*The following are excerpts from various articles and books. One may wish to find the articles or books in their entirety.*

*It should also be noted that 'The Next Bite' magazine is dedicated to Pike, Musky and Walleye fishing and does not necessarily unnaturally favoring one species over the other.*

*If some of the web links do not work, try searching the website or contacting the webmaster of the site as sometimes pages get moved, etc.*

*This information was compiled by T. Cook of Painted Post, NY.*

**'North American Fisherman' TV Show**
**'Trophy Florida Largmouth' Episode from the 2005-2006 Season**
**http://www.outdooraction.com/NAF.html**

Dr. Hal Schramm, a world-renowned fisheries biologist at Mississippi State University and North American Fisherman fisheries biology speaker, talked about how to turn populations of small fish [pike] into populations of nice trophy pike.

He mentioned that Minnesota and Wisconsin conducted studies based upon data gathered from 29 different lakes. These studies concluded that that the abundance of big pike was inversely related to the abundance of little pike (i.e. more small fish = fewer large fish and vice versa). Dr. Schramm stated in such scenarios there was a lot of fish, a lot of mouths to fill which meant slow growth of the fish. These studies noted that populations associated with strong populations of larger pike had pike population densities of about 5 pike over 14 inches per acre. In lakes that had high densities of smaller fish, there was a need to reduce pike population but target smaller fish (i.e. raise the population of big pike).

Dr. Schramm also stated that while largemouth bass and walleye may share the same body of water, it is actually pike-on-pike predation that has the biggest effect on a pike population. Pike can handle prey that is up to 1/3 of its own body length.

In order to raise the numbers of large pike, one needs to rely on angler assistance. Dr. Schramm stated that while it might be hard to release that 30" pike, it is that pike that will build a 40" pike and help prevent bite after bite from smaller fish.

**(Excerpt) The Next Bite – Summer 2001**
**Research [Column]**
**By Russ Warye**

Trophy pike populations are always dramatically impacted if unregulated harvest is allowed to occur. Without naming names, several famous Canadian fly-in destinations in the late 1970's and early 1980's were virtually depleted of their large pike populations in an era when we as anglers didn't know better.

In the early 1980's Manitoba was the first to mandate catch-and-release of large fish, followed shortly by the Northwest Territories. They are a tremendous resource and as stated personally in numerous seminars we as anglers are guilty of constantly over-harvesting these incredible fish. Look at size limits in our respective states, bat limits and antiquated spearing seasons, difficult to justify in this era of increasing fishing pressure of a finite resource. All combine to keep the vast majority of United States viable populations in a small size range. Angling harvest is responsible – and nothing else, except for those occurrences where overpopulation has resulted in stunting – overpopulation exacerbated by the removal of large fish by anglers.

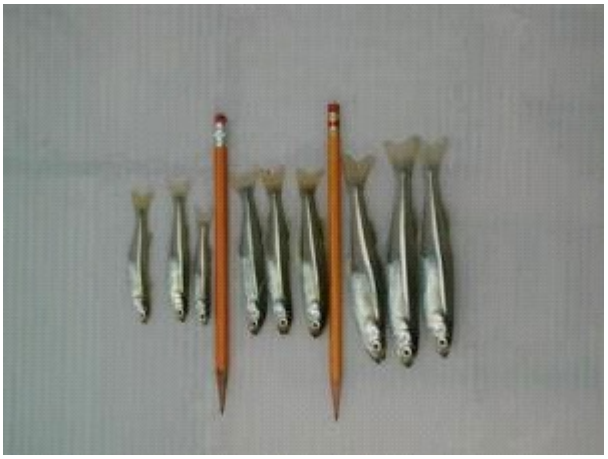
**(Excerpt) The Next Bite – Winter 2003**
**Quick Hits [Column]**
**By Daniel Bagur**

Brönmark and Miner found that carp exposed to predators grew to become shorter but fatter than those grown in the absence of predators. Fatter fish are harder to swallow and it seems that the presence of a predator has the effect of changing the way certain fish grow.

In his book 'The Captive Sea,' Craig Phillips described an occasion when he fed 200 minnows into a tank of piranhas while working at a seaquarium. Within an hour, half of the minnows had been chased down and eaten. The next day, only 12 of the minnows remained. These 12 fish remained in the tank untouched. Phillips suggested that this was the result of familiarity. The piranhas no longer associated these lucky individuals with food. The really interesting part came when other minnows were added to the tank. These newcomers were rapidly chased and eaten, but the locals were left alone. It seems that prey familiarity detracts from feeding incentive.

**University of California Riverside -- January 19, 2006**
**Fewer Fish Eggs, Smaller Fish Result From Over-fishing**
**UCR graduate student leads research showing how evolution slows recovery of fish population**
**http://www.newsroom.ucr.edu/cgi-bin/display.cgi?id=1224**

The practice of harvesting the largest individuals from a fish population introduces genetic changes that harm the overall fish population, a UC Riverside graduate student and colleagues have determined. Removing the large fish over several generations of fish causes the remaining fish in the populations to become progressively smaller, have fewer and smaller eggs with lower survival and growth, and have lower foraging and feeding rates, the researchers report.



*The figure shows the decrease in body size in Atlantic silverside as found by a research team led by UCR graduate student Matthew Walsh. The silverside, having been reared for five generations in laboratory experiments, are all the same age. The fish shown here are from the fifth generation. The fish on the left are from populations from which large individuals were harvested over five generations; the fish in the middle are from populations from which fish were harvested at random over five generations; and the fish on the right are from populations from which only small fish were harvested over five generations. (Photo credit: M. Walsh*)

**(Excerpt) North American Fisherman**
**Out For Blood -- Take advantage of a brute trout's penchant for flesh**
**By: David Hart**

Back when the concept of catch-and-release wasn't the religion it is today, Chuck Kraft and his friends would gladly take a fillet knife to some of the biggest trout they caught. As he and his buddies knelt by the water's edge and prepared their catch for the fire, they noticed hard lumps in the stomachs of many of the larger trout: crayfish.

"Nine out of 10 of the big browns we caught had crayfish in their bellies. I'm not talking little crayfish, either. Many of them were 3 or 4 inches long," he says. "Naturally, that got the wheels turning in my head, so I started experimenting with some of my smallmouth flies that imitated crayfish and baitfish."

**Killer Instinct**

Despite their dainty reputation and habit of sipping tiny insects from the water's surface, trout—big trout in particular—are opportunistic killers that readily eat meat. A close inspection of their mouths shows rows of sharp teeth that hook inward, clearly designed for taking large, live prey.

Kraft, who guided for smallmouth bass and trout on waters throughout western Virginia for 22 years, was one of the few who realized the two fish had a lot more in common than many anglers think.

"If you look at all the aquatic life in a typical trout stream, you'll find a whole lot more than just insects. Crayfish, minnows, sculpins, madtoms, salamanders, frogs—you name it, it's there for the taking," says Kraft.

**Prime Times**

Big trout will feed heavily on aquatic insects and they'll readily sip size 20 midges off of the surface. But put the equivalent of a slab of prime rib in front of them and they'll gladly skip the hors d'oeuvres. That's why Kraft rarely uses insect patterns on trout streams with lots of big fish. And he often out-fishes his peers who are too stubborn to start with a big meat pattern.

"You can bet I'm going to put a big minnow pattern in front of a rising trout if I think it's big enough to take a big fly," Kraft says. "He may not eat it, but I'd bet you nine times out of 10 he will because it's a big, easy meal, and no fish wants to pass up an easy meal."

**Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign -- September 21, 2007**
**Research Cautions to Catch-and-Release in Less than 4 Minutes**
**By Debra Levey Larson**
**http://www.nres.uiuc.edu/Dynamic.aspx?PageId=124&ContentObjectId=1248&ContentObjectName=Research+Cautions+to+Catch-and-Release+in+Less+than+4+Minutes**

URBANA - Recreational fishing that involves catch-and-release may seem like just good fun, and that released fish go on to live happily ever after, but a recent study at the University of Illinois shows that improper handling techniques by anglers can increase the likelihood of released fish being caught by predators.

After the stress of the catch and lack of oxygen from being out of water, the fish is in a weakened state. When it eventually gets released back into the water, if fish haven't been handled properly, they are more likely to be caught by a predator.

A study on the effects of catch-and-release angling on bonefish which was conducted by a team led by University of Illinois researcher Cory Suski. The article is available online in the journal Comparative Biochemical and Physiology Part A and will be published in an upcoming issue.

"Whenever a fish is caught and reeled in, it expends a lot of energy so that's one stressor," said Suski. Depending upon the skill of the angler, the catching can last a long time and put additional stress on the fish. When the fish is brought up on the deck or in the boat to measure and take a picture, it faces an additional challenge and cannot obtain enough oxygen, and the fish continues to accumulate physiological disturbances. "Our recommendation to catch-and-release sport anglers is that they minimize the time it takes to actually land the fish and take a picture, and then get it back into the water as soon as possible."

Suski's goal isn't to eliminate catch-and-release sport fishing; in fact he hopes the research will help conserve fish populations and the economic benefits from recreational fishing.

How long can a fish be out of water? Results from the study showed that both the duration of an exercise bout (the catch) longer than four minutes, as well as the length of exposure to air, will result in a proportional increase in negative effects on the fishes' physiological condition. The study also showed that the longer duration of the catch-and-release, the longer the time the fish needed to recover and the greater likelihood of the fish being caught by predators.

The fish in the study were caught in nets, put into dark tanks and allowed to rest. Later they were chased to simulate angling. Blood samples were taken at various time intervals after the angling simulation in order to monitor the levels of calcium, lactate and glucose during recovery.

"We found that it took two to four hours for the fish to recover to normal levels. We also observed that early during the recovery time the fish were acting kind of woozy -- that behavior would mean they would be less likely to out-swim a predator," said Suski. "Our study indicated that the four-hour recovery for bonefish is sufficient for at least some physiological variables to return to baseline values."

Suski likened the fishes' physiological changes when being caught to the lactate that builds up in a runner's muscles after running a 100 yard sprint. The runner's heart rate and breathing may return to normal fairly quickly, but the lactate build-up can take a much longer time to return to normal.

The study identified several strategies for fisheries management in catch-and-release settings:

Minimize the length of time spent angling the fish
Minimize the length of time the fish is exposed to air after being caught
The longer that the fish is presented with challenges, the longer it will take to recover after being released
The temperature of the water can also affect recovery time -- warmer water may increase recovery time.

The project was supported by Bonefish and Tarpon Unlimited, the Charles A. and Anne Morrow Lindbergh Foundation, Canadian Foundation for Innovation, the Ontario Research Fund, Carleton University, the Cape Eleuthera Foundation and the University of Illinois.

**(Excerpt) The Next Bite – Winter 2003**
**Release 'Em Right [Column]**
**By Ross Fisher**

Rules for Rapid Release:

Just Cut Hooks – In most cases, a fish is well hooked, or you wouldn't have got him to the net or cradle, so cut hooks. Go with a quality brand of cutters. Cheap side cutters on your old pair of pliers just won't do it.

Tool Location – Every angler in the boat should know where release tools are located. Central location and easy access means no confusion or lost time trying to find any of your needed tools.

The [Water] Is Your Livewell – Keep the fish in the water until you're ready to roll with photos, then lift it out, support it with both hands in a horizontal fashion and take your photos and release. A big net like a Beckman or Frabill or the Kwik Kradle are great for using the [Water] as your livewell – just keep the fish's head in the water!

Quit the 'Death Grip' [i.e. vertical holds] – There have been many articles written on the unnatural position these holds place fish in, and the stress and physiological damage they can cause.

Be Aware of Smoking Hot Water – If water temperatures are above 75, you have to consider it as a significant factor in your release techniques.

**(Excerpt) The Next Bite – Fall 2004**
**The Real Deal [Column]**
**By Rod Ramsell, Minnesota Department of Natural Resources**

The gill lamellae on the gill filaments are very fragile tissues. When removed from the water, they tend to collapse and are vulnerable to temperature extremes that can result in the dehydration or freezing of these delicate structures. Damage to these tissues can inhibit a fish's ability to respire efficiently upon release.

Fish subjected to exhaustive exercise is complicated by an inverse physical relationship between water temperature and dissolved oxygen. The higher the water temperature, the less dissolved oxygen water is able to hold in solution. Fish, being cold-blooded animals, have metabolic rates that increase as water temperature increases, thus increasing their demand for dissolved oxygen. The end result is, it will take much longer for [a] fish to intake the level of dissolved oxygen needed for recovery than it would in cooler water conditions. To put his in perspective in our human example, this would be a similar effect to [a] runner going around the block three times while on top of Pikes Peak in the Colorado Rockies during the summer. The air available for the runner to recover from exhaustive exercise at that altitude is also greatly reduced, and his recovery time will also be increased significantly. If you take a mid-summer fish out of the water, [it's equivalent to having the above mentioned runner being forced to hold their breath at the end of the run].

[A fish] comes from a medium that is denser than the air in which [people] live. The water medium of a fish's world provides support for its body. Without that support a fish becomes susceptible to other physiological stressors.

The worst type of out-of-water handling is the vertical hold. A vertical hold exerts a significant amount of stress on the fish's mechanical physiology.

For the average healthy muskellunge, approximately 5 to 12 percent of its weight is in the skull. The remaining 88 to 95 percent of the weight is comprised of the trunk musculature, trunk skeleton, skin, and the viscera. The larger the fish, the higher the percentage of non-skull body weight within that range. This is due to the fact that, at a certain point in their life (approximately 42 inches in length), adult muskellunge tend to increase in size proportionately more in girth than in length.

The primary supportive connection of all this body mass is the muscle and ligament connection of the first cervical vertebrae with the base of the skull. Very little support is provided by the connective tissue on the underside of the head in the vicinity of the isthmus. As a result, a fish held (or hung) vertically has a tremendous amount of gravitational stress upon its mechanical physiology. This can best be seen by the amount of stretch of a fish's length when it is held vertically. A 39-inch muskellunge, measured laying flat on a measuring board, will measure between 40 and 40.5 inches when held vertically; a 48 inch muskellunge will measure between 50.5 and 51 inches under the same conditions. This increase in length results from the stretching of connective tissues between some of the more anterior vertebrae and the articulation of some of the weakly "hinged" areas and skeletal structures within the skull.

Muscles in the critical areas will resist the pull of gravity on a fish's mass briefly, but fatigue quickly causes those muscles to relax and put excessive strain on the vulnerable connective tissues. Should a fish struggle or start to shake while in this vertical position, than permanent damage that will result in mortality of that fish becomes virtually guaranteed.

The amount of pull on the muscles and fragile bones of the operculum (gill cover) can also be a concern on vertically held fish. Injury to these mechanical structures can have negative effects on a fish's ability to feed and respire normally.

[In a horizontal hold], if the fish is rotated such that the supporting hand is more on the fish's flank, then there is less chance for injury to the internal organs.

The best way to support the mass of a muskellunge using a horizontal hold is to use [as much of the] supporting arm as a "cradle" (much the same way you would cradle an infant) while the control hand has a grip in the vicinity of the side of the head.

In all out-of-water handling options, the loss of the protective mucus layer that protects fish from waterborne bacterial and viral infection is an additional concern. This is especially true during the warmer water temperature months when the populations of these organisms are at their peaks.

**(Excerpt) The Next Bite – Spring 2005**
**Research [Column]**
**By Daniel Isermann**

Removal of large pike is most often cited as the culprit behind declines in pike size within lakes that once produced large fish. Angler harvest for many fish species, including northern pike, is frequently size-selective, with anglers tending to remove older larger individuals from a population. These large individuals often take a long time to replace, especially in more northerly locations where pike growth is slow and a 20-pound fish might be [18-21 years old]. Removal of individual large specimens from a population not only reduces the number of available large fish, it also makes it more difficult for other members to attain large size. Cannibalism by large pike is thought to be an important mechanism in regulating small pike numbers. These larger fish essentially keep the population in balance with regards to the availability of habitat and food.

The answer to the problem of too many small pike would seem obvious: remove some of them and give the remaining fish more elbow room. Large-scale removal efforts incorporating nets and fish toxins have been tried in attempt to reduce populations of several fish species including bullheads, stunted crappies, carp and pike. These removal efforts have generally met with little success and any perceived benefits are often short-lived. In most cases, insufficient numbers of fish are removed to achieve desired results. Remaining fish quickly replace their lost brethren through reproduction, or new fish colonize the lake from adjoining waters. Promoting angler harvest of small pike in stunted populations would also seem a viable alternative. Getting anglers to take home small pike is often tough because these fish aren't perceived as top table fare, largely due to the perceived difficulties in cleaning them. Angler harvest is often insufficient to remove enough pike to turn things around, and, as stated previously, anglers often take the largest fish in the population.

Increased harvest or removal of fish from a population often results in changes in reproductive strategies, with fish becoming sexually mature at younger ages, which can lead to increases in the number of young fish produced annually. This also means that fish will begin diverting energy to the production of eggs and sperm earlier in life, resulting in less energy being dedicated to actual growth of the individual fish. So in some cases, removing pike might only exacerbate the hammerhandle problem.

In many places, pike have yet to attain the catch-and-release status of their hallowed cousin the muskie and harvest of large pike remains the norm, especially during ice fishing seasons. Minimum size limits have seen increased use across pike country in an attempt to preserve large pike. Some resource agencies have instituted slot length limits, hoping protection of mid-sized fish will equate to more large fish that can better regulate small pike numbers and increase angler satisfaction.

In lakes that have the ability to grow big pike (in other words, lakes with adequate forage and cool water refuges for mature pike), harvest regulations hold some hope of improving the average size of pike. Angler compliance with these regulations will be crucial to their success.

**(Excerpt) The Next Bite – Spring 2005**
**Quick Hits [Column]**

"Save the Pike" campaign in Europe:

http://www.szczupak.org/

Click the above link and click the British flag in the upper right-hand corner for English.

**(Excerpt) The Next Bite – Winter 2005**
**The Real Deal [Column]**
**By Michael Butler, PhD. Candidate Trent University, Aquatic Biodiversity and Conservation Unit of the Ontario Ministry of Natural Resources**

Vertical Holds and Time-out-of-Water:

I solicited comments from researchers who routinely handled big muskies or pike. Among them were: Bernard Lebeau, Ed Crossman, Terry Margenau, Rod Ramsell, Bob Strand, Steve LaPan and Arunas Liskauskas. Specifically, I asked these and other experts to comment on the risk of injury to larger (25 pounds or more) fish arising from being vertically suspended from the jaw.

While each of the muskellunge management professionals drew from a unique set of experiences, all were outspoken in recommending against the single-handed, vertical suspension of larger fish, as they felt this increased the likelihood of mechanical injury to the fish. Some – Rod Ramsell, Minnesota Department of Natural Resources, and Steve LaPan, New York State Department of Environmental Control – provided accounts of injuries or delayed mortality for muskellunge subjected to this kind of handling. As well, all emphasized minimizing out-of-water time, and some, a well-supported horizontal hold, if a photograph was necessary.

My enquiries didn't end with the North American Esox specialists. I posed the same question to dozens of marine biologists, fish physiologist and biomechanical engineers. These are folks who know much better than I do just what makes a big fish tick, and what might constitute mishandling. Some were authorities on gill mechanics, while others were experts on the physical properties of different tissue types. Of great relevance was the experience of the marine biologists who, as a group, had captured, tagged and released hundreds of thousands of large saltwater fishes on several continents.

This group of scientists was unanimous in the view that the vertical hold (again of a 25-pound plus fish) by the jaw presents a much greater chance of injury to the fish. Many comments converged on the risk of injury to the fragile structures around the gills. Consistently, the muskie handlers and salt-water fish trackers were advocates of using a sling/stretcher/cradle type of device to control fish and maintain a horizontal orientation.

I became familiar with the recent work of our own Upper Great Lakes Management Unit of the Ontario Ministry of Natural Resources, under the direction of Arunas Liskauskas. After nearly 10 years of conducting spring spawning surveys involving the trapnetting, spawn-taking and biological sampling of medium to very large muskellunge (many fish over 50 pounds) on Lake Huron, the fisheries crews have developed considerable expertise in handling big fish. They have learned to restrain, weigh, measure, transfer, and sample fish only while they are being held horizontally in a cradle.

I should emphasize here that the experts I consulted are not opponents of killing fish. Most of the natural resource biologists are hunters and anglers. Thus, all are members of one or more groups who have themselves been targeted by the animal-rights fringe. Their views are grounded in science and experience, not sentimentality.

A seemingly small increase, say 2 percent, in annual angling mortality may result in a very significant decrease in recruitment, erosion of potential trophy production and the decline of the stock. In the current Ontario fishing regulations, as well as pamphlets co-published by the Ontario Ministry of Natural Resources and Muskies Canada, vertical holds of muskellunge are strongly discouraged.

Researchers from Dr. Bruce Tufts' lab at Queen's University have studied the blood chemistry associated with stress and delayed mortality for angled salmonids, walleye and bass. In all cases, out-of-water time has been identified as the most significant human-caused stressor. This has led to modifications of the weigh-in procedures in a growing number of Ontario bass tournaments. Bass are weighed in a column of water thus eliminating air exposure and reducing the weighing time from 30 to 5 seconds in a process that's now 'hands-off'.

Researchers suggested that during the preferred horizontal hold, contact between the fish and dry surfaces (hands, arms and clothing) should be minimized; otherwise protective mucous or "slime" could be removed. They recommended avoiding the "hug shot" where the fish is held against the chest inside the forearms, favoring instead two pre-wetted hands being the only points of contact between angler and fish.

*[See full article for full text responses from 12 fisheries experts from around the world.]*

**(Excerpt) The Next Bite – Summer 2005**
**Research [Column]**
**By Rob Kimm**

The double-crested cormorant (Phalacrocorax auritus), is a large (the average adult weighs around four and one half pounds), fish-eating waterbird with a slender, hooked bill and large webbed feet set well back on its body. Common to wide areas of North America, the greenish-black birds are adaptable, efficient aquatic predators.

Cormorants are divers, typically feeding in depths from 5 to 25 feet of water and able to remain submerged for 30 to 70 seconds in pursuit of their prey. Though fish are the mainstay in the cormorant diet, crustaceans and aquatic insects are also fair game. An adult cormorant can typically consume ¾ of a pound of fish per day throughout the year and travel from 5 to 10 miles from their colonies to feed.

Leech Lake, like the Great Lakes and many other inland and coastal waters, is home to an ever-increasing number of cormorants. The US Fish and Wildlife Service (USFWS) estimates the cormorant population in North America is growing at a rate of 20 percent a year – faster in some areas. The population explosion – the second this century – has brought with it rising hostility and alarm over the cormorants' potential effect on commercially and recreationally valuable fisheries.

The sudden expansion, dramatic collapse and rapid resurgence of their population is woven into the warp and weft of fisheries management an environmental policy in the 20th century.

The first colonization of the Great Lakes began on the far western edge of Lake Superior in 1913. By 1920, active colonies were found on Lake Nipigon and on Lake Huron and Georgian Bay by the early 30s. Cormorants finally appeared on Lake Erie and Lake Ontario by the late 30s and by the early 40s were well established.

The answer may lie not with the cormorants but with the changing biomass of the Great Lakes at the dawn of the 20th Century. Overharvest, habitat destruction, the sea lamprey infestation, exotic species, declining water quality – all had combined to drastically alter the nature of the fisheries of the Great Lakes. Near cataclysmic declines in stocks of native predators such as Atlantic salmon, lake trout, perch and walleyes coincided with the explosion of rainbow smelt and alewife, both non-native species to the Great Lakes introduced in the late 19th century. The smelt and alewives provided abundant forage for the arriving cormorants. In the absence of competition and offered a virtually limitless food supply, the cormorants flourished.

Organized efforts to control cormorant populations, authorized by regulatory agencies and otherwise, began by the 1950s.

Control efforts persisted into the 1960s, then gradually tailed off as cormorant populations diminished. Yet even after control efforts were abandoned, populations in the Great Lakes and across the continent continued their decline. In the Great Lakes, the introduction of salmon reduced the numbers of alewives and smelt, but not enough to account for the rapid disappearance of double-crested cormorants. By 1973, cormorant populations on the Great Lakes had declined by 86 percent and they disappeared completely from Lake Michigan and Lake Superior.

Though DDT itself was only mildly toxic, DDE (Dichlorodiphenyldichloroethylene), whether passed into the environment as a contaminant in manufactured DDT or a resultant metabolite from ingested DDT, caused significant reproductive problems in some species of birds. While effects on passerine species ("perching birds" including crows, robins and sparrows) was minimal, raptors, cormorants, pelicans and a variety of other predatory birds were profoundly affected by DDT. DDT and its metabolic byproducts accumulate through the food chain, with apex predators, aquatic and terrestrial, amassing high levels in fatty body tissues. The metabolites caused eggshell thinning in birds by blocking enzymatic processes that transfer calcium into developing eggshells. As DDT continued to accumulate throughout the food chain, the resultant reproductive consequences decimated populations and dropped nesting success to near zero. In some locations, cormorant eggshells examined by researchers in 1970 were nearly 30 percent thinner than pre-DDT samples. Nesting cormorants crushed their own eggs simply by sitting on them. Less evocative than ospreys, less symbolic than bald eagles, cormorants were nonetheless devastated by DDT.

Under pressure from environmentalists, and faced with mounting scientific evidence of DDT's long-term effects, the Environmental Protection Agency ultimately put an end to domestic use of DDT on June 14, 1972, when EPA Administrator

William D. Ruckelshaus issued an order canceling virtually all remaining Federal registrations of DDT products, save for a few exceptions for public health, quarantine and minor crop uses.

As early as the mid 1970s, cormorant populations began what was to be a dramatic recovery. From 1973 to 1991, cormorant populations in some areas grew at a rate of 35 percent a year. As with their initial entry into the Great lakes basin, conditions were ideal for cormorant colonization. The effects of the Clean Water Act of 1972 and other environmental initiatives were beginning to be felt; the curtain was being closed on more than a century of commercial fishing; the sea lamprey infestation was being brought under control. Fishery populations across North America began to rebound. Unique and sometimes unrelated circumstances converged to open an improbable sequence of windows, though which came cormorants in their thousands, winging their way back from near oblivion.

In 1998, 73 nesting pairs of cormorants were counted on Leech Lake. By 2004, that number had risen to more than 2,500. Some 10,000 individual cormorants lived in little Pelican Island. Eastward across the Great Lakes, similar population growth. On one colony in the St. Lawrence River, Strachan Island, 38 pairs were counted in 1992. By 1999, there were 433. The return of the cormorant has brought renewed conflict with anglers, lakeshore quality advocates, and even other species of birds with which they compete for food and nesting space.

For fisheries managers, the return of the cormorants brought renewed concern for their effects on sport fisheries. As the population began to rise and colonies across the Great Lakes and upper Midwest were reestablished, fish populations in heavily colonized areas began to shift away from historic norms. Cormorants have been cited as a possible cause. As early as 1995, studies began to indicate potentially severe localized predation on game fish by resident cormorant populations.

On New Yak's Oneida Lake, a popular and productive walleye and perch fishery, the New York State Department of Environmental Conservation (NYDEC) had for decades been using a stock-recruitment relationship model to assess walleye populations and plan stocking efforts. Based on survey data dating back to the 1950s, the model had proven highly accurate in assessing the lake's walleye population. In the early 1990s, coincidental with an increased cormorant population on the lake, the model began to fall apart. Model results began to overestimate the actual numbers of adult walleyes present in Oneida, sometimes dramatically, indicating high mortality of age-1 to oge-4 walleyes. Model data suggested that 112,000 walleyes from the 1995 year class would reach adult size. 32,000 actually did. By 1999, Oneida's adult walleye population had dropped from an average of 675,000 (based on data collected between 1958 and 1990), to 215,000. Similar declines were noted in the yellow perch population, Perch are not only an important forage fish for Oneida's walleyes, but a popular sport fish as well.

On leech lake, biologists became concerned over the near-total absence of entire year classes of walleyes, and angling success rates for below historical averages brought calls to "do something" about leech Lake's walleye decline from resort owners and local anglers. "Doing something," in the opinion of many, meant doing something about the cormorants. Minnesota Department of Natural Resources regional fisheries supervisor Henry Drewes told the St. Paul Pioneer-Press: "We had a 2001 year class of walleye that appeared to be everywhere on leech lake, but as recently as the spring of 2002, they seemed to have disappeared. They've disappeared in the main regions of the lake where the birds are feeding, but the walleye population is present in the deep portions of the lake in the western basin. While we don't have a smoking gun, we believe that foraging cormorants are part of the component to what's happening with walleyes and perch."

Present on the lake from May through September, Leech lake's 10,000 cormorants consume more than 1.1 million pounds of fish per year.

On eastern Lake Ontario, smallmouth bass were the concern. Smallmouth populations, stable for several years, began to decline in the early 1990s in the eastern part of the lake, while other areas maintained healthy numbers. Fisheries research conducted in both New York and Ontario showed that mortality among young smallmouth bass increased concurrent with the expansion and reestablishment of cormorant colonies. NYDEC research on cormorant diets concluded that smallmouth comprised only 1.6 percent of the average cormorant diet (Johnson, et. al., 2002). The number seems insignificant-until you consider that 1.6 percent, given the region's cormorant population, totals around 1.3 million smallmouth annually, across eastern lake Ontario. The study authors added that cormorants "may be taking male smallmouth off of nests, with implications for recruitment and year-class strength."

Back on Oneida, biologists not only researched cormorant diet, but compared the overall take of cormorants to that of sport anglers. In raw numbers, and somewhat amazingly, the overall harvest of walleyes and yellow perch by sport anglers and cormorant s was nearly equal. Yet further details from this and the Ontario studies, as well as anecdotal evidence from Leech Lake, point out a consistent thread in research on the cormorants' effects on fish populations. While angler and cormorant take on Lake Oneida were nearly equal, cormorants targeted only sub-adults – fish from age-1 to age-3 – while sport anglers targeted adult walleyes age-4 and over. Cormorants consumed 10 times the number of age-2 perch compared to anglers, and only cormorants

consumed age-1 perch. (VanDeValk, et. al, 1999). On Lake Ontario, cormorants were shown to target age-2 to age-5 smallmouth, before they'd reached spawning size.

Aggressively controlling cormorant populations, either by nest oiling eggs (applying vegetable oil to eggs suffocates the chick inside, yet the adult cormorants will continue to attempt to incubate, rather than re-nesting), or "direct control measures" (shooting them) is controversial, especially in cases where the primary argument is their competition with sport anglers. It's a solution one biologist likened to "asking wildlife agencies to shoot owls and hawks so there'd be more pheasants to hunt." Yet balancing cormorant populations with fisheries that are highly critical to local and regional economies may become a necessity. On Leech lake, the Leech Lake Band of Ojibwa, which owns little Pelican Island, has already begun attempting control measures, beginning with cutting down the island's roosting trees, leaving little Pelican Island as a barren, rocky outcrop. The cormorants, undaunted, simply nested on the ground. At the time of this writing, the Leech Lake Band, together with the US fish and Wildlife Service, the Minnesota Department of Natural Resources, and Wildlife Services, a division of the US Department of Agriculture, were in the midst of formulating a control plan for the Leech Lake cormorant population which will incorporate both lethal and non-lethal population control measures. Even before the plan was formulated, however, there was general agreement that the leech Lake cormorant population should be reduced down to between 250 and 750 nesting pairs-a 70 to 90 percent reduction.

The situation on Leech Lake, and the difficulty in determining how to, and even whether to, control a single cormorant colony, illustrates the difficulty in formulating a consensus on cormorants. It's a conundrum complicated by a tangle of regulatory jurisdictions. Multiple agencies ranging from local to federal – even tribal – hold sway over bits and pieces of regulatory turf. Cormorants are federally protected, and listed under international migratory bird treaties with both Canada and Mexico. Wildlife Services, given their mandate to address the economic effects of wildlife on agriculture, is in the mix with the US Fish and Wildlife Service. On border waters, the Canadian Wildlife Service has its own mandates. Among governmental agencies, which by necessity must work together to address the cormorant issue, there is little agreement on whether or not cormorants even pose a problem. While state fisheries officials confront declining game fish populations and angry anglers and resort owners demanding action on the 'cormorant problem,' US Fish and Wildlife Service biologists maintain that "Based on a review of the best available science, we recognize that DCCOs [double-crested cormorants] generally have only minor direct impacts on sport fish populations, being just one of a myriad of biotic and abiotic regulatory factors... We do not believe that a large-scale reduction of DCCO populations to benefit sport fish populations is biologically warranted." (USFWS, 1997). Meanwhile, the Canadian Wildlife Service calls the return of the cormorant to the Great lakes a "tremendous success story." Even in matters of policy, cormorants invite contradiction.

**(Excerpt) The Next Bite – Summer 2005**
**Quick Hits [Column]**
**By Dr. Gene Smith, DVM**

Supporting the weight of a fish by the gills or mouthparts will absolutely damage water-flow efficiency and, coupled with hook damage and metabolic stress, increases the likelihood of delayed mortality.

While some fishes including catfish and carp have gill lamellae with more rigid supporting cells that do not collapse out of water, teleost fishes [large group of fishes with bony skeletons, including most common fishes. The teleosts are distinct from the cartilaginous fishes such as sharks, rays, and skate] do not. Muskies held out of the water for photos, etc., are, in essence, suffocating. What seems a benign few seconds for another photo could mean death for an exhausted muskie or pike.

The oxygen carrying capacity of blood is greatly enhanced by hemoglobin.

Different species have different hemoglobin types. Carp hemoglobin will load with oxygen at low DO [diffused oxygen] levels common in ponds and lakes, allowing them to survive in nearly any system. By contrast, trout hemoglobin requires nearly twice the oxygen partial pressure to load to capacity. It's a trade off deal. Carp can live nearly anywhere but lack high oxygen saturation in the tissues, while trout can only live in restricted areas with high oxygen levels, but maintain high tissue oxygen tension and can maintain high levels of activity that carp are not capable of. Muskies and pike, like trout, are salmonids. Muskies in particular, however, may have both hemoglobin types allowing them to thrive in systems with modest DO levels, expanding their geographic range.

**(Excerpt) The Next Bite – Summer 2005**
**Release 'Em Right [Column]**
**By Charlie McDonald of Kesagami Wilderness Lodge**

Conservation, conservation, conservation - that's the message you will hear time and time again if you have a chance to visit a particular fly-in Lodge and their outposts in Northern Ontario, Canada. Kesagami Provincial Park is a fly-in operation that devotes itself completely to catch and release and the safe handling of trophy pike with a very limited selective harvest of small walleyes

for shore lunch. The lodge is almost fanatical in promoting the protection of the fishery, and that is paying big dividends in excellent fishing.

14 years ago Bob Mattson and Marsha Gibbs were fortunate enough to buy a lodge that was the sole commercial establishment in what is now a "wilderness class" park. It had established a quiet but solid reputation for its awesome trophy pike fishery and, to a lesser extent, its bountiful walleyes. Guests had, however, been taking 50-100 monster pike out of the lake each year for trophy mounts. Adding to that was also a policy that allowed guests to take home their limit of walleyes. The fishery was very productive, but the new owners could see that this type of harvest would eventually deplete the resource, and probably in the not-too-distant future, so they introduced new and revolutionary (at the time) conservation measures: All pike to be released no matter what the size, one or two walleyes up to 16 inches could be kept for shore lunch and no walleyes to take home. In addition, all guests were required to fish lures with single barbless hooks to help in reducing the damage to the fish.

No live bait was allowed to help eliminate the chance of deeply gut-hooked fish, and catch and release cradles replaced the mesh landing nets in all boots to further help protect the trophy fish. The lodge owners went one more step by commissioning the production of a videotape teaching guests the principles of catch and release and conservation minded angling. Based on TV footage shot by Canadian Sportfishing, some new scripting was added and segments shot to promote playing fish quickly, using heavy tackle to avoid prolonged fights, the proper use of the release cradle, and the conversion of tackle to single barbless. Every group that books now receives a copy of the videotape. And guests are encouraged to request additional copies if needed for other members of their party. The owners are fully committed to the protection of these rare trophy fish, going to lengths to discourage meat hunters from booking. They have even issued bans on guests who have abused the resource. Owner Marsha Gibbs explains "We can replace the guests, we can't easily replace these beautiful trophy fish. We'll sacrifice revenue but we won't sacrifice these fish."

Does fish conservation work? Is it actually good for business? You bet it is! The previous owner had warned that preventing guests from taking fish home to eat and not allowing them to take a trophy for the wall would hurt business. Are you kidding? Business tripled. People realized that the fish caught and photographed were back in the lake swimming and not hanging dead on a wall somewhere. It is with great confidence that you can show photos of trophy pike knowing that they are still prowling the lake, as opposed to gracing a basement wall. Anglers are becoming more sophisticated, and are now looking specifically for a fishing destination that has progressive conservation policies.

Guests have bought-in whole heartedly to the concept of gentle handling of fish, taking only a very limited harvest of small fish for a shore lunch. They know that they can have a fiberglass or graphite reproduction made if they want to have a trophy fish on their wall. They come fishing because they want to catch trophy fish and know that when they release their fish, there's a good chance it can be caught again and again. One guest comments that "I want my kids and grandkids to visit Northern Ontario in the future and be able to experience the same quality of fishing I'm experiencing right now. I have a deep reverence for these fish because they are like no other. They hove abnormally broad shoulders and immense girths. The special genetics here need to be preserved so we all have a chance to come and experience the quality of fishing enjoyed by our forefathers." That's a great statement to make, and it's indicative of the respect that many fishing enthusiasts now have for the resource.

When fisheries are protected from overharvest, and proper catch and release tech piques are emphasized, and even required, you have an incredible chance at a new Canadian record fish. A fish from Kesagami Lake actually set the Ontario and Canadian "live release" record back in 1995, and that was only for a 45-inch fish. Several fish over that size have been caught and witnessed including two fish of 54 inches.

It makes you think about the results of dedication and perseverance to a conservation policy that truly protects a trophy fishery. How far will you go to protect a fishery?

**By Pete Maina, The Next Bite Magazine, General Manager**

There are many issues surrounding catch and release fishing. One issue we haven't spent a lot of time on is mandatory release-proactive regulations that require release of all fish, a majority of fish, certain size-structure ranges in a fish species, etc.

There are many variables – each species and fishery with its own unique conditions – that play a role as to where and how special regulations should be established. And total catch and release in many cases is not necessary or preferable. Often, selective harvest is the way to go with many species. And even with a species like Esox Masquinongy, at the top of the food chain, in some waters it could be best to purposefully harvest some fish. It all boils down to each individual water's makeup. Statewide or provincial blanket regulations don't cut it. And this is why we have folks called fisheries specialists who monitor such things and therefore, we hope, make the correct management calls.

In a very basic sense, protecting certain species of fish from overharvest becomes more important as we move to larger fish, farther up the food chain (and therefore to fish occurring in the lowest densities), and as we move farther north (where fish grow slower ) and it gradually becomes less and less feasible to replenish fisheries artificially via stocking. When we are talking about slow-growing fish like pike or muskies, or a big-fish species twice as slow-growing like a lake trout, the time required to rebound from overharvest is measured in decades.

Proactive fisheries management is important. This means protecting a tremendous resource. Sadly, to this day, regulations are reactive in many places. This means things got all screwed-up ... fisheries got damaged ... to the point of angling interest diminishing or flat-out ending... and then, there is "reaction" with protective regulations, stocking possibly, but sadly, it's too late. It takes time to fix things.

There are folks who still vehemently rally against proactive regulations (however, they still desire quality fishing).

**(Excerpt) The Next Bite –Fall 2005**
**Research [Column]**
**By Daniel Isermann**

Muskies & walleye… competition or confusion?

Long before fishing could be considered solely as a recreational venture, walleyes and muskies were harmoniously coexisting in a variety of waters across North America. The same is true today, but with the advent of modern agriculture and the local supermarket, both species support popular recreational fisheries where harvest is an option, rather than a necessity. The fish still get along just fine, but the anglers who pursue each species don't always see eye to eye when it comes to the management of a particular lake, meaning that some of the walleye faithful are quick to blame muskies when their fishing seems to go in the tank. Is there any truth to these accusations?

In most cases the idea that muskies are negatively impacting walleye populations is merely a product of angler misconceptions concerning the biology of each species.

True, muskies are apex predators, making their living extinguishing the lives of other critters, most of which sport fins of some sort. The same can be said of walleyes, who also satisfy their hunger by ingesting fish. Diet studies reveal that muskies are opportunistic predators, and, on occasion, an unlucky walleye finds itself in harm's way. Same can be said about the dietary activity of walleyes, and although muskies are probably a rare meal, plenty of smaller walleyes meet their demise as a result of cannibalistic elders. We'll cover that more in a bit.

As opportunists, muskies and walleyes key in on abundant forage. In lakes across the upper Midwest and Ontario, species like yellow perch, ciscoes, whitefish, suckers, and smelt top the menus of both species. In southern waters where muskies and walleyes coincide, shad are typically key forage species. Edibility and ease of capture ultimately dictate what fish eat. Rare are the instances where walleyes are the most abundant forage available to muskellunge, and although walleyes might be tops among anglers for table fare, muskies seem to take only a passing interest in them. Sure, a muskie will deftly pluck an unsuspecting walleye swaggering down a weed edge at dusk, but the same fish is not going to scour the lake looking for walleyes when other prey species are abundant and more easily obtained. Bottom line: walleye predation by muskellunge contributes little to the overall mortality of walleyes in most lakes.

But walleyes and muskies do eat the same kind of prey. For example, in lakes where muskies primarily rely on yellow perch as prey, we typically find that walleyes are dining on the same thing. So, maybe muskies are stealing food from walleyes? Well, first things first. In order for competition to exist between walleyes and muskies for food, forage must be a limiting factor, meaning that there isn't enough grub to satisfy every fish. This is a definite reality in many cases, but intraspecific competition among walleyes and shifts in forage abundance are probably more important factors in determining how much food each walleye gets, rather than muskellunge abundance. Huge hatches of walleyes result in high densities of young walleyes that must compete against each other for available food resources, and we often find that big year classes of walleyes exhibit slower growth than smaller year classes. Furthermore, populations of popular prey species like perch and smelt are very cyclic, resulting in some periods where prey is overly abundant, followed by stretches of low abundance where walleyes might turn to less optimal prey items. As I mentioned previously, walleyes are notorious cannibals. When additional prey resources wane, walleyes are often quick to turn to their own offspring as food. In some cases, it has been suggested that cannibalism might be an important factor in regulating the number of walleyes reaching adulthood.

Why aren't muskies competing significantly with walleyes for food? First of all, even in the best of lakes, muskies occur in very low densities. They're hard to catch, whether we're talking about anglers using rods and reels, or fish biologists using nets and electricity. In most lakes there are just not enough muskies out there to be negatively affecting walleyes in terms of predation or

competition for food. The point being, competition with other walleyes is likely a far more important factor regulating walleye survival than the "dreaded" muskie. Furthermore, while muskie and walleye diets might overlap in terms of the type of fish that are being eaten, the relative size of those unlucky fish can be grossly different. True, for a portion of their life span, muskies and walleyes are of a similar size, but while very few walleyes break the thirty-inch mark, muskies frequently make it beyond the big 3-0. Yes, at certain points walleyes and muskies eat prey of similar size. A twenty-inch walleye and, let's say, a seventeen-inch muskie, eat things that are pretty close in terms of dimensions. But bigger muskies like fairly good-sized portions, turning to larger perch and maybe even to larger prey like suckers when their gape allows it. While big walleyes also eat big prey, ten-inch perch and foot-long suckers remain a rare occurrence in the stomachs of most walleyes. In southern reservoirs, gizzard shad typically grow really fast, and it's likely that big muskies are feeding at the upper end of the shad length spectrum, lapping into a range of prey sizes that walleyes and most bass rarely get their lips around.

So why the fluctuations in walleye fishery quality? Walleyes, like many freshwater sportfish, exhibit relatively high variability in reproductive success. This occurs in most walleye populations. Some years very few walleyes make it beyond their first winter. In other years millions of walleye fry hatch and survive to eventually reach harvestable size. Obviously, years of poor walleye production will eventually result in periods of poorer fishing, as these weak year classes move through the fishery. Why the massive differences in walleye reproductive success? In many cases, production of young walleyes has been linked to a variety of environmental factors, from water warming rates to duration of winter. Get the right set of conditions and walleyes explode. Sub-optimal conditions result in poor, or in some cases, failed walleye reproduction.

Although we try to mitigate this variation in walleye production through stocking and by restricting walleye harvest, in many cases, stocking is primarily a cosmetic measure. The success of walleye length limits remains a source of much debate, despite the fact that anglers are convinced of their effectiveness. In most lakes, biologists and fisherman alike remain at the mercy of Mother Nature when it comes to supplying walleyes for us to catch.

Finally, to explain declines in walleye fishery quality in some lakes, walleye anglers need to look no further than the mirror. The impact of angler harvest on walleye populations typically dwarfs anything that muskies can dish out. Not to say that overfishing is a problem in all lakes, but walleye fisheries are typically harvest-oriented, meaning that once a walleye reaches harvestable size its typically headed home for dinner if an angler brings it boatside. A strong year class reaching harvestable size often attracts a swarm of angler effort, and after a year or two of good fishing, things start to calm down a bit, especially if recent production of walleyes has been relatively poor. This is typically when anglers start to complain that something – meaning something besides angler harvest and variable production – has resulted in poor fishing.

Lest we forget, many top muskie waters also support outstanding walleye fisheries. Lake of the Woods, Lac Seul, Mille Lacs, Vermillion, New River, etc. In a lot of cases what's good for muskies – good habitat, good forage base, and effective fishery management – is also good for walleyes. One of the few studies that mentions the relationship between muskie abundance and walleye populations found that high walleye abundance coupled with relatively high muskie abundance was a good indicator of where self-sustaining (no stocking needed) walleye populations existed in Wisconsin lakes*. In a nutshell, we have little scientific evidence or reason to suspect that the quality of walleye populations is regulated by muskie abundance.

* Nate, N.A. and five coauthors. 2003. Predicting the occurrence and success of walleye populations from physical and biological features of northern Wisconsin lakes. North American Journal of Fisheries Management 23:1207-1214.

**(Excerpt) The Next Bite – Summer 2006**
**The Real Deal [Column]**
**By Colby Simms**

Muskies have gotten slapped with a bad rap over the years. Many anglers that pursue other species such as crappies, walleyes and bass have had negative feelings about muskies and muskie fishing. Many of them believe that muskies eat the fish that they target, and damage the fishery by doing so. While it is true that a muskie may eat the occasional gamefish, these fish species are not typically the muskie's preferred prey and are not used as forage as often as many baitfish species are.

One of the likely reasons that many anglers have held onto the belief that muskies damage the fishing for other gamefish species is because they've probably had a muskie follow or even attack a smaller gamefish that is on the end of their line. The common school of thought is that if this occurs once in a while when they happen to be on the water fishing, that it must happen all of the time. What many fail to take into consideration is this fish is being fought by an angler. The fish is struggling and making itself appear injured - a trigger to a muskie's instincts, just as it would be to any other predator. It is because the fish is being played to the boat that the muskie comes in to investigate or attack. How many times though, have we seen a bass attack a hooked bluegill or crappie that's being fought? Bass sometimes attack other bass on the line, pike and walleyes attack other pike and walleyes, catfish attack crappies, and so on. I can't tell you how many times I've been fighting a saltwater fish when it was attacked by a larger or sometimes even a smaller predator in the ocean, with or without teeth. I've even seen big largemouth bass attack small muskies

being played to the boat, but it doesn't mean that they prey on them on a regular basis, and it certainly does not mean that they negatively affect the muskie fishery, just as muskies do not negatively affect the bass fishing.

Studies have shown that baitfish species such as shad, ciscoes, suckers and other similar prey are used heavily by muskies where they are available. In fact, muskies do not typically prefer to eat most gamefish species because of the sharp spines and fins they have. These fish simply do not go down well. Soft-rayed baitfish are much easier to swallow and a much better food source. Perhaps more importantly, they're also more abundant.

Mark Boone is a Fisheries Biologist with the Missouri Department of Conservation and head of Missouri's Muskie Program. Mark advises "I'm not aware of any muskie population that has adversely affected other fisheries. Muskies have prey preferences just like people. In the Midwest, muskies prefer gizzard shad". They also eat carp and suckers that are often common in reservoirs. Muskies have a tendency to eat fusiform fish, long and slender, unlike gamefish species such as crappies and sunfish.

Today's anglers are better educated and less apt to hold strong negative feelings toward fish species that do not adversely affect other gamefish populations. Many of today's anglers are open minded and willing to listen to a case that is well presented.

In the north country, it's easy to show that muskies do not hurt the fishing for other gamefish species by looking at the health of the fisheries where muskies are a native presence. Many of the very best walleye, trout, panfish, and bass fisheries in the north also contain muskies. In fact, some of the best places to target one or more of these species are also some of the best places to target muskies. This is proof that muskies coexist well with other gamefish and do not hurt the fishing for these species. In the south, there's a similar but different school of thought. Impoundments where muskies have been stocked are prime places for the birth of negative attitudes, as they would not likely exist in these waters without stocking efforts. What many fail to realize is that bass and other species were once stocked into these impoundments as well. It's just that they typically existed in these waters for a longer period of time, and may reproduce on their own. These fish populations might not require regular stocking to maintain their numbers.

Anglers have pursued bass, catfish, bluegills and other species on many of these waters for years before the introduction of muskies into the system. In the past, it seemed that every time a cold front shut the action down, someone would blame the muskies. We've all heard it at one time or another. "The muskies are eating all of our fish" is the common statement-when poor weather conditions are actually the culprit, and anglers refuse to change their tactics and adjust to get back on the fish. Again, these attitudes are changing, with thanks in large part to our fisheries biologists and other experts who spread the truth about muskies, but also thanks to knowledgeable muskie anglers who work to change negative attitudes. Many anglers in the south are also beginning to realize that good places to fish for other species also contain muskies. In fact, just like in the north country, some of the best southern muskie waters are also excellent bass, catfish, panfish and walleye fisheries.

Shawn Hirst is a Fisheries Biologist with the Illinois Department of Natural Resources. Shawn has data showing that muskie stocking does not have a detrimental effect on other fish species in a lake. In fact, he offers the following, "During my spring 2005 survey on Kinkaid Lake I recorded the second highest largemouth bass catch rate (bass/minute) on record and the highest crappie catch rate (crappie/minute) on record. Also, the bass population has increased since the muskie stocking program was initiated in 1985." A good idea is to suggest that anglers concerned with the presence of muskies in their favorite waters contact the state fisheries biologist in their area, as this will likely put all of their fears to rest.

Just like stripers and other large predators, muskies utilize large populations of big baitfish like gizzard shad that can grow to an unusable size for most other fish. When large gizzard shad and similar baitfish species grow very large, few predators can prey on them, and they can compete with gamefish for food. Muskies control these large baitfish. Ray Simms and I guide on Kinkaid Lake in Southern Illinois, and have fished its waters for more than 20 years. As regulations have changed, we've seen the entire fishery improve firsthand. The muskie fishery at Kinkaid is excellent and has been getting better and better for many years. At the same time, the bass fishing, crappie fishing and catfish fishing has continued to improve as well. The largemouth bass fishing has really boomed, and we're catching more and bigger bass each year. It certainly seems that the muskies have co-existed quite well with bass and other species in Kinkaid.

Kevin and Brian Duffer have been fishing Missouri's Pomme De Term Lake for many years for both muskies and bass and have had great success with both species. Kevin offers "the fishing for each species at Pomme is rivaled only by the other. The muskies seem to eat mostly shad, and we catch most of our fish on shad imitating lures."

The fishing guides on my team and I have had good bass fishing results in other popular muskie waters like Kentucky's Cave Run Lake, The Chippewa Flowage in Wisconsin and Pipestone Lake in Ontario, to name just a few. It certainly seems that good muskie fishing and good bass fishing go hand in hand, and the same is true for many other species as well, from north to south.

**(Excerpt) The Next Bite – Summer 2006**
**Release 'Em Right [Column]**
**By Pete Maina**

Waves are a prime example of a serious, stress-increasing condition.

In waves, the fish has to get below the surface to revive. The accepted standard of reviving esox over the side of the boat, holding fish by the tail, isn't a good thing in waves. The reason holding upright is a good thing in calmer waters is that you are able to make a tired fish work less to maintain its equilibrium. In the case of big waves, with you being in a rocking boat, the exact opposite is occurring. Your holding it by the tail means the fish has to follow the boat's movement… and the fish's reaction is to fight that. If the fish remains upright on its own, let it go. Remember to try pointing the fish downward at a 30 to 45 degree angle, as it often helps it to go down, but even if it stays up, it is better off.

**(Excerpt) The Next Bite – Spring 2006**
**Fisheries First [Column]**
**By Pete Maina**

There's a study looking at the effects of water temperature on release survival. The study which I first read about in the In-Fisherman magazine (February '05 issue) was a walleye tournament mortality study done by Brian Graeb and Dr. David Willis of South Dakota State University. The study was done in 2002 on a Lake Francis Case (a Missouri river reservoir in South Dakota).

While mortality at individual catch and release events has been studied before, this study was interesting in that they studied three different events, and did things the same way in terms of how fish were handled in each case. Tourney-caught walleyes went through the rigors of fighting, transport and weigh-in. The control fish were collected by electrofishing and held in the same conditions as the tourney fish (round, indoor pools fed by water from the reservoir) for 68 hours. The only significantly differing factor was water temperature.

In an April event, with water temps at 45 degrees, 98 percent of tourney walleyes survived, as did all of the control fish. In a May event, the water was 58 degrees, and now survival of the tourney fish dropped to 82 percent, though all the control fish again survived. In June the water was at 67 degrees (not what we'd normally consider overly warm). Just 20 percent of the tourney-caught fish survived (yikes)! And the control fish all survived.

I don't know about you, but to me, that was very eye opening. It confirms that release/handling/time stressors are additive, but even more obvious and important is that water temperature is a huge factor to consider when considering to how much handling fish can take. In cold water, anglers handle fish a certain way, and basically all of them survive. But, add 20-plus degrees to the surface temperatures and-with the some handling mind you-the majority of the fish the anglers catch die.

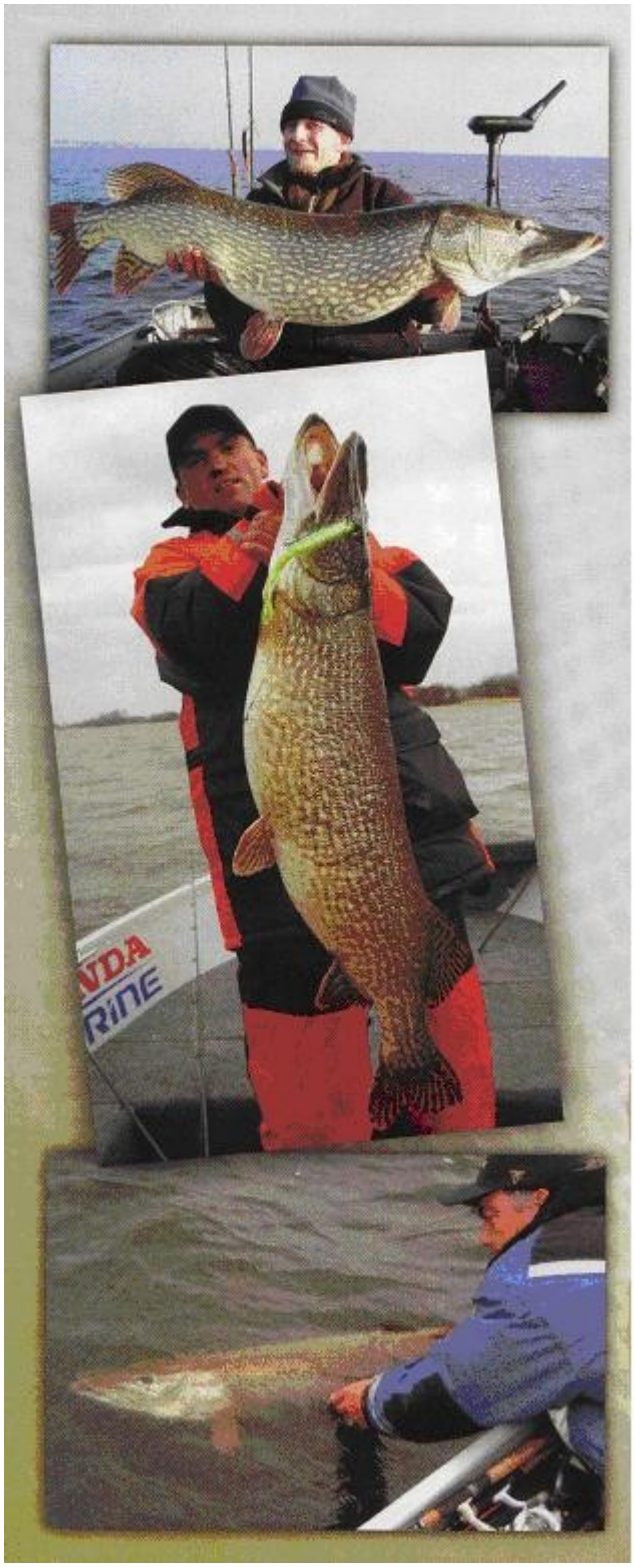
I won't pontificate on all of the implications of this, but obviously it's something to seriously consider for all anglers, guides, TV shows, and for those who operate any release tournament events with formats extending handling holding of fish.

For esox anglers, the lines are gray, but as water temperatures climb into the mid 70 degree range and beyond, if angling, I believe that a barbless hook policy with no lifting from the water to be the most responsible way to handle release under these conditions. Minimize any time and handling stressors. And, boy, if it gets in the 80s, it's time to consider not fishing.

There have been many cases where it seems anglers will ignore common sense (I know I have. And I try not to these days) ... while waiting for some type of study, or info, to "prove" something definitively. My plea here is that we reaccept the basic principles and values of common sense as they apply to fisheries. We just can't afford waiting around for study results before implementing something that is painfully obvious.

**(Excerpt) The Next Bite – Winter 2007**
**Pike in Holland: 25 Years of Catch and Release**
**By Jan Eggers**

One should know pike like this 19.4 kilo [42.75 lbs] fish are not so rare as one might expect. They are caught, and released, every season in Holland. Let me tell you something more about how that became possible.



Until 1997, the main method for catching pike was fishing with live baits, but then live bait use was banned, and lure fishing became the most popular method.

Until -1980, there were no limits for the number of pike one could catch and kill, and quite a number of pike were taken home for the pot. With the increasing number of people, the pollution of the water with nitrates and phosphates became a problem in Holland. The clear waters of the past became, through eutrofication, greener and greener. And weeds started to disappear due to lack of sunlight penetration. More and more good pike habitat disappeared, and serious fishermen started to urge a ban on killing pike, and promoted catch and release. By my personal contacts, people like Gill Hamm of Muskies, Inc., Larry Ramsell, and Dr. Ed Crossman in North America, and Vic Bellars, Neville Fickling and Martyn Page of the Pike Anglers Club of Great Britain, I became convinced of the importance of catch and release of pike.

As a result I started the SNB, Pike Anglers Club of Holland and Belgium, and our logo was a fisherman releasing a pike. I was elected president-a job I held for 20 years. The SNB was well accepted, and is growing fast, with about 2000 members at the moment.

Besides promoting catch and release, we showed people how to fish with the so-called quick strike rigs. I even introduced them in the US. These rigs made it possible to set the hook at once and not let the pike swallow prey fish plus treble(s).

It was not the hardest job to convince pike fishermen that releasing the pike they had caught was good for the future of pike fishing. First of all, some key fishermen and outdoor writers like Bertus Rozemeijer, Keel Ketting, Jan Schreiner and myself wrote a lot of articles in all Fishing magazines in Holland and Belgium about the importance of releasing pike. The argument was simple. You could not only catch bigger pike after some rears, but also, the bigger pike were eating quite a number of bream, a fish which makes the water dirty by looking for bloodworms in the soft mud bottom.

Already after a few years practicing catch and release in my local polder canals, we could see an increase of the number of big pike. The dream limit for pike in Holland is 100 cm, about 40 inches. When a pike of 100 cm was caught in the seventies, it was a sensation, and a picture of this dead pike was shown in local and regional newspapers.

But little by little we saw pictures of pike of 105, 110 and even 115 cm from the same shallow (maximum 3 feet deep) canals. The record for these waters is a fish of 120 cm with a weight of 14 kilos.

**Conversion Table (millimeters to inches)**

| Millimeters | Inches |
|---|---|
| 100 mm | 3.9 in. |
| 200 mm | 7.9 in. |
| 300 mm | 11.8 in. |
| 400 mm | 15.7 in. |
| 500 mm | 19.7 in. |
| 600 mm | 23.6 in. |
| 700 mm | 27.6 in. |
| 800 mm | 31.5 in. |
| 900 mm | 35.4 in. |
| 1000 mm | 39.4 in. |

**Conversion Table (Centimeters to inches)**

| Centimeters | Inches |
|---|---|
| 10 cm | 3.9 in. |
| 20 cm | 7.9 in. |
| 30 cm | 11.8 in. |
| 40 cm | 15.7 in. |
| 50 cm | 19.7 in. |
| 60 cm | 23.6 in. |
| 70 cm | 27.6 in. |
| 80 cm | 31.5 in. |
| 90 cm | 35.4 in. |
| 100 cm | 39.4 in. |
| 110 cm | 43.3 in. |
| 120 cm | 47.2 in. |

The increase in the quality of pike happened not only in more and more polder canals, but also in the big artificial lakes, and pits where they took the sand used for the new parts of the cities, like we have around Amsterdam.

In the southern part of Holland, artificial lakes were formed by closing some sea gaps. In these brackish reservoirs pike and zander were doing very well and it was no exception to hear of 40 pound pike and 30 pound zander caught there.

It is an unwritten law that we don't publish the names of these lakes and sometimes when one of these specimen hunters gives me a nice picture of a fat, pregnant pike mamma, I don't even ask where it was caught. This is a guarantee that I not mention it in my articles and am not .responsible for extra fishing pressure.

One should know that Holland has some different rules regarding record fish registration. In Holland the longest fish is the record, not the heaviest one. So that is also the reason we don't know the weight of a lot of very big pike caught, for they were only measured.

This also makes it easier to release them as soon as possible, and that they do survive was proved a umber of times by catching the same big one later in the season or even one or more years later. This February 2006 I caught a pike of 104 cm that was caught in January 2005 with a length of 99 cm, and in 2004 when it was 93 cm. The split dorsal fin and the scars on its belly show it was exactly the same pike, caught 3 times, in the same area.

**(Excerpt) The Next Bite – Fall 2007**
**Fisheries First [Column]**
**By Pete Maina**

We have increasingly more people – more pressure, with modern tools – and finite water to fish. With increasing pressures, harvest habits have to change. People catch and release voluntarily, and folks are good stewards of the resource. The reality, though, especially with modern tools like high tech electronics and modern boats and motors, is that a few can do much damage. Many became aware of two distinct examples in the state of Wisconsin this past spring.

The following is an excerpt from an article by Dean Bortz, editor of Wisconsin Outdoor News, from the May 4, 2007 edition:

> Lac du Flambeau. Wis. A 57-inch muskie was speared by Jerome LaBarge of Lac du Flambeau on Sunday, April 22. LaBarge told 2 sport shop owners that he had also speared a 53-inch tiger muskie four nights before. One source called Wisconsin Outdoor News to remind the newspaper that LaBarge is one of three Lac du Flambeau tribal members who were involved in the "Big Carr walleye incident" from last spring. Three tribal members were cited for spearing too many large walleyes from Big Carr Lake in Oneida County last spring. The Lac du Flambeau tribal court suspended LaBarge's off-reservation spearing privileges for this year, as part of the penalties for that offense, according to Lac du Flambeau tribal attorney Terry Hoyt.

Also this past spring, there was a push by many anglers to increase the size limit for muskies from 50 to 54 inches on the Bay of Green Bay. The muskies fishery is very low density there – and yet due to fall and spring movements in the system, fish seem to be very vulnerable to anglers at times.

The size limit itself, to me, is good news, but the "why" behind the effort certainly isn't. The reason I say this is that these potential changes (they're still not officially in place at the time of this writing) are reactive rather than proactive. In a case like this, for the good of the fishery, it would be best that the protective limits are put in place as soon as the growth rates are documented, as the low density and vulnerability is a known factor on this body of water.

I heard rumblings last fall and through the winter that there were quite a few large muskies harvested – fish in the 50-inch range – and that a particular angler took multiple fish… If even half of what was reported was true (Maybe a generous assessment. These are fish stories, after all…), it wasn't good news for the fishery.

Fishing pressure can increase dramatically – and near instantly – with the first "guess what I caught" report.

I spoke with Captain Dennis Radloff of Sterling Guide Service, who was fishing the Bay last fall, to get an idea of what occurred. Apparently, the one individual keeping multiple big fish is a taxidermist who likes to mount large fish for display. Dennis said that Randy Tripkee harvested six fish over 50-inches last fall. On one day, two fish were kept that an angler with him caught – technically legal, as there were two licenses in the boat. Dennis also said he knew for certain of four other muskies over 50 inches harvested, and said likely there were more he wasn't personally aware of.

Certainly, quite a bit of damage was done to a low density population. There are significantly fewer large muskies to catch now, and we know they grow slowly even on systems with exceptional growth rates. There is obviously a negative affect on reproduction potential.

In reality, it was only a handful of anglers – a small percentage – who were fishing there with any intent to harvest legal muskies, but to me there is no doubt that this is a pretty obvious example of why we continue to need regulations to protect fisheries. Of course, regulation should be specific to the species and each fishery's dynamics to be truly effective.

What I really hope is that more anglers are able to recognize the need for protective regulations.

An issue I believe to be very important with regard to regulation, and muskies specifically, is the fact that currently anglers are able to take multiple fish during the course of a season. Considering the densities of muskies, allowing anglers a bag limit of one a day with no seasonal limit is, to me, poor management. There is plenty of evidence to suggest that while intentional harvest for muskies is performed by a minority of anglers, a minority of these are satisfied with stopping at one. I think the time has come for the purchasing of a muskie stamp to be required to harvest muskies – and that the harvest should be limited to one or two

(maximum) a year, rather than one or two a day. Fish would be registered like turkey or deer. It would do more to protect muskie fisheries from over harvest by individuals and this would be very valuable management information for biologists.

**(Excerpt) In-Fisherman April/May 2004**
**Bits & Pieces [Column]**

**Holding Big Fish by Gord Pyzer**

Conservation Science


Is there evidence to suggest that holding a big lake trout, muskie, pike, or catfish by its jaw or gill plate, without supporting its belly, can be injurious? Rob Swainson, who manages Ontario's Lake Nipigon and Nipigon River, says anglers need to handle big trout differently than small ones. Swainson remembers landing his first big trout. He gloved it by the tail and lifted it out of the water – that's when he heard a popping sound-as the vertebrae separated in the fish's backbone.

If holding a heavy fish vertically by its gill plate, without supporting its belly, can result in damage, why do we catch so few fish with obvious injuries? Swainson says he's only seen one or two large lake trout with deformed backbones. "I'm not surprised," he says, "because popping vertebrae likely means death for big fish. They swim away, but I doubt they survive.

"Big fish need extra body support," he says. "If someone were to lift you up," he asks rhetorically, "would you want to be held by the neck? Or would you rather be lifted by putting both arms under your body?"

As an assistant hatchery supervisor, Ohio biologist Elmer Heyob sees more fish with deformed backbones than most field biologists see. Most of the fish he sees with crooked spines are survivors of genetic defects. You don't see them in the wild, he notes, because they never make it past the fry stage.

Like Swainson, Heyob is an avid angler, with muskies a particular passion. He says one problem with holding a big fish vertically is that the fish appears to calm down. Heyob says the fish are calm only because they're nearly paralyzed from vertebrae strain.

Heyob: "We have an Ohio-based muskie club annual tournament that Ohio Division of Wildlife personnel often attend. We keep a redwood measuring board handy that we also use in our research. One of the contestants caught a muskie that they hung from a hook at the marina. When they measured it with a tape it was 51 inches long. When we remeasured it on the board it had shrunk back to 49 inches." The extra length was from vertebrae separation.

If you must measure a fish, Heyob and Swainson recommend doing it while the fish is in the water alongside the boat. "In a perfect world," Heyob says, "we'd just look at the fish in the water and remove the hooks. But many anglers want a picture or two and sometimes the actual weight of a big fish."

When lifting a large fish out of water, it's essential to support most of its weight with one hand under the belly. It's the same for using one of the new tools that grips a fish's mouth and contains a built-in scale. A more fish-friendly weighing method, according to Heyob, is to lift the fish in a knotless net turned on its side, using the gripping tool to hang onto the hoop to get the weight (subtract the net weight).

**(Excerpt) In-Fisherman April/May 2004**
**Bits & Pieces [Column]**

## DO LANDING NETS HARM FISH?

**Conservation Science »** In-Fisherman has long recommended the use of thick rubber or knotless-mesh nets to land fish, rather than nets with knotted thin nylon or rayon open meshes that more readily scrape away fish slime and injure fish.

Researchers from the University of Illinois and Canada's Queen's University* recently compared the injuries and mortalities of bluegills caught by anglers and landed with four types of nets—rubber, knotless nylon, fine-knotted nylon, and course-knotted nylon nets—to fish caught and held out of water an equal time but not netted. Fish were caught in an Ontario lake when surface temperatures were 79°F. Anglers used circle hooks and only fish hooked in the upper jaw or lip were studied. Dorsal spine clips identified the landing method used for each fish.

No hand-landed fish died during a 7-day holding period, but mortality rates ranged from 4 to 14 percent for fish landed with nets. Mortalities occurred between 2 and 5 days after capture.

Retention in a landing net for 30 seconds caused more fin and skin damage than in hand-landed fish. Dying fish exhibited impaired swimming ability, severe tail fin erosion, and expanding fungal lesions near their tails, starting approximately 24 hours prior to death.

Bluegills landed without nets had fewer obvious injuries. Knotted-mesh nets caused more fin and skin damage than knotless or rubber-mesh nets. Knotless-mesh nets

**Total mortality of bluegills landed with various types of nets.**

| Treatment | Sampling | Total mortality (%) |
|---|---|---|
| Control | 50 | 0 |
| Rubber | 50 | 4 |
| Knotless | 50 | 6 |
| Fine knotted | 50 | 14 |
| Coarse knotted | 50 | 10 |


**(Excerpt) In-Fisherman August/September 2006**
**Bits & Pieces [Column]**

HARVEST EFFECTS ON FISH SIZE

Genetic Indicators—

Harvesting the largest individuals from a fish population introduces genetic changes that harm the overall fish population, according to a study published in the February issue of Ecology Letters. Removing the large fish over several generations caused the remaining fish to become progressively smaller.

Researchers conducted harvest experiments on Atlantic silversides under a variety of regimens. They reared the fish through five generations, selectively removing the largest individuals from each. They then evaluated multiple traits, such as body size, from the fifth generation. "We found that removing the large fish in each generation, as in most fisheries, caused declines in many aspects of the life history, physiology, and behavior of this marine fish," Matthew R. Walsh says.

Walsh observes that commercially exploited populations of fish often are slow to recover because fishing selects for evolutionary changes in the life history of the fish. "To effectively manage exploited fisheries, the impacts of these genetic changes must be considered and accounted for. Because changes in the fish are genetic, they don't immediately go away when fishing ceases," he says.

In-Fisherman

Adapted from Fisheries News column, Fisheries, Vol. 31, No. 2.

**In-Fisherman May-June 2006 (Vol. 17 No. 4 )**
**Gulp Goes the Walleye**
**A selection of pertinent science topics as seen by staff fishery biologist Steve Quinn**

LIKE MANY POPULAR WALLEYE WATERS, northern Wisconsin lakes typically contain largemouth and smallmouth bass, pike, and muskie, in addition to walleye. A recent study by Wisconsin biologists indicates that all these species interact, but only largemouth bass influence walleye numbers and growth rates.*

The two species varied inversely: In lakes with self-sustaining populations, more largemouth meant fewer walleyes, and vice versa. This could be the result of bass predation on walleyes or water-quality factors that might favor bass over walleyes. Almost 5 percent of the largemouth diet consisted of walleyes, though walleyes ate few bass. High bass numbers also corresponded to fast walleye growth, presumably as bass predation reduced the number of small walleyes competing for limited food supplies. Also, walleye stocking success decreased as bass numbers increased, likely due to predation.

In one lake with natural walleye reproduction that was stocked with 39,300 additional juvenile walleyes, data suggested that largemouths could consume up to 82,500 juvenile walleyes per year. The investigators concluded that walleye stockings into waters with strong largemouth bass populations primarily boost bass populations. Management to maximize both species in those waters may be unrealistic.

Ralph Manns

* Fayram, A. H., M. J. Hansen, and T. J. Erlanger. 2005.
Interactions between walleyes and four fish species with implications for walleye stocking.
N. Amer. J. Fish. Mgmt. 25(4):1321-1330.

**(Excerpt) In-Fisherman February 2008**

**State of the Squaretail**
**By Matt Straw**

Wild brook trout of the northeast now occupy less than 50% of the stream miles occupied in pre-colonial times, according to Eastern Brook Trout Joint Venture.

**(Excerpt) In-Fisherman 2008 Guide – Pike & Muskie**

**State Of The Muskie Union**
**By Gord Pyzer**

[Gord Pyzer wrote up] the legislative package to increase the muskie size-limit on Lake of the Woods from 40 to 48 inches. It was seen as a bold move at the time. The first 4-foot-minimum muskie size-limit imposed anywhere in the world. It worked better than anyone could have imagined.

Almost immediately, anglers reported seeing a startling increase in the average size of the fish they were catching. Even the technicians and biologists, checking the trap nets, were surprised at the number of muskies that were suddenly poking their noses on the 48-inch limit.

In [one top fishery], so many giant fish were killed in such a short period of time that famed muskie researcher, Dr. Ed Crossman, feared the 350 estimated surviving mature muskies might not find each other in the spring to spawn.

As things calmed down and high-quality muskie management became the norm rather than the exception the minimum size-limit was raised even higher. Today, the region's marquee muskie waters, containing genetically pure wild strains of native muskies, are protected by a 54-inch minimum size-limit.

[Guide Scott Jaeger commented] "I caught six over 50 inches, including two 53-inch muskies this past summer. People used to kill everything, especially the non-muskie anglers who would catch a fish accidentally. But the regulations now protect the population, they're spawning successfully, and there's a pile of 38-to-42 inch muskies coming into the fishery."

[Doug Johnson, famed musky angler, commented] "The last four years I've seen numbers of fish from the strong 1995 through 1997 year-classes. Those muskies are 48 to 52 inches long. The 2000 to 2003 year-classes also are strong, and those fish are showing up as 38-to-45 inchers."

Even in lakes [noted for large numbers of big fish], where fishing pressure spiked after anglers descended on the [certain sections] in the mid-1980s and early 1990s, there weren't enough big fish for every angler to kill his or her personal best., even if it was only a single fish. Within a few short years, the catch-per-unit-effort data showed it was taking anglers twice as long to catch a muskie half as large as it was before the word got out. A total catch-and-release muskie regulation was implemented on the and it's paying off.

Is there a way to perhaps fine-tune regulations to produce even bigger, say 60-inch plus, 65-pound, world-record fish?

Doug Johnson doesn't think so. He says the regulations have done a superb job, but that it's now up to muskie anglers to do their part by better handling of the fish they catch and release.

"It's particularly a problem with the bigger fish," he says, "as they're harder to handle and more likely to be photographed numerous times. There's really no need to take ten photographs of these fish."

When muskie anglers use quick-strike rigs properly, they likely injure no more fish than when casting lures. Charles Weiss of Muskie's Canada [Canadian fishing club] adds "using livebait is backward, in my view, and shows a disregard for the fish."

Gord Bastable, owner of Vermilion Bay Lodge, states prohibiting angling at night might produce positive benefits. It was banned years ago as a strategy to protect the walleye fishery but has paid unexpected benefits for the muskie population. Might expansion of the regulation produce similar results elsewhere?

Ontario researchers Dr. John Casselman and the late Dr. Ed Crossman assembled one of the most massive muskie data banks ever, reviewing the catches of over 74,000 muskellunge, and carefully examining the cleithrum bones from another 2,400 trophy-sized fish.

The data indicate that muskies can live to be 30 years old. But few fish achieve that longevity, and the maximum age of late appears to have decreased by two years. If that's the case, it means that the annual mortality rate – likely caused by poor fish-handling methods – has increased from 18 to 20 percent. That may not sound significant until you remember three things: muskies spawn throughout their entire lives; the biggest fish lay the most eggs; and the giants usually always result from the largest year-classes.

Viewed in this context, say the scientists, you'd need a 70-percent increase in annual recruitment to ensure that the same number of muskies reach their maximum age and thus maximum trophy potential.

Indeed, if we can reduce the mortality of the oldest and biggest muskies by 2 percent, we can restore the number of giants to their previous levels of abundance. Better still, if we can further reduce the mortality rate of the biggest fish by another 2 percent through improved fish-handling techniques, we can effect the same positive changes as if we had increased the annual recruitment of muskies by a staggering 70 percent.

Anglers have discovered that most of the prime muskie waters in Northwest Ontario also offer wonderful smallmouth fishing. And many of the best muskie pots are also ideal bass fishing locations at certain times of the year. Bass anglers cast smaller lures, typically topwaters, crankbaits, and jerkbaits with multiple treble hooks. And they rarely use wire leaders.

Not surprisingly, it's common for bass anglers to be "bitten off" by pike and muskies several times a day. These small lures, at times inhaled deeply by giant muskies, are the cause of significant "accidental" mortality. With the advent and availability of premium light-wire and titanium leaders (and tie-able wire), smallmouth anglers would not only save themselves plenty of expensive lures, but they'd also increase the potential of catching the muskie and decrease muskie mortality.

**(Excerpt) River Predators © 1990 -- Whitewater Publications**
**By Dan D. Gapen, Sr.**

P. 4

Fishing river mouths along Lake Superior's northern shore remained good long into the 1950s. More rivers were researched, and new fisheries were discovered. Finally, in the mid 50s, the huge pike stopped coming. Some blamed commercial fishing and paper mills which festered along the giant lake's northern shoreline. I'm not sure why the decline, but somehow those two, along with angling pressure, may have created the demise in spring pike runs. It was at the time the sea lampreys became a problem in Superior's lake trout fishery. This, too, may have been to blame.

P. 5

Yes, big pike are back in the rivers which flow into Lake Superior but not in the numbers I once knew.

P. 13

The surprising factor about reproduction in northern pike is the mortality of its eggs. Egg death is listed at 99.8 percent. That is a hatching success of 1800 young fish to leave the spawning grounds out of a million eggs hatched. To make matters worse, tiny pike will prey on their brothers as easily as they do on other species.

**(Excerpt) Pike and the Pike Angler © 1971, 1981 – Stanley Paul & Co. Ltd**
**By Fred Buller**

P. 51

Natural enemies play their part, as do the scourges of drought, disease and starvation, to ensure that a reciprocal counterpoise is re-established in the plant and animal kingdoms after a population explosion of this or that plant or animal has caused a temporary imbalance.

The No. 1 enemy of small pike is a bigger pike, but the traditional foremost natural enemies of medium and big pike, namely the osprey and the otter, have declined (in numbers) to such an extent that it can be said that in Britain a big pike has only one enemy left – man.

P. 70

A pike of 3 lb may lay 28,500-41,700 eggs; a pike of 10 lb, 85,000-122,000 eggs, and a pike of 15 lb, 186,000-226,000 eggs.

The weight of female gonads (ovaries), expressed as a percentage of the total body weight, increased from about 2 percent in August to about 7 percent in October; 10 percent in November; 12.5 percent in December; 14 percent in January; 15 percent in February; and finally, when fully ripe, up to 18-20 percent.

P. 84

Keen Buss, American fisheries biologist, tells us that out of a total of 250 references and personal communications, many of the latest reports refer to the importance of pike populations in maintaining good lake fishing.

In America the belief that the piscivorous (fish-eating) habits of the Northern pike were detrimental to other fishes has persisted down the years.

A few adult spawners die each year on the spawning grounds. In Michigan, at least 7 percent of the breeders died in the spawning area. A number of spawners apparently jumped out on the bank, some died from injuries suffered in spawning and some were eaten by larger pike and other predators.

The greatest mortality factor is predation on fry. The losses of eggs due to egg predators was estimated to be 98 percent and by the time the fry had reached .8 inches the total mortality was 99.4 percent.

P. 165-167

I had a flash of insight into the probable feeding behavior of pike after I read an account of some studies on the behavior of the lions of the African plain. The African lion, previously thought by all to be the epitome of the killing kind (just like the pike), who is said to murder all he meets with, is in reality a scavenger as well as a killer: an anneal that prefers to clear up the dead or steal another's kill rather than go to the bother of making its own kill. Perhaps the pike is like the lion in that it doesn't extend itself unnecessarily.

I gained an insight into what might be going on under the surface of one of Britain's biggest lakes, Loch Lomond, where pike feed to a considerable extent on powan (Coregonus), by reference to a scientific paper, `Studies of Loch Lomond', written by Dr H. D. Slack:

`Fish as young as eighteen months and as old as ten years were examined but scale readings showed that three- and four-year-olds predominated.'

From this I began to speculate on the fate of the flourishing four-year-old fish who nevertheless seldom survive to become five-year olds. What happens to them'? The most simple explanation is the most likely one: they die and sink to the bottom. A few get washed up on the banks but thousands, even tens of thousands, do not. They just disappear. Where? I suspect they go down the throats of pike and eels as do the casualties of all the other species inhabiting the loch.

To help get this matter in focus we should remember that if the mean turnover of fish life in a fishery is five years then each year practically one whole year class, possibly 25 per cent (by weight) of the population of fodder fish becomes available in the form of dead or dying fish to the pike and other scavengers. In a large lake we can be sure that the total weight of these fish can be measured in tons rather than hundredweights.

If the figures given reflect a reasonably accurate picture of the true situation that obtains in a fishery, then they indicate why pike readily accept deadbaits: such behavior is routine, based on the pike's economic preference.

In English pike-angling literature the pike has been referred to as the `fell tyrant of the watery plain'. There is no doubt whatever that pike in the northern hemisphere, in situations where they face no competition from the Wels catfish or the muskie of North America. are at the apex of the predator food chain. And, from what we know of their scavenging habits, they are probably at the apex of the scavenging chain as well.

From our new-found evidence (although so far as I know no scientific study of the pike's diet, vis-à-vis the proportionate intake of dead or live food, has been conducted), we can speculate as to the pike's preferred method of feeding - although we are still unable to describe the pike's preference for individual food items since the pike may, for all we know, prefer to eat a trout (dead or alive) rather than a perch in either state.

1. The pike's first preference is to pick up any worthwhile fish or food morsel found dead in its path. Reason for this behavior: maximum economy of effort.

2. The pike's second preference is to strike at any worthwhile injured or sick fish or food morsel that it chances upon. Reason: assured success with economy of effort.

3. The pike's third preference is to ambush a live food item of preferred size (15-20 per cent of its own weight). Reason: to preclude the need for further effort in the immediate future.

**(Excerpt) Walleye © 1983 – Cowles Creative Publishing**
**From the 'Hunting and Fishing Library'**
**By Dick Sternberg, Minnesota Department of Natural Resources, Retired; considered one of the top walleye anglers in the U.S.**

P. 26

Originally, walleyes were found only in a triangular area extending across Canada and south to Alabama. But as a result of widespread stocking, they are now found in almost every state and province. Few attempts have been made to introduce walleyes outside North America.

Two subspecies of walleyes have been identified in North America: the yellow walleye, Stizostedion vitreum vitreum, and the blue walleye or blue pike, Stizostedion vitreum glaucum. The yellow walleye, commonly referred to simply as walleye, is the only remaining subspecies.

Yellow walleyes usually have an olive-green back, golden sides and a white belly. Distinctive markings include a milky-white tip on the lower lobe of the tail and a black blotch at the rear base of the spiny dorsal fin.

Blue walleyes had a steel-blue back, silvery sides and larger eyes. They were found only in lakes Erie and Ontario. But due to severe water pollution and excessive commercial fishing, they are now thought to be extinct.

P. 29

Much of the seemingly mysterious behavior of walleyes can be explained by their acute night vision, finely tuned lateral-line sense and sharp hearing. They also have a good sense of smell, but it does not appear to play a prominent role in their life.

P. 30

YELLOW PERCH make ideal prey. They have poor night vision and cannot see an approaching walleye. At night, perch rest with their fins touching bottom. Scuba divers have caught resting perch with their hands.

Like most other predatory fish, walleyes are opportunists. They eat whatever foods nature provides them. In many mesotrophic lakes, walleyes feed primarily on yellow perch, often stalking them at night on shoals less than 5 feet deep. In the Missouri River reservoirs of North and South Dakota, walleyes frequently eat smelt, which they sometimes follow into water over 100 feet deep. In southern reservoirs, walleyes commonly suspend to feed on gizzard or threadfin shad, pursuing them in wide expanses of open water.

Although small fish make up the bulk of the diet in most waters, there are times when walleyes feed almost exclusively on insects, both immature and adult forms. Occasionally, walleyes eat snails, leeches, frogs, mudpuppies, crayfish and even mice.

The abundance of natural food is the major factor that determines how well walleyes bite. When food is scarce, they spend much of their time moving about in search of a meal, so the chances are greater that they will take your bait or lure. But when food is plentiful, the opposite is true.

A commonly heard old wives' tale is that walleyes refuse to bite in summer because they have sore mouths. But in reality, they are consuming more food than at any other time of year. Fishing picks up again in fall when predation and other natural mortality have substantially reduced the crop of young baitfish.

Fishing success in a given body of water can change dramatically from year to year, depending on whether or not there is a good baitfish hatch. Occasionally, baitfish become so abundant that walleyes are almost impossible to catch in midsummer.

In some years, adverse weather prevents baitfish from spawning successfully. As a result, forage is scarce.

P.32-33

Compared to most other freshwater fish, walleyes can tolerate an exceptionally wide range of environmental conditions. This explains why they are found from northern Canada to the southern United States.

SPAWNING HABITAT. Shallow. rocky shorelines and reefs make ideal spawning habitat. The eggs fall into crevices between the rocks where they are safe from crayfish and other egg-eating predators. Spawning is most successful in large lakes because the spawning habitat is exposed to the wind. Some wave action is necessary to prevent the eggs from silting over and keep them aerated. So it is not surprising that lakes of this type have the highest walleye populations. Walleyes can also spawn in rivers and streams, if there is enough rocky bottom.

pH. This is a term used to denote the acidity or alkalinity of the water. pH is measured on a scale from 1 to 14, with 1 the most acidic and 14 the most alkaline. A pH of 7 is neutral. Fishing waters usually have pH levels ranging from 6 to 9. If the pH drops below 5.5, walleye eggs do not develop properly, so the fish eventually disappear.

Canadian researchers have found that adult walleyes avoid pH levels below 6 or above 9. But within that range, pH has no effect on walleye behavior. Because the walleye's pH comfort range corresponds to the range found in most waters, there is no need to concern yourself with pH.

**(Excerpt) Northern Pike and Muskie © 1992 – Cowles Creative Publishing**
**From the 'Hunting and Fishing Library'**
**By Dick Sternberg, Minnesota Department of Natural Resources, Retired; considered one of the top walleye anglers in the U.S.**
NOTE: The author is the same author of the book on walleye in the library series

P. 9-10

A sea of misinformation surrounds the northern pike and muskellunge. Even today, we hear stories of huge pike or muskies attacking swimmers or charging outboard motors. Such tales make good copy in magazine articles, but only serve to perpetuate the "evil" image of these fish.

Of course, pike and muskies are the top predators in any body of water, and they'll eat larger prey than most other freshwater fish. But they're not the ruthless killers they're commonly portrayed to be.

Northern pike and muskellunge, along with pickerel, are sometimes referred to as Esocids; they belong to the pike family, whose technical name is Esocidae.

Muskies seldom reach the population density of pike. Although they deposit just as many eggs, the hatch rate is lower, and because pike hatch earlier, they prey heavily on young muskies.

Compared to pike, muskies are more selective as to what they eat. Muskies can afford to be choosy; pike can't. Since muskies aren't as numerous, they face less food competition from other members of their breed.

Because pike aren't as selective, they're much easier to catch. In a creel survey conducted on a Wisconsin lake, angler removed 50 percent of the pike crop in a single season.

The relative ease of catching pike makes them extremely vulnerable to overfishing. In most heavily fished waters, pike over 10 pounds are unusual.

All Esocids are excellent food fish, with lean, white, flaky, mild-tasting meat. Muskies, however, are too scarce to kill for the meat. Release them to fight another day.

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A few days after depositing their eggs, females leave the spawning area. Males usually stay around for several weeks, but do not protect the eggs. With no parents guarding them, the eggs are vulnerable to predators such as crayfish, predacious insects and small fish.

The hatch rate of the eggs is highly variable, but pike eggs hatch at a much higher rate than muskie eggs. Pike eggs sink slowly and are adhesive, so they cling to vegetation. Muskie eggs sink more rapidly and are not adhesive, so many of them settle into the mud and die from lack of oxygen.

In waters with both pike and muskies, pike fry get a head start because of the difference in spawning time. Consequently, they're larger and can easily prey on muskie fry. In one experiment, 25,000 pike fry and 25,000 muskie fry were stocked in a pond. A month later, 409 pike, but only 4 muskies, remained.

"I have always believed that a bounty should be paid for big muskies. Their appetites are voracious. Often they kill for the sheer fun of it, and the destruction they can do in an hour is appalling. "Harry Botsford - Field and Stream magazine - August 1956

Writings like this have contributed to the widespread misunderstanding of muskies and pike. Often called "water wolves," these toothy predators inspire wild visions in the minds of the uninformed. As a result, many anglers have the attitude that the fish shouldn't be stocked in their waters for fear of wiping out bass, walleyes and other "more desirable" gamefish. The following discussion summarizes the latest research into the feeding habits and growth of pike and muskies.

In reality, pike and muskies consume about the same amount of food in comparison to their weight as most other freshwater fish.

Throughout the rest of their lives, fish continue to make up the bulk of their diet, but they will eat practically anything within the acceptable size range, including frogs, crayfish, mice, muskrats and ducklings.

Given a choice, both species would choose a soft-finned, cylindrical-bodied forage fish, such as a sucker, over a deep-bodied, spiny-rayed fish, such as a sunfish. The latter type would be harder to swallow and more likely to lodge in their throat. But in reality, pike and muskies eat plenty of sunfish, perch and other spiny-rayed fish, probably because they're commonly found in Esocid habitat.

[Pike] feed year around, but if the water temperature exceeds 75 in summer, the quantity of food they consume drops dramatically

Poor summertime pike fishing is mainly a result of this feeding slowdown, not loss of teeth as many anglers believe.

In many lakes; pike become so numerous that they dramatically reduce the crop of forage fish, resulting in severe stunting. Lakes with plenty of high-fat forage, such as ciscoes or smelt, produce considerably fewer pike, but the fish are big and deep-bodied.

Although anglers often accuse muskies of cleaning out all the forage in a lake, rarely do the fish become numerous enough to cause a food shortage. As a result, stunting is a far less serious problem with muskies than with pike.

Water temperature also affects growth. Pike grow fastest at a water temperature of about 66ºF; muskies, about 73.

The rapid growth of northerns in cool water explains why deep lakes usually produce bigger pike than do shallow ones. In summer, shallow lakes warm uniformly from top to bottom; so pike cannot find cool water. When forced to live at temperatures well above their comfort range, they grow slowly and their life span is much shorter than normal.

In warm water, pike seldom live more than 6 years; muskies, 12. But in cool water, both species may live 25 years or more. The Canadian-record muskie, a 65 pounder was determined to be 30 years old.

Pike reach a maximum size about two-thirds that of muskies. The North American record pike weighed 46 pounds, 2 ounces; the record muskie, 69 pounds, 15 ounces. Pike from Europe and Asia approach the muskie's maximum size. The largest well-documented Eurasian pike weighed 67 pounds, 4 ounces.

On the average, Eurasian pike outweigh North American pike of the same length by about 13 percent. Pike genetics differ very little throughout their range, so it's uncertain why Eurasian pike are heavier-bodied.

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Throughout much of the northern pike's range, overfishing has resulted in a dramatic decline in average size of the fish. Because pike are so aggressive, even moderate fishing pressure may cause problems. The results of overfishing are soon obvious. The big, deep-bodied pike disappear and are replaced with a much denser population of skinny, underfed pike that weigh less than 2 pounds.

Because of the catch-and-release ethic among muskie anglers and minimum-size restrictions, the decline in average size of muskies has not been as dramatic as that of pike. Many states have recently imposed higher minimum-size limits to further reduce the harvest of small- to medium-sized muskies. Although big muskies are harder to come by than they were a few decades ago, an impressive number of good-sized fish are caught each year.

To provide quality pike fishing in the future, conservation agencies in some states and provinces have established regulations to limit the harvest of big pike. And it's likely that many more agencies will follow suit in the near future.

Despite the trend toward more stringent pike regulations, a few states and provinces still allow darkhouse spearing in winter. This practice is a throwback to the days when pike were regarded as "snakes," fish not qualified for gamefish status. And there's no doubt that pike size has dramatically in almost all heavily speared lakes. Michigan and South Dakota also allow darkhouse spearing of muskies on certain waters.

Several states permit underwater spearing of pike with SCUBA gear and in Vermont, you can shoot pike in spawning streams with handguns.

Increasing turbidity levels in many streams have resulted in serious declines in muskie populations. The problem usually results from erosion of stream-banks or agricultural lands in the watershed, or from pollution. Although muskies can tolerate turbid water for a short time, they disappear when it persists for a prolonged period. They cannot feed as well as they should, and sedimentation may smother their eggs.

Perhaps the most serious and difficult-to-solve problem facing pike and muskies is the destruction of spawning habitat. Often, developers fill in or damage prime spawning marshes to build homes or shopping centers. Spawning habitat also suffers when lakeshore property owners remove nuisance weeds for easier boat access or sand their beaches to improve swimming conditions.

Roughfish can also destroy spawning habitat. Carp, for instance, move into weedy bays when the water warms in spring, roiling the shallows and rooting up vegetation that provides a base for the eggs and cover for the fry.

Yet another reason for loss of spawning habitat: a rapid increase in water fertility, usually the result of agricultural or municipal wastes draining into a lake or stream. When water fertility increases too much, the oxygen level at the bottom drops so low that the eggs cannot survive.

The impressive size and voracious feeding habits of these top predators spur the imagination of even the most rational anglers. The result is a multitude of misconceptions, some of which perpetuate the belief that pike and muskies are undesirable species.

[Myth] - The muskies in the lake air eating all the other gamefish.

This belief often prevails around waters recently stocked with muskies. While there's no doubt that muskies eat some gamefish, they're rarely numerous enough to have a significant impact on other gamefish populations. A dense pike population poses a much greater threat.

[Myth] - Pike and muskies lose their teeth in summer; get sore mouths and don't feed.

The fish shed teeth continuously as old ones break or work loose. The shedding is no greater in summer, and the fish don't get sore mouths. lf fishing slows in summer; it's for one of the following reasons:

- Because of the abundance of natural food, the fish are less likely to take an angler's bait than in periods when food is scarce.
- Pike feeding may slow in summer as a result of high water temperatures, but in most waters, muskies feed heavily all summer long.
- The fish have moved deeper than the majority of anglers are fishing.

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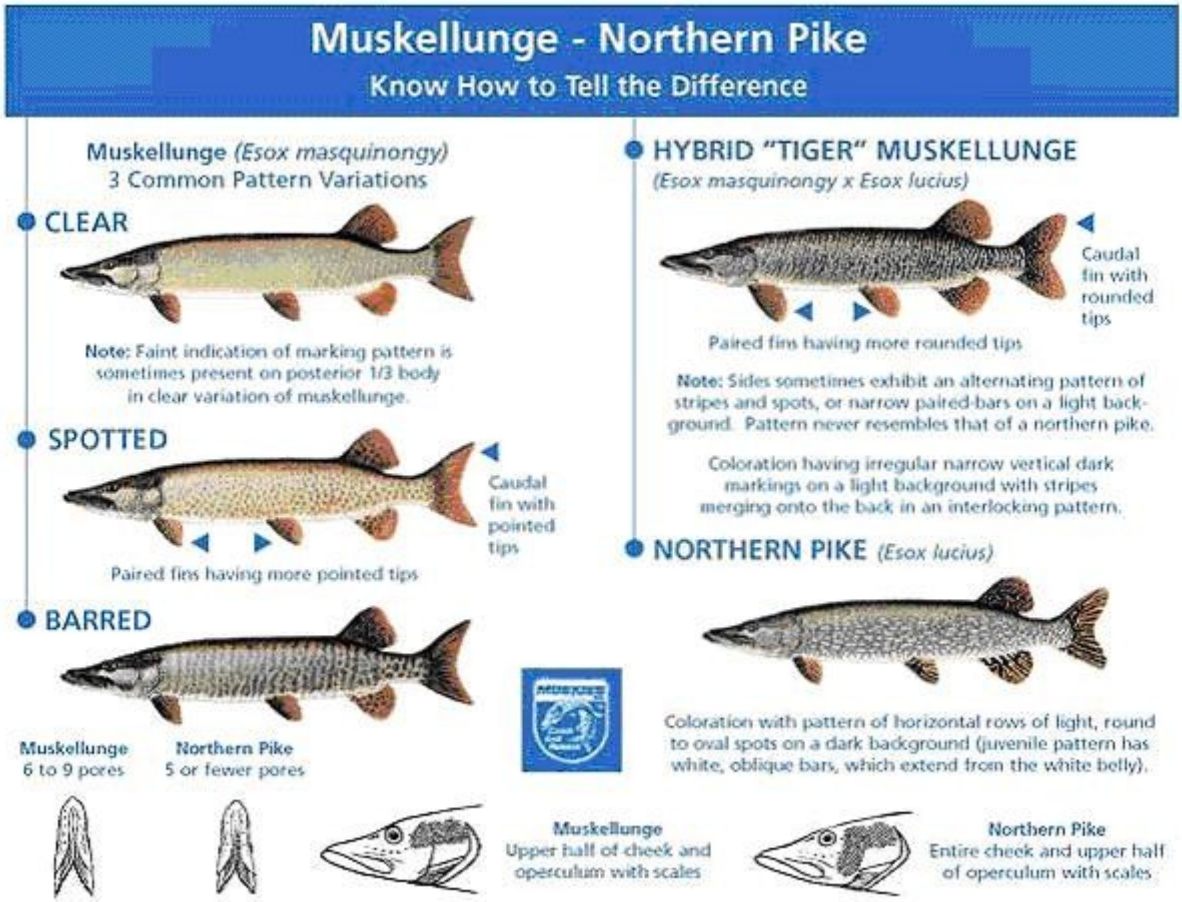
If you want fish to eat, take small pike.

**The following chart is from the following link:**

http://www.musky.ca/difference-between-muskie-tiger-musky-northern-pike.htm



**(Excerpt) Musky Hunter – February / March 2004**
**Release: Let's Do It Right**
**By Brad Latvaitis; fisheries professional for three decades, certified by the American Fisheries Society and an advisory governor to the National Fresh Water Fishing Hall of Fame since 1977**

Few muskies are available per each acre of water. A fishery could never support the mass harvest of its top predator.

In 1966, Gil Hamm founded Muskies Inc. and encouraged a "catch and release" philosophy in 1968. Since 1990, releases in excess of 99 percent have been reported

Scientists use blood and muscle tissue chemistries of fish as indicators of stress level. In catch and release studies, a group of "rested" fish is compared to a group of fish that have either been exercise to exhaustion or actually put on a hook and line and angled to exhaustion. The rested group and the exhausted group are then anaesthetized and blood and muscle tissue samples are collected and analyzed. The results obtained from one species of fish are generally believed to be applicable to other species.

Several external stresses have been identified as potential contributors to mortalities due to angling. For example: l.) several studies document that internal changes and delayed post-angling mortality are enhanced at warmer water temperatures, 2.) in some species, following exhaustion, larger individuals may experience a greater internal disturbance than smaller, 3.) potentially; fish in the best condition (highest condition factors) take longer to reach exhaustion and experience greater post-angling internal disturbance than less conditioned fish, and most importantly 4.) brief air exposure after exhaustion is a significant additional stress which may ultimately influence whether a released fish survives.

All chances for survival improve in colder water. Survival significantly improves when a fish is not removed from the water.

Let's take a closer look at research conducted by Ferguson and Tufts at Queen's University in Kingston, Ontario using rainbow trout. These researchers reported that after one-minute of air exposure following exhaustion, blood lactate continued to increase during the entire observation period (four hours) compared to a peak in blood lactate after one-hour in exhausted fish that were not exposed to air. Also, the peak in lactate was less than half of what the air -exposed fish experienced. Initially, rainbow trout that were exposed to air experienced a dramatic change in blood gases. Importantly, survival after 12 hours was 100 percent in rested fish, 88 percent in exhausted fish, 62 percent in exhausted fish exposed to air for 30-seconds and only 28 percent for exhausted fish exposed to air for one minute.

That research strongly suggests that air exposure significantly increases the potential for death in exhausted fish. This suggestion is supported by data as well as theory. For example, research has attributed mortality after exhaustive exercise to the extent of "intracellular acidosis" within the muscle (this suggests that retention of lactates may contribute to mortality). Equally important is the fact that during air exposure the delicate portions of a fish's gills collapse if they're not supported by water, resulting in a reduction in respiratory surface area and a large reduction in the oxygen content of blood.

Similar to a person who has just finished exercising, the normal response to exhaustion is heavy breathing (enhanced oxygen transport in response to increased oxygen requirements). Taking a fish out of the water after fighting it is equivalent to holding your breath after strenuous exercise. The longer your fish is out of the water, the greater the potential for death.

You can attempt to reduce stress by practicing water release when water is warm. Importantly, release - if we want to do it right - - requires each and every one of us to minimize the amount of time that our [fish] is out of the water.

Take care to offer body support while not removing too much body slime (use gloves) during release.

Have tools ready to cut hooks from the fish and/or net, or to cut your line to make it easier to remove the bait.

**Musky Hunter – June / July 2004**
**Musky Matters [Column]**
**The `Release' Part of Catch and Release**
**By Larry Ramsell**

It is a given in today's musky world that serious musky anglers release nearly all of the muskies they catch, regardless of size. Experienced anglers who have handled many muskies manage this task pretty much without thought. Experience has been their teacher and they proceed with confidence. But what about the occasional angler who has just hooked a nice musky and wants to release it safely?

We are going to assume here, that you already have the proper and necessary release tools handy, such as Hook-outs or long-nosed pliers and a good set of boltcutters. Most anglers today net their muskies, but is it always really necessary, especially on the smaller fish? How many fish photos do you really need? It you net your fish, please keep it in the water at the side of the boat, using your net as a holding pen while you remove or cut the hooks (don't be afraid to cut a hook if it doesn't or won't come out easily).

If you must hold your fish for a quick photo, please support the fish with both hands in a horizontal position and don't keep them out of the water any longer than you can hold your breath!

Now for the important part - the actual release. After you have removed or cut the hooks (and, if necessary taken a quick photo and placed the fish gently back in the water) get control of the musky's tail and hold the fish upright. If, when you loosen your grip the fish starts to tilt, it will need further care. Do not move the fish rapidly back in forth in the water trying to revive it, as you may do more harm than good (pulling a musky backwards through the water can cause damage to the delicate gills, their breathing apparatus). If it fails to stay upright on subsequent attempts to let it go, it may be necessary to "burp" the excess air from its air bladder, which is below center on a musky and can tip a tired fish over. Do this by putting its back against the side of the boat and taking your free hand and sliding it along the fish's stomach from tail toward its head to expel any excess air.

As you are holding the fish, it is best to keep the musky's head lower in the water than the tail and, if anything, gently move the fish's tail from side to side, causing the fish's body to respond in an "S" pattern. This can help revive the fish and cause it to want to "go." If you feel the muscles tense or the fish faintly tries to pull away, let it go. Stay close for awhile and make sure it is okay.

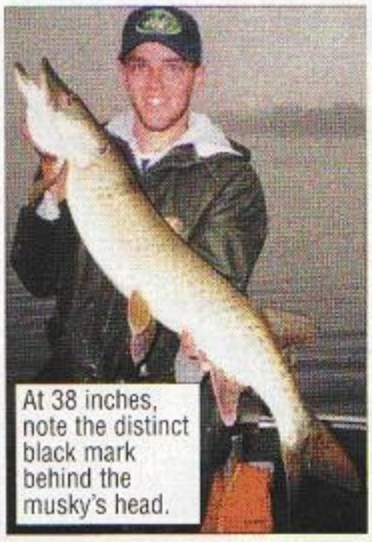
**Musky Hunter – October / November 2004**
**Musky Matters [Column]**

# Evidence Why We Practice Catch & Release

On December 5, 1998, Twin Cities area guide Josh Borovsky caught a 38-inch musky while fishing on a small Minnesota metro area lake. The fish had a unique marking located a short distance behind its gill plate on its left side. A quick photo was taken and the fish was released.

Two years later Josh was bringing in some reels to be serviced at Hayes Tackle Plus in Minneapolis when he noticed a photo of a familiar fish on the bragging board. It was a photo of the same fish that he had caught two years earlier. Josh recognized the angler in the photo as an employee of Tackle Plus. After a brief discussion with the employee, Josh discovered the musky now measured a little over 42 inches. It was caught in the late fall period again within 100 yards of its original capture. The Tackle Plus employee also released the fish.






Believe it or not, the story doesn't end there. Fast forward another two years to November 19, 2003 when Josh caught the same fish again! The fish now measured 45 1/2 inches and had put on considerable girth since its last capture. It was caught within 20 feet of the spot where he originally encountered the fish four years earlier. Josh released the fish again and hopes to reunite with the fish again at a future date.

"I have caught many fish that have been larger than that one. But, there's something extra special and rewarding about catching a fish that you released earlier in its life. Maybe I'll catch it again when it's a 50-incher," Borovsky said.

**(Excerpt) Musky Hunter – December 2004 / January 2005**
**Saving Muskies, One Mount At A Time**
**By Patricia Strutz, fishing guide, Eagle River, Wisconsin (www.ablondandherboat.com)**

Once I was working on a batch of replica mounts," begins taxidermist Rick Lax, "I was painting them and while looking at the photos I noticed three of them were the exact same fish! She was a spotted musky, 51 inches long with a 24-inch girth, and was missing the top part of her tail. Three separate fishermen had caught and released her up on Eagle Lake that summer and were now getting replicas made. Unbelievable! Had one of these anglers decided to keep her, the other two would have never caught their `fish of a lifetime'."

Advances in the world of taxidermy have become integral among anglers embracing a strong catch and release ethic. Release proponents find replica mounts an essential tool. Advocates emphasize the increased pressure on a finite resource and cite replicas as one of the answers for those who want to put a fish on the wall.

Regardless of the debate, replicas play a major part in our sport. They've come along way since their humble beginnings and are becoming more socially accepted and encouraged.

Fish replicas have been produced since the early 1900s for natural history museums. Doug Petrousek of Douglas Taxidermy in Naperville, Illinois, explains, "The quality of skin mounts in those days did not fit the requirements for accuracy and structural integrity needed for minimal maintenance over the years it was on display. In those early years, plaster and mache types of compounds were used for casting since fiberglass was not yet available. Commercially; skin mounts were the norm. Over the years, with the introduction of new types of resins, artificial parts were used in the skin mounts to help overcome some problematic areas in certain species. Most notably, fish such as trout, salmon, and many ocean fish were oftentimes replicated. These oily fish had a tendency to 'bleed out through the gills', causing discoloration on skin mounts."

Though it's difficult to pinpoint the exact time replicas entered the mainstream musky world, taxidermists agree that Victor Birontas of Artistic Anglers in Minnesota was one of the pioneers in thee industry. During the 1970s and early 1980s, Birontas worked closely with Alaskan taxidermist Hunter Fisher to create many of the very first freshwater sportfishing graphite replicas ever produced.

Ron and son Rick Lax and Joe Fittante were also key to the origin of musky replicas. About 15 years ago the Laxes had the opportunity to remount the world record tiger musky caught by John Knobla in 1919. Rick Lax of Lax Taxidermy in Conover, Wisconsin, explains, "We soaked it all down to the original skin, put a new form in it, and molded the fish. That's what really got us started in making the molds for replicas ourselves. Before that, you could buy only limited styles of casts from taxidermy supply houses. Catch and release was not nearly as prevalent as it is today."

Fittante, owner of Fittante Taxidermy in Amigo, Wisconsin, echoes these sentiments: "When I started about 18 years ago I bought the blanks. The choices were so limited that I started to develop my own molds to become self-sufficient and much more artistic. The old casts were very artificial-looking. Developing molds to capture these dimensions has certainly improved thee quality of replicas."

Today, many taxidermists still buy casts (the blank fish model) from taxidermy supply houses. Taxidermists who make their own molds tend to choose nice specimens - no scars, scales in excellent condition, etc.

Though there's a lot of money tied up in making molds, taxidermists can pour hundreds of replicas from a single master mold. An inch can be gained or lost by adjusting the head accordingly. Girth can be adjusted by simply adding in or taking out pieces in the casts. The fish can then he customized by painting its markings, using a customer's photograph as a guide.

Cosmetic touch-ups are also a possibility. For example, if the photograph shows the fish had scars from spawning or splits in the fin from the net, the customer may choose to replicate their catch exactly as it was when they caught it, or they may alter it to be more cosmetically appealing.

"The obvious benefit is that the fish being reproduced is still swimming and available for another angler to catch. This emotional and conservational factor is important to many musky hunters," relates Gary Michalsen of Lake Tomahawk Taxidermy, located in northern Wisconsin. "With the increased size limits on most Canadian and some U.S. waters, the availability of replicas enables anglers to have something on their walls to remember their largest catch and release - even if it falls under the lake's legal size limit."

Skin mounts are generally more prone to deterioration over time. Replicas are much less susceptible to fading or discoloration and should last indefinitely. When accidents happen, touch-up repairs on broken replicas are also easier to manage.

Matt Yernatich of Artistic Anglers confirms this superior benefit, “We offer a lifetime guarantee on all replicas. We could never support that claim on skin mounts because they are just too vulnerable to deterioration over the years.”

Lastly, producing several copies of the same fish offers a wider audience of appreciation. Lax has made multiple replicas of Knobla’s world record tiger musky. “The original is hung up at The Minnow Bucket in Phelps, Wisconsin. Several bait shops and museums have one of the replicas. This allows a more sizable number of people to view this incredible specimen,” he said.

Some anglers are deterred by the price difference. In general, taxidermists producing a replica charge around $2 more per inch than a skin mount. Fittante explains: “There are more costs involved - the development of the mold, additional materials needed, and the painting makes it much more labor intensive. However, it will last forever and the mere fact that you are able to replenish the resource is worth the extra hundred bucks for a 45-inch fish.” Fittante and Lax have taken bold measures this year by charging the same amount ($12 per inch) for both skin mounts and replicas.

Fittante stresses the importance of a good photograph: “Get a great sideview shot to properly show the coloration patterns. Make sure you are out of the sunlight so it doesn’t wash out the colors. Turn off your flash, too, as that will make it look white or silver. Try to get as close up as you can. A precise length measurement and a clear photo is really all we need. Take other measurements only if you can do so without jeopardizing the health of the fish. The girth measures the biggest area around the belly. Other nice measurements include behind the gills and around the tail.”

Specific measurements, such as the width of the tail or the hook of the jaw, can be taken while the fish is placed safely in a deep net in the water. Michalsen suggests photographing a fish on its side while it’s in the water. If a photo is not available, provide photos of other fish caught from the same body of water or cut out photos from Musky Hunter of fish that look very similar. That, coupled with exact measurements, should provide your taxidermist with enough information to create an accurate replica.

Replicas only require basic dusting and cleaning with Windex. Since they are relatively smooth, they are much easier to dust than skin mounts since scales nurture dust buildup. Keep them out of direct sunlight. Although not prone to fading, the paint on replicas can still dull over time. Hanging them over a heating vent or fireplace is not recommended, either, since heat can melt or cause the finish to bubble.

Many taxidermists report a growing number of replicas over skin mounts - in some cases, replicas account for 80 percent of their musky business. “We are always trying to improve by striving for more natural-looking attitudes, customized painting, flexible fins that won’t break, and so on,” notes Fittante.

Gills can now be molded or sculpted, flared or closed, and even sport gill rakers. Computerized technology makes it possible to take a photo of your fish, enlarge it to scale, and then make a stencil of every bar or marking on that fish-an exact replica. This, of course, would be very labor intensive ... but the possibilities are endless.

With an ever-increasing amount of fishing pressure on a limited resource, replicating fish can be a powerful tool. And, society is changing and one can not deny that catch and release is becoming a mainstream philosophy among fishermen. Ron Lax quips, “We had to kill one fish to save hundreds

http://www.fittantereplicas.com
http://www.laxreproductions.com

[NOTE: For anglers in upstate NY, one can try ‘Fish Wish Taxidermy’ (http://fishwish.homestead.com) located in Pulaski, NY. The Gander Mountain store in Henrietta, just outside of Rochester, has many mounts on display.]

**(Excerpt) Musky Hunter – August / September 2005**
**Musky Matters [Column]**
**Walleye Angler Boats Green Bay Giant**

What may have been the largest fish to have been produced to date in the Green Bay musky restoration project was caught by accident by a walleye fisherman April 16.

Ryan Dempsey of Green Bay was casting for walleyes with his friend, Eric Haataja of West Allis, when he hooked a 56-inch musky. The anglers claimed the giant fish had a 33 ½-inch girth.

Dempsey and Haataja, who is a guide and charter captain (www.wibigfish.com), measured the musky in the water. They then lifted it for a few quick pictures before releasing it. Dempsey said the fish took off like a shot after the release.

Taxidermist Joe Fittante of Antigo is creating a replica mount of the fish. Dempsey, who manages the Rocky Outdoor Gear store in Green Bay, said the replica will be on display there around the end of July.


**(Excerpt) Musky Hunter – February / March 2005**
**Netting Muskies**
**By Crash Mullins, Field Editor, guide, tournament pro, owner: Crash's Landing tackle shop (www.crashslanding.com)**

Much has changed in the last 20 years. One of the greatest improvements has to be the landing net.

With a net dipped in a form of rubber compound that will not allow the hooks to penetrate through to the barbs of the hooks, deep bags and large rims, these nets have more or less become a livewell that's extremely easy on fish we plan to release. I've been using these improved nets for many years as a guide, and the first time I used one on a fish I thought it was the greatest thing since sliced bread.

Besides Frabill, other companies such as Beckman and Stowmaster make big nets with coated bags, and for good reason – they benefit the fish.

[For muskies], you need a hoop of at least 30 inches across and a very deep bag. I use Frabill's Big Kahuna model, which is 40 inches across the rim and 60 inches deep. With muskies 40 inches or lager, I try to net them head-first. If the fish is less than 40 inches it doesn't make a lot of difference.

I always leave the fish in the water over the side of the boat. Have your hook removing tools ready. I do not put the fish and net on the floor of the boat for unhooking; instead, I rest the hoop of the net on the gunnel of the boat with the net and fish still in the water. Completely remove the lure from the fish and net before you lift the fish out of the net. Don't be afraid to cut the hooks as this will save you a lot of time as well as help the fish.

Then, relax and regain your composure. Get your camera ready before you bring the fish out of the net. Get a quick picture and put the musky back in the water.

The beauty of a big net is it will allow you to improvise when you need to. You can land fish faster, put less stress on the fish, and ensure a quality release.

Here are three of the most common mistakes that I have seen:

1. Keeping the net handle retracted instead of extended and ready to be used.

2. [Assuming a second angler will perform the netting], placing the bottom (bag) of the net in the water before you are ready to net the fish.

   You should hold the bag with your opposite hand or hold it alongside the hoop until you are ready to net, and be aware of lures and boat cleats that might become entangled in the bag.

3. Trying to net "green" muskies, fish that aren't ready for netting. Don't make wild stabs. These are last resorts. Make a smooth, swift motion with the net and follow through until the entire fish is in the net.

**(Excerpt) Musky Hunter – April / May 2006**
**Musky Matters [Column]**

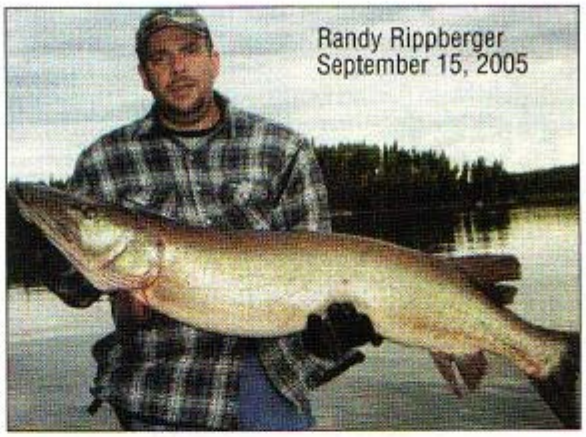
# Giant Musky Released Again

Randy Rippberger of Genoa, Illinois, had numerous surprises last September while fishing Ontario's Cedar Lake.

Rippberger was fishing with his father, Norm Rippberger of South Elgin, Illinois, on September 15, 2005, when he boated his largest musky, a 48-incher, on a loon-colored TopRaider. While catching his largest musky was great, his story gets better.

Two hours later Rippberger was casting a home-made black and white double marabou spinner that measures over 14 inches in length when he had a tremendous hit. "We started to get the fish in the net when it decided to give one last try of escaping, almost pulling my dad overboard," Rippberger recalled. "So I had one hand on the pole and the other on him so he doesn't go for a swim."

The giant measured 52 inches long and the Rippbergers estimated it to exceed 40 pounds. Arriving home following the trip, Rippberger found the October/November 2005 issue of *Musky Hunter* waiting in his mailbox. "I start reading about a woman who caught a 52-inch fish on the same lake 13 months earlier so when I get my pictures back I start comparing photos to see whose looks bigger (hey, I'm a guy) but to my surprise it looks to be the same fish. I don't mean they look alike, they are the same fish."





The woman, Betsy Kennedy-Geurts of Randolph, Wisconsin, had caught the 52-incher from Cedar Lake on August 12, 2004. Her photo appeared in the Reader Spotlight section of *Musky Hunter*.

To confirm that this is the same fish for yourself, check the growth on the fish on its left side just above the pelvic fin, and the split anal fin. Other markings along the tail are similar.

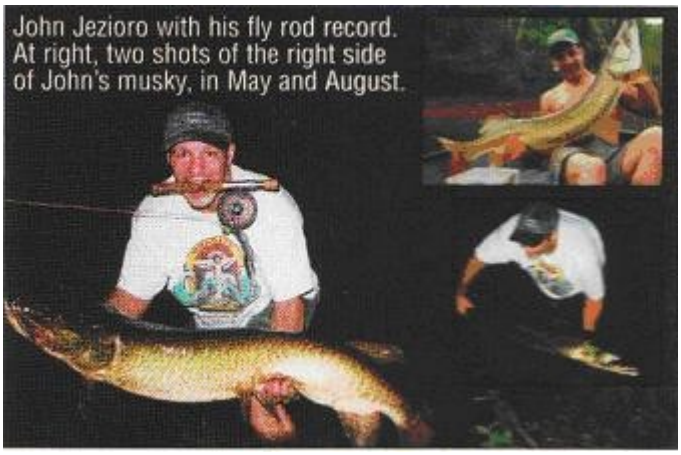
When ordering a replica from taxidermist Joe Fittante of Antigo, Wisconsin, Rippberger learned that Geurts had also ordered a replica of her fish from Fittante. One musky has been the fish of a lifetime for at least two different anglers.

"That's so awesome," said Geurts told *Musky Hunter* when she found out someone else had caught her fish. "That's why we release them — so somebody else can catch them."

**(Excerpt) Musky Hunter – June / July 2006**
**Musky Matters [Column]**
**Twice-Caught Musky Lands Angler In Record Book**

Lifelong fly fisherman John Jezioro of Fairmont, West Virginia, had a goal of catching a world record musky on a fly rod. He just didn't know he'd end up catching the same musky twice.

Proving once again that catch and release works, Jezioro caught a big Musky on conventional tackle in May 2005 from West Virginia's Tygart River before boating the same fish (see photos) again on August 26, only this time while fly fishing. On a certified scale, the musky weighed an even 29 pounds before he released it, and the catch has been recognized by the International Game Fish Association (IGFA) as a fly fishing world record in the 12-pound test tippet class.




**(Excerpt) Musky Hunter – October / November 2006**
**Musky Matters [Column]**
**Catch & Release Works with Wisconsin Four-Footer**

Chris Draeger of Milwaukee was fishing with his friend Joey Rozanski on July 29, 2005, when he had a strike. Rozanski eventually slipped the net under a solid 48-incher, which Draeger released after photos.

Fast forward to July 1, 2006, as Draeger went fishing with his friend, John Johannes of Brookfield, Wisconsin. This time, Draeger was the net man.



Johannes and Draeger measured the musky at 48 inches and after photos it "swam away like a champ," Johannes said.

About a month later, Johannes was looking at his fish photos when he realized his and Draeger's muskies were the same fish. Not only did the fish's marking match, but it bore a DNR tag. "Catch and release does work," Johannes said.

**(Excerpt) Musky Hunter – December 2006 / January 2007**
**Musky Matters [Column]**
**Giant Musky Near Minnesota Record**

Minnesota's Mille Lacs Lake has been producing giant muskies the past few years and in early October the lake came within a musky meal of producing the new state record.

On October 6, anglers Jolly Dahms and Derek Walton, both of Lakeville, Minnesota, fished with Mille Lacs guide Steve Jonesi when Dahms hooked a monster.

In case you're wondering what a 50-pound musky looks like, here it is in a photo and being released. Jolly Dahms of Lakeville. Minnesota, hefts his 54-inch, 53pounder from Lake Mille Lacs (top) and releases the giant (below).

Dahms' musky measured 54 inches long and carried a 28-inch girth and weighed 53 pounds.

Dahms figured the fish was out of the water but 30 seconds for the weighing. "As I placed her in the water she immediately started moving. Within 10 seconds she was swimming on her own. The only problem was the water was too shallow for her to swim, so Steve quickly jumped in the water and helped her reach deeper water. She swam off strongly under the dock area and Tawni was able to watch her swim out past the end of the docks with a spotlight. I can proudly say with confidence she is eating ciscoes as I say this.

**(Excerpt) Musky Hunter – February / March 2007**
**Musky Matters [Column]**
**"Halftail" Caught Four Times In Three Years**
**By Kevin Moore, owns Muskies, Etc. Guide Service in southeast Wisconsin**

There is a big, healthy musky in southeast Wisconsin with a partial tail amputation that just loves to get her picture taken. "Halftail," as we affectionately call her, had the first photo session with guide Dennis Radloff one day before the full moon at 4:58 p.m. on October 28, 2003. The fish measured out at just over 45 inches.

The following season, I was guiding Pete Barber and Rich Wren on Okauchee on June 3 during a new moon. At 4 p.m., Pete hooked into a big fish. He had already boated two fish that day, so he handed the rod off to Rich. After a robust battle, Halftail was measured at 46 3/4 inches, photographed and released.

Then on November 27, 2005, Kevin Mahlberg caught, photographed and released Halftail, this time on Oconomowoc Lake. This is remarkable because Halftail had traveled across three lakes (Okauchee, Lower Okauchee and Upper Oconomowoc Lakes) and over, under, around or through a 12-foot dam, then downstream another quarter mile and into Oconomowoc Lake.


Halftail had her picture taken again on June 10, 2006, after John Bilello captured her on Oconomowoc Lake again. She was still 47 inches but appeared to have put on a few pounds as we all do in the off-season.

It was fortunate that all four pictures of this fish were taken showing the same side making for positive identification.

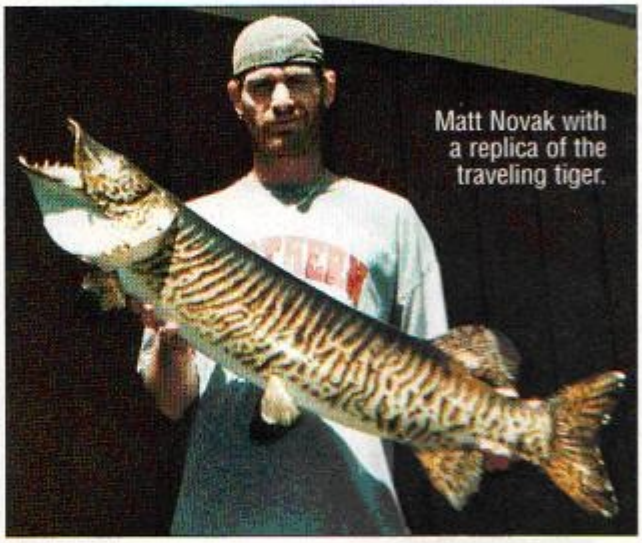
It will be interesting to see where Halftail will be pictured next.

**(Excerpt) Musky Hunter – April / May 2007**
**Musky Matters [Column]**

# Hybrid Musky Goes For 19-Mile Journey

**By Mike Cookas**

Seeing the story of "Halftail," the musky that was caught at least four times and swam through a dam to do so (*Musky Hunter*, February/March 2007) reminded me of the story of a tiger musky that traveled 19 miles between captures.


Matt Novak with a replica of the traveling tiger.

On a rainy August 12, 2001, legendary Chippewa Flowage guide Joe Jasek was guiding world record fly rod specialist Jim Matchlut, and chose to work the shallow waters of the Chief Lake section of the Flowage. Matchlut's choice that day was a No. 9 fly rod with a 30-pound test tippet and a favorite purple bug. Moments later, a 36-inch tiger musky nailed the purple bug and an aerial battle began. Jasek eventually netted the tiger and inserted a tag — No. 338-Jasek — in the dorsal fin.

After photos, the musky was released and neither guide nor angler could have imagined how far this musky would travel.

On June 3, 2004, I was guiding Matt Novak of Chicago on the Chippewa River. Novak chose a half-ounce Storm jig with 18-pound test no-stretch line. While working the bottom of the river, Novak set the hook on the slightest tap, and a beautiful 43 1/2-inch tiger musky leaped several times before I netted it.

I immediately noticed a tag in the dorsal fin. After close examination, the tag read 338-Jasek! A quick phone call to Joe found out a lot more about this fish.

The tiger musky, tagged 2 years and 10 months before, had made an unbelievable 19-mile trip around several islands, stump fields, bogs, old river beds, sand bars and fishermen before it traveled through the Winter Dam. This fish would have had to survive being sucked down a 40-foot high iron gate, squeezed through a 10-inch opening while avoiding being crushed against cement bunkers below the dam.

Well, it did survive all this and still lives in the Chippewa River. Two guides and two fisherman will be forever linked to this beautiful tiger musky, which proves some muskies travel extremely long distances. Proper catch and release methods help to ensure high survivability.

**Musky Hunter – August / September 2007**
**Musky Matters [Column]**
**MHM Field Editor Catches Same Musky Twice**

Jim Bortz and his favorite Indiana musky in 2006 (left) and 2007.

So what are the chances? During a taping of The Musky Hunter television show in May of 2006, Musky Hunter magazine Field Editor Jim Bortz boated a 49-inch musky while fishing with host Jim Saric.

Almost a year later, Bortz traveled to the same Indiana lake and boated the same [fish]! The fish was caught perhaps not more than 100 feet apart.

"I had no idea it was actually the same fish until almost a week later when I pulled up both photos and compared them. I was absolutely astonished!" said Bortz. "Every stripe and spot matched up perfectly. The fins that were split the year before had healed nicely and there were no indications that big musky had ever been caught before.

“It seems strange that I would drive for 350 miles and catch the same fish on two consecutive trips. In 25-plus years of musky fishing I’ve never done anything quite like this. It’s certainly a testimonial to the success of catch and release in our sport.”

**Musky Hunter – October / November 2007**
**Musky Matters [Column]**
**Big LCO Tiger Musky Caught Again**

The big Las Courts Oreilles hybrid musky whose multiple captures was featured in Musky Hunter (February/March 2007) has been caught and released again.

This time, it was John Heppner of Chicago who was fishing with partner Mark Alicz of Downers Grove, Illinois, on LCO's Musky Bay on June 3 when he caught the fish. Heppner (left in the photo) and Alicz measured the musky at 49 inches and weighed it at 35 pounds.

"On the initial strike he darted down away from the boat," recalled Heppner. "My line peeled out for about a minute straight. Then I slowly worked him in. The progress was pretty slow so I just focused on keeping tension on the line.

"Mark almost netted him on the first try but he quickly ducked down when his head got near the top of the water. Then, about 15 seconds later he came up perfectly and we netted him. We were in pure shock. It was actually bigger than it looked in the water."

Heppner said when the fish was released it "darted under the boat and quickly disappeared." Later, he showed photos to the Wick family, owners of Anglers Haven Resort, and "they immediately recognized it as the same musky that was caught before."

The musky, with distinctive side markings and a split dorsal fin, had been caught at least three times prior to Heppner's effort – at 35 inches long on June 8, 2000 and June 17, 2000 and at 47 inches long on June 16, 2006.

**Musky Hunter – October / November 2007**
**Musky Matters [Column]**
**Distinctive Musky Is Homebody**

Bead Nelson (above) and Jason Bomber boated the same musky nearly three years apart.

A nice musky that lives in Lake Monona, near Madison, Wisconsin, has proven to be a homebody and survived some kind of skin ailment.

Brad Nelson of Madison was casting on September 1, 2004, when he had a strike from what proved to be a 46-inch musky. As he was unhooking the fish, he noticed unusual bumps or boils on its left side near the tail.

On July 26, 2007, Jason Bomber of Madison was fishing a couple hundred yards from where Nelson caught his musky. He had a strike from a nice musky that was longer than 46 inches, but not quite 47. He then noticed the same bumps on its side that Nelson's fish had three years earlier – it was the same fish.

"We don't know what caused the rash or boils," said Bomber, "but it has clearly had them for over three years now."

**(Excerpt) Musky Hunter – December 2007 / January 2008**
**Musky Matters [Column]**

Tom Kelly strains to hold up his 54-inch musky from Tennessee's Great Falls Lake. Weight estimation formulas say this fish, which Kelly released after photos, could have weighed within ounces of the 24-year-old state record of 42 pounds 8 ounces.

Big Musky Challenges Tennessee State Record

Tennessee may be a bit removed from the musky-crazed Midwest, but some fast action on a reservoir there in September yielded a musky that would have challenged the state record. However, the angler chose to release the big fish.

Tom Kelly of Dalton. Georgia, was fishing with guide Dwayne Hickey (www.tennesseebassguides.com) of McMinnville, Tennessee, on September 1 when he boated a 54-inch fish with a 25-inch girth. The LxGxG/800 formula for the fish estimates the fish's weight at about 42 pounds, which is within an eyelash of the current Tennessee record, a 42-pound 8-ounce fish caught on April 27, 1983 by Kyle Edwards from Norris Reservoir.

Kelly and Hickey were fishing Great Falls Lake in the central part of the state. They started the day catching six muskies within the first hour. After an hour of no action, the big one struck.

"Bam! Tom's drag went off and he thought he was hung up on the bottom," Hickey told Musky Hunter. "I stood up and saw a deep flash and knew he had a big fish. The fish fought hard for a couple of minutes, but soon came to the boat and went airborne. We knew we had a fish of a lifetime on."

After a quick measurement and photos, Kelly chose to release the musky and plans to have a replica made.

**(Excerpt) Interactions between Walleyes and Four Fish Species with Implications for Walleye Stocking**

**http://www.uwsp.edu/water/mhansen/2005_Fayram_et_al_2.pdf**

**North American Journal of Fisheries Management 25:1321–1330, 2005**

**DOI: 10.1577/M04-203.1**

**ANDREW H. FAYRAM***
**Wisconsin Department of Natural Resources, Bureau of Fisheries Management and Habitat Protection, 101 South Webster Street, Madison, Wisconsin 53711, USA**

**MICHAEL J. HANSEN**
**College of Natural Resources, University of Wisconsin–Stevens Point, 800 Reserve Street, Stevens Point, Wisconsin 54481, USA**

**TIMOTHY J. EHLINGER**

**Department of Biological Sciences, University of Wisconsin–Milwaukee, 3209 North Maryland Avenue, Milwaukee, Wisconsin 53211, USA**

Abstract.—We used a number of different data sets and four criteria to evaluate evidence of competition and predation between walleye Sander vitreus and northern pike Esox lucius, muskellunge E. masquinongy, smallmouth bass Micropterus dolomieu, and

largemouth bass M. salmoides in northern Wisconsin lakes. The four criteria were as follows: (1) indices of population abundance were inversely related, (2) two species had shared resources or one species preyed on the other, (3) competition or predation was strong enough to produce a measurable effect, and (4) experimental manipulations produced results consistent with the hypothesis of competition or predation. Using these criteria, we identified which species interact most strongly with walleyes, determined the most likely mechanism for interaction (predation, competition, or both), and characterized the effects of walleye stocking on these species. Largemouth bass was the only species that strongly interacted with walleyes: (1) indices of largemouth bass and walleye population abundance were inversely related in lakes with self-sustaining walleye populations; (2) the diet of largemouth bass included juvenile walleyes; (3) walleye growth was positively related to indices of largemouth bass abundance; and (4) survival of stocked walleyes was negatively related to indices of largemouth bass abundance, and indices of largemouth bass abundances increased as an index of walleye stocking intensity increased. A bioenergetics analysis of one lake that was stocked with 39,300 juvenile walleyes, but also has some natural reproduction of walleyes, suggested that the largemouth bass population could consume up to 82,500 juvenile walleyes per year. Our findings suggest that largemouth bass interact strongly with walleyes through predation, that they can limit the survival of stocked walleyes, and that walleye stocking can result in increased largemouth bass populations. Therefore, management goals seeking to simultaneously maximize largemouth bass and walleye populations may be unrealistic.

**(Excerpt) Big Butternut Lake Fisheries Assessment Survey**
**Polk County, Wisconsin**
**2003-2004**
**MWBIC (2641000)**

**http://dnr.wi.gov/fish/reports/final/polk_bigbutternutlake_2003-2004.pdf**

**By**

**Heath M. Benike**
**Senior Fisheries Biologist, Wisconsin Department of Natural Resources, Northern Region-Barron, April, 2005**

Executive Summary

Big Butternut Lake, a 378-acre drainage lake located in north central Polk County in Luck, Wisconsin was surveyed in 2003-2004 following the Wisconsin Department of Natural Resources Treaty Assessment protocol. Projected angler effort for all species of fish in was 60.3 hours/acre, of which 71% was directed towards panfish. Largemouth bass were the most common gamefish caught by anglers followed by northern pike and walleye, but northern pike were the most common gamefish harvested by anglers. Largemouth bass relative abundance has increased 1,850% since 1985. Conversely, the 2003 adult walleye population estimate of 1.0 fish/acre was 77% lower compared to a past survey of 4.7 fish/acre in 1990. More importantly, a strong relationship exists that documents a decrease in walleye abundance coinciding with a subsequent increase in largemouth bass abundance. Based on this information, largemouth bass regulation changes are recommended in an effort to reduce largemouth bass densities and potentially restore walleye abundance to historic levels.

**[NOTE: Great 'Catch-And-Release' Pike Story from Europe]**

**http://www.pacgb.co.uk/articles/blomedit.htm**

**[NOTE: Good Info on Seneca Lake, NY]**

**http://fli.hws.edu/pdf/Dwyer_%20FINAL.pdf**

**http://en.wikipedia.org/wiki/Seneca_Lake_(New_York)**

**(Excerpt) Fishery Management Plan for Nelson Lake, Sawyer County, Wisconsin -- October, 2004**

**http://www.dnr.state.wi.us/org/gmu/upchip/documents/nelson.pdf**

**Prepared by:**

**Frank B. Pratt, Senior Fisheries Biologist**
**Wisconsin Department of Natural Resources**
**Sawyer County, Hayward**

**and**

**David J. Neuswanger, Fisheries Team Leader**
**Wisconsin Department of Natural Resources**
**Upper Chippewa Basin, Hayward**

Historical Perspective on the Fishery

DNR survey records indicate three distinct periods in the history of the Nelson Lake fishery. Prior to 1970, Nelson Lake was dominated by largemouth bass and panfish, though stocked walleye contributed to the overall fishery. Between 1970 and 1990, a self-sustaining walleye population dominated the fishery. Estimated density reached an unsustainably high 16 adults per acre during the height of walleye dominance. Excessive numbers led to slow growth and poor size structure. Since 1990 walleye density has declined; and it is widely perceived that largemouth bass abundance has increased dramatically, resulting in an excellent bass fishery. High bass density has probably contributed to low walleye recruitment and continues to keep adult walleye density below 2 per acre.

Nelson Lake has a history of producing very large bluegill, bullheads, largemouth bass and northern pike. It is one of the few lakes in the Upper Midwest with a documented capacity to produce bluegill weighing more than 2 pounds. In 1977, a former state record bluegill was taken from Nelson Lake – a trophy weighing 2 lbs. 5 oz. In 1983, the current 12# line class world record yellow bullhead was taken from Nelson Lake – a trophy weighing 3 lbs. 5 oz. Also in 1983, two largemouth bass caught in Nelson Lake were confirmed to weigh over 8 pounds – rare fish at this latitude. Anecdotal evidence of trophy pike potential can be found among the 1990 fish photos of the Sawyer County Record, where nine northern pike over 20 pounds were reported as taken from Nelson Lake that year alone.

Nelson Lake lies within the Ceded Territory and therefore is shared with Ojibwe tribal harvesters. Despite its close proximity to the Lac Courte Oreilles Reservation, Nelson Lake historically has been speared by the Bad River and Red Cliff tribes. Tribal harvest has ranged from 0 to 1600 fish, averaging slightly fewer than 500 adult walleyes (0.2 per acre) per year. This would comprise less than 10% of the adult walleye population even during low-density years. In most years, this level of tribal harvest has triggered a conservative reduction in the sport fishing daily bag limit from 5 to 2 in order to virtually eliminate any risk of exceeding the estimated safe harvest level of 35% for the combined methods of harvest.

Aquatic Community Overview

A thorough survey of aquatic macrophytes has not been conducted at Nelson Lake. Macrophyte growth is somewhat limited by light penetration in the tannin-stained waters, but when Secchi disk visibility is relatively high (5-7 feet) for long periods of time, extensive beds of macrophytes can develop. Known plant species include large-leaf pondweed, clasping-leaf pondweed, white-stem pondweed, northern water milfoil, elodea, coontail, white water lily, and wild rice.

Aquatic macrophytes have developed sufficiently in most years to facilitate high survival of young largemouth bass. Regulatory protection (spawning season closure and a 14-inch minimum length limit since 1997) and increased largemouth bass recruitment have dramatically affected fish community structure, shifting it from domination by walleye to domination by largemouth bass. The decline in walleye density has led to increased recruitment and density of black crappie and bluegill, neither of which are growing as fast or getting as big as Nelson Lake anglers have come to expect. Abundant crappie combined with largemouth bass may be preying upon young walleye and are probably preventing the restoration of a walleye-dominated fish community. The 2004 appearance of rusty crayfish portends a period of unpredictable change in macrophyte abundance and fish community structure at Nelson Lake.

Northern pike are the top predators in Nelson Lake, exhibiting good growth and the potential to reach memorable size. But pike have declined in abundance in recent years as largemouth bass have become increasingly dominant. Smallmouth bass are present, but rare, despite suitable spawning substrate in many areas. In lakes with abundant littoral zone macrophytes, largemouth bass tend

to outcompete smallmouth bass. Muskellunge are extremely rare in Nelson Lake. They do not seem to be reproducing successfully, and they have not been stocked by DNR.

Bluegill and black crappie are the most abundant and sought-after panfish species in Nelson Lake. Other panfish include yellow perch (important as prey for walleye), pumpkinseed, and rock bass. All three species of bullheads (black, yellow, and brown) are present. Non-game fish known to occur in Nelson Lake include log perch, trout-perch, Johnny darter, rainbow darter (rare), white sucker (major prey species), common shiner, golden shiner, bluntnose minnow, rosyface shiner, blacknose minnow (rare), and central mudminnow. Several species present in the Totogatic River are found on rare occasion in the lake itself, including burbot, brook trout, shorthead redhorse, golden redhorse, northern hogsucker, and creek chub.

Aside from the recent appearance of rusty crayfish, exotic plants and animals have been of little concern at Nelson Lake to date. Large Chinese mystery snails (1.75-inch diameter) have existed alongside our native apple snails (1.50-inch diameter) for at least 20 years and do not seem to have caused any problems. A dedicated public awareness effort will be needed to keep other exotic invasive species out of Nelson Lake.

**Muskies Inc. – August 2007**
**International News [Column]**
**By John Underhill**

Minnesota DNR Shares Findings on
Muskie Diet/Impact of Stocking on
Other Fish Populations

by John Underhill muskiefool@yahoo.com

This information was presented at the latest Esox workshop. It is broken down so it's a bit easier to understand. If any of you would like the actual studies, please contact:
John Underhill, Conservation Director, MI Chapter 54

The Facts About Muskies

The Minnesota DNR has been working feverishly to find out some hard facts on Muskie diet, stocking effects and the overall impact on lakes before and after the introduction of this top of the line predator. Here are some of their observations and research. I hope you will take a moment to read and open your mind to these new and ground breaking findings. The good news is they are going to be spending more time and effort to gain more knowledge and get the FACTS out to all concerned interests.

Minnesota DNR Biologist Jerry Younk notes that Trophy Pike outnumber Trophy Muskie in the same lakes 3 to 1.

Muskies grow as large in Southern Minnesota (French Lake) as they do in any other region of the State; this is due to ample food supplies of Rough fish. Muskies' diets were found to contain very few species of fish that may be of concern to Anglers. Bozek 1999 investigated 34 Northern Wisconsin lakes through the spring, summer and fall. Yellow Perch and White Sucker were the primary diet, with crayfish a bigger part of the diet than Walleye, despite being abundant on many of the lakes. Muskies actually eat more small Muskies than Walleye.

Muskies, once thought to have extreme negative effects on Pike and Walleyes, were studied by Fayram in 2005. Evaluating evidence of predation and competition between several species of fish (including Walleye, Northern Pike, Smallmouth Bass, Largemouth Bass and Muskie), the findings came as a shock to some, but confirmed the beliefs of many that fish lakes like Mille Lacs and Vermillion. In the study lakes, the only fish that had a negative effect were the Largemouth Bass, negatively affecting the abundance of adult Walleye during electro fishing studies. The Muskie electro fishing effort showed that Muskies have a positive effect on the numbers of adult Walleye, indicating that competition between these fish was unlikely.

Muskies are now being actively stocked in 41 Minnesota lakes by the Minnesota DNR. Their findings were focused on seven (7) species and lake classes. This is a brief summary of the results:

Northern Pike numbers declined in 3 individual lakes and increased on 2 with the weight of fish being no different across the state. The distribution of fish per netting or trap was similar to years before the Muskie was introduced.

Walleye numbers increased on 9 individual lakes and declined on 2, with a lack of year/class stocking being sited in 1 of these lakes. The average of eight was not any different statewide.

Yellow Perch numbers increased on 3 lakes, with no significant decreases and no difference statewide, with distributions of fish similar to before stocking.

Bluegill numbers increased on 2 lakes and showed no significant decline or statewide trends.

White Sucker numbers declined on 4 lakes and increased on 1, with no significant statewide or lake class trends.

Black Crappie numbers increased on 2 lakes in gill nets and showed no difference in trap nets. Post stocking numbers were within norms or above in comparison with lake classes.

Tullibee showed no differences at any level before or after stocking.

Therefore the lack of any constant trends across any of these species lakes or lake classes, combined with the fact that most of these lakes were considered above the average for their lake class and within the range expected, suggests that Muskie coexist and have coexisted very well in these types of lakes and at the densities that the Minnesota DNR manages its Muskellunge program.

We here in Minnesota enjoy some of the best fishing on the planet and it's all due to the hard work and dedication of a few individuals and the Minnesota DNR. When we can work together to manage the resource for the sake of the resource, we hit a home run every time, as is evident in the Walleye and Sturgeon program on Rainy River and also the extensive regulatory needs that have been imposed on the "Walleye Factory" Mille Lacs. If we can understand that regulations are imposed for the betterment and welfare of the ecosystem and not as a punishment for individuals or groups, we will continue to have great fishing opportunities.

The Members of Muskies, Inc. Chapter 54 have worked very hard to help with every aspect of the resources we all enjoy in Southern Minnesota: working with local Big Brothers and Big sisters to put on Kids' fishing days, donating hundreds of hours working on resource issues, putting on presentations for local groups, working hand in hand with the local DNR office stocking and research programs, working with Cabela's at their kids' fishing contest, talking to Politicians at local and state and federal levels, and communicating to the general public the need to release BIG FISH of all species. They are the future of our lakes, rivers and streams. We do this to make the overall fishing experience better for all anglers and outdoor enthusiasts.

We would like to invite you to a Meeting, or to join our small but growing group of truly dedicated men, women and children who all believe that there should be Trophy fishing opportunities available for all species. We love the outdoors and feel we need to protect the future for the outdoors and all the pastimes that are represented in the state. If you would like to get involved or just learn more about Trophy fishing and conservation, we would love to meet you.

Thank You
Muskies, Inc.
Southern Crossroads Chapter 54

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**(Excerpt) Pike in Your Waters**

**http://www.pacgb.co.uk/pdfs/pikeinyourwaters.pdf**

**Produced and Published**

**By The Pike Anglers' Club of Great Britain**

Introduction

This publication has been compiled using most of the authoritative scientific evidence available today. As you might expect it is intended to promote the presence of pike in fisheries, but not at the expense of good sport for other anglers, or at a financial cost to fishery managers and owners. Quite the contrary: it will show that the presence and survival of good pike stocks are not only vital to maintain healthy fisheries but can also have significant cost benefits. Pike anglers are not so blinkered that they cannot realize that good pike fishing depends upon healthily balanced ecosystems, which benefit all anglers equally in the long term.

There are certain truisms that The Pike Anglers' Club of Great Britain (PAC) has been explaining and advising upon since the Club's inception in 1977. These relate to the way in which perceived pike problems are compounded and not alleviated by the usual methods of dealing with them - i.e. culls. There is a wealth of scientific information to illustrate that culling pike can be counterproductive which we shall discuss in detail later, but there are other reasons for conserving pike stocks, which is where we will start. First of all, we need to look at the root of the problem by examining the place that pike occupies in the minds of some anglers.

The Truth About Pike

Pike are an indigenous species in Britain and have been living in balance with their food fish for as long as they have been present, at least 25 million years. Far from being the malevolent monster of popular mythology, pike are not killing machines. They certainly do not over-predate their food fish. If they did they would soon find themselves starving to death. In fact you might be surprised how small the dietary requirements of pike actually are.

Pike get little credit for the essential work they do in regulating the balance of fish populations in fisheries. These are the fish that scavenge older prey fish that become diseased and die. It is also true that pike do not solely prey on other species of fish; they also feed on their own young, and for this reason they can happily exist in waters which contain pike only. Where there is a choice, pike will rarely feed on one species exclusively. Given that the pike also prey on any other form of aquatic life that becomes available – birds, rodents, amphibians, etc. – the weight of food which a pike consumes in a year is modest.

'Pike problems' often get brought to the attention of fishery managers when anglers complain of pike seizing fish as they are being played to the bank. This often occurs a number of times to one angler in one swim. He may be forgiven for thinking that there is a pack of ravenous pike in that swim. It is more likely that just one pike is responsible. A fish being played to the bank - especially if it 'splashes' as this happens - is more attractive to a pike than one swimming naturally. If the pike fails to get a meal on the first attack, it will return for another attempt, and again, until it is successful. Anglers who report a 'swim full of pike on a feeding frenzy' are, in all probability, seeing one pike trying to get a meal that keeps getting dragged away from it.

It is also true that pike are more active in the warmer months, as are a greater number of anglers, so it is hardly surprising that most 'pike problems' are reported at this time of year. A genuine 'pike problem' is almost certainly a symptom of a much more serious fishery management malaise.

Population dynamics are poorly understood and it is often fish stocking policies, rather than predation by pike, which disrupt the 'balance of nature'. Before deciding that you have a 'pike problem' from anecdotal evidence, it is wise to have the true pike population, and its balance with prey species, assessed professionally.

Pike in Mixed Fisheries

Quite clearly, where there is only one species of fish in a water (some man-made trout and carp fisheries are managed in this way), the presence of the pike is undesirable. In most other waters, both large and small, still and running, the removal of pike in terms of both ecology and finance is a very dubious activity indeed.

The Scientific Argument

It has been demonstrated in a number of scientific studies that the removal of large pike is not the best management policy where pike are perceived to be a problem in a fishery. It has been shown that the removal of these fish results in no decrease in pike biomass because the reduced pike-on-pike predation increases the survival rates of the smaller individuals. The average size of the pike is reduced but the numbers of individuals rises - often dramatically. Ironically, this leads to an increase in the number of pike being seen by anglers and a 'pike problem' has been created where it may not actually have existed previously. A detailed appraisal of how pike culling can be counterproductive is to be found in the *Supporting Evidence* section of this publication.

The Economic Argument

For pike culling to have any impact it has to be carried out rigorously and, more importantly, continuously. It has been suggested that 30% (or more) of the pike population must be removed annually for the removal to be effective. The financial costs involved in this kind of operation are considerable. Indeed, the economic benefits of retaining the pike as an angling resource should be considered and weighed against the costs of attempting to eradicate them before embarking on a pike removal exercise.

Natural Fisheries

What could be termed 'wild' fisheries may not always provide direct income from pike anglers (although there are examples where fishing permit sales are a source of revenue). However, visiting pike anglers - who may stay for a week or more - can be responsible for generating income for the local economy. Where waters are left to their own devices as far as stock levels are concerned it is wise not to attempt to 'improve' the situation for one species over another. Upsetting the pike population will have knock on effects on the populations of other species, and if the pike numbers are significantly reduced smaller predatory fish species (e.g. perch) whose numbers were controlled by the pike, may increase in numbers, with unforeseen ecological implications.

Supporting Evidence

Dietary Requirements

The dietary requirements of pike are predictable and have been studied by several authors (e.g. Kipling & Frost 1970). In general terms, a diet comprising between 13oz-1lb of prey fish per pound of pike per annum is needed to merely keep the pike alive (the 'maintenance ration'): Johnson (1966) lists an average figure equivalent to 1.4lb/lb/year, with a range of 1.3-1.8, whereas Mann (1982) reports an annual value of 0.8/g/g.

(Note, however, that there is a positive correlation between food consumed and increasing temperature, and higher values have been recorded for pike kept under unnaturally-warm experimental conditions.)

Where pike are undergoing normal growth, 2-3.5lb of prey fish per pound of pike per annum is a common ration. For example, in his study of the Middle Level drainage system, Kell (1985) calculated that the annual consumption of prey fish by pike was 254 per cent of their body weight; and Popova (1978) cites studies which revealed figures of 341-344 per cent in the Volga delta and 270-340 per cent in Rybinsk Reservoir.

Conversion from prey flesh to pike flesh can also be predicted, and the ratio between weight gain and total food consumed during normal growth is often between 1:5 and 1:10. Popova (1978) lists a figure of 1:8.8 and Mann (1982) calculated a ratio of 1:6.6.

Prey Preferences

The selection of prey by pike has been the subject of numerous studies. Some authors have noted that as pike grow larger, they eat larger prey (e.g. Diana 1979), although small prey are still consumed; other authors (e.g. Willemsen 1967) have concluded that it is the relative abundance of prey species which determines the diet of pike. Popova (1967) concluded that prey choice appeared to be governed solely by its availability to pike.

If offered a choice of prey species, there is some evidence that pike may select soft-rayed species in preference to fish bearing spines (Mauck & Coble 1971). However, other authors report that spined fish - usually perch or related species - are the dominant prey of pike (see Johnson 1966, Diana 1979). Flickinger & Clarke (1978) reported heavy predation by newly introduced pike on bluegills (a spined species), whereas there was no change in the numbers of carp and black crappies (soft-rayed and spined species respectively). In Llandegfedd Reservoir, South Wales, analyses of the stomach contents of large pike revealed substantial numbers of perch and relatively few trout (Welsh Water Authority, unpublished data).

That pike tend to be opportunist, rather than selective piscivores is supported by the fact that the stomach contents listed by Frost (1954) and Mann (1982) comprised nearly the entire range of fish species at both studied sites, Lake Windermere and the River

Frome. Seasonal changes in the diet of pike do take place in response to the availability of prey (described by Lawler 1965 and many other authors). However, the scientific literature does not support the notion that pike will always 'prefer' a particular prey species - irrespective of its abundance - an allegation often leveled at pike in salmonid fisheries.

The extent of intraspecific (pike-on-pike) predation has been noted by many authors (e.g. Toner & Lawler 1969, Pitcher 1980). Toner (1969) revealed results which showed that small pike formed 25 to 32 % of the food of other, larger pike. This has particularly important consequences for the survival of pike during their juvenile stages. Bry & Gillet (1980) report figures of 79 per cent losses of young pike through cannibalism; and Wright & Giles (1987) discovered that pike fry contributed 27.3 per cent of the number of fish in the diet of small pike kept in experimental ponds.

Large pike represent the only natural piscivorous predator of smaller pike and their presence will help to keep the number of small pike in check.

Spawning Success

Kell (1985) concluded that recruitment to the pike population is largely determined by survival of the younger stages in the life cycle, rather than the number of parents or the quantity of spawn which is shed, with predation and starvation being the prime causes of larval mortality. Clepper (1975) also failed to identify any correlation between the size of the spawning stock and subsequent year-class strength for a variety of predatory fish, including pike.

Natural Balance

The data from numerous sources demonstrate that on stable fisheries there is a weight-to-weight relationship between predatory fish and the prey which are available to them. This finding is in direct agreement with the original assertion of Johnson (1949) and the detailed pond experiments conducted by Swingle (1950). The studies on the status of the ponds, either balanced or unbalanced, revealed that the predator/prey ratio, by weight, of balanced ponds was between 1:1.4 to 1:10. The studies showed that 77% of the best 'balanced' populations had ratios between 1:1.3 and 1:1.6.

Conversely 'unbalanced' populations had ratios of between 1:0.06 and 1:63. Most unbalanced populations had a relatively small weight of predators in relation to the weight of prey. It appears that the weight of prey present is a function of the fertility of the water, whereas the weight of predators is, within limits, dependent on the weight of prey.

Since the results of these studies were published it has been confirmed that in most established fisheries in Britain, the ratio, by weight, between pike and their prey is approximately 1:10. This has been determined from the results of hundreds of counts of fish following the complete de-watering of fisheries or total fish mortalities and the findings have been confirmed by fish population studies using seine nets, electro fishing, traps etc.

In his review of a large quantity of data derived from eastern European predator fisheries, Popova (1967) cites pike biomasses of 10-13 per cent of that of their available prey; Kell (1985) lists survey data for the Sixteen Foot drain which give a relationship of 12 per cent; and Templeton (1995) recommends that pike fisheries should be stocked with prey fish at a weight of eight times that of the pike. When Broughton (unpublished data) analyzed the catch statistics from several hundred scientific surveys of still and running water fisheries in the English Midlands, an average weight ratio between pike and their available prey was found to be approximately 1:10.

Using the ratio of 1:10, one can predict that 300lb of prey fish would be able to support some 30lb of pike without any long-term, adverse effects on the abundance of either type of fish. A useful analogy is to imagine that the prey fish represent a sum of money which is invested. In effect, pike are consuming the interest, leaving the capital sum untouched.

This balance is a so-called dynamic equilibrium - in other words, it will swing one way or another in response to entirely natural phenomena (such as spawning success or outbreaks of disease). Equally, if the balance swings markedly in favor of one 'side', ecological pressures ensure that eventually it will swing back in the other direction (described in detail by Carlander 1958 and Anderson & Weithman 1978).

If this were not the case, there would be countless examples of fisheries in which pike have become dominant or have totally eradicated the stocks of prey fish, and this would be a continuing situation on unmanaged waters. We have reviewed a huge volume of the published scientific literature on pike in the British Isles, Europe, North America and elsewhere, and there appears to be just one example where pike had 'eaten themselves out of house and home' (Munro 1957).

Ricker (1952) described three types of numerical relationships between predatory fish and their prey. Mann (1982), Kell (1985) and other authors have concluded that pike probably fall into Ricker's Type B model, in which: "Predators at any given abundance

take a fixed fraction of prey species present, as though there were captures at random encounters". This means that predation is dependant on the numbers of prey, rather than the numbers of predators.

Because of the annual production of fish flesh within a fishery as a result of spawning and growth, there is little danger of pike consuming a large percentage of the potential prey fish. They will, in fact, consume some of the surplus fish flesh produced each year, ensuring that the weight of both predators and prey remains in balance.

General Comments On Management Principles

There are a wide variety of physical, chemical and biological factors which influence fish populations in exploited fisheries.

Where both predators and prey are present, factors which increase fish numbers include:

- immigration
- natural recruitment (successful spawning)
- stocking, be it planned, accidental or illegal.

Factors which decrease fish numbers include:

- emigration
- pollution
- disease and parasitism
- 'natural' mortalities
- predation - by the same species, other fish, other animals or birds
- removals, either deliberate (cropping/culling) or theft
- angling, through deliberate or accidental actions.

In assessing the reason(s) for changes in the status or composition of fish populations, it is important that each of these factors is considered. All too often, those charged with managing fisheries draw cause-and effect conclusions based on prejudice, hearsay or inadequate data. Historically, the persecution of pike in British fisheries was a case in point, based on the fallacious notion that if left to their own devices, the pike would eat all of the other species to extinction.

With improved knowledge and its wider dissemination to anglers, attitudes have changed rapidly in the last few decades. It is fair to state that the far greater protection afforded to pike has not been accompanied by a decline in the quality of fishing for non-pike species.

Were this not the case, there would undoubtedly be a substantial groundswell of angling opinion in favor of rescinding pike conservation measures and resuming widespread pike culls... which there is not. Scientists and anglers in many other countries, notably in some other western European nations and in North America, share this more enlightened attitude to pike.

Results of Pike Culling

By far the most exhaustive scientific work in Britain has been that conducted by the Freshwater Biological Association and the Centre for Ecology and Hydrology at Lake Windermere where pike have been removed since the 1940s. The results are very complex, but for the purposes of this publication can be summarized, thus:

- There was an initial drop in the numbers of pike but these then remained relatively stable for a number of years.
- The average size of the pike has fallen.
- The total tonnage of pike has increased.
- Their speed of growth has increased.

Studies on the effect of pike removal on a Swedish lake were published by Otto (1979), who identified three defined stages which occurred as a result of this removal:

1. A brief initial phase in which the proportion of large pike increased, due to the high susceptibility of small pike to capture or to an increase in growth rate of the remaining pike.
2. A phase in which the number of small fish increased in number, due to reduced cannibalism and/or increased intraspecific (i.e. pike-on-pike) competition.

3. A phase in which small and large pike numbers do not change.

It is worth reporting that the biomass (total weight of all pike present within a fishery) did not change markedly.

Many of the scientific papers make exactly the same point as Winifred Frost and her co-workers have made in their studies of Lake Windermere pike - remove the smaller number of big pike and the result is increased numbers of small pike, increased total tonnage of predators and therefore increased predation. The Pike Anglers' Club call this type of fishery management negative pike management, as in nearly every case like this the result is a bigger problem. Positive pike management, however, benefits all parties.

[NOTE: See document link for list of references which is quite substantial.]

**(Excerpt) Washington State Tiger Musky Proposal**

**http://wdfw.wa.gov/hab/sepa/06047_proposal.pdf**

Predation

Predation issues with muskellunge are nearly identical to those of tiger muskie, though quite different from northern pike, which can potentially achieve much higher population densities. Native northern pike populations in the mid-western U.S can achieve densities as high as 24 adult fish/acre (Pierce and Tomcko 2005), while adult muskellunge densities approaching 1 fish/acre are considered quite high (Cornelius and Margeneau 1999). Hansen (1986) reported a density of 0.3 adult muskellunge/acre for eight Wisconsin lakes, while Siler and Beyerle (1986) achieved an artificially high density of 0.84 adult muskellunge/acre through supplemental stocking and a 36-inch length limit.

Like tiger muskie, muskellunge target fusiform, soft-rayed fish species, although they are somewhat less selective with regard to consuming some species of spiny-rayed prey. Engstrom-Heg et al. (1986) demonstrated that when presented with soft-rayed prey and yellow perch, both tiger muskie and muskellunge generally ate the soft-rayed prey first, but muskellunge preyed upon perch more readily than tiger muskie. Supporting this finding, Bozek et al. (1999), in a study of 34 water bodies in Wisconsin, found that yellow perch made up 30% (by number) of muskellunge diet. However, other spinyrayed fish such as walleye (0.9%), sunfish (7%), and black bass (2.9%) combined to make up a very small portion of the diet. A study conducted by Fayram et al. (2005) indicated that there was no evidence of strong interaction, through either competition or predation, between walleye and muskellunge.

Four of the seven waters stocked with tiger muskies in Washington have received studies focusing on their foraging habits. In the seven waters that contain tiger muskies, the target forage fish were suckers, northern pikeminnow, tench, carp, and sunfish. Caromile (WDFW, unpublished data) concluded that tiger muskies in Merwin and Mayfield lakes did not target chinook, coho, or steelhead fry or smolts, nor did they target kokanee, bull trout, and cutthroat. Instead, in both lakes northern pikeminnow was the primary prey species. In Curlew Lake, Baker and Bolding (WDFW, unpublished data) found that northern pikeminnow was the most abundantly consumed prey item by tiger muskie in summer and fall, accounting for 40% and 34% (by number) of the diet, respectively, but they were consumed at a lower rater in the spring (15% of diet). Rainbow trout accounted for 16% of the diet in the summer and 28% of the diet in fall, but were more commonly eaten in the spring (40% of diet). Largemouth bass made up between 15-20% of the diet during all three seasons. Tiger muskie selected for northern pikeminnow, and to a lesser extent trout, in the summer and fall. However, in spring, rainbow trout were selected for while northern pikeminnow were selected against. Tiger muskie selected against largemouth bass during all three seasons, eating few in comparison to their relative abundance in the lake.

In Silver Lake, Baker and Bolding (WDFW, unpublished data) saw a similar pattern with regard to trout predation by tiger muskie, with most occurring in the spring and little to none in the summer and fall. Instead, during the warmer months, tiger muskies selected small pumpkinseed sunfish and largemouth bass as prey, most likely as a result of the relatively small size of the recently stocked tiger muskies (mean size = 28 inches) and their subsequent inability to consume the predominately 12-15 inch target forage population (tench).

While there is some predation on trout by tiger muskie in Washington waters, it is important to note that it is seasonally restricted to the cooler months when tiger muskie are likely feeding less actively. Also, these trout populations are artificially increased with hatchery stockings of catchable-sized trout, making them available for trout anglers as well as tiger muskies. Although no bioenergetics model for tiger muskie currently exist, one can make the logical assumption that tiger muskie metabolic demand increases with water temperature. Consequently, the number of trout eaten by tiger muskie is lower in comparison to the target forage species, which either compete directly with trout for food and habitat resources (e.g. northern pikeminnow and pumpkinseed sunfish) or prey on trout themselves (e.g. northern pikeminnow and largemouth bass).

It is also important to make a distinction between hatchery planted trout and salmon. While trout carry out their entire life cycle in freshwater (and are, therefore, exposed to predation from the standpoint of size, for much of their lives), salmon are by comparison, exposed to predation for a much shorter period of time. Adult chinook, coho, and steelhead are too large to be consumed by tiger muskie, while smolts are too small to be an attractive prey selection. Tiger muskie and other esocids target prey that are 20-30% of their own body length (Baker and Bolding, WDFW unpublished data: Bozek et al. 1999). Therefore, during the period when salmon and steelhead are at this preferred prey size and would be most vulnerable to predation from muskies, they are absent from fresh water, returning only after reaching sufficient size to make them invulnerable to esocid predation.

Muskellunge coexisted in their native range with popular gamefish such as walleye, smallmouth bass, largemouth bass, crappie, and sunfish species. Fisheries managers from Minnesota, Wisconsin, and Michigan have since successfully added chinook, coho, steelhead, and brown trout to waters containing muskellunge (R. F. Strand, Minnesota DNR, personal communication).

**FREQUENTLY ASKED QUESTIONS**
**Regarding Muskellunge Length-Limit Regulations**
**Information from Fisheries Biologists, Fishermen and Fishery Professionals**
**Compiled by Michael J. Roberts**

**http://dnr.wi.gov/fish/musky/Musky%20length%20limit%20faq.pdf**

*Will higher musky length limits cause overpopulation and impacts on other species?*

Muskies are a low-density species, even in the absence of angler harvest. High minimum length limits are not appropriate for all waters. They are best suited to large waters with low-density muskie populations where a few fish will have the opportunity to live long and grow large. Most class A-1 muskie populations have fewer than 0.5 adult muskies per acre of water. In contrast, an average adult bass or walleye population is about 8 times this value and northern pike populations are even higher. Even with their larger size, muskies have less of on impact than other species simply because of the number of mouths to feed.

As the largest predator in a lake, muskies can pretty much eat what they like. Studies have shown that what they prefer to eat are smooth, fatty forage species like suckers and cisco. For example, a recent study examined the food habitats of Wisconsin Muskellunge (Bozek et al. 1999). Thirty-four musky lakes where sampled over a 4-year period, with 1,092 muskellunge (8 to 46 inches in length) examined. Only 6 walleye (0.9% of the diet items) were found in all the samples.

A recent multi-lake study, Fayram et al. (2005) found that largemouth bass was the only game fish that had a detrimental impact on the survival of stocked walleyes. In contrast, northern pike, muskellunge and small mouth bass did not have strong predatory or competitive interactions with walleye populations. For example, in the past, musky have been introduced to lake systems in an attempt to quell stunted panfish populations. It has never worked, it is just too difficult to reach the required density of musky. Bass and Walleye have much more of an effect on panfish and can be used to control stunted populations.

*Most serious musky fishermen today release all of their muskies, "Why do we want to regulate something the public is already doing voluntarily?"*

An estimated 92 % of all muskies are released, but the mean length of harvested muskies is only 37 inches (Simonson and Hewett 1999). As a fish grows larger than 40 inches, the odds of its being kept instead of released keep increasing. Based on data in Casselman (1999), it takes a female musky an average of 9 years to reach 40 inches and another 7 years to reach 50 inches. It may be caught many times during this time, but each fish can only be harvested once. Casselman et al (1996) suggest that with a 2% increase in mortality, recruitment would need to be doubled to maintain the number of trophy muskellunge in a population. Relying solely on voluntary release is not an effective way to grow big muskies.

*What do you say to people who feel higher length limits are only requested by trophy fishermen, "so they can get their picture in the papers?"*

The main goal is to protect the existing fish in the system to increase the size structure, which will help natural reproduction maintain the musky fishery, hopefully with no stocking in the future. This is the best and cheapest way to increase the size and protect existing genetic stock. A favorable by product is a quality "catch and release" fishing opportunity while the fish grow. From survey information, the WDNR collected from all species fishermen, the majority of anglers consider a trophy musky to be 50 inches or larger. This is the most desired length, so it makes sense to protect the fish to that size on appropriate lakes.

The other part to this question is whether all lakes should have the same regulation, or if we should have a few lakes where we manage for big fish and some lakes that are managed for higher densities with smaller minimum length limits. (i.e., even if you like to harvest all legal muskie, should there be a few lakes where they are protected until they grow truly large?)

*Some say higher length limits mean slower growing male muskies will never be harvested and will therefore become overpopulated and wasted.*

Most male muskies can and do reach 40 inches or more if they are given the chance to live long enough. A fish can be caught multiple times, but it can only be killed once, so anything that reduces angling mortality will improve the quality status of the fishery. The real issue is whether "not harvested" is the same as "wasted." With very high minimums; only a limited number of very large females will be taken. Therefore, there is no worry the sex ratio will become unbalanced. The noticeable change will be the number of fish that make it to the mid- to upper 40s. The true question is, if a fish harvested at 42 inches has more value than the same fish released at 42, 43, 47 and 49 inches, even if it dies of hooking mortality or old age. Many agree the added enjoyment a quality fish provides when it is caught again and again would not be considered a waste.

*I've been buying fishing licenses all my life and I deserve to keep the muskies I catch!*

Looking strictly at economics, in lakes where stocking is needed, no one angler spends enough money on fishing licenses in a lifetime to cover the cost of more than a very few legal muskies. Based on the cost to produce and stock musky fingerlings and the number of stocked fish surviving to adulthood several years later, each stocked musky reaching legal size can be worth hundreds or even thousands of dollars. The higher limits can help bolster natural reproducing and stocking on some lakes can be limited or even eliminated. Remember that revenue from fishing licenses goes towards many programs in addition to musky stocking. The high cost of musky stocking is justified in terms of benefits to the economy of the state, in addition to the enjoyment that muskies provide, but here again a muskellunge is most valuable when it is alive, swimming, and is caught more than one time.

*I can't catch a legal musky now. If the minimum length limit is increased, I'll never catch one!*

The length limit is too often used as a magical dividing line between success and failure in fishing. We need to help anglers change their thinking and simply strive to catch the biggest fish they can, without worrying about how many are "legal." All muskies are exciting to catch, legal-sized or not, and hopefully that's one of the main reasons people fish for them. A 35-inch fish should be just as much fun to catch whether the minimum length limit is 34 inches, 45 inches, or even 50 inches. Remember that higher length limits will continually improve chances of landing big muskies, including the musky of a lifetime!

**[Invasive Species Info with Emphasis Upon Zebra Mussels]**

**http://fli.hws.edu/pdf/Dwyer_%20FINAL.pdf**

-- See section on 'Zebra and Quagga' mussels

Zebra mussels are native to Black, Caspian, and Azov Seas, Ural River

Some other species: tyulka, a shad-like fish already invading European rivers; the Eurasian minnow; the Black Sea silverside; the European perch; and the monkey goby

**http://www.seagrant.sunysb.edu/MediaArticles/WDT-ZMs072500.htm**

**http://en.wikipedia.org/wiki/Zebra_mussels**

**http://en.wikipedia.org/wiki/Quagga_mussel**

**[Some Basic Recommendations to Help Prevent Spread of Invasive Species via Boating]**

rinse your boat and equipment with hot tap water (> 40° C); or
spray your boat and equipment with high pressure water (250 psi); or
dry your boat and equipment for at least five days, before transporting to another waterbody.

**[Positive Impact on Some Native Species via Zebra Mussel]**

Zebra mussels do have a positive impact on some native species. Many native fish, birds, and other animals eat young and adult zebra mussels. Migratory ducks have changed their flight patterns in response to zebra mussel colonies. Lake sturgeon feed heavily

on zebra mussels, as do yellow perch, freshwater drum, catfish, and sunfish. The increase in aquatic plants due to increased water clarity provides excellent nursery areas for young fish and other animals, leading to increases in smallmouth bass populations in Lake St. Clair and the Huron River. However, these native species do not feed heavily enough on zebra mussels to keep the populations under control.

**[Zebra Mussel Impact on Ecosystems]**

Significant changes to aquatic ecosystems have been documented as a result of the introduction of zebra mussels. Zebra mussels filter out large amounts of phytoplankton, and compete with many species of zooplankton which are an important food source for young fish. One such species is Diporeia which is a tiny shrimp-like organism that lives in the bottom mud and who's source of food is settling algae from the water column. Since zebra mussels invaded in the 1980s, there has been a decline in the numbers of Diporeia which normally make up to 70 percent of the living biomass in a healthy lake bottom. Species such as whitefish and other prey fish including alewife, bloater, smelt and sculpin directly depend on Diporeia as a food source. The decline in Diporeia may be linked to declines in numbers and the condition of species such as whitefish, sculpin, smelt and young lake trout from various Great Lakes. This may further have an impact on sport fish such as adult salmon, trout and walleye which feed on prey fish.

The feeding activity of zebra mussels results in changes in the normal energy cycle within a water column. Each mussel can filter about one litre of lake water per day, however, not all of what they consume is digested. What they don't eat is combined with mucus as "pseudofeces" and is discharged onto the lake bottom where it accumulates. Organisms that benefit most from these changes are those that live on the lake bottom such as invertebrates (which include aquatic insects, worms, snails, etc.) and aquatic plants. This filtering causes the water to become clearer allowing more sunlight to penetrate the water column. Changes in weed growth patterns occur and forces some fish, such as walleye that are light sensitive, to find new habitat.

When zebra mussels filter the water, they also remove contaminants which become concentrated in their tissues. Although this may sound like a positive thing, organisms that feed on zebra mussels may accumulate these contaminants in their own tissues. An example are some duck species such as Lesser and Greater Scaup, which now feed on zebra mussels, have elevated levels of contaminants in their tissues which may influence their survival and/or reproduction success. Another invader, the round goby, which predominantly feeds on zebra mussels, may accumulate contaminants in their tissues and may pass those contaminants on to sport fish species which are now consuming them.