*North American Journal of Fisheries Management*, 2026, **00**, 1–23
https://doi.org/10.1093/najfmt/vqag045
Published: 22 July 2026
**Special Section | Review**

American Fisheries Society

# Special Section on Black Bass 2025 Symposium Proceedings

# A review of contemporary science-based best practices for black bass tournament anglers, organizers, and regulators

L. LaRochelle[1,*], J. Zhang[1], C. D. Suski[2], C. T. Hasler[3], J. C. Madden[1], J. Lombardo[2], R. Davis[1], A. J. Danylchuk[4], and S. J. Cooke[1]

[1]Fish Ecology and Conservation Physiology Laboratory, Department of Biology, Carleton University, Ottawa, Ontario, Canada
[2]Department of Natural Resources and Environmental Sciences, University of Illinois, Urbana, Illinois, USA
[3]Department of Biology, University of Winnipeg, Winnipeg, Manitoba, Canada
[4]Department of Environmental Conservation, University of Massachusetts Amherst, Amherst, Massachusetts, USA

*Corresponding Author: L. LaRochelle. Email: larochelle96@gmail.com.

## Abstract

***Objective***: **Live-release black bass *Micropterus* spp. tournaments are a popular recreational activity across their native and introduced ranges. There are two common live-release formats: a catch, weigh (or measure), and immediately release and the more traditional format where fish are captured, retained in a live well, weighed at a central location at the end of the day, and then released. These events are economically beneficial to host communities, yet there remains concern about certain practices that occur during live-release black bass tournaments with respect to their effects on the welfare of fish. Here, we critically assess the state of the contemporary science-based evidence surrounding the logistic (e.g., time of year, weigh-in process) and fish care (e.g., barotrauma relief techniques, live-well management) actions that are common in black bass tournaments.**

***Methods***: **By synthesizing the evidence base, we provide recommendations for anglers, regulators and tournament organizations to consider when making decisions in the best interest of the fish. Each topic was searched, and relevant studies on black bass live-release tournaments were included.**

***Results***: **Tournament organizations could be more diligent to avoid planning events before and during the black bass reproductive period (especially during parental care) and during the warmest months of the year, when water temperatures are the warmest. Bass boat manufacturers should include oxygen and temperature sensors within live wells, allowing anglers to have real-time information on live-well conditions. To that end, educating anglers on water quality parameters, the physiological requirements of black bass, and how to mitigate stress and mortality would be useful. Regulators could also consider being more engaged in monitoring black bass tournaments to ensure that best practices are embraced to ensure welfare of the fish. However, it is worth noting that newer catch, weigh (or measure), and release formats eliminate many of the issues with fish care that occur during retention and weigh-ins.**

***Conclusions***: **Given increasing pressures on black bass (e.g., more tournaments, better technology, climate change), a shift in the current social norms within the black bass tournament space could be considered to help ensure that black bass welfare is maintained during tournaments.**

**Keywords:** catch-and-release, live well, *Micropterus*, regulations, scientific evidence

**Received:** October 22, 2025. **Revised:** April 12, 2026. **Accepted:** June 4, 2026

## Lay summary

Black bass tournament formats have evolved over time. Much research has focused on improving fish care for traditional (i.e., central weigh-in) tournaments; however, the newer catch–weigh–release format avoids many of the challenges and issues with traditional tournaments altogether.

## Introduction

Competitive live-release black bass *Micropterus* spp. tournaments are a popular sporting activity worldwide, with tournaments hosted in North America, South America, Europe, Asia, and Africa (for example, see B.A.S.S. Nation Chapters, https://www.bassmaster.com/bass-nation-chapters/). Specifically for North America, the number of black bass tournaments held annually has increased over the past several decades (Driscoll et al., 2012), with the majority being local "club" tournaments (i.e., small events). It should also be noted that although fewer in number, "professional" tournaments are spectacles that attract substantial media attention and a large public following. In the early 1980s, annual events in North America were just over 10,000 (Duttweiler, 1985), and by the late 1980s, the number of tournament events doubled, with 23,000 events occurring annually in the United States (Schramm, Armstrong, Fedler, et al., 1991). By the early 2000s, there were 32,000 tournaments held per year in the United States (Schramm & Hunt, 2007), further increasing in the early 2010s to nearly 42,000 tournament events held annually in the southeastern United States alone (Driscoll et al., 2012). These events provide immense economic benefits to hosting regions, with revenues generated through accommodation rentals, food, fuel, and tackle from local shops (Schramm, Armstrong, Fedler, et al., 1991). Importantly, most of these benefits accrue in rural regions (Schramm, Armstrong, Fedler, et al., 1991). Despite the socioeconomic and cultural benefits (see Cooke, 2026, for a summary of the cultural aspects of black bass fishing and tournaments) and the move away from catch-and-kill events, there have been concerns about possible adverse effects on the sustainability of the black bass populations since the early days of live-release black bass tournaments (Barnhart, 1989; Holbrook, 1975; Schramm & Gilliland, 2015). With increasing ethical concern for how humans interact with wild animals in natural resource contexts (Smith et al., 2024), there has also been interest in efforts that improve fish welfare for all forms of fishing, including tournaments (Diggles et al., 2011; Ferter et al., 2020).

Black bass tournaments in the late 1960s were catch-and-kill events; anglers would bring their five heaviest black bass on a stringer to be weighed. In 1972, Ray Scott had a vision of conservation in mind and urged that anglers keep their black bass alive for the entirety of the tournament. The advent of the live well (on boats for keeping black bass alive during a tournament) enabled the advent of the contemporary live-release tournament format. At present, traditional live-release tournaments involve anglers capturing three to six black bass (usually a five-fish limit) and placing them into a mandatory onboard functioning live well. These fish must meet total length restrictions set by tournament directors or jurisdictional regulations and usually range between 30.5 cm (12 inches) and 45.7 cm (18 inches), depending on the species and tournament location. Once an angler reaches their limit, the angler is able to cull (i.e., high-grade), if legal, to attain the heaviest set of five fish for the weigh-in. Captured fish that are culled by anglers can be released anywhere, oftentimes in locations other than where they were captured. At the end of the fishing period (typically 8 h), black bass that are still retained in the live well are brought to a central weigh-in location where they are weighed using an air or water weigh-in system (Suski et al., 2004; Tufts & Morlock, 2004). After being weighed, the fish are either released immediately near the weigh-in location or held in tanks on either a live-release boat or truck to be released at a predetermined location. There are other less prevalent retention formats (e.g., events that do hourly weigh-ins for individual fish or shore-based events where fish are transported to a central weigh-in by vehicle; Cooke et al., 1998). Ensuring that black bass are in good condition for the entirety of the tournament is an important aspect of the live-release tournament format and warrants critical best fish handling practices that will increase survival, reduce sublethal stressors, and result in more sustainable fisheries (Schramm, Armstrong, Funicelli, et al., 1991). Anglers receive penalties for bringing moribund fish to the scale, and mortality events from live release can increase scrutiny and negative views by the public or other anglers (Wilde, 1998; Wilde et al., 2002). Thus, many aspects of a contemporary live-release angling tournaments prioritize the safe capture, retention, and release of captured fish.

Evidence to date suggests that black bass tournaments have minimal to no adverse effects at the population level (Allen et al., 2004; Driscoll et al., 2007). Yet, despite the priority that anglers and organizers place on fish care during tournaments, there has always been uncertainty around traditional live-release tournaments (Schramm, Armstrong, Funicelli, et al., 1991) concerning their potential harm to individual fish (e.g., Kamara et al., 2024). More specifically, there are several factors during live-release tournaments that may result in negative effects at the individual level. During live-well holding, for example, black bass can experience crowding (Cooke et al., 2002), exposure to diseases from other fish (Schramm & Davis, 2006; Schramm et al., 2004; Steeger et al., 1994), impaired recovery rates from hypoxia (Hartley & Moring, 1995; Suski et al., 2006), and physical injuries from collisions or abrasion within the live well (Brooke et al., 2019; Maynard et al., 2013; McLaughlin et al., 1997; Steeger et al., 1994). Assuming that water quality and thermal environments are suitable during live-well retention, Suski et al. (2004) suggest that the weigh-in and the air exposure period associated with it are the most challenging aspects of a live-release tournament event for fish because of the biochemical and metabolic disturbances (i.e., decreases in energy stores, increases in metabolites like lactate and hormones like cortisol, as well as cardiorespiratory alterations and osmoregulatory challenges; e.g., Suski et al., 2004) that occur as a result of the weigh-in process. Furthermore, exceeding the carrying capacity and depletion of resources can occur when black bass are stockpiled in common locations following weigh-in and can lead to concerns related to crowding, resource depletion, or increased susceptibility to capture (Richardson-Heft et al., 2000; Wilde, 2003). Beyond stockpiling, displacing fish from their capture location to a weigh-in location can hinder the ability of the fish to return to their site of capture (e.g., Abrams et al., 2021; D. T. Brown et al., 2015; Ridgway, 2002). Thus, a number of factors during live-release black bass tournaments can act alone or synergistically to increase the mortality levels of captured, weighed, and released fish or otherwise negatively affect black bass.

Given the range of potential aspects of a tournament where common practices can negatively affect individual fish, a number of best practices have emerged over time that have been embraced and shared within the black bass fishing community that are directed at alleviating welfare concerns and maximizing fish survival. These best practices include a shift in angler ethics and support for catch and release of fish, the incorporation of technological advances in fish care (e.g., oxygenation systems), some unsubstantiated remedies intended to revive fish (e.g., pouring carbonated water on gills) or improve fish condition in the live wells (e.g., various substances that purport to facilitate recovery and maintain fish health and condition), and science-backed recommendations such as the Bass Anglers Sportsman Society's (B.A.S.S.) *Keeping Bass Alive* "document/online resource," which has evolved and been updated over time (Gilliland & Schramm, 2009; Gilliland et al., 2002). Although the *Keeping Bass Alive* document is authored by noted experts in the field and relies on some published literature, it is directed primarily toward the traditional black bass live-release format and thus does not cover all of the ways that black bass are captured and handled and released during tournaments. The evidence base regarding how fish respond to anthropogenic and natural stressors is constantly growing, and angler activities are constantly evolving—many of which can either harm or help fish and extend beyond the *Keeping Bass Alive* document. In this way, there are aspects of fish care and recommendations that are either absent from or in need of updating within the *Keeping Bass Alive* document to ensure that fish care at tournaments is current and based on the best available science. For example, the document does not cover relevant topics such as weigh-in locations or fishing during the spawning period. Also, best practices are species and context specific (Cooke & Suski, 2005), meaning that they may differ across species, aquatic systems, and reproductive stages of the target species. It is known that Smallmouth Bass *M. dolomieu* have jaw morphology and physiological tolerances (e.g., for temperature, dissolved oxygen, ammonia) that are different from those of Largemouth Bass (*M. nigricans* [previously known as *M. salmoides*]; Bennett et al., 1989; Furimsky et al., 2003; Hartley & Moring, 1995). Some tournaments also include other species, for example, Spotted Bass *M. punctulatus*, and southern tournaments undoubtedly target Florida Bass *M. salmoides* (previously *M. s. floridanus*). Moreover, it is also known that fish are locally adapted to their environment, so even fish of the same species can vary in terms of their physiological tolerances, metabolism, and sensitivity to stress across their range (most well studied in salmonids; Fields et al., 1987; reviewed in McKenzie et al., 2021). Indeed, research on Pacific salmon *Oncorhynchus* spp. has revealed significant intraspecific variation that is relevant to fisheries interactions (Raby et al., 2015). Such information for black bass is largely absent other than the recognition that outbreeding occurs when fish that are from different regions are bred, indicating that locally adapted gene complexes have been perturbed (e.g., Cooke et al., 2001; Philipp & Claussen, 1995). Therefore, creating best practices for live-release black bass tournaments that cover the range of tournament formats is challenging and likely needs to be both geographically and species specific.

To that end, the objective of this synthesis is to provide the best available evidence-based practices for various black bass tournament formats to minimize the adverse effects of live-release tournaments on individual fish. We focused on studies that are peer reviewed, technical reports or theses, and that do not consider unsubstantiated claims (whether on products or websites or angler testimonials) to be valid forms of evidence, although that does not mean that a given product or method that is purported to benefit fish does not do so. Rather, we simply lack sufficient information to assess the veracity of a given claim or anecdote. We acknowledge that it is often bottom-up activities of individual anglers, entrepreneurs, or tournament organizers that lead to innovations in fish care, but such efforts need to be validated experimentally to ensure that they are beneficial for fish (and not harmful or simply "snake oil"). The information that is provided in this review can be used by black bass anglers to improve their fish care while fish are being transported in the live well and provide ways that tournament directors can improve tournament protocols. Furthermore, this synthesis will provide information that fisheries managers can use to educate anglers and create regulations that enhance the welfare of black bass for live-release tournaments. We begin by synthesizing the available evidence, identifying the extent to which the current B.A.S.S. guidelines (i.e., *Keeping Bass Alive*) align with that evidence, and then we identify key uncertainties and knowledge gaps that could be addressed. The sequence of the sections follows how a typical live-release black bass tournament would unfold. It is organized by what should be considered prior to the tournament occurring, during tournament hours, and after the tournament weigh-in has been completed.

## Tournament organization and planning

### Water temperature

One of the most crucial factors that affects fish behavior and survival during an angling event is water temperature (Figure 1). Fish are ectotherms; thus, most biological processes, including metabolic rates, cellular function, protein function, and protein structure, depend on water temperature (e.g., Brett, 1971; Fry, 1971; Prosser, 1991). In a review by Gale et al. (2013), postrelease mortality and sublethal effects in other freshwater fish species increase by 70% in warmer temperatures. In recreational fisheries, the combination of prolonged air exposure, increased exercise, and injury can

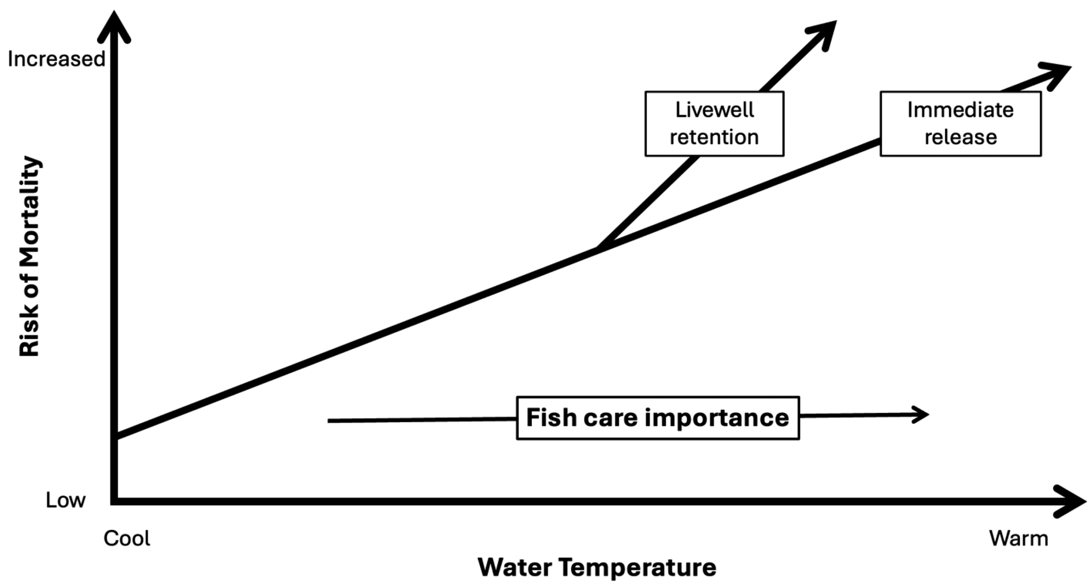


**Figure 1** Diagram showing the potential of mortality for two tournament scenarios with increasing water temperatures.

exacerbate the sublethal and lethal consequences of water temperatures (e.g., Cooke et al., 2002; Gingerich et al., 2007). Physiological alterations such as increased blood glucose and lactate (Brownscombe et al., 2014; Dinken et al., 2022; Gustaveson et al., 1991), elevated cardiac output (Cooke et al., 2003; Schreer et al., 2001), increased oxygen consumption (Diaz et al., 2007), stunted growth (Fantini et al., 2021), and increased possibility of fungal infections (Cooke et al., 2000) at higher water temperatures have all been reported for Smallmouth Bass and Largemouth Bass. Greater initial and delayed mortality in warmer water temperatures has been reported in both simulated tournament settings (Keretz et al., 2018; Neal & Lopez-Clayton, 2001; Schramm et al., 1987; Wilde, 1998) and nontournament settings (Cooke & Hogle, 2000). Ultimately, the fate of fish following release from a tournament is heavily influenced by water temperature, which allows, or halts, their ability to complete the critical biological processes that are needed to recover (Elliot, 1981; Gale et al., 2013). Different species will exhibit differing thermal ranges and maximum tolerances, which can also shift by geographical location (e.g., Beitinger et al., 2000). Although fish metabolism, swim speed, and growth generally increase at higher temperatures (e.g., Coutant, 1975; Diaz et al., 2007; Kelsch, 1996), there is a threshold that, when exceeded, can impact the fitness and survival of the fish due to the disruption of a number of cellular and metabolic processes (e.g., Farrell et al., 2008; Pörtner et al., 2008; Steinhausen et al., 2008; D. P. White et al., 2020).

Upper thermal tolerances for black bass vary by species and across their geographical range. Both lab and field studies have demonstrated that water temperature has a strong influence on the postcapture survival of black bass across their range (e.g., Maahs et al., 2021; Neal & Lopez-Clayton, 2001; Schramm et al., 1987; Welborn & Barkley, 1974; Wilde, 1998). Laboratory studies suggest that mortality of Largemouth Bass increases when water temperatures are >33°C (Keretz et al., 2018). For Smallmouth Bass in the north, laboratory studies suggest that mortality increases when temperatures exceed 32°C (Coble, 1975; E. A. Edwards et al., 1983), and Smallmouth Bass in their southern range have a higher threshold for mortality at 38°C (Brewer et al., 2022). However, laboratory and simulated studies likely overestimate these temperature thresholds given the differences from field studies, which consistently show mortality at lower temperatures. For field studies, mortality increases when water temperatures are >25°C, but variation occurs across the black bass species and range (Coutant, 1975; G. P. Edwards et al., 2004; Hartley & Moring, 1995). What is clear from these studies is that northern populations of black bass are more sensitive to warm water temperatures than the southern population of black bass that have a higher temperature tolerance (Coutant, 1975; G. P. Edwards et al., 2004; Hartley & Moring, 1995; Seidensticker, 1975). Yet, the common theme is that risk of mortality increases during the summer months, when water temperatures are the warmest (Hay et al., 2025). Overall, temperature thresholds for risk of mortality are lower for Smallmouth Bass (20–25°C) than for Largemouth Bass (25–30°C). While generally, tournaments should be more aware of the effects that water temperatures can have on mortality, these discrepancies in threshold also highlight the need to be cautious and consider that subpopulations from different regions may differ in thresholds for when mortality risk increases.

Water temperature affects not only the metabolic rate of black bass but also the amount of dissolved oxygen that the water can hold, which affects the ability of fish to cope with stressors and recover from an angling event (Schreer et al., 2001; Suski et al., 2006). At warm water temperatures, dissolved oxygen concentrations are reduced, yet the metabolic demand of black bass is increased and they require more oxygen to maintain basic bodily functions. Warm water also has physiological implications that limit, or even halt, oxygen delivery within fish (Jutfelt et al., 2024). Indeed, the dilemma of an increased metabolic rate and oxygen demand from warm water, in conjunction with the stress of low oxygen availability in the surrounding warm water, can result in the mortality of fish (Pollock et al., 2007). It is also clear that Smallmouth Bass are more susceptible to low oxygen levels than Largemouth Bass (Furimsky et al., 2003).

### Effects on spawning black bass

When water temperatures reach approximately 14°C in the late winter or early spring, male Smallmouth Bass and Largemouth Bass move into the littoral zone and create depressions in the substrate, forming nests (e.g., Kramer & Smith, 1962). While both species may occur in similar water bodies, Largemouth Bass nest in finer (e.g., silt), vegetated substrate and Smallmouth Bass nest in coarser, rockier substrate (e.g., gravel). After egg deposition, females leave the nest, leaving the male to guard the nest and fry for approximately 5 weeks until fry reach independence. During this time, the male will aggressively defend the brood from predators, with this period being crucial for the survival of the offspring (e.g., Cooke et al., 2006; M. L. Gross & Kapuscinski, 1997; M. R. Gross, 2005; Parkos et al., 2011; Philipp et al., 1997; Ridgway et al., 1989).

Black bass can be vulnerable to angling during the reproductive period, as they increase aggression levels to protect their brood during this time, particularly at northern latitudes (Sutter et al., 2014). Capturing males during the spawning period can result in 50% of the brood being predated within 8–10 min of capture, which subsequently increases the risk of nest abandonment (e.g., Stein & Philipp, 2015; Suski et al., 2003; Zuckerman et al., 2014). The potential for nest abandonment or a halt in parental care by the male increases with decreasing number of eggs or fry (Suski & Philipp, 2004; Zuckerman et al., 2014). Nest abandonment by males increases in the southern range (i.e., lower latitude) of Smallmouth Bass (Hanson et al., 2008). What is important about nesting success in northern latitudes (e.g., Ontario, Canada) is that it is directly related to recruitment success (Philipp et al., 2023) and therefore suggests that angling nesting fish can have negative effects on the population of black bass (Philipp et al., 1997). Although nest abandonment following capture occurs across the range of black bass (Hanson et al., 2008; Philipp et al., 1997; Trippel et al., 2017), the lack of population effects in southern climates (e.g., Florida, USA) might be due to the high productivity and greater densities of black bass in southern systems, where they have the ability spawn multiple times per year (Dadzie & Aloo, 1990; Hargrove & Austin, 2017; Shaw & Allen, 2014; Waters & Noble, 2004). Overall, avoiding capturing black bass during the nesting period is prudent to help increase recruitment success (Philipp et al., 1997, 2023) in systems with low productivity that do not receive supplemental stocking.

Given that fish size (length or weight) is an important metric for black bass tournament success, size in relation to spawning behavior is an important factor to consider. Generally, larger males are more aggressive and are more successful in defending their nests (Gingerich & Suski, 2011). Therefore, these larger, aggressive males are more likely to carry their brood to independence (Philipp et al., 1997). Taking aggressive males off their nests for an extended period, particularly in weigh-in tournament format tournaments, can greatly decrease black bass nesting success (Diana et al., 2012). Not allowing these aggressive males to succeed in reproduction is also a major driver in human-driven fisheries-induced evolution (Philipp et al., 2015). Aggressive males are more likely to be angled off nests in tournaments and are likely to be unsuccessful in raising their broods to independence, thus leaving smaller, less aggressive males to succeed in spawning. Due to the plasticity in age of maturation that is seen in centrarchids, overall population sizes are subject to change if there is a decrease in larger males. Smaller males will mature at an earlier age and thus invest less energy in growth (e.g., Aday et al., 2006; Drake et al., 1997). As a result, fisheries induced evolution can happen, potentially shifting the demographic of the black bass population toward producing smaller fish (Philipp et al., 2023).

While it would be best to avoid angling for nesting black bass altogether (Gwinn & Allen, 2010; Philipp et al., 2023), we recognize there are logistical and socioeconomic challenges associated with changing tournament dates or locations to accommodate this. Aside from shifting tournament location or dates on short notice, organizations should plan to avoid holding events on water bodies during the suspected spawning period as much as possible. However, in all reality, tournament scheduling generally occurs several months prior to the event occurring, predicting the exact time frame on which spawning and fry guarding will be finished at different locations is extremely challenging. In a situation where the majority of black bass are still spawning or guarding their brood during the period of the tournament, we strongly encourage tournament organizations to be flexible and adopt the catch–weigh–release format (Diana et al., 2012). We understand the logistical challenges associated with having to fill each vessel with an official marshal, but proceeding with a catch–weigh–release format (i.e., caught, weighed, and released immediately at the site of capture) will reduce the time that black bass are away from their nest, minimize brood predation, reduce nest abandonment, and ultimately increase recruitment success (Hanson et al., 2007). Current research on the effects of angling on nesting success has mostly been focused in northern geographical regions, so there is a need for more research across a broader range of latitudes (like in Hanson et al., 2008).

## Fish capture

### Gear choice

Gear choice made by anglers prior to capture (e.g., rod and line) and at the point of capture (e.g., landing method) has a direct effect on the fight duration of the fish (reviewed in Brownscombe et al., 2017; LaRochelle et al., 2025). Once hooked, fish experience a startle response, which often results in the fish engaging in burst swimming with fast-twitch white muscle (anaerobic exercise) while combating the fishing gear (Kieffer, 2000; see also Bieber & Suski, 2024). Burst swimming during an angling event depletes the energy stores in white muscle (e.g., glycogen, adenosine triphosphate, phosphocreatine), resulting in an accumulation of anaerobic by-products such as lactate (Gustaveson et al., 1991; Kieffer et al., 1996; Wood, 1991). Exhaustion occurs when the white muscle energy reserves are depleted, and longer fight times result in greater levels of lactate accumulation (Kieffer, 2000). Fish that are exhausted can have immediate reflex impairments (e.g., loss of equilibrium; Danylchuk et al., 2007) and may lack the ability to burst swim once released, all of which can decrease the overall fitness of captured fish (e.g., failure to avoid predators; Brownscombe et al., 2014). The magnitude of physiological and behavioral disturbances that captured black bass experience will be reduced by selecting appropriate gear that avoids unnecessarily long fight times and exhaustion (Brownscombe et al., 2017; Cooke & Suski, 2005; LaRochelle et al., 2025). Reducing the magnitude of physiological and behavioral disturbances means that black bass will be able to recover from the capture event faster and be more resilient to other challenges that are associated with live-release tournaments (e.g., air exposure, live-well retention, weigh-in).

Recent trends in black bass angling have shifted toward the use of finesse lures (light lures), which are best fished on lighter rods and light line (i.e., 2.3 kg [5 lb]). These lighter setups are essential for anglers, as they allow the anglers to cast and work lures effectively. However, black bass that are captured on lighter setups have longer fight times than fish that are captured on medium to heavier traditional black bass setups to avoid breaking the line (Cooke et al., 2016; LaRochelle et al., 2025). Avoiding light gear (e.g., line) when targeting larger black bass is recommended to avoid excessively long fight times.

Beyond the rod and line that are used, there is a clear increase in fight time with increasing body size of fish within a respective species (Griffin et al., 2022; LaRochelle et al., 2023, 2025). There are landing methods that can be used to shorten the fight times for larger fish, especially when using lighter gear. Landing nets are an important tool that anglers can use to reduce the fight times of fish, especially larger fish (see LaRochelle et al., 2023). The available area to corral a fish when using a net is much greater than the precision needed to grab the fish by hand. Although not using the proper net (e.g., knotted-polypropylene mesh) can increase handling times and cause physical damage to fish, such as fin erosion (Barthel et al., 2003), epithelial damage (Colotelo et al., 2011), and scale loss (Lizée et al., 2018). Using a landing net helps to reduce not only fight times but also the number of fish that are "boat-flipped." This technique is often used by experienced black bass tournament anglers and relies on the momentum of fish in conjunction with swinging the rod to extract the fish from the water and land it directly in the boat. Although this method can be effective at landing fish, there are issues related to having fish being placed onto the deck or bottom of a boat. Removal of the protective mucus and scale loss can occur when fish are placed on abrasive surfaces such as the carpet of a boat (Colotelo et al., 2011). Mucous and scale loss makes fish prone to fungal infection and diseases (e.g., *Saprolegnia*) that can lead to delayed mortality (Colotelo et al., 2013; Schwabe et al., 2014).

Currently, landing nets are not allowed to be used in black bass tournaments at the highest levels (i.e., professional). It may be beneficial to reconsider these requirements when anglers are primarily going to be using finesse gear to capture black bass. Allowing anglers to use a rubber net, which could be restricted (e.g., size and length) by the organization, would reduce unnecessarily long fight times and the subsequent exhaustion of black bass.

## Hooking injuries

When a fish successfully engages with an organic or artificial bait configured with single or multiple hooks, the point(s) of the hook(s) penetrate hard and soft tissues, inevitably causing physical injury (reviewed in Muoneke & Childress, 1994). In catch-and-release fishing, including for black bass tournaments regardless of tournament type, the extent and severity of hooking injury can pose sublethal and lethal effects (Siepker et al., 2007). There has been considerable research focused on hooking injury in centrarchids, including black bass species that are commonly targeted in tournaments (Cooke & Danylchuk, 2020; Cooke et al., 2003, 2022). Although almost all black bass tournaments focus on the use of artificial baits, studies that have specifically focused on hooking injuries when using live/dead organic baits (e.g., Cooke et al., 2003, 2012; Hussey et al., 2025) can also help inform best practices across tournament types. The extent and severity of hooking injury can be influenced by a wide range of factors including the type and number of hooks on the lure (Trahan et al., 2021), the use of scented lures (Dunmall et al., 2001), anatomical hooking location (Cooke et al., 2022; Trahan et al., 2021), angler experience (Clarke et al., 2021; Dunmall et al., 2001; Siepker et al., 2007), and the force needed for dehooking prior to being put in a live well or when released at the point of capture (Cooke et al., 2021, 2022).

Hook choice and whether a hook is barbed or barbless are aspects of fishing that are in an angler's control, and using science to inform best practices can reduce both physical and physiological damage to black bass (Brownscombe et al., 2017). The difficulty of hook removal increases with the use of treble hooks and barbed hooks and when baits are configured with multiple hooks (Hussey et al., 2025; Trahan et al., 2021). Although specialized dehooking tools and techniques can be used to assist anglers when removing hooks, their use often requires exposing fish to air and additional handling (Vermaire et al., 2025), physiological stress (Cooke et al., 2021), and epithelial damage (Colotelo & Cooke, 2011), thus prolonging recovery. When a fish is hooked deeply (e.g., esophagus), it is advised to cut the line and leave the hooks in, as digging the hook out can result in physical injury to vital organs and reduce survival (Cooke & Danylchuk, 2020; Cooke et al., 2022). It is recommended that black bass anglers have hook-cutting tools in their possession during tournaments, or anytime they are practicing catch-and-release angling. Requiring anglers to cut the line or hook when fish are deeply hooked can help lower initial and delayed mortality.

## Holding and weighing fish

How black bass are held by anglers can influence the duration of recovery following release (Skaggs et al., 2017). For example, Skaggs et al. (2017) revealed that Florida black bass that were held vertically with a lip gripper or held horizontally by using a single hand to lip the fish took longer to recover from the angling event than fish that were supported using two hands, one holding the lip and the other supporting the body. Given that black bass tournaments require exposing fish to air for weighing, collective evidence indicates that the duration of air exposure should be minimized, especially at higher water temperatures (Cooke et al., 2002; Thompson et al., 2008; A. J. White et al., 2008). Although it can be challenging to accurately weigh individual fish without exposing them to air, moving toward methods that avoid vertically hanging fish could be the next step. Anglers and tournament officials may consider moving away from vertically hanging fish given that vertically hanging fish can increase the recovery period (Skaggs et al., 2017). Using a cradle with nonabrasive material could be a good alternative to vertically hanging black bass while trying to weigh them.

### Cull tags

Traditional weigh-in based competitive fishing events for black bass involve "culling," whereby smaller fish held in live wells are replaced by larger fish over the course of a given day. To make culling more efficient, it is common for tournament anglers to weigh fish at the time of capture, temporarily apply some form of tag, and then record the weight before putting the fish in the live well. That way, subsequent catches can be weighed and it can be quickly determined if that fish should be released or switched with an existing fish to increase the total weight of fish in the live well. To tag or mark fish, a variety of tools are used, including lip-based gripping or penetrating clips, tail lassos, stringer-like gill clips, or putting fish in mesh sleeves. Concern for the effects of these devices on black bass (e.g., injury to mouth/gills, skin damage/mucous loss, impairments in respiration) has prompted two studies on the topic. First, Chong et al. (2021) compared the effects of different devices and concluded that physiological recovery (i.e., blood-based metrics) of Largemouth Bass following capture was delayed in fish that were exposed to a range of different marking methods relative to fish that were held without any mark. Second, Kamara et al. (2024) quantified the effect of cull tags on physical injury in Largemouth Bass and also included a 3-d holding period to quantify mortality. No mortalities were observed during holding in the study by Kamara et al. (2024), but all of the fish that were marked with commonly used cull tags showed increased injury rates, and the through-the-gill-arch clip showed higher injury rates relative to other tags, consistent with previous stringer studies on Smallmouth Bass and Northern Pike *Esox lucius* (Cooke & Hogle, 2000; Madden et al., 2023). Given that the available evidence suggests that the use of marks (i.e., cull tags) tends to delay recovery and cause various levels of injury, best practice would suggest limiting their use for fish that are likely to be brought to the weigh-in. Additional work is needed to determine whether it is possible to design weigh-ins that hold fish individually to enable easier sorting without any marking or additional handling. Indeed, Brooke and Tufts (2012) filed a patent that involves using padded chambers to hold fish in that manner. Research that was cited in the patent application suggests that the padding has the added benefit of reducing collisions of the fish with the walls of the live well. We also acknowledge that the culling issue is moot for fish that are captured as part of catch–weigh–release tournaments (see Cooke et al., 2020), notwithstanding the fact that some weighing methods involve temporarily suspending fish using clips that are not unlike those that are used for culling. Anglers may consider avoiding or reducing the amount of time they suspend fish from their cull tags when they are in the process of culling or lifting fish from the live well to weigh bags.

## Live-well management

### Live-well water temperature and circulation

Water quality and temperature in the live well are critical factors in attempts to keep black bass alive during retention and transportation. Live wells use recirculating pumps that fill from the surface of the lake. Commercially manufactured live wells have varying operational methods (e.g., recirculation, aeration, oxygenation) to help improve the water quality. Anglers will opt to recirculate water within the live well to help add dissolved oxygen, or they may opt to replace the water with exterior surface water to help remove metabolic waste, ammonia buildup and replenish dissolved oxygen levels (Kwak & Henry, 1995).

Black bass that are retained in live wells during tournament events are likely to experience temperatures similar (± 2°C) to the epilimnion (i.e., surface) of the surrounding water, assuming that anglers run their live-well pumps regularly, as the water in the live well is pumped from the surface (Hartley & Moring, 1993; Hay et al., 2025; Sullivan et al., 2015). Because most black bass species are likely captured from the epilimnion of the water body owing to declines in oxygen below the thermocline (Barrett et al., 2024; Suski & Ridgway, 2009), it is likely that fish that are held in live wells that regularly draw in surface water would not experience changes in water temperature from that of the epilimnion where they were captured during a tournament day. The exception here is when fish are residing and are captured from near or in the thermocline. In this situation, the differences in capture temperature relative to that during live-well retention may be stark.

Research concerning live-well water temperature has been focused mostly on Largemouth Bass, with little evidence for water temperature thresholds for other black bass species (e.g., Smallmouth Bass). Mortality does not occur when Largemouth Bass are retained in a live well at 25°C and water temperatures change by ±4°C during a 6-h holding period, indicating that warming water temperatures when the live well is 25°C are not problematic (Dinken et al., 2022). However, mortality of Largemouth Bass was 100% when live-well temperatures increased by 4°C when the fish were retained in live wells that were 33°C, but mortality was minimal when the water temperature was kept the same at 33°C (Keretz et al., 2018). When water temperatures are <29°C during a tournament, evidence suggests that the temperature of the live well does not induce mortality or impair recovery from exercise, suggesting little threat to Largemouth Bass or the need for water temperature mitigation (Keretz et al., 2018; Suski et al., 2006). But, if water temperatures in the live well exceed 29°C, the risk of mortality increases and the need for mitigation may be warranted (Keretz et al., 2018).

Another concern with live-well water temperature relates to the cooling of water, largely through practices performed by anglers (albeit this issue is similar to what might be experienced at a weigh-in event coordinated by a tournament organizer). To mitigate warm water temperatures in the live well, anglers have been recommended by B.A.S.S. fish care guidelines to add ice to their live wells to reduce water temperatures when surface water temperatures exceed 24°C (Gilliland et al., 2002). There is a lack of evidence to support that decreasing water temperatures in the live well can reduce mortality of black bass (Dinken et al., 2022; Keretz et al., 2018; Schramm et al., 2006). Cooling the live-well water temperatures by 5°C did not reduce delayed mortality in Largemouth Bass after a tournament (Ostrand et al., 2011). Furthermore, when live wells are cooled by 4°C or more, recovery rate is reduced and mortality is imminent for Largemouth Bass (Keretz et al., 2018; Suski et al., 2006; VanLandeghem et al., 2010). Supercooling live wells by 12°C or more can result in a sixfold increase in cortisol and doubling of glucose levels in Largemouth Bass (VanLandeghem et al., 2010).

In some scenarios, live-well temperatures may present a heat shock concern for black bass. Heat shock during live-well confinement could occur if water temperatures at the location of capture differ from those at the epilimnion (i.e., fish angled in deeper and colder water) or from different locations that have different thermal regimes within a water body (e.g., VanLandeghem et al., 2010). Ideally, live-well temperatures match the temperature of the water from which the fish were captured (Suski et al., 2006). If events are to be held during periods of high water temperatures, cooling of the live well by using ice may act as a potential mitigation strategy. Ice for live-well use should be unchlorinated (including chloramine), which is best achieved by freezing water from the water body where one is fishing or by using unchlorinated water. When the use of ice is warranted, it is important that live-well water temperatures are not supercooled and the water temperature is not cooled beyond more than 4°C of the surface water temperature (Dinken et al., 2022; Keretz et al., 2018; Sullivan et al., 2015).

## Water chemistry

During live-well retention, water chemistry in the live well must be maintained to ensure fish health and survival. As fish recover from stressful events, like angling, metabolic wastes, primarily ammonia ($NH_3$), and carbon dioxide ($CO_2$) are excreted and can build up in live wells (Harmon, 2009; Kwak & Henry, 1995). As these two molecules increase in concentration in the water, pH decreases (Kwak & Henry, 1995). All of these outcomes can have negative consequences for fish health in live wells (Kwak & Henry, 1995). Unionized ammonia levels above 0.2 mg/L are toxic and can result in death; however, these levels are unlikely to be reached during tournaments (Suski et al., 2007). Likewise, $CO_2$ above 10 mg/L can begin to have negative physiological effects on fish (Kates et al., 2012) but are also unlikely to be reached during tournaments. Low pH (<7.0) can reduce the efficiency of oxygen transport in fish blood (Milligan & Wood, 1987) and increase the toxicity of $NH_3$ (Thurston et al., 1981). Despite the low likelihood that $NH_3$, $CO_2$, and pH will be serious issues during tournaments (Suski et al., 2007), crowding and high temperatures in live wells will exacerbate the rate at which toxic levels of these compounds and pH will be reached.

Live-well management is important for maintaining appropriate water chemistry to ensure that fish survive to weigh-in and are in the best condition for release. Various chemical solutions are available to tournament anglers to handle changes in live-well chemistry. Anglers can add commercial water conditioners, which claim to add electrolytes (e.g., salts); maintain pH; and remove nitrates, ammonia, chlorine, chlorides, and heavy metals. Packaging on some products also claims that water conditioners will rejuvenate fish slime and stop bleeding. In an early study, Plumb et al. (1988) found no change in mortality for angled Largemouth Bass that were held in live wells that contained a commercially available water conditioner. Similarly, three different water conditioners did not improve the stress parameters in the blood of Largemouth Bass relative to control fish, and postrelease locomotor activity was unchanged relative to controls (LaRochelle et al., 2024). In fact, it is possible that the addition of water conditioners can have negative effects on angled fish, as Cooke et al. (2002) added a commercially available water conditioner to holding tanks following a 30-s simulated angling event and found that the recovery of cardiac output in Smallmouth Bass was delayed relative to recovery in fish that were held in ambient water. The addition of noniodized salt has been tested to see whether it improves recovery and reduces the mortality of tournament-caught fish (Cooke et al., 2002; Ostrand et al., 2011). These studies suggest that the addition of salt actually delays cardiac recovery (Cooke et al., 2002) and does not reduce mortality (Ostrand et al., 2011). Therefore, flushing the live well constantly with fresh water could be all that is necessary to maintain water chemistry to ensure fish health and low mortality during retention.

## Oxygen

The link between live-well management and dissolved oxygen levels is clear: The greater the biomass of fish, the more oxygen demand there will be, and during warmer periods, the ability of water to hold dissolved oxygen will decline and the metabolism of recovering fish will increase (Hartley & Moring, 1993; Kwak & Henry, 1995; Suski et al., 2006). Too much (i.e., hyperoxygenation) or low (i.e., hypoxic conditions) oxygen in live wells impairs recovery and could lead to mortality (Keretz et al., 2018; Suski et al., 2006). Hypoxic conditions are challenging for fish in the live well because their arterial oxygen pressure decreases with decreasing oxygen availability (Furimsky et al., 2003). It is important to note that oxygen consumption rate for black bass increases significantly with increasing water temperatures (Beamish, 1970; Diaz et al., 2007). The interaction of oxygen consumption with different water temperatures is important to understand when managing live-well oxygen levels. Furthermore, black bass species differ in their sensitivity to the availability of dissolved oxygen and tolerance to hypoxia (Furimsky et al., 2003). Therefore, it is important to maintain appropriate dissolved oxygen levels in live wells while retaining black bass, and this will differ by species and temperature.

Anglers have access to many products that improve dissolved oxygen levels, including portable aerators and oxygenation kits that consist of sensors, oxygen tanks, and injectors. An important difference between aerators and oxygenation kits, other than cost, is that aerators draw in air (21% $O_2$) and oxygenation involves using compressed 100% pure $O_2$. Therefore, dissolved oxygen concentrations can be high (>20 mg/L), especially when using compressed pure $O_2$. Despite the promise of these systems to maintain dissolved oxygen levels in a live well, anglers need to be cautioned against the dangers of excessive oxygenation (supersaturation) in water. The motivation for fish to "breathe" and pass water over their gills is driven by the absence of oxygen in the environment such that high oxygen environments will reduce ventilation rates (Shultz et al., 2011; Smith & Jones, 1982). Therefore, too much oxygenation, or supersaturation (e.g., >200% dissolved oxygen), in live wells will delay physiological recovery relative to fish that are held at ambient oxygenation, meaning that excessive dissolved oxygen levels should be avoided (Suski et al., 2006). It is therefore recommended that constantly refreshing live-well water with ambient fresh water using the live-well pump can help maintain adequate dissolved oxygen levels within the live-well water (Hartley & Moring, 1993) with the goal of 100% dissolved oxygen levels in the live-well water.

### Barotrauma

When present in fish, barotrauma presents a complication to anglers during black bass tournaments. Due to a lack of a pneumatic duct connecting their esophagus to their swim bladder, black bass are vulnerable to barotrauma symptoms when they are caught in deep water (>6.1 m) and quickly reeled to the surface (Carlson, 2012; Strand et al., 2005; Twardek et al., 2018). Rapid pressure changes (from high pressure at depth to low pressure at the surface) can result in symptoms like exophthalmia (bulging eyes), organ eversion through the mouth or anus, and bloating (Humborstad et al., 2017; Rummer & Bennett, 2005; Schreer et al., 2009). While dramatic pressure change can trigger such symptoms immediately, symptoms will worsen as fish are held for prolonged periods at surface pressure—such as during a standard tournament format where fish are held in a live well to be weighed at the end of the day (Jarvis & Lowe, 2008; Madden et al., 2024).

Without mitigation from the angler, released fish that are suffering from barotrauma will be unable to descend back to depth and left vulnerable on the surface, often resulting in death (I. Brown et al., 2010; Gravel & Cooke, 2008). Positive buoyancy and other symptoms can be mitigated by either manually removing air from the swim bladder of the fish using a hypodermic needle (e.g., fizzing or venting; Wilde, 2009) or by using weights to descend the fish to depth and repressurize them (Drumhiller et al., 2014). Both can be beneficial and effective for barotrauma-affected fish (Eberts & Somers, 2017; Rudershausen et al., 2023). Other tools, such as fin weights, have shown varying degrees of effectiveness in barotrauma mitigation (Eberts, Butt, & Somers, 2018; Eberts, Zak, et al., 2018; Elliott et al., 2021).

Fizzing is often favored as a rapid solution as it can be performed while fish are held in the live well, halting the development of further symptoms and allowing a recovery period before the eventual release (Elliott et al., 2021; Gilliland et al., 2002; Lee, 1992; Shasteen & Sheenan, 1997; Wilde, 2009). However, the invasiveness of fizzing requires practice with some general knowledge of fish anatomy (Scyphers et al., 2013), and there is contradicting evidence supporting the efficacy of this method to increase postrelease survival (Madden et al., 2024; Wilde, 2009). Shasteen and Sheenan (1997) suggest that punctured swim bladders were functional immediately, however this study occurred in a laboratory lacking realism of what typically happens when fish are released in the wild. Madden et al. (2025) suggests that puncture wounds from fizzing may reduce short-term swim bladder function, thereby requiring anglers to release fish in a thoughtful location with appropriate habitat (<9 m/30 ft).

Currently, Barb Elliott from B.A.S.S. provides a phenomenal barotrauma kit as well as training sessions on how to properly mitigate barotrauma symptoms for all anglers that are involved in tournaments where barotrauma could be an issue. Black bass tournament organizations may consider providing educational workshops or guidelines on proper barotrauma mitigation methods prior to tournaments. Finally, anglers should always be ready (i.e., have the appropriate tools and knowledge) to fizz fish captured fish, especially when targeting black bass in deep water (>6 m). The best barotrauma mitigation method for black bass that are retained in a live well is the use of fizzing, but it must be done properly without further injuring the fish. Tournament anglers capturing black bass that could have barotrauma (i.e., from depths >6 m) and holding them in their live wells must be confident in their ability to fizz fish properly. If they are unable to complete the fizzing process responsibly, they might consider avoiding catching fish from depths greater than 6 m.

## Logistics and organization

### Weigh-ins

The culminating event of a "traditional" black bass fishing tournament is the weigh-in during which anglers transport their catch to a centralized location at the end of a competition period for weighing. Both dry weigh-ins, during which fish are placed into a dry container and weighed, and wet weigh-ins, during which fish are weighed in a vessel of water (Cooke et al., 2020; LaRochelle et al., 2022; Suski et al., 2004) are standard formats that are used by tournament officials. Some tournaments have holding tanks for anglers to place their weigh-in bags with fish as they wait to weigh their fish. Such water-filled holding tanks may sometimes have water conditioners in them. Much research has focused on the negative effects of the weigh-in process postrelease of the fish, with a focus on physiological consequences and mortality (Schramm et al., 1987; Suski et al., 2003, 2004). However, major factors influencing physiological stress in tournament-captured fish begin long before the weigh-in.

Weigh-ins themselves provide further challenges. The air exposure and subsequent bursts of physical activity derived from a dry weigh-in format have been shown to increase lactate and deplete muscle energy stores (Suski et al., 2004). Although wet weigh-ins reduce air exposure times, they can still facilitate hypoxic conditions via transfer and weigh-bags if care is not taken by anglers and organizers to regularly monitor dissolved oxygen during all times where fish are held in water (Killen et al., 2006; Suski et al., 2004) to avoid further physiological stress and cumulative effects of the aforementioned sublethal stressors. However, measures can be taken to reduce these effects and may need to be species specific. For example, different precautions regarding oxygen at the weigh-in may be warranted (i.e., in-water weigh-in, reduced bag limits) for tournaments where Smallmouth Bass are the primary target (i.e., Great Lakes: Elliott et al., 2025) given that they are more sensitive to hypoxia (Furimsky et al., 2003). Overall, the stress of black bass during the weigh-in process can be minimized if the air exposure period and exposure to hypoxic waters (e.g., holding troughs, weigh-in tanks) are minimized. This could be achieved by reducing the time that fish are removed from the water for pictures, reducing the time fish spend in the weigh-in bags while queued to weigh-in, and by ensuring that aerators are used to replenish dissolved oxygen in weigh-in troughs.

### Release location

Following the conclusion of most traditional tournaments, anglers and organizers begin the process of returning fish to the waterbody where they were captured. In many tournaments, it is common for fish to be released at a single location that is adjacent to the weigh-in location, such as a dock or a boat ramp. Release in these situations can occur in a number of ways, including anglers simply walking to the release location after weighing and returning their fish to the water by hand (Hay et al., 2025). This can also be facilitated with a chute/tube that extends offshore into deeper water (Eberts, Butt, & Somers, 2018; Eberts, Zak, et al., 2018).

The process of releasing large numbers of captured fish at a common location can result in a number of negative consequences for the released fish as well as the receiving environment. For example, the act of transporting fish away from a capture point may remove fish from preferred habitats and force them to inhabit suboptimal locations that can impede growth, survival, and reproduction (Beyer et al., 2010; Ricks & Maceina, 2008). Releasing fish into locations such as a marina or other similar, high-traffic, public areas has the potential to expose fish to noise, reduced water quality, or pollution, all of which can increase stress, limit food intake, and result in impaired growth (An, Kampbell, & Breidenbach, 2002; An, Kampbell, & Sewell, 2002; Jacobsen et al., 2014; Sadoul & Vijayan, 2016). Furthermore, studies have shown that large numbers of fish can remain at or near common release points for several weeks or months (Abrams et al., 2021; Maynard et al., 2017; Ricks & Maceina, 2008; Wilde, 2003), and this increased density of fish in a relatively small location can result in density-dependent competition and reduced access to prey (Ricks & Maceina, 2008). Therefore, practices that release tournament-caught fish at a common release location can result in negative consequences for the fish.

To minimize the adverse effects that can occur by releasing fish at a common point adjacent to the weigh-in location, which might not always be suitable habitat, anglers and organizers have a number of possible alternatives. For example, following the weigh-in, anglers could return fish to their live wells on their boats and distribute fish at a few locations beyond the typical release point, prioritizing areas that are commonly known to hold fish, thereby reducing the density of fish at a single point and depositing fish in favorable habitats. Alternatively, truck- or trailer-mounted release tanks could be placed near the weigh-in location and fish distributed around the lake into multiple locations by driving on roads. A similar process of distributing captured fish around the lake can be done using a live-release boat with holding tanks and driving around the water body. When using release tanks, either trailer-mounted or on a live-release boat, care must be taken to monitor water parameters such as dissolved oxygen and temperature to avoid subjecting fish to suboptimal conditions that can contribute to impairment or mortality (Suski et al., 2007).

## Are black bass tournaments killing fish?

Mortality of black bass from live-release tournaments has historically ranged from 0% to 50% (see meta-analysis by Wilde, 1998). However, the total level of mortalities from these types of events has decreased (Wilde et al., 2002) and tournament-related mortalities are likely not affecting black bass populations (e.g., Allen et al., 2004; Driscoll et al., 2007; Sylvia et al., 2021). For the most part, the rate of mortality has declined, but there remains some initial and delayed mortality that still occurs following live-release tournaments. Today, tournament-related mortalities are even lower (e.g., 1% to 6%, G. P. Edwards et al., 2004; Sylvia et al., 2021) and are likely attributed to advances in technology (e.g., boat live-well designs, battery technology), conservation efforts by tournament organizations (e.g., B.A.S.S. weigh-in system), increased scientific evidence on best fish handling practices, and shifts in social norms around conservation ethics. Unfortunately, when things go wrong with live-well operations while fish are being retained (e.g., battery or water pump failure) or during the weigh-in (e.g., B1 event in July 2019 on the St. Lawrence River; Elliott et al., 2025), mass mortality can still occur. Moreover, warm water temperatures are almost always involved in these mortality events (Wilde, 1998).

The change in black bass taxonomy has raised important research needs. Typically, we have thought about black bass fishing guidance as being germane across all black bass species or simply split between Largemouth Bass and Smallmouth Bass. Today, we now know that Largemouth Bass and Florida Bass are indeed unique species that have different environmental tolerances. Those factors need to be considered when developing guidance for tournaments given that there is a move toward species-specific guidelines (Cooke & Suski, 2005). The world is also changing such that freshwater fishes are increasingly facing conditions of drought, high temperatures, low oxygen (i.e., hypoxia), dynamic winter conditions (i.e., winter weirding), invasive species, and pathogens (Harrod, 2015). How those external drivers will influence how black bass respond to the stress of tournaments is unclear, but we should be working collectively toward optimizing catch-and-release practices so that fish are in the best possible state to deal with those other challenges. What is essential is to ensure that any actions that are proposed by anglers or tournament anglers are evaluated scientifically to ensure that they truly improve the experience for fish.

## Catch–weigh–release tournaments

Recently, in an attempt to alleviate some of the concerns related to fish welfare, a new live-release tournament format has been introduced (summarized in Cooke et al., 2020). This new tournament format was brought forward by Major League Fishing (MLF) in 2012 and relies on a tournament official being present in the boat of each angler. Once a fish is captured, the official weighs the fish and it is immediately released at the location of capture. Depending on the tournament series, the scoring design differs. The most common design, which was brought forward by MLF, has anglers capturing as many fish as possible during the allotted time and the angler with the largest cumulative weight obtained through the tournament day, or days depending on the format, wins the event. At the end of the angling period, the angler with the largest cumulative weight obtained throughout the tournament day(s) wins the event. Other events use total cumulative length of fish or the weight of the largest five fish.

The catch–weigh–release tournament format is one potential solution to issues associated with live-release tournaments. This format removes the aspects of highest mortality risks in traditional live-release tournaments such as live-well retention (e.g., live-well failure, hypoxia, crowding) and weigh-in period (Figure 2). Furthermore, catch–weigh–release tournaments also reduce the displacement of fish from the location of capture (e.g., no culling or central weigh-in), which could ensure that black bass are not removed from their nest for a long period during the spawning period.

The new catch–weigh–release format has been adopted by several black bass kayak leagues and relies on photo evidence for measuring fish. More recently, B.A.S.S.—pioneers of the traditional tournament format since the early 1950s—also adopted this format for their tournament events on Lake Fork in Texas, USA, to comply with fish size retention regulations. More regional/local tournament events appear to be embracing the catch–weigh–release approach, taking advantage of cell phone apps that allow participants (and spectators) to receive updates in real time on fish catches (Wegman, 2019; see also Cooke et al., 2020). What is also promising is that some college fishing events (the next generation of tournament anglers) are embracing catch–weigh–release formats, which suggests that norms will continue to evolve over time. The newly adopted tournament format can potentially provide some important improvements to fish welfare, yet there are still some concerns that are shared between these two different weigh-in formats (e.g., air exposure, hanging fish vertically during weight measurement, capture during spawning period).

The adoption of alternative weigh-in methods when possible, such as the catch–weigh–release format in which black bass are captured and officially weighed under the supervision of an onboard referee (or via photograph for smaller organizations), has the potential to mitigate the accumulation of these physiological stressors and increase survival rates postrelease. However, there are some complications related to the logistics of embracing this format. One of the more challenging aspects of this type of tournament is the need for an official marshal (i.e., referee) to be in each boat to ensure accuracy of scoring and reducing the possibility of cheating. This hurdle is less likely to occur at the professional level but may be a considerable feat for small club-like tournament events. A potential solution to this issue could be the use of

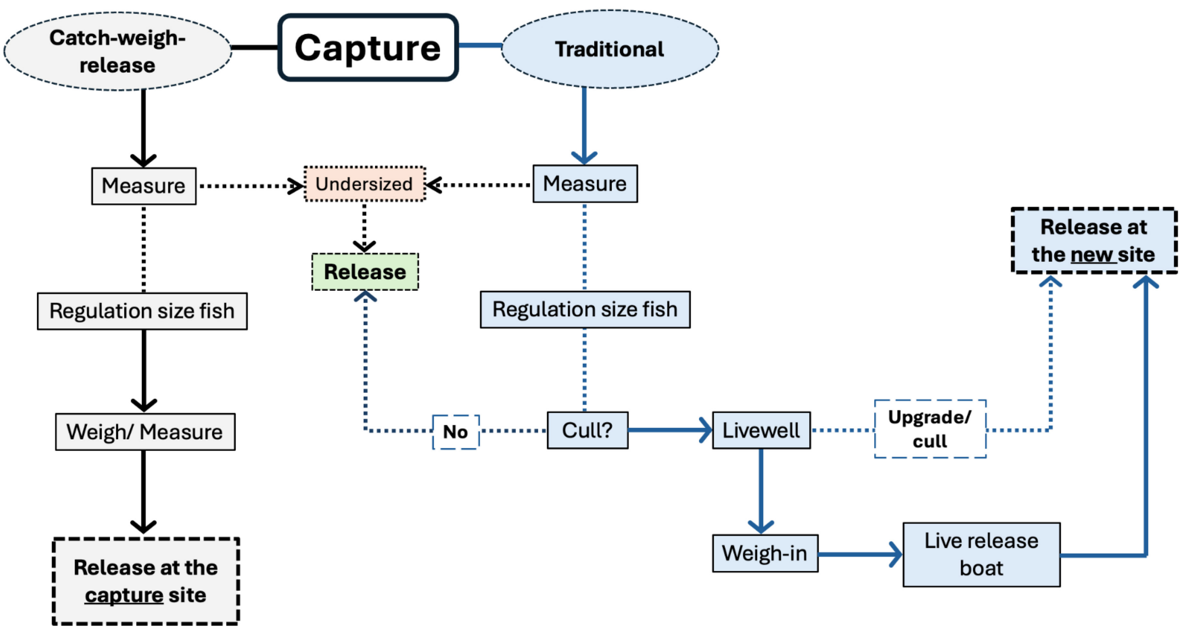


**Figure 2** Flow diagram of what occurs during a live-release black bass tournament for both a traditional live-well-retention tournament and a catch–weigh–release tournament. The order of steps for the catch–weigh–release tournament is filled with the light gray and the traditional live-well-retention tournament with a central weigh-in is filled with a light blue.

cameras mounted on each boat that provides a live stream, and anglers would have to abide by specific rules that would need to be followed for each catch to count for scoring. For example, the rules could specify that all catches must be captured on camera, the scale is zeroed and shown to the camera prior to weighing the fish, the weighing process is recorded on the live feed, and the release of that fish could be recorded. Essentially, each step would be recorded, allowing for the anglers to be held accountable. Additionally, the scales to be used by all competitors should be calibrated and have the ability to continuously record the weights on the scales for the duration of the day. This would ensure that the weights that are entered can be further validated. Finally, the catch–weigh–release format would essentially remove the potential for community engagement at the weigh-in. However, community engagement could still be achieved by tournament organizations creating a "command hub" area, with screens where live streams are shared for the community to congregate and watch. These are some of the potential reasons that the catch–weigh–release format is not being adopted fully, yet.

## Conclusion

Conservation considerations in black bass tournaments have advanced significantly over the past several decades. Just like Ray Scott (B.A.S.S. founder) did when changing tournaments from a catch–kill format to a catch-and-release format, current tournament organizations must be willing to change how they operate if black bass tournaments become a threat to black bass populations. Current initiatives to ensure the conservation of fisheries from the top tournament organizations (MLF and B.A.S.S.) are not completely coherent with current science-based evidence and need to be updated (*Keeping Bass Alive*; see Table 1). What is interesting is that the *Keeping Bass Alive* (i.e., Gilliland & Schramm, 2009; Gilliland et al., 2002) information guide provides suggestions that are not followed by the top angling series in the B.A.S.S. organization (Table 1; e.g., allowing the use of nets). Changing tournament logistics to reflect science-based evidence would improve fish welfare. This is especially important given that the "average angler" tends to model their behavior after that of fisheries professionals and social media celebrities (e.g., YouTubers). Furthermore, social media outlets are a great way for professionals and media celebrities to share and educate anglers on good science-based practices.

Social norms among black bass tournament anglers should move away from abiding by best fish handling practices that are not supported by scientific evidence (Danylchuk et al., 2018). If operated properly and water conditions are appropriate, live wells can actually help with recovery of black bass (LaRochelle et al., 2022, 2024; Suski et al., 2006). There are several practices that are related to live-well management that are suggested by anglers and the angling industry that are not scientifically tested or supported by current scientific evidence (beyond claims made by manufactures—especially related to various live-well additives). Innovations that promote fish welfare are important; however, it is essential that these innovations are scientifically tested before being promoted and embraced.

The B.A.S.S. organization has created a conservation branch that has undoubtedly improved the welfare and conservation of black bass during live-release tournaments. This organization is the driving force behind the current guides (i.e., *Keeping Bass Alive*; Gilliland & Schramm, 2009; Gilliland et al., 2002) that are used by tournament anglers for fish welfare, but it omits some of the bigger logistical issues. Collaboration between scientists, regulators, and tournament organizers is needed to ensure that tournament procedures truly benefit fish. Tournament organizations could provide monetary or in-kind support and resources for research when anglers are suggesting and promoting fish-handling techniques that have not been scientifically tested. For example, just like some companies devote 1% of their profits to the planet, imagine what would be possible if every tournament dedicated some of their pot for black bass science and conservation. Ultimately, black bass tournaments can only thrive and occur if the ecosystem they visit has a strong population of black bass. Without a strong population, this sport would not exist, and therefore, it is in the best interest of all involved, from the anglers to the agencies providing tournament permits to the tournament organizations, to have the best practices for the fish that are based on scientific evidence.

Black bass tournament formats and regulations have constantly evolved throughout the history of their existence. Tournament organizations should remain open to format and regulation changes based on scientific evidence and evolving social norms. Anglers should also be more open to learning and follow science-based best fish-handling practices. As anthropogenic development and climate change threatens our aquatic ecosystems in new ways (e.g., extreme heat waves), reducing tournament-related sublethal effects on individual fish may be important for the future of our black bass fisheries. Without sustainable black bass populations, tournament fishing for black bass will no longer exist, emphasizing the obvious imperative for embracing change that is focused on fish welfare.

Tournament organizations could consider reducing the number of fish that anglers are allowed to retain in their live well during a tournament day. Most tournaments allow a maximum of five fish per angler or team per day. Alternatively, when water temperatures are extreme or fish are spawning, tournament organizations may consider reducing the number of black bass that are allowed to be retained to three or four per day (e.g., Canadian Sport Fishing League—2025 Sturgeon Lake Wildcard event; BaitFuel Fishing Tour–Thousand Island Open). Reducing the number of fish in the live well not only reduces the crowding of fish while retained but also reduces the number of individuals that are using the limited oxygen available in the warm live-well water (Hartley & Moring, 1993). For example, this is especially relevant for tournaments on the Great Lakes, and other bodies of water, where anglers specifically target Smallmouth Bass that are less tolerant of low oxygen (Elliott et al., 2025; Furimsky et al., 2003). Reducing the number of fish that can be retained in the live well when water temperatures are extreme could reduce the number of fish that could be at risk of mortality. Additionally, tournament organizations could provide anglers with the opportunity to weigh fish in at any point during the

**Table 1** Critical assessment of the current *Keeping Bass Alive* (Gilliland & Schramm, 2009) document and comparison of the statements with the current scientific evidence.

| ***Keeping Bass Alive* section** | **Scientifically supported** | **Example references** |
|---|---|---|
| *Slime coat* | | |
| Avoid boat flipping | Avoid contact with rough surfaces (i.e., avoid letting fish touch the carpet). | Cooke and Hogle, 2000; Colotelo and Cooke, 2011 |
| Landing net | Helps reduce fight time and excessive exhaustion. Use rubber nets to avoid fin and epithelial damage. | LaRochelle et al., 2023; Lizée et al., 2018 |
| Hold fish by lower jaw without body support | Vertically hanging large fish by hand or with grips can be damaging. | Danylchuk et al., 2008; Skaggs et al., 2017 |
| *Hook removal* | | |
| Removal of all hooks | Removing deep hooks increases chances of mortality. Cut the line of deeply hooked fish. | Cooke and Danylchuk, 2020; Fobert et al., 2009 |
| Use of hemostat or pliers | Pliers or hemostat can reduce unhooking duration but can cause more tearing damage. | Cooke et al., 2021; Vermaire et al., 2025 |
| Hook-reversal technique | This method causes excessive bleeding, gill damage, and mortality. | Cooke et al., 2022 |
| *Air exposure* | | |
| Duration | Minimize air exposure as much as possible. | Cook et al., 2015; White et al., 2008 |
| *Culling* | | |
| Cull tags | Avoid cull tags that go through the gills. | Chong et al., 2021; Cooke and Hogle, 2000; Kamara et al., 2024 |
| *Live-well management* | | |
| Injury | Injury is caused from being retained in the live well. Padding can help reduce injury while being retained and transported. | Brooke et al., 2019; Maynard et al., 2013 |
| Oxygen levels | Try to keep water at 100% dissolved oxygen saturation. | Carmichael et al., 1984; Suski et al., 2006 |
| Recirculation | No studies have assessed this. | No scientific evidence |
| Aerators | No studies have assessed this. | No scientific evidence |
| Water temperature (use of ice) | Do not reduce water temperature more than 5°C from capture temperature. | Dinken et al., 2022; VanLandeghem et al., 2010 |
| Chemical additives | Chemical additives do not help recovery or reduce retention stress. | Cooke et al., 2002; LaRochelle et al., 2024; Plumb et al., 1988 |

day to help reduce the total retention time. This would allow anglers to bring fish to the weigh-in at any point in the day to avoid unnecessarily long retention times when water temperatures are elevated. Relatedly, if water temperatures are high (e.g., an increasingly normal summer reality), central weigh-in black bass tournaments may need to be restricted through voluntary actions of tournament officials or by government authorities. For nontournament anglers, avoiding holding fish in the live well for an end-of-the-day picture when the water temperature is warm could also be considered. Ideally, a shift in the social norm for black bass tournaments would occur. The new norm and paradigm shift, which is not something new for black bass tournaments (e.g., shift from catch-and-kill to live-release tournaments in the 1970s), could consider pausing central weigh-in tournaments during warming water temperatures and opt to use catch–weigh–release formats during these periods.

Black bass tournaments may consider not holding tournaments before and during the spawning period. Tournament organizations could be more diligent when planning their schedule to avoid holding tournaments on water bodies when they suspect black bass are about to spawn or are going to be spawning. Retaining fish for central weigh-ins adds many more logistical steps (e.g., coordination of live-release boats) and opens more possibilities for challenges that can potentially have negative effects on individual black bass and the population. Of the most concern is the transport of fish that lay eggs, which are subjected to a stress event (live-well retention) and are now removed from the area where they were going to spawn. Because tournament anglers are targeting the largest black bass in the aquatic system, larger, more fecund fish are more prone to being brought to the weigh-in. This is concerning for egg-bearing females that are being transported several kilometers away from where they were getting ready to spawn, potentially reducing their chances of successful reproduction. Furthermore, the stress of live-well retention for egg-bearing females can have negative effects on the brood (e.g., smaller juveniles; Ostrand et al., 2004). If tournament dates happen to align with the prespawn or spawning period of black bass, a shift to the catch–weigh–release format should be strongly considered by the tournament organization.

Beyond anglers, organizations, and regulators, boat manufacturing companies are in a strong position to push new initiatives for fish conservation by implementing water quality sensors in their live wells. Incorporating water temperature and dissolved oxygen sensor could be beneficial for allowing anglers to manage their live wells properly. The caveat to this would be that anglers would need to be educated on how to use such a system properly and how to mitigate potential harmful conditions in the live well. Of course, these sensors would need to be calibrated, but having real-time data on what is happening with the water in the live well could be important for fish welfare overall. One could even envision a future where that information is transmitted live to the tournament organizer, with penalties levied for participants if their live-well environmental conditions exceed predetermined thresholds.

## Future research

There is currently a gap in knowledge on the ideal live-well retention methods for different black bass species across their geographic range. For example, research on oxygen requirements and upper thermal temperature limits for Largemouth Bass in their southern limit may not be applicable for Largemouth Bass in northern climates. This also holds true for Smallmouth Bass. More research is needed to bolster the evidence on oxygen requirement and upper temperature thresholds across species and geographical locations. In general, there have been relatively few science-based innovations in live-well design (although, see Brooke & Tufts, 2012, for an example of a padded live-well patent).

Social science could play a major role in understanding the view of the public on live-release black bass tournaments. Such studies could provide valuable information around the basis for negative perceptions surrounding the sport in certain regions or on specific water bodies. Social studies could provide anglers or organizers with information on drivers underlying negative perceptions and thus guide where reform is needed. Further, social science could be used to analyze the hesitancy surrounding the adoption of catch–weigh–release tournaments. Understanding the reasons why these practices are challenging or ways to adopt them more holistically may be a good first step to overcoming some of the issues surrounding the adoption of catch–weigh–release tournaments. That would seem a profitable research direction given that the use of catch–weigh–release tournaments addresses many of the issues that affect fish welfare during black bass tournaments (Cooke et al., 2020).

We also acknowledge that the primary domain of the fisheries managers is the population (Corsi, Quist, et al., 2025), whereas much of the research on black bass tournaments is focused on the individual and related welfare issues. Of course, issues at the individual level can scale up to affect populations (Cooke et al., 2025). There remains a gap between research that focuses on individual fish (welfare) and research that focuses on population-level processes such that there is need for more holistic research (Corsi, Cooke, et al., 2025). There is need for more ecologically relevant empirical research and modeling to fully understand the contexts in which black bass tournaments may contribute to issues that extend beyond individual welfare and influence the population.

## Data availability

No data were used in the creation of this manuscript.

## Ethics statement

As this article reviewed existing data and literature, no ethical guidelines were applicable to this study.

## Funding

L. LaRochelle and S. J. Cooke are supported by the Natural Sciences and Engineering Council of Canada.

## Conflicts of interest

The authors declare no conflict of interest aside from their participation in black bass fishing.

## Acknowledgments

We recognize that tournament organizations are a business and that viewership is best when anglers are catching fish. We also recognize that tournament organizations are trying their best to be conservation oriented for the benefit of black bass and the sector. We acknowledge that all of the coauthors are avid anglers and that several participate in black bass angling tournaments. We thank the reviewers for their feedback and suggestions, which improved this synthesis.

## References

Abrams, A. E. I., Zolderdo, A. J., Lédée, E. J. I., Lawrence, M. J., Holder, P. E., & Cooke, S. J. (2021). Dispersal patterns of Largemouth Bass and Smallmouth Bass following early-, mid-, and late-season fishing tournaments in an eastern Ontario lake. *North American Journal of Fisheries Management*, *41*, 1454–1464. https://doi.org/10.1002/nafm.10664

Aday, D. D., Philipp, D. P., & Wahl, D. H. (2006). Sex-specific life history patterns in Bluegill (*Lepomis macrochirus*): Interacting mechanisms influence individual body size. *Oecologia*, *147*, 31–38. https://doi.org/10.1007/s00442-005-0242-x

Allen, M. S., Rogers, M. W., Myers, R. A., & Bivin, W. M. (2004). Simulated impacts of tournament-associated mortalities on Largemouth Bass fisheries. *North American Journal of Fisheries Management*, *24*, 1252–1261. https://doi.org/10.1577/M03-212.1

An, Y. J., Kampbell, D. H., & Breidenbach, G. P. (2002). *Escherichia coli* and total coliforms in water and sediments at lake marinas. *Environmental Pollution*, *120*, 771–778. https://doi.org/10.1016/S0269-7491(02)00173-2

An, Y. J., Kampbell, D. H., & Sewell, G. W. (2002). Water quality at five marinas in Lake Texoma is related to methyl tert-butyl ether (MTBE). *Environmental Pollution*, *118*, 331–336. https://doi.org/10.1016/S0269-7491(01)00301-3

Barnhart, R. A. (1989). Symposium review: Catch-and-release fishing, a decade of experience. *North American Journal of Fisheries Management*, *9*, 74–80. https://doi.org/10.1577/1548-8675(1989)009<0074:SRCARF>2.3.CO;2

Barrett, H., Gregory, S., & Armstrong, J. (2024). Evidence of a temperature-oxygen squeeze within floodplain thermal refuge habitats. *Freshwater Biology*, *69*, 1118–1130. https://doi.org/10.1111/fwb.14294

Barthel, B. L., Cooke, S. J., Suski, C. D., & Philipp, D. P. (2003). Effects of landing net mesh type on injury and mortality in a freshwater recreational fishery. *Fisheries Research*, *63*, 275–282. https://doi.org/10.1016/S0165-7836(03)00059-6

Beamish, F. W. H. (1970). Oxygen consumption of Largemouth Bass, *Micropterus salmoides*, in relation to swimming speed and temperature. *Canadian Journal of Zoology*, *48*, 1221–1228. https://doi.org/10.1139/z70-211

Beitinger, T. L., Bennett, W. A., & McCauley, R. W. (2000). Temperature tolerances of North American freshwater fishes exposed to dynamic changes in temperature. *Environmental Biology of Fishes*, *58*, 237–275. https://doi.org/10.1023/A:1007676325825

Bennett, D. H., Dunsmoor, L. K., Rohrer, R. L., & Rieman, B. E. (1989). Mortality of tournament-caught Largemouth and Smallmouth bass in Idaho lakes and reservoirs. *California Fish and Game*, *75*, 20–26.

Beyer, H. L., Haydon, D. T., Morales, J. M., Frair, J. L., Hebblewhite, M., Mitchell, M., & Matthiopoulos, J. (2010). The interpretation of habitat preference metrics under use–availability designs. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *365*, 2245–2254. https://doi.org/10.1098/rstb.2010.0083

Bieber, J. F., & Suski, C. D. (2024). The physiology of catch and release angling. In A. Todgham, J. Rummer, E. Standen, D. Fudge, & A. Esbaugh (Eds.), *Encyclopedia of fish physiology* (Vol. 3, 2nd ed., pp. 588–598). Elsevier. https://doi.org/10.1016/B978-0-323-90801-6.00067-7

Brett, J. R. (1971). Energetic responses of salmon to temperature: A study of some thermal relations in the physiology and freshwater ecology of Sockeye Salmon (*Oncorhynchus nerka*). *American Zoologist*, *11*, 99–113. https://doi.org/10.1093/icb/11.1.99

Brewer, S. K., Mollenhauer, R., Alexander, J., & Moore, D. (2022). Critical thermal maximum values for stream fishes, including distinct populations of Smallmouth Bass. *North American Journal of Fisheries Management*, *42*, 352–360. https://doi.org/10.1002/nafm.10749

Brooke, T. C., Elliott, C. W., Holden, J., Wang, Y., Hornsby, R. L., & Tufts, B. L. (2019). The importance of live-well transport in the physiological disturbance experienced by Smallmouth Bass in tournaments on large water bodies. *North American Journal of Fisheries Management*, *39*, 1260–1268. https://doi.org/10.1002/nafm.10357

Brooke, T. C., & Tufts, B. L. (2012). *Fish living system and live-well padding therefor* [U.S. Patent Application No. 13/476,014]. U.S. Patent and Trademark Office. https://patentimages.storage.googleapis.com/3f/20/c8/ad251b427f120b/US20120291335A1.pdf

Brown, D. T., Rice, J. A., Suski, C. D., & Aday, D. D. (2015). Dispersal patterns of costal Largemouth Bass in response to tournament displacement. *North American Fisheries Management*, *35*, 431–439. https://doi.org/10.1080/02755947.2015.1009660

Brown, I., Sumpton, W., McLennan, M., Mayer, D., Campbell, M., Kirkwood, J., Butcher, A., Halliday, I., Mapleston, A., Welch, D., Begg, G. A., & Sawynok, B. (2010). An improved technique for estimating short-term survival of released line-caught fish, and an application comparing barotrauma-relief methods in Red Emperor (*Lutjanus sebae* Cuvier 1816). *Journal of Experimental Marine Biology and Ecology*, *385*, 1–7. https://doi.org/10.1016/j.jembe.2010.01.007

Brownscombe, J. W., Danylchuk, A. J., Chapman, J. M., Gutowsky, L. F., & Cooke, S. J. (2017). Best practices for catch-and-release recreational fisheries–angling tools and tactics. *Fisheries Research*, *186*, 693–705. https://doi.org/10.1016/j.fishres.2016.04.018

Brownscombe, J. W., Marchand, K., Tisshaw, K., Fewster, V., Groff, O., Pichette, M., Seed, M., Gutowsky, L. F. G., Wilson, A. D. M., & Cooke, S. J. (2014). The influence of water temperature and accelerometer-determined fight intensity on physiological stress and reflex impairment of angled Largemouth Bass. *Conservation Physiology*, *2*, Article cou057. https://doi.org/10.1093/conphys/cou057

Carlson, T. J. (2012). Barotrauma in fish and barotrauma metrics. In A. N. Popper, & A. Hawkins (Eds.), *The effects of noise on aquatic life* (Advances in Experimental Medicine and Biology 730, pp. 229–233). Springer.

Carmichael, G. J., Tomasso, J. R., Simco, B. A., & Davis, K. B. (1984). Characterization and alleviation of stress associated with hauling Largemouth Bass. *Transactions of the American Fisheries Society*, *113*, 778–785. https://doi.org/10.1577/1548-8659(1984)113<778:CAAOSA>2.0.CO;2

Chong, D. R., Abrams, A. E., Zolderdo, A. J., Lawrence, M. J., Reid, C. H., & Cooke, S. J. (2021). Physiological consequences of different fishing tournament culling methods on Largemouth Bass. *North American Journal of Fisheries Management*, *41*, 26–34. https://doi.org/10.1002/nafm.10489

Clarke, S. H., Brownscombe, J. W., Nowell, L., Zolderdo, A. J., Danylchuk, A. J., & Cooke, S. J. (2021). Do angler experience and fishing lure characteristics influence welfare outcomes for Largemouth Bass? *Fisheries Research*, *233*, Article 105756. https://doi.org/10.1016/j.fishres.2020.105756

Coble, D. W. (1975). Smallmouth Bass. In H. Clepper (Ed.), *Black Bass biology and management* (pp. 21–22). Sport Fish Institution.

Colotelo, A. H., & Cooke, S. J. (2011). Evaluation of common angling-induced sources of epithelial damage for popular freshwater sportfish using fluorescein. *Fisheries Research*, *109*, 217–224. https://doi.org/10.1016/j.fishres.2010.12.005

Colotelo, A. H., Raby, G. D., Hasler, C. T., Haxton, T. J., Smokorowski, K. E., Blouin-Demers, G., & Cooke, S. J. (2013). Northern Pike bycatch in an inland commercial hoop net fishery: Effects of water temperature and net tending frequency on injury, physiology, and survival. *Fisheries Research*, *137*, 41–49. https://doi.org/10.1016/j.fishres.2012.08.019

Cook, K. V., Lennox, R. J., Hinch, S. G., & Cooke, S. J. (2015). Fish out of water: How much air is too much? *Fisheries*, *40*, 452–461. https://doi.org/10.1080/03632415.2015.1074570

Cooke, S. J. (2026). Maxims for responsible and sustainable black bass management and conservation. *North American Journal of Fisheries Management*, *vqag012*, https://doi.org/10.1093/najfmt/vqag012.

Cooke, S. J., Abrams, A. E. I., Zolderdo, A. J., & Suski, C. D. (2020). On improved care of black bass during live-release competitive angling events: Recent innovations and associated research needs. *Fisheries*, *45*, 178–183. https://doi.org/10.1002/fsh.10393

Cooke, S. J., Bunt, C. M., & McKinley, R. S. (1998). Derby determined vital statistics and trends of Smallmouth Bass (*Micropterus dolomieu*) recreational fishery in the middle reach of the Grand River, Ontario. *Canadian Field-Naturalist*, *112*, 451–458. https://doi.org/10.5962/p.358448

Cooke, S. J., Cooke, C. J., & Brownscombe, J. W. (2016). Ultralight of heavyweight? The interactive effects of gear strength and air exposure on reflex impairment in Largemouth Bass. *Transactions of the American Fisheries Society*, *145*, 1202–1207. https://doi.org/10.1080/00028487.2016.1208116

Cooke, S. J., Cooke, C. J., Cooke, J. T., Cooke, B. W., Danylchuk, A. J., & Brownscombe, J. W. (2021). Efficacy of dehooking tools for the removal of hooks from the jaw region of angled fish. *Fisheries Research*, *240*, Article 105965. https://doi.org/10.1016/j.fishres.2021.105965

Cooke, S. J., & Danylchuk, A. J. (2020). Hook disgorgers remove deep hooks but kill fish: A plea for cutting the line. *Fisheries Management and Ecology*, *27*, 622–627. https://doi.org/10.1111/fme.12462

Cooke, S. J., Danylchuk, A. J., Tracey, S. R., Arlinghaus, R., Lennox, R. J., Brownscombe, J. W., Weir, A., Hinch, S. G., Paterson, D. A., Guckian, M. L., & Danylchuk, A. J. (2025). Individual outcomes matter in the context of responsible and sustainable catch-and-release practices in recreational fisheries and their management. *Fisheries*, *50*, 172–181. https://doi.org/10.1093/fshmag/vuae023

Cooke, S. J., & Hogle, W. J. (2000). Effects of retention gear on the injury and short-term mortality of adult Smallmouth Bass. *North American Journal of Fisheries Management*, *20*, 1033–1039. https://doi.org/10.1577/1548-8675(2000)020<1033:EORGOT>2.0.CO;2

Cooke, S. J., Kassler, T. W., & Philipp, D. P. (2001). Physiological performance of Largemouth Bass related to local adaptation and interstock hybridization: Implications for conservation and management. *Journal of Fish Biology*, *59*, 248–268. https://doi.org/10.1111/j.1095-8649.2001.tb01389.x

Cooke, S. J., LaRochelle, L., Danylchuk, A. J., Danylchuk, S. C., & Griffin, L. P. (2022). Influence of hook barbs on the "through-the-gill" hook removal method for deeply hooked Smallmouth Bass. *Fisheries Research*, *251*, Article 106322. https://doi.org/10.1016/j.fishres.2022.106322

Cooke, S. J., Nguyen, V. M., Murchie, K. J., Danylchuk, A. J., & Suski, C. D. (2012). Scientific and stakeholder perspectives on the use of circle hooks in recreational fisheries. *Bulletin of Marine Science*, *88*, 395–410. https://doi.org/10.5343/bms.2011.1056

Cooke, S. J., Ostrand, K. G., Bunt, C. M., Schreer, J. F., Wahl, D. H., & Philipp, D. P. (2003). Cardiovascular responses of Largemouth Bass to exhaustive exercise and brief air exposure over a range of water temperatures. *Transactions of the American Fisheries Society*, *132*, 1154–1165. https://doi.org/10.1577/T02-059

Cooke, S. J., Philipp, D. P., Wahl, D. H., & Weatherhead, P. J. (2006). Energetics of parental care in six syntopic centrarchid fishes. *Oecologia*, *148*, 235–249. https://doi.org/10.1007/s00442-006-0375-6

Cooke, S. J., Schreer, J. F., Wahl, D. H., & Philipp, D. P. (2002). Physiological impacts of catch-and-release angling practices on Largemouth Bass and Smallmouth Bass. In D. P. Philipp, & M. S. Ridgway (Eds.), *Black bass: Ecology, conservation, and management* (Symposium 31, pp. 489–512). American Fisheries Society.

Cooke, S. J., & Suski, C. D. (2005). Do we need species-specific guidelines for catch-and-release recreational angling to effectively conserve diverse fishery resources? *Biodiversity and Conservation*, *14*, 1195–1209. https://doi.org/10.1007/s10531-004-7845-0

Corsi, M. P., Cooke, S. J., Danylchuk, A. J., Guckian, M. L., Kozfkay, J. R., & Quist, M. C. (2025). Points of consensus on catch-and-release: Considerations for science, ethics, and fisheries management. *Fisheries*, *50*, 182–184. https://doi.org/10.1093/fshmag/vuae024

Corsi, M. P., Quist, M. C., Kozfkay, J. R., Roth, C. J., & Schill, D. J. (2025). Why the whole is greater than the sum of its parts: A case for population-level management. *Fisheries*, *50*, 164–171. https://doi.org/10.1093/fshmag/vuae022

Coutant, C. C. (1975, February 3–6). *Responses of bass to natural and artificial temperature regimes* [Paper presentation]. National Symposium on the Biology and Management of Centrarchid Basses, Tulsa, Oklahoma, USA.

Dadzie, S., & Aloo, P. A. (1990). Reproduction of the North American black bass, *Micropterus salmoides* (Lacepède), in an equatorial lake, Lake Naivasha, Kenya. *Aquaculture Research*, *21*, 449–458. https://doi.org/10.1111/j.1365-2109.1990.tb00483.x

Danylchuk, A. J., Adams, A., Cooke, S. J., & Suski, C. D. (2008). An evaluation of the injury and short-term survival of Bonefish (*Albula spp.*) as influenced by a mechanical lip-gripping device used by recreational anglers. *Fisheries Research*, *93*, 248–252. https://doi.org/10.1016/j.fishres.2008.06.001

Danylchuk, A. J., Danylchuk, S. C., Kosiarski, A., Cooke, S. J., & Huskey, B. (2018). Keepemwet fishing: An emerging social brand for disseminating best practices for catch-and-release in recreational fisheries. *Fisheries Research*, *205*, 52–56. https://doi.org/10.1016/j.fishres.2018.04.005

Danylchuk, S. E., Danylchuk, A. J., Cooke, S. J., Goldberg, T. L., Koppelman, J., & Philipp, D. P. (2007). Effects of recreational angling on the post-release behavior and predation of Bonefish (*Albula vulpes*): The role of equilibrium status at the time of release. *Journal of Experimental Marine Biology and Ecology*, *346*, 127–133. https://doi.org/10.1016/j.jembe.2007.03.008

Diana, M. J., Larsen, A. L., Siepker, M. J., & Wahl, D. H. (2012). Effects of tournament compared with catch and release angling on nest abandonment of Largemouth Bass. *North American Journal of Fisheries Management*, *32*, 832–837. https://doi.org/10.1080/02755947.2012.694836

Diaz, F., Re, A. D., Gonzalez, R. A., Sanchez, L. N., Leyva, G., & Valenzuela, F. (2007). Temperature preference and oxygen consumption of the Largemouth Bass *Micropterus salmoides* (Lacepede) acclimated to different temperatures. *Aquatic Resources*, *38*, 1387–1394. https://doi.org/10.1111/j.1365-2109.2007.01817.x

Diggles, B. K., Sawynok, W., & Olyott, L. G. H. (2011). Development of an environmental standard for recreational fishing tournaments. In T. D. Beard, R. Arlinghaus, & S. G. Sutton (Eds.), *The angler in the environment: Social, economic, biological, and ethical dimensions* (Symposium 75, pp. 251–261). American Fisheries Society. https://doi.org/10.47886/9781934874240.ch15

Dinken, C. P., Keretz, K. R., Schramm, H. L., Jr., Petrie-Hanson, L., Schilling, M. W., & Allen, P. J. (2022). The effects of water temperature and simulated angling on the physiological stress response of Largemouth Bass. *Transactions of the American Fisheries Society*, *151*, 487–506. https://doi.org/10.1002/tafs.10365

Drake, M. T., Claussen, J. E., Philipp, D. P., & Pereira, D. L. (1997). A comparison of Bluegill reproductive strategies and growth among lakes with different fishing intensities. *North American Journal of Fisheries Management*, *17*, 496–507. https://doi.org/10.1577/1548-8675(1997)017<0496:ACOBRS>2.3.CO;2

Driscoll, M. T., Schramm, H. L., Jr., & Hunt, K. M. (2012). Trends in fishery agency assessments of black bass tournaments in the southeastern United States. *Proceedings of the Southeastern Association of Fish and Wildlife Agencies*, *66*, 25–32.

Driscoll, M. T., Smith, J. L., & Myers, R. A. (2007). Impact of tournaments on the Largemouth Bass population at Sam Rayburn Reservoir, Texas. *North American Journal of Fisheries Management*, *27*, 425–433. https://doi.org/10.1577/M06-075.1

Drumhiller, K. L., Johnson, M. W., Diamond, S. L., Reese Robillard, M. M., & Stunz, G. W. (2014). Venting or rapid recompression increase survival and improve recovery of Red Snapper with barotrauma. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science*, *6*, 190–199. https://doi.org/10.1080/19425120.2014.920746

Dunmall, K. M., Cooke, S. J., Schreer, J. F., & McKinley, R. S. (2001). The effect of scented lures on the hooking injury and mortality of Smallmouth Bass caught by novice and experienced anglers. *North American Journal of Fisheries Management*, *21*, 242–248. https://doi.org/10.1577/1548-8675(2001)021<0242:TEOSLO>2.0.CO;2

Duttweiler, M. (1985). Status of competitive fishing in the United States: Trends and state fisheries policies. *Fisheries*, *10*, 5–7. https://doi.org/10.1577/1548-8446-10-5

Eberts, R. L., Butt, J. C., & Somers, C. M. (2018). Unexplained variation in movement by Walleye and Sauger after catch-and-release angling tournaments. *North American Journal of Fisheries Management*, *38*, 1350–1366. https://doi.org/10.1002/nafm.10235

Eberts, R. L., & Somers, C. M. (2017). Venting and descending provide equivocal benefits for catch-and-release survival: Study design influences effectiveness more than barotrauma relief method. *North American Journal of Fisheries Management*, *37*, 612–623. https://doi.org/10.1080/02755947.2017.1307292

Eberts, R. L., Zak, M. A., Manzon, R. G., & Somers, C. M. (2018). Walleye responses to barotrauma relief treatments for catch-and-release angling: Short-term changes to condition and behavior. *Journal of Fish and Wildlife Management*, *9*, 415–430. https://doi.org/10.3996/112017-JFWM-096

Edwards, E. A., Gebhart, G., & Maughan, O. E. (1983). *Habitat suitability index models: Smallmouth Bass* (FSQ/OBS-82/10.36). U.S. Fish and Wildlife Service.

Edwards, G. P., Jr., Neumann, R. M., Jacobs, R. P., & O'Donnell, E. B. (2004). Factors related to mortality of black bass caught during small club tournaments in Connecticut. *North American Journal of Fisheries Management*, *24*, 801–810. https://doi.org/10.1577/M03-149.1

Elliot, J. M. (1981). Some aspects of thermal stress on freshwater teleost. In A. D. Pickering (Ed.), *Stress and fish* (pp. 209–245). Academic Press.

Elliott, C. W., Row, A. J., & Tufts, B. L. (2021). Comparison of angler interventions for Smallmouth Bass experiencing barotrauma in catch-and-release angling tournaments. *North American Journal of Fisheries Management*, *41*, 834–843. https://doi.org/10.1002/nafm.10590

Elliott, C. W., Row, A. J., Zhu, C., Hornsby, R. L., Wolf, P. H., Ridgway, M. S., & Tufts, B. L. (2025). Characteristics of the black bass tournament fishery in eastern Lake Ontario and the St. Lawrence River. *Journal of Great Lakes Research*, *51*, Article 102696. https://doi.org/10.1016/j.jglr.2025.102696

Fantini, L. E., Smith, M. A., Jones, M., Roy, L. A., Lochmann, R., & Kelly, A. M. (2021). Growth parameters in northern Largemouth Bass *Micropterus salmoides* raised near their upper thermal tolerance for 28 days. *Aquaculture Reports*, *21*, Article 100845. https://doi.org/10.1016/j.aqrep.2021.100845

Farrell, A. P., Hinch, S. G., Cooke, S. J., Patterson, D. A., Crossin, G. T., Lapointe, M., & Mathes, M. T. (2008). Pacific salmon in hot water: Applying aerobic scope models and biotelemetry to predict the success of spawning migrations. *Physiological and Biochemical Zoology*, *81*, 697–708. https://doi.org/10.1086/592057

Ferter, K., Cooke, S. J., Humborstad, O. B., Nilsson, J., & Arlinghaus, R. (2020). Fish welfare in recreational fishing. In T. Kristiansen, A. Fernö, M. Pavlidis, & H. van de Vis (Eds.), *The welfare of fish* (Animal Welfare 20, pp. 463–481). Springer. https://doi.org/10.1007/978-3-030-41675-1_19

Fields, R. S., Lowe, S., Kaminski, C., Whitt, G. S., & Philipp, D. P. (1987). Critical and chronic thermal maxima of Northern and Florida Largemouth Bass and their reciprocal $F_1$ and $F_2$ hybrids. *Transactions of the American Fisheries Society*, *116*, 856–863. https://doi.org/10.1577/1548-8659(1987)116<856:CACTMO>2.0.CO;2

Fobert, E., Meining, P., Colotelo, A., O'Connor, C., & Cooke, S. J. (2009). Cut the line or remove the hook? An evaluation of sublethal and lethal endpoints for deeply hooked Bluegill. *Fisheries Research*, *99*, 38–46. https://doi.org/10.1016/j.fishres.2009.04.006

Fry, F. E. J. (1971). The effect of environmental factors on the physiology of fish. In W. S. Hoar, & D. J. Randal (Eds.), *Environmental relations and behavior* (Fish Physiology 6, pp. 1–98). Academic Press. https://doi.org/10.1016/S1546-5098(08)60146-6

Furimsky, M., Cooke, S. J., Suski, C. D., Wang, Y., & Tufts, B. L. (2003). Respiratory and circulatory responses to hypoxia in Largemouth Bass and Smallmouth Bass: Implications for "live-release" angling tournaments. *Transactions of the American Fisheries Society*, *132*, 1065–1075. https://doi.org/10.1577/T02-147

Gale, M. K., Hinch, S. G., & Donaldson, M. R. (2013). The role of temperature in the capture and release of fish. *Fish and Fisheries*, *14*, 1–33. https://doi.org/10.1111/j.1467-2979.2011.00441.x

Gilliland, G., & Schramm, H. (2009). *Keeping bass alive: A guidebook for tournament anglers & organizers* (2nd ed.). B.A.S.S. https://www.bassmaster.com/wp-content/uploads/2013/05/KeepingBassAlive_guidebook20comp.pdf

Gilliland, G., Schramm, H. L., & Shupp, B. (2002). *Keeping bass alive*. B.A.S.S.; ESPN Productions. https://assets.espn.go.com/winnercomm/outdoors/bassmaster/pdf/keeping_bass_alive.pdf.

Gingerich, A. J., Cooke, S. J., Hanson, K. C., Donaldson, M. R., Hasler, C. T., Suski, C. D., & Arlinghaus, R. (2007). Evaluation of the interactive effects of air exposure duration and water temperature on the condition and survival of angled and released fish. *Fisheries Research*, *86*, 169–178. https://doi.org/10.1016/j.fishres.2007.06.002

Gingerich, A. J., & Suski, C. D. (2011). The role of progeny quality and male size in the nesting success of Smallmouth Bass: Integrating field and laboratory studies. *Aquatic Ecology*, *45*, 505–515. https://doi.org/10.1007/s10452-011-9371-y

Gravel, M. A., & Cooke, S. J. (2008). Severity of barotrauma influences the physiological status, postrelease behavior, and fate of tournament-caught Smallmouth Bass. *North American Journal of Fisheries Management*, *28*, 607–617. https://doi.org/10.1577/M07-013.1

Griffin, L. P., Fordham, G., Curd, G., Narty, C., Adam, P. A., Brownsombe, J. W., Cooke, S. J., & Danylchuk, A. J. (2022). Short-term response of Giant Trevally (*Carnax ignobilis*) to capture and handling in a catch-and-release fly fishing recreational fishery, Republic of the Seychelles, western Indian Ocean. *Fisheries Research*, *252*, Article 106337. https://doi.org/10.1016/j.fishres.2022.106337

Gross, M. L., & Kapuscinski, A. R. (1997). Reproductive success of Smallmouth Bass estimated and evaluated from family-specific DNA fingerprints. *Ecology*, *78*, 1424–1430. https://doi.org/10.1890/0012-9658(1997)078[1424:RSOSBE]2.0.CO;2

Gross, M. R. (2005). The evolution of parental care. *The Quarterly Review of Biology*, *80*, 37–45. https://doi.org/10.1086/431023

Gustaveson, A. W., Wydoski, R. S., & Wedemeyer, G. A. (1991). Physiological response of Largemouth Bass to angling stress. *Transactions of the American Fisheries Society*, *120*, 629–636. https://doi.org/10.1577/1548-8659(1991)120<0629:PROLBT>2.3.CO;2

Gwinn, D. C., & Allen, M. S. (2010). Exploring population-level effects of fishery closures during spawning: An example using Largemouth Bass. *Transaction of the American Fisheries Society*, *139*, 626–634. https://doi.org/10.1577/T08-089.1

Hanson, K. C., Cooke, S. J., Suski, C. D., & Philipp, D. P. (2007). Effects of different angling practices on post-release behaviour of nest-guarding make black bass, *Micropterus* spp. *Fisheries Management and Ecology*, *14*, 141–148. https://doi.org/10.1111/j.1365-2400.2007.00534.x

Hanson, K. C., Gravel, M.-A., Redpath, T., Cooke, S. J., & Siepker, M. J. (2008). Latitudinal variation in physiological and behavioral responses of nest-guarding Smallmouth Bass to common recreational angling practices. *Transactions of the American Fisheries Society*, *137*, 1558–1566. https://doi.org/10.1577/T07-228.1

Hargrove, J. S., & Austin, J. D. (2017). Parentage and mating patterns in a Florida Largemouth Bass (*Micropterus salmoides floridanus*) hatchery. *Aquaculture Research*, *48*, 3272–3277. https://doi.org/10.1111/are.13051

Harmon, T. S. (2009). Methods for reducing stressors and maintaining water quality associated with live fish transport in tanks: A review of the basics. *Reviews in Aquaculture*, *1*, 58–66. https://doi.org/10.1111/j.1753-5131.2008.01003.x

Harrod, C. (2015). Climate change and freshwater fisheries. In J. F. Craig (Ed.), *Freshwater fisheries ecology* (pp. 641–694). John Wiley & Sons. https://doi.org/10.1002/9781118394380.ch50

Hartley, R. A., & Moring, J. R. (1993). Observations of black bass (Centrarchidae) confined during angling tournaments: A cautionary note concerning dissolved oxygen. *Aquaculture*

*Research*, *24*, 575–579. https://doi.org/10.1111/j.1365-2109.1993.tb00632.x

Hartley, R. A., & Moring, J. R. (1995). Differences in mortality between Largemouth and Smallmouth bass caught in tournaments. *North American Journal of Fisheries Management*, *15*, 666–670. https://doi.org/10.1577/1548-8675(1995)015<0666:DIMBLA>2.3.CO;2

Hay, A. A., Oller, R. E., Glomb, J. C., & Suski, C. D. (2025). Seasonal variation in responses of Largemouth Bass (*Micropterus nigricans*) caught during live-release angling tournaments. *Fisheries Management and Ecology*, *32*, 81–96. https://doi.org/10.1111/fme.12785

Holbrook, J. A. (1975). *Bass fishing tournaments*. Sport Fishing Institute.

Humborstad, O. B., Ferter, K., Kryvi, H., & Fjelldal, P. G. (2017). Exophthalmia in wild-caught Cod (*Gadus morhua* L.): Development of a secondary barotrauma effect in captivity. *Journal of Fish Diseases*, *40*, 41–49. https://doi.org/10.1111/jfd.12484

Hussey, J., LaRochelle, L., Danylchuk, A. J., Danylchuk, S. C., Cooke, B. W., Cooke, J. T., Cooke, J. A., & Cooke, S. J. (2025). Influence of four hook types across four hook removal tools, including bare hands, on the effectiveness of hook removal and reflex impairment of Bluegill (*Lepomis macrochirus*) captured from a lake in eastern Ontario. *Fisheries Management and Ecology*, *32*, Article e12672. https://doi.org/10.1111/fme.12672

Jacobsen, L., Baktoft, H., Jepsen, N., Aarestrup, K., Berg, S., & Skov, C. (2014). Effect of boat noise and angling on lake fish behaviour. *Journal of Fish Biology*, *84*, 1768–1780. https://doi.org/10.1111/jfb.12395

Jarvis, E. T., & Lowe, C. G. (2008). The effects of barotrauma on the catch-and-release survival of southern California nearshore and shelf rockfish (Scorpaenidae, *Sebastes* spp.). *Canadian Journal of Fisheries and Aquatic Sciences*, *65*, 1286–1296. https://doi.org/10.1139/F08-071

Jutfelt, F., Ern, R., Leeuwis, R. H. J., & Clark, T. D. (2024). Effects of climate warming. In A. Todgham, J. Rummer, E. Standen, D. Fudge, & A. Esbaugh (Eds.), *Encyclopedia of fish physiology* (Vol. 3, 2nd ed., pp. 14–31). Academic Press. https://doi.org/10.1016/B978-0-323-90801-6.00183-X

Kamara, S. R., Hay, A. A., Oller, R. E., & Suski, C. D. (2024). Examining the consequences of angling tournament culling practices on Largemouth Bass. *North American Journal of Fisheries Management*, *44*, 1280–1293. https://doi.org/10.1002/nafm.11048

Kates, D., Dennis, C., Noatch, M. R., & Suski, C. D. (2012). Responses of native and invasive fishes to carbon dioxide: Potential for a nonphysical barrier to fish dispersal. *Canadian Journal of Fisheries Aquatic Sciences*, *69*, 1748–1759. https://doi.org/10.1139/f2012-102

Kelsch, S. W. (1996). Temperature selection and performance by Bluegills: Evidence for selection in response to available power. *Transactions of the American Fisheries Society*, *125*, 948–955. https://doi.org/10.1577/1548-8659(1996)125<0948:TSAPBB>2.3.CO;2

Keretz, K. R., Dinken, C. P., Allen, P. J., Colvin, M. E., & Schramm, H. L., Jr. (2018). The effect of water temperature, angling time, and dissolved oxygen on the survival of Largemouth Bass subjected to simulated angling and tournament handling procedures. *North American Journal of Fisheries Management*, *38*, 606–622. https://doi.org/10.1002/nafm.10058

Kieffer, J. D. (2000). Limits to exhaustive exercise in fish. *Comparative Biochemistry and Physiology, Part A: Molecular & Integrative Physiology*, *126*, 161–179. https://doi.org/10.1016/S1095-6433(00)00202-6

Kieffer, J. D., Fergusson, R. A., Tompa, R. E., & Tufts, B. L. (1996). Relationship between body size and anaerobic metabolism in Brook Trout and Largemouth Bass. *Transactions of the American Fisheries Society*, *125*, 760–767. https://doi.org/10.1577/1548-8659(1996)125<0760:RBBSAA>2.3.CO;2

Killen, S. S., Suski, C. D., Cooke, S. J., Philipp, D. P., & Tufts, B. L. (2006). Factors contributing to the physiological disturbance in Walleyes during simulated live-release angling tournaments. *Transactions of the American Fisheries Society*, *135*, 557–569. https://doi.org/10.1577/T05-168.1

Kramer, R. H., & Smith, L. L. (1962). Formation of year classes in Largemouth Bass. *Transactions of the American Fisheries Society*, *91*, 29–41. https://doi.org/10.1577/1548-8659(1962)91[29:FOYCIL]2.0.CO;2

Kwak, T. J., & Henry, M. G. (1995). Largemouth Bass mortality and related casual factors during live-release fishing tournaments on a large Minnesota lake. *North American Journal of Fisheries Management*, *15*, 621–630. https://doi.org/10.1577/1548-8675(1995)015<0621:LBMARC>2.3.CO;2

LaRochelle, L., Bernardi, J., Madden, J. C., Brownscombe, J. W., Goodenough, A. M., Danylchuk, A. J., & Cooke, S. J. (2025). Effects of recreational fishing gear type on reflex impairment and post-release swimming activity of Smallmouth Bass. *Fisheries Management and Ecology*, *32*, Article e12776. https://doi.org/10.1111/fme.12776

LaRochelle, L., Burton, D., Madden, J. C., Danylchuk, S. C., Danylchuk, A. J., & Cooke, S. J. (2023). Using a novel biologging approach to assess how different handling practices influence the post-release behaviour of Northern Pike across a wide range of body sizes. *Aquatic Living Resources*, *36*, Article 25. https://doi.org/10.1051/alr/2023019

LaRochelle, L., Haniford, L. S. E., Burton, D., Bieber, J. F., Robichaud, J. A., Suski, C. D., Danylchuk, A. J., & Cooke, S. J. (2024). Do live-well additives influence the physiological and behavioral recovery of Largemouth Bass? *North American Journal of Fisheries Management*, *44*, 189–203. https://doi.org/10.1002/nafm.10975

LaRochelle, L., Trahan, A., Brownscombe, J. W., Danylchuk, A. J., & Cooke, S. J. (2022). Comparison of different tournament weigh-in formats on the short-term postrelease behaviour black bass assessed with biologgers. *North American Journal of Fisheries Management*, *42*, 250–259. https://doi.org/10.1002/nafm.10736

Lee, D. P. (1992). Gas bladder deflation of depressurized Largemouth Bass. *North American Journal of Fisheries Management*, *12*, 662–664. https://doi.org/10.1577/1548-8675(1992)012<0662:GBDODL>2.3.CO;2

Lizée, T. W., Lennox, R. J., Ward, T. D., Brownscombe, J. W., Chapman, J. M., Danylchuk, A. J., Nowell, L. B., & Cooke, S. J. (2018). Influence of landing net mesh type on handling time and tissue damage of angled Brook Trout. *North American Journal of Fisheries Management*, *38*, 76–83. https://doi.org/10.1002/nafm.10033

Maahs, B., Sylvia, A., & Weber, M. J. (2021). Effects of number of Largemouth Bass per live-well compared to environmental conditions on post release tournament survival. *Fisheries Research*, *243*, Article 106101. https://doi.org/10.1016/j.fishres.2021.106101

Madden, J. C., LaRochelle, L., Burton, D., Danylchuk, A. J., Landsman, S. J., & Cooke, S. J. (2023). Condition and postrelease mortality of angled Northern Pike temporarily retained on stringers. *North American Journal of Fisheries Management*, *43*, 1395–1406. https://doi.org/10.1002/nafm.10943

Madden, J. C., LaRochelle, L., Burton, D., Danylchuk, S. C., Danylchuk, A. J., & Cooke, S. J. (2024). Biologgers reveal unanticipated issues with descending angled Walleye with barotrauma symptoms. *Canadian Journal of Fisheries and Aquatic Sciences*, *81*, 212–222. https://doi.org/10.1139/cjfas-2023-0141

Madden, J. C., LaRochelle, L., Goodenough, A. M., Danylchuk, A. J., & Cooke, S. J. (2025). Free falling: Fizzing wild-caught Smallmouth Bass results in the inability to control buoyancy in deep water. *Fisheries Management and Ecology*, *32*, 41–49. https://doi.org/10.1111/fme.12780

Maynard, G. A., Mihuc, T. B., Schultz, R. E., Sotola, V. A., Reyes, A. J., Malchoff, M. H., & Garneau, D. E. (2013). Use of external indicators to evaluate stress of Largemouth (*Micropterus salmoides*) and Smallmouth (*M. dolomieu*) bass at tournaments. *The Open Fish Science Journal*, *6*, 78–86. https://doi.org/10.2174/1874401X01306010078

Maynard, G. A., Mihuc, T. B., Sotola, V. A., Garneau, D. E., & Malchoff, M. H. (2017). Black bass dispersal patterns following catch-and-release tournaments on Lake Champlain. *North American Journal of Fisheries Management*, *37*, 524–535. https://doi.org/10.1080/02755947.2017.1296515

McKenzie, D. J., Zhang, Y., Eliason, E. J., Schulte, P. M., Claireaux, G., Blasco, F. R., Nati, J. H., & Farrell, A. P. (2021). Intraspecific variation in tolerance of warming in fishes. *Journal of Fish Biology*, *98*, 1536–1555. https://doi.org/10.1111/jfb.14620

McLaughlin, S. A., Grizzle, J. M., & Whitely, H. E. (1997). Ocular lesions in Largemouth Bass, *Micropterus salmoides*, subjected to the stresses of handling and containment. *Veterinary & Comparative Ophthalmology*, *7*, 5–9.

Milligan, C. L., & Wood, C. M. (1987). Regulation of blood oxygen transport and red cell pH after exhaustive activity in Rainbow Trout (*Salmo gairdneir*) and Starry Flounder (*Platichthys stellatus*). *Journal of Experimental Biology*, *133*, 263–282. https://doi.org/10.1242/jeb.133.1.263

Muoneke, M. I., & Childress, W. M. (1994). Hooking mortality: A review for recreational fisheries. *Reviews in Fisheries Science*, *2*, 123–156. https://doi.org/10.1080/10641269409388555

Neal, J. W., & Lopez-Clayton, D. (2001). Mortality of Largemouth Bass during catch-and-release tournaments in a Puerto Rico reservoir. *North American Journal of Fisheries Management*, *21*, 834–842. https://doi.org/10.1577/1548-8675(2001)021<0834:MOLBDC>2.0.CO;2

Ostrand, K. G., Cooke, S. J., & Wahl, D. H. (2004). Effects of stress on Largemouth Bass reproduction. *North American Journal of Fisheries Management*, *24*, 1038–1045. https://doi.org/10.1577/M02-154.1

Ostrand, K. G., Siepker, M. J., & Wahl, D. H. (2011). Effectiveness of live well additives on Largemouth Bass survival. *Journal of Fish and Wildlife Management*, *2*, 22–28. https://doi.org/10.3996/092010-JFWM-037

Parkos, J. J., III, Wahl, D. H., & Philipp, D. P. (2011). Influence of behavior and mating success on brood-specific contribution to fish recruitment in ponds. *Ecological Applications*, *21*, 2576–2586. https://doi.org/10.1890/10-1870.1

Philipp, D. P., & Claussen, J. E. (1995). Fitness and performance differences between two stocks of Largemouth Bass from different river drainages within Illinois. In H. L. Schramm, Jr., & R. G. Piper (Eds.), *Uses and effects of cultured fishes in aquatic ecosystems* (Symposium 15, pp. 236–243). American Fisheries Society.

Philipp, D. P., Claussen, J. E., Koppelman, J. B., Stein, J. A., Cooke, S. J., Suski, C. D., Wahl, D. H., Sutter, D. A. H., & Arlinghaus, R. (2015). Fisheries-induced evolution in Largemouth Bass: Linking vulnerability to angling, parental care, and fitness. In M. D. Tringali, J. M. Long, T. W. Birdsong, & M. S. Allen (Eds.), *Black bass diversity: Multidisciplinary science for conservation* (Symposium 82, pp. 223–234). American Fisheries Society. https://doi.org/10.47886/9781934874400.ch20

Philipp, D. P., Toline, C. A., Kubacki, M. F., Philipp, D. B. F., & Phelan, F. J. S. (1997). The impact of catch-and-release angling on the reproductive success of Smallmouth Bass and Largemouth Bass. *North American Journal of Fisheries Management*, *17*, 557–567. https://doi.org/10.1577/1548-8675(1997)017<0557:TIOCAR>2.3.CO;2

Philipp, D. P., Zolderdo, A., Lawrence, M. J., Claussen, J. E., Nowell, L., Holder, P., & Cooke, S. J. (2023). COVID-19 reduced recreational fishing effort during the black bass spawning season, resulting in increases in black bass reproductive success and annual recruitment. *Fisheries Research*, *259*, Article e106580. https://doi.org/10.1016/j.fishres.2022.106580

Plumb, J. A., Grizzle, J. M., & Rogers, W. A. (1988). Survival of caught and released Largemouth Bass after containment in live wells. *North American Journal of Fisheries Management*, *8*, 325–328. https://doi.org/10.1577/1548-8675(1988)008<0325:SOCARL>2.3.CO;2

Pollock, M. S., Clarke, L. M. J., & Dubé, M. G. (2007). The effects of hypoxia on fishes: From ecological relevance to physiological effects. *Environmental Reviews*, *15*, 1–14. https://doi.org/10.1139/a06-006

Pörtner, H. O., & Farrell, A. P. (2008). Ecology: Physiology and climate change. *Science*, *322*, 690–692. https://doi.org/10.1126/science.1163156

Prosser, C. L. (1991). *Environmental and metabolic animal physiology*. Wiley-Liss.

Raby, G. D., Donaldson, M. R., Hinch, S. G., Clark, T. D., Eliason, E. J., Jeffries, K. M., Cook, K. V., Teffer, A., Bass,

A. L., Miller, K. M., Patterson, D. A., Farrell, A. P., & Cooke, S. J. (2015). Fishing for effective conservation: Context and biotic variation are keys to understanding the survival of Pacific salmon after catch-and-release. *Integrative and Comparative Biology*, *55*, 554–576. https://doi.org/10.1093/icb/icv088

Richardson-Heft, C. A., Heft, A. A., Fewlass, L., & Brandt, S. B. (2000). Movement of Largemouth Bass in northern Chesapeake Bay: Relevance to sportfishing tournaments. *North American Journal of Fisheries Management*, *20*, 493–501. https://doi.org/10.1577/1548-8675(2000)020<0493:MOLBIN>2.3.CO;2

Ricks, B., & Maceina, M. (2008). Effects of catch-and-release tournament fishing on dispersal and population metrics of black bass in Lake Martin, Alabama. In M. S. Allen, S. Sammons, & M. J. Maceina (Eds.), *Balancing fisheries management and water uses for impounded river systems* (Symposium 62, pp. 293–308). American Fisheries Society. https://doi.org/10.47886/9781934874066.ch20

Ridgway, M. S. (2002). Movements, home range, and survival estimation of Largemouth Bass following displacement. In D. P. Philipp, & M. S. Ridgway (Eds.), *Black bass: Ecology, conservation, and management* (Symposium 31, pp. 525–533). American Fisheries Society.

Ridgway, M. S., Goff, G. P., & Keenleyside, M. H. (1989). Courtship and spawning behavior in Smallmouth Bass (*Micropterus dolomieui*). *The American Midland Naturalist*, *122*, 209–213. https://doi.org/10.2307/2425905

Rudershausen, P. J., Schmidt, H. M., Merrell, J. H., Runde, B. J., & Buckel, J. A. (2023). Effectiveness of venting and recompression for increasing postrelease survival of barotraumatized Black Sea Bass across a range of depths. *North American Journal of Fisheries Management*, *43*, 257–267. https://doi.org/10.1002/nafm.10864

Rummer, J. L., & Bennett, W. A. (2005). Physiological effects of swim bladder overexpansion and catastrophic decompression on Red Snapper. *Transactions of the American Fisheries Society*, *134*, 1457–1470. https://doi.org/10.1577/T04-235.1

Sadoul, B., & Vijayan, M. M. (2016). Stress and growth. In C. B. Schreck, L. Tort, A. P. Farrell, & C. J. Brauner (Eds.), *Biology of stress in fish* (Fish Physiology 35, pp. 167–205). Academic Press. https://doi.org/10.1016/B978-0-12-802728-8.00005-9

Schramm, H. L., Armstrong, M. L., Fedler, A. J., Funicelli, N. A., Green, D. M., Hahn, J. L., Lee, D. P., Manns, R. E., Quinn, S. P., & Waters, S. J. (1991). Sociological, economic, and biological aspects of competitive fishing. *Fisheries*, *16*, 13–21. https://doi.org/10.1577/1548-8446(1991)016<0013:SEABAO>2.0.CO;2

Schramm, H. L., Armstrong, M. L., Funicelli, N. A., Green, D. M., Lee, D. P., Manns, R. E., Jr., Taubert, B. D., & Waters, S. J. (1991). The status of competitive sport fishing in North America. *Fisheries*, *16*, 4–12. https://doi.org/10.1577/1548-8446(1991)016<0004:TSOCSF>2.0.CO;2

Schramm, H. L., & Davis, J. G. (2006). Survival of Largemouth Bass from populations infected with Largemouth Bass virus and subjected to simulated tournament conditions. *North American Journal of Fisheries Management*, *26*, 826–832. https://doi.org/10.1577/M04-211.1

Schramm, H. L., & Gilliland, G. (2015). Achieving high survival of tournament-caught black bass: Past efforts and future needs and opportunities. *Journal of the Southeastern Association of Fish and Wildlife Agencies*, *2*, 50–56.

Schramm, H. L., Grizzle, J., Hanson, L., & Gilliland, G. (2004). *Improving survival of tournament-caught bass and the effects of tournament handling on Largemouth Bass virus disease* (Internal Agency Completion Report). Mississippi Cooperative Fish and Wildlife Research Unit, Mississippi State University.

Schramm, H. L., Haydt, P. J., & Portier, K. M. (1987). Evaluation of prerelease, postrelease, and total mortality, of Largemouth Bass caught during tournaments, in two Florida lakes. *North American Journal of Fisheries Management*, *7*, 394–402. https://doi.org/10.1577/1548-8659(1987)7<394:EOPPAT>2.0.CO;2

Schramm, H. L., & Hunt, K. M. (2007). Issues, benefits, and problems associated with fishing tournaments in inland waters of the United States: A survey of fishery agency administrators. *Fisheries*, *32*, 234–243. https://doi.org/10.1577/1548-8446(2007)32[234:IBAPAW]2.0.CO;2

Schreer, J. F., Cooke, S. J., & McKinley, R. S. (2001). Cardiac response to variable forced exercise at different temperatures: An angling simulation for Smallmouth Bass. *Transactions of the American Fisheries Society*, *130*, 783–795. https://doi.org/10.1577/1548-8659(2001)130<0783:CRTVFE>2.0.CO;2

Schreer, J. F., Gokey, J., & DeGhett, V. J. (2009). The incidence and consequences of barotrauma in fish in the St. Lawrence River. *North American Journal of Fisheries Management*, *29*, 1707–1713. https://doi.org/10.1577/M09-013.1

Schwabe, M., Meinelt, T., Phan, T. M., Cooke, S. J., & Arlinghaus, R. (2014). Absence of handling-induced *Saprolegnia* infection in juvenile Rainbow Trout with implications for catch-and-release angling. *North American Journal of Fisheries Management*, *34*, 1221–1226. https://doi.org/10.1080/02755947.2014.959673

Scyphers, S. B., Fodrie, F. J., Hernandez, F. J., Jr., Powers, S. P., & Shipp, R. L. (2013). Venting and reef fish survival: Perceptions and participation rates among recreational anglers in the northern Gulf of Mexico. *North American Journal of Fisheries Management*, *33*, 1071–1078. https://doi.org/10.1080/02755947.2013.824932

Seidensticker, E. P. (1975). Mortality of Largemouth Bass for two tournaments utilizing a “don’t kill your catch” program. *Proceedings of the Annual Conference Southeastern Association of Game and Fish Commissioners*, *28*, 83–86.

Shasteen, S. P., & Sheenan, R. J. (1997). Laboratory evaluation of artificial swim bladder deflation in Largemouth Bass: Potential benefits for catch-and-release fisheries. *North American Journal of Fisheries Management*, *17*, 32–37. https://doi.org/10.1577/1548-8675(1997)017<0032:LEOASB>2.3.CO;2

Shaw, S. L., & Allen, M. S. (2014). Localized spatial and temporal variation in reproductive effort and Florida bass. *Transactions of the American Fisheries Society*, *143*, 85–96. https://doi.org/10.1080/00028487.2013.829123

Shultz, A. D., Murchie, K. J., Griffith, C., Cooke, S. J., Danylchuk, A. J., Goldberg, T. L., & Suski, C. D. (2011). Impacts of dissolved oxygen on the behavior and physiology of bonefish: Implications for live-release angling tournaments. *Journal of Experimental Marine Biology and Ecology*, *402*, 19–26. https://doi.org/10.1016/j.jembe.2011.03.009

Siepker, M. J., Ostrand, K. G., Cooke, S. J., Philipp, D. P., & Wahl, D. H. (2007). A review of the effects of catch-and-release angling on black bass, *Micropterus* spp.: Implications for conservation and management of populations. *Fisheries Management and Ecology*, *14*, 91–101. https://doi.org/10.1111/j.1365-2400.2007.00529.x

Skaggs, J., Quintana, Y., Shaw, S. L., Allen, M. S., Trippel, N. A., & Matthews, M. (2017). Effects of common angler handling techniques on Florida Largemouth Bass behavior, feeding, and survival. *North American Journal of Fisheries Management*, *37*, 263–270. https://doi.org/10.1080/02755947.2016.1249317

Smith, C. A., Tantillo, J. A., Hale, B., Decker, D. J., Forstchen, A. B., Pomeranz, E. F., Lauber, T. B., Schiavone, M. V., Frohlich, M. V. S. K., Lederle, P. E., Benedict, R. J., Hurst, J., King, R., Siemer, W. F., & Baumer, M. S. (2024). A practical framework for ethics assessment in wildlife management decision-making. *The Journal of Wild Management*, *88*, Article e22502. https://doi.org/10.1002/jwmg.22502

Smith, F. M., & Jones, D. R. (1982). The effect of changes in blood oxygen-carrying capacity on ventilation volume in the Rainbow Trout (*Salmo gairdneri*). *Journal of Experimental Biology*, *97*, 325–334. https://doi.org/10.1242/jeb.97.1.325

Steeger, T. M., Grizzle, J. M., Weathers, K., & Newman, M. (1994). Bacterial diseases and mortality of angler-caught Largemouth Bass released after tournaments on Walter F. George Reservoir, Alabama-Georgia. *North America Journal of Fisheries Management*, *14*, 435–441. https://doi.org/10.1577/1548-8675(1994)014<0435:BDAMOA>2.3.CO;2

Stein, J. A., & Philipp, D. P. (2015). Quantifying brood predation in Largemouth Bass (*Micropterus salmoides*) associated with catch-and-release angling of nesting males. *Environmental Biology of Fishes*, *98*, 145–154. https://doi.org/10.1007/s10641-014-0244-9

Steinhausen, M. F., Sandblom, E., Eliason, E. J., Verhille, C., & Farrell, A. P. (2008). The effect of acute temperature increases on the cardiorespiratory performance of resting and swimming Sockeye Salmon (*Oncorhynchus nerka*). *Journal of Experimental Biology*, *211*, 3915–3926. https://doi.org/10.1242/jeb.019281

Strand, E., Jørgensen, C., & Huse, G. (2005). Modelling buoyancy regulation in fishes with swimbladders: Bioenergetics and behaviour. *Ecological Modelling*, *185*, 309–327. https://doi.org/10.1016/j.ecolmodel.2004.12.013

Sullivan, C., Hasler, C., & Suski, C. D. (2015). Do live-well temperatures differ from ambient water during black bass tournaments? *North American Journal of Fisheries Management*, *35*, 1064–1069. https://doi.org/10.1080/02755947.2015.1079575

Suski, C. D., Kieffer, J. D., Killen, S. S., & Tufts, B. L. (2007). Sub-lethal ammonia toxicity in Largemouth Bass. *Comparative Biochemistry and Physiology, Part A: Molecular & Integrative Physiology*, *146*, 381–389. https://doi.org/10.1016/j.cbpa.2006.11.005

Suski, C. D., Killen, S. S., Cooke, S. J., Kieffer, J. D., Philipp, D. P., & Tufts, B. L. (2004). Physiological significance of the weigh-in during live-release angling tournaments for Largemouth Bass. *Transactions of the American Fisheries Society*, *133*, 1291–1303. https://doi.org/10.1577/T03-145.1

Suski, C. D., Killen, S. S., Kieffer, J. D., & Tufts, B. L. (2006). The influence of environmental temperature and oxygen concentration on the recovery of Largemouth Bass from exercise: Implications for live-release angling tournaments. *Journal of Fish Biology*, *68*, 120–136. https://doi.org/10.1111/j.0022-1112.2006.00882.x

Suski, C. D., & Philipp, D. P. (2004). Factors affecting the vulnerability to angling of nesting male Largemouth and Smallmouth bass. *Transactions of the American Fisheries Society*, *133*, 1100–1106. https://doi.org/10.1577/T03-079.1

Suski, C. D., & Ridgway, M. S. (2009). Seasonal pattern of depth selection in Smallmouth Bass. *Journal of Zoology*, *279*, 119–128. https://doi.org/10.1111/j.1469-7998.2009.00595.x

Suski, C. D., Svec, J. H., Ludden, J. B., Phelan, F. J. S., & Philipp, D. P. (2003). The effect of catch-and-release angling on the parental care behavior of male Smallmouth Bass. *Transactions of the American Fisheries Society*, *132*, 210–218. https://doi.org/10.1577/1548-8659(2003)132<0210:TEOCAR>2.0.CO;2

Sutter, D. A. H., Shaw, S. L., Allen, M. S., Philipp, D. P., & Suski, C. D. (2014). Reproductive investment drives capture probability in fish: An interspecific comparison. *Fisheries Management and Ecology*, *21*, 338–342. https://doi.org/10.1111/fme.12073

Sylvia, A., Dinsmore, S. J., & Weber, M. J. (2021). Tournament and non-tournament anglers have little effect on a Largemouth Bass population compared to natural mortality. *Canadian Journal of Fisheries and Aquatic Sciences*, *78*, 1597–1610. https://doi.org/10.1139/cjfas-2020-0442

Thompson, L. A., Cooke, S. J., Donaldson, M. R., Hanson, K. C., Gingerich, A., Klefoth, T., & Arlinghaus, R. (2008). Physiology, behavior, and survival of angled and air-exposed Largemouth Bass. *North American Journal of Fisheries Management*, *28*, 1059–1068. https://doi.org/10.1577/M07-079.1

Thurston, R. V., Chakoumakos, C., & Russo, R. C. (1981). Effect of fluctuating exposures on the acute toxicity of ammonia to Rainbow Trout (*Salmo gairdneri*) and Cutthroat Trout (*S. clarki*). *Water Research*, *15*, 911–917. https://doi.org/10.1016/0043-1354(81)90147-0

Trahan, A., Chhor, A. D., LaRochelle, L., Danylchuk, A. J., & Cooke, S. J. (2021). Influence of artificial lure hook type on hooking characteristics, handling, and injury of angled freshwater gamefish. *Fisheries Research*, *243*, Article 106056. https://doi.org/10.1016/j.fishres.2021.106056

Trippel, N. A., Hargrove, J. S., Leone, E. H., Austin, J. D., & Allen, M. S. (2017). Angling-induced impacts on recruitment and contributions to reproduction in Florida Bass. *Transactions of the American Fisheries Society*, *146*, 871–887. https://doi.org/10.1080/00028487.2017.1301997

Tufts, B. L., & Morlock, P. (2004). *The Shimano water weigh-in system: A "fish friendly" guide*. Shimano Sport Fisheries Initiative.

Twardek, W. M., Lennox, R. J., Lawrence, M. J., Logan, J. M., Szekeres, P., Cooke, S. J., Tremblay, K., Morgan, G. E., & Danylchuk, A. J. (2018). The postrelease survival of Walleyes following ice-angling on Lake Nipissing, Ontario. *North American Journal of Fisheries Management*, *38*, 159–169. https://doi.org/10.1002/nafm.10009

Vanlandeghem, M. M., Wahl, D. H., & Suski, C. D. (2010). Physiological responses of Largemouth Bass to acute temperature and oxygen stressors. *Fisheries Management and Ecology*, *17*, 414–425. https://doi.org/10.1111/j.1365-2400.2010.00740.x

Vermaire, C., Madden, J. C., LaRochelle, L., Danylchuk, A. J., & Cooke, S. J. (2025). Evaluating hook removal techniques on jaw-hooked Smallmouth Bass captured with soft-plastic jigs. *North American Journal of Fisheries Management*, *45*, 342–348. https://doi.org/10.1093/najfmt/vqaf005

Waters, D. S., & Noble, R. L. (2004). Spawning season and nest fidelity of Largemouth Bass in a tropical reservoir. *North American Journal of Fisheries Management*, *24*, 1240–1251. https://doi.org/10.1577/M03-048.1

Wegman, W. (2019, April 16). *Why traditional tournament weigh-ins might soon disappear*. Outdoor Canada. https://www.outdoorcanada.ca/why-traditional-tournament-weigh-ins-might-soon-disappear/

Welborn, T. L., Jr., & Barkley, J. H. (1974). Study on the survival of tournament released bass on Ross R. Barnett Reservoir, April 1973. *Proceedings of the Annual Conference Southeastern Association of Game and Fish Commissioners*, *27*, 512–519.

White, A. J., Schreer, J. F., & Cooke, S. J. (2008). Behavioral and physiological responses of the congeneric Largemouth (*Micropterus salmoides*) and Smallmouth bass (*M. dolomieu*) to various exercise and air exposure durations. *Fisheries Research*, *89*, 9–16. https://doi.org/10.1016/j.fishres.2007.08.008

White, D. P., Nannini, M. A., & Wahl, D. H. (2020). Examining the effects of chronic, lake-wide elevated temperatures on behavioural expression in Largemouth Bass, *Micropterus salmoides*. *Journal of Fish Biology*, *97*, 39–50. https://doi.org/10.1111/jfb.14313

Wilde, G. R. (1998). Tournament-associated mortality in black bass. *Fisheries*, *23*, 12–22. https://doi.org/10.1577/1548-8446(1998)023<0012:TMIBB>2.0.CO;2

Wilde, G. R. (2003). Dispersal of tournament-caught black bass. *Fisheries*, *28*, 10–17. https://doi.org/10.1577/1548-8446(2003)28[10:DOTBB]2.0.CO;2

Wilde, G. R. (2009). Does venting promote survival of released fish? *Fisheries*, *34*, 20–28. https://doi.org/10.1577/1548-8446-34.1.20

Wilde, G. R., Shavlik, C. E., & Pope, K. L. (2002). Initial mortality of black bass in B.A.S.S. fishing tournaments. *North American Journal of Fisheries Management*, *22*, 950–954. https://doi.org/10.1577/1548-8675(2002)022<0950:IMOBBI>2.0.CO;2

Wood, C. M. (1991). Acid-base and ion balance, metabolism, and their interactions, after exhaustive exercise in fish. *Journal of Experimental Biology*, *160*, 285–308. https://doi.org/10.1242/jeb.160.1.285

Zuckerman, Z. C., Philipp, D. P., & Suski, C. D. (2014). The influence of brood loss on nest abandonment decisions in Largemouth Bass *Micropterus salmoides*. *Journal of Fish Biology*, *84*, 1863–1875. https://doi.org/10.1111/jfb.12404