spinners is my favorite steelhead technique. They are a very versatile lure and can be presented at all angles with the current. While they cannot be retrieved directly against the current as they will rise to the surface, you can still back them down by giving line at a rate slower than the current to keep them deep and spinning. Spinners attract steelies both visibly and sonically from a considerable distance so they allow you to cover water fairly quickly. This is especially helpful in late winter when the fish are likely to be quite scattered. Take advantage and cover lots of water until you find fish.

While spinners work especially well in moving water, spoons are also good cast and retrieve lures. Both of these offerings are easy to get down to the correct depth and their flash really turns on the migratory rainbows. Silver is my first choice of finishes when the steelhead are holding deep because it reflects light best. Brass and copper are also effective and I frequently switch to them when the water is low and clear and the day is bright. Adding fluorescent orange, red, or chartreuse tape to the back of the spinner blade or spoon will make your lure even more irritating and thus irresistible to migrating steelhead.

These lures should be retrieved as slowly as possible, just fast enough to keep them spinning or wobbling. If you are casting upstream, you'll have to crank a little faster to keep the lures working properly. Conversely, if you are sweeping spinners or spoons across the current you might not have to turn the reel handle at all. Spinners with broad, flat French type blades are best because they spin well on slow retrieves. Likewise, highly curved spoons like the Little Cleo and BC Steel will wobble at fairly slow retrieve speeds.

Spinners and, to a somewhat lesser extent, spoons have a resistance that you feel when they are retrieved. That means the lure is working properly. A sensitive rod and smooth running reel enhance your ability to feel the lure working. If you don't sense resistance, the lure could be fouled or working improperly. Or, more often than you might think, the reason could also be that a steelhead has softly inhaled the lure. When in doubt, set the hook.

PLUGGING AWAY

High action, compact plugs or crankbaits are traditionally backed downstream at a rate slower than the current speed. This can be accomplished from an anchored boat or a drift boat



Close-up of a bright spring steelhead on a minnow plug

believe spawn bags, single eggs, and insect larva continue to catch steelies because they strike them out of irritation and then hang on to the naturally feeling and tasting offering long enough for anglers to set the hook. It is this same invading their space irritation factor that causes spring steelhead to grab flashy spinners, minnow

hassle of preparing the bait or keeping it fresh and alive.

Artificial lures for steelhead can be grouped into three categories based on the way they are usually presented. High action plugs or crankbaits are usually held against the current; spinners and spoons are cast and retrieved; and relatively weightless lures or flies are drifted with the current. Of

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“Luring”
Cont’d from page 20

that is rowed to keep the craft moving slower than the current. Wading anglers can also drop back plugs when they can wade in

been hot in recent years and rattling plugs help the steelhead zero in when the water is stained or turbid.

You can also cast and retrieve these plugs for steelhead. Upstream casts

I am guessing the rainbows don’t like other fish, even small ones in their space. These plugs seem to become especially effective as spawning time approaches, perhaps because steelhead don’t like other fish to be around when they start laying eggs.

DRIFTING ALONG

Drifted lures such as flies, jigs, beads and light, often buoyant drift “lures” also work well for spring steelhead. With this group we are using the river’s current to deliver our offering. While some anglers still stick with traditional bottom bouncing techniques, the vast majority of Great Lakes anglers are now using floats.

Except for jigs, most drift lures are either buoyant or have little weight of their own. Therefore some weight must be added. Bottom bouncing anglers usually employ a two way swivel and attach their mainline to one loop and a leader of two to four pound lighter material in test to the other loop. Leaving a long tag end to the leader enables you to attach split shot or hollow pencil lead to it. The weight needs to be heavy enough to keep your offering near the bottom but not so heavy as to drag and snag frequently. You are much better off to be a little high in the water column than to be snagging up all the time.

Float anglers also need to add weight unless using a jig. Small split shot spread out in a pattern on the leader are usually employed. Keeping your offering suspended a foot or two above the bottom will be most effective as steelhead look

forward and up. If the surface current is not riffled or choppy you can enhance the effectiveness of your offering, especially marabou dressed jigs by jiggling your bobber with your rod.

There are large numbers of commercial drift lures

available. You can also tie your own flies, jigs, and yarn balls. Bright colors continue to be best and two contrasting colors are even better. Don’t forget you can also cast flies and other weightless drift lures with conventional fly tackle.

Cast your fly a bit upstream from where you suspect the steelhead to lie and allow it to sink. Twitch the fly to make it appear alive as it sweeps through the holding water.

“Luring”
Cont’d on page 23



Terri Bedford with a spring steelhead on a spinner.

above the holding water.

Hotshots, Wiggleworts, Kwickfish, Flatfish, Hot-n-Tots, and Brad’s Wigglers are long time favorites for plug pullers. Many other high action bass or walleye crankbaits can also be effective but be sure that the hooks and split rings on them are strong enough. Choose light and bright colors to get the steelhead’s attention as you invade their territory. Fluorescent chartreuse, orange, pink, and red are all excellent hues. Metallic finishes and contrasting colors are also great at getting the attention of a big ironhead. Copper has

are not very effective because of the difficulty of getting the floating lures down with the current but quartering downstream and then sweeping against the current can be very effective. Casting the plugs can help you get them into tight spots in the cover that would be difficult to reach with a boat.

In recent years, minnow plugs or stick baits have been very successful in catching steelhead. They are also best fished against or quartering against the current. They may be appealing to the feeding instincts of the steelhead but



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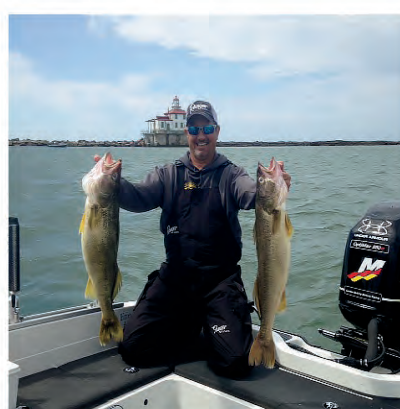
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Month	Date	Event	Information	Membership Meetings Held at:
April	13	Membership Meeting	Board Mtg 5:30 - 6:30 PM Social 6:00 - 7:00 PM Mtg 7:00 - 8:30 PM	St. Joseph-Benton Harbor Elks 541 601 Riverview Drive Benton Harbor, MI 49022 Contact: Jim Marohn 269-208-2784
May	11-13	Summer Challenge Tournament	www.fishthesummerchallenge.com	
June	8	Membership Meeting	Board Mtg 5:30 - 6:30 PM Social 6:00 - 7:00 PM Mtg 7:00 - 8:30 PM	
July	13	Membership Meeting	Board Mtg 5:30 - 6:30 PM Social 6:00 - 7:00 PM Mtg 7:00 - 8:30 PM	
August	10	Membership Meeting	Board Mtg 5:30 - 6:30 PM Social 6:00 - 7:00 PM Mtg 7:00 - 8:30 PM	
September	14	Membership Meeting	Board Mtg 5:30 - 6:30 PM Social 6:00 - 7:00 PM Mtg 7:00 - 8:30 PM	
October	12	Membership Meeting	Board Mtg 5:30 - 6:30 PM Social 6:00 - 7:00 PM Mtg 7:00 - 8:30 PM	
November	8	Membership Meeting	Board Mtg 5:30 - 6:30 PM Social 6:00 - 7:00 PM Mtg 7:00 - 8:30 PM	
December	2	Winter Challenge Tournament		
	8	Christmas Party		

2017 TCAS Steelheader's Calendar of Events				
Month	Date	Event	Information	Membership Meetings Held at:
April	5	Membership Meeting		06:30 PM
	22	Torch Lake Salmon Tournament	Tim Potter/Rich Wilks	Traverse City Senior Center
	29	MWS Brown Trout Tournament Ludington		801 Front St Traverse City MI 49686
May	3	Membership Meeting		06:30 PM
	6	Brown Trout Tournament Frankfort	Carl MacDonald/Randy Richardson	
	13	MWS Brown Trout Tournament Ludington		
	20	Torch Lake Salmon Tournament	John Truchan, host Bill Frost	
June	7	Membership Meeting		06:30 PM
	24	Saginaw Bay Walleye Tournament	Jamie	
July	1-8	2016 National Cherry Festival		
		NO MEMBERSHIP MEETING		
	1	MWS Walleye Tournament (Saginaw Bay or Lake Erie)		
	8	Lake Charlevoix Tournament	Tim Potter/Rich Wilks	
	15	MWS Salmon Tournament - Holland		
	20,22,23	MWS Salmon Tournament - Ludington		
August	2	Membership Meeting		06:30 PM
	5,6	MWS Salmon Tournament - Manistee		
	13	MWS Salmon Tournament - Frankfort		
	26	Lake Ballaigie Tournament	Tim Potter/Rich Wilks	
September	6	Membership Meeting		06:30 PM
	9	MWS Salmon Tournament - Frankfort		
	16	Crystal Lake Tournament	Warret Smith	
	23	Senior Center Fish Fry		
	23	MWS Manistee River Tournament		
	30	Grand Traverse Bay Tournament (Elk Rapids)	Joe Crozen	
October	4	Membership Meeting		06:30 PM
	21	Port Captains Meeting		
November	1	Membership Meeting		06:30 PM
December	8	Christmas Party		

“Luring”
 Cont'd from page 21
TO SUM UP
 Utilizing a small, black duo-lock snap on the end of your line will allow you to quickly change lures to match the holding water. Cutting and retying takes time and is a bother and you probably won't bother even though you know a different spinner or plug would be better for the situation at hand. If you pre-tie some leaders and floats you can even switch from casting lures to drift fishing.

Remember that steelhead need cover on their river migrations, and while they orient to current, they also need to be able to rest. You can think of cover as anything that keeps the fish hidden from view. The simplest cover is water depth. The clearer the water, the deeper the hole must be to provide protection. A riffled surface helps hide the fish and allows them to lie in shallower water.

Boulders, submerged logs, and clay or rock shelves or ledges provide both cover and serve to break the current for migrating steelhead. Steelies will usually lie quite close to these obstacles. A billed cap and polarized sunglasses are essential for success, both to see the cover structure and possibly the fish.

If you are not ready to trade in your spawn sacs for something artificial, you can still employ hardware as an aid. Casting spinners or pulling plugs will help you find scattered fish, and once a concentration is located, you can drift the holes with eggs. Conversely, if you are drifting a run with bait that you know holds steelhead but they are not taking, you can use hardware as a change of pace. The flashing lure might also agitate them into changing position and becoming more receptive to your egg. Finally, adding yam or a bright drift lure above your hook will make your spawn bag more visible to the fish and may excite them into taking it.

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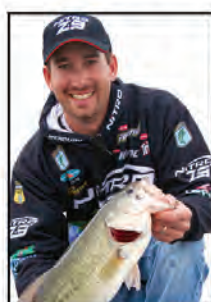
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