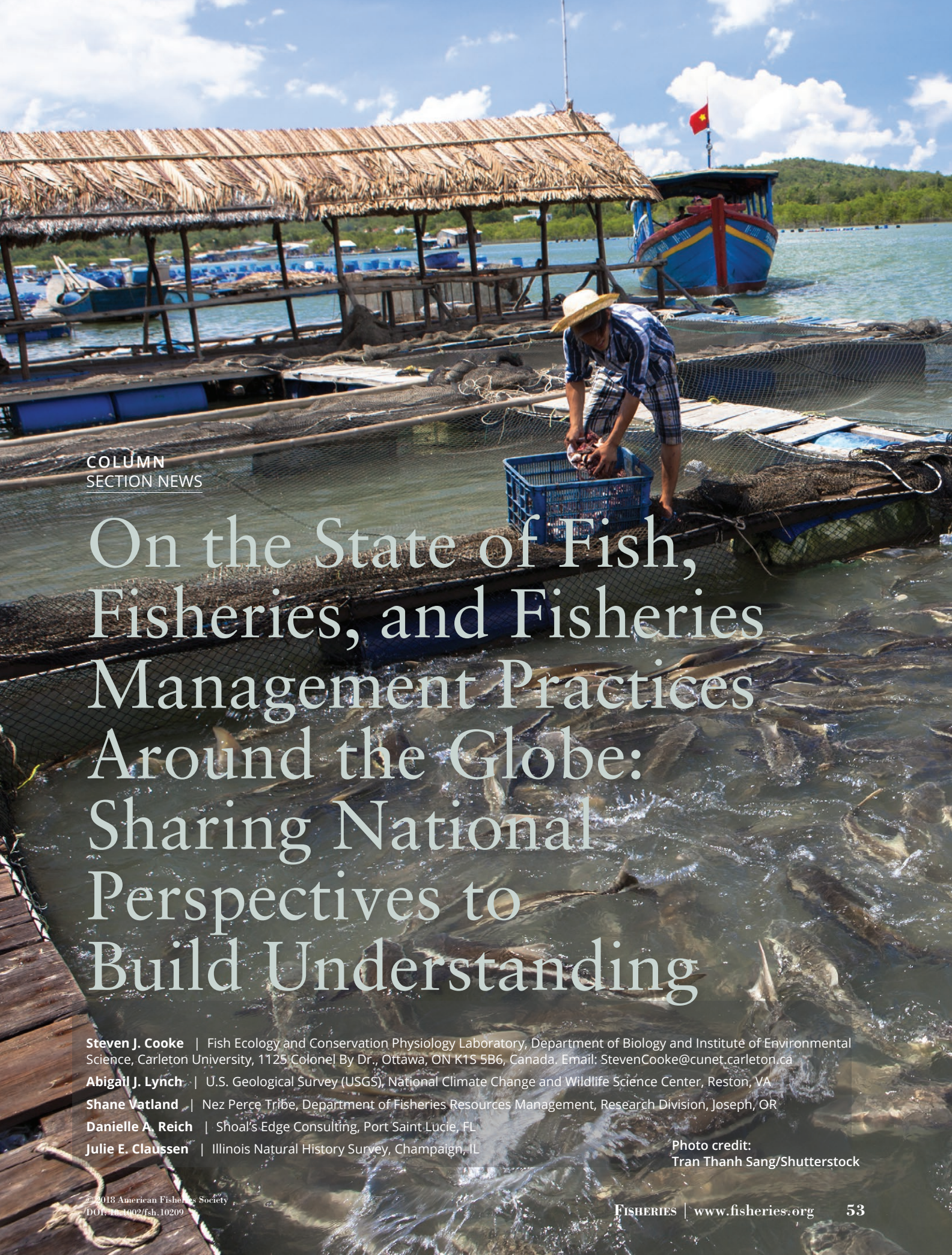

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On the State of Fish, Fisheries, and Fisheries Management Practices Around the Globe: Sharing National Perspectives to Build Understanding

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From the polar oceans to flooded rice fields in southeast Asia to the Amazon River in South America, humans have forged strong nutritional, economic, and social/cultural connections with fish. The relationships between humans (and indeed humanity) and fish can be traced back to the earliest human settlements, with evidence of fishing dating back as early as 70,000 years ago (Henshilwood et al. 2001; O'Connor et al. 2011). Although we continue to capture fish as part of industrial-scale commercial fisheries from inland (Welcomme et al. 2010) and marine (Pauly et al. 2005) systems, which have substantial global reach, the role of small-scale fisheries is also being acknowledged. It is now recognized that small-scale fisheries engage several fold more participants and support livelihoods and nutritional security for some of the poorest people on the planet (Andrew et al. 2007). Aquaculture is increasingly considered to be a potential solution to food insecurity, especially in the face of continued overexploitation of wild fish stocks (Naylor et al. 2000; Bostock et al. 2010). Indigenous people the world over maintain intricate cultural relationships with fish, often linked to spirituality (Tengberg et al. 2012). Also, millions of people around the globe fish for fun (i.e., recreational fishing; Cooke and Cowx 2004), with food as just one of the many motivating factors (Cooke et al. 2018).

It is well understood that inland and marine fish generate many ecosystem services that benefit humans (Holmlund and Hammer 1999; Lynch et al. 2016); these services can be divided into four principal categories: supporting (e.g., nutrient cycling), regulating (e.g., water quality, food-web maintenance), provisioning (e.g., fish yield for human consumption; recreational fishing experiences; wealth generation and support of livelihoods), and cultural (e.g., spiritual/religious, societal connection to nature). Yet, the specific ecosystem services associated with a given fish population or assemblage vary greatly around the globe. Similarly, the ways in which humans rely on provisioning and cultural services generated by fish vary greatly among regions. What a *ngarr* means to someone in Myanmar is presumably somewhat different than what a *poisson* means to someone in France or a fish means to someone in the United States. Moreover, even within a country different users and sectors may relate to fish in very different ways. For example, an Indigenous elder in Canada that has captured a fish for ceremonial purposes clearly has a different relationship with that fish than a Canadian angler who captured the same species by rod and reel and then let it go voluntarily. It is difficult to generalize within and across regions when it comes to fish and fisheries.

These globally diverse relationships between people and fish, however, are not well-represented in peer-reviewed literature. The vast majority of fisheries science (whether fundamental biology or management-relevant case studies) published in peer-reviewed literature emanates from developed countries. A bibliometric study of fisheries science (see Jarić et al. 2012) determined that more than three-fourths of the fisheries literature emanated from North America and Europe. There are many reasons for the apparent imbalance in peer-reviewed publications in the realm of fisheries science including, but not limited to, differences in capacity, training, funding, and governance, combined with the reality that English is the international standard for most international peer-reviewed journals. Despite an underrepresentation of the remainder of the globe in peer-reviewed literature, these regions are conducting fisheries research and applying management interventions, and North America and Europe can learn much in the realm of fisheries science from these underrepresented regions.

The world is a big place and the problems we face as a global society are monumental. Consider the United Nations' 2030 Agenda for Sustainable Development where the theme is "Transforming Our World" (UN 2015). The hope is that all countries and all stakeholders, acting in collaborative partnership, will implement this agenda, which includes 17 Sustainable Development Goals (SDGs) and 169 targets. Those behind the SDGs are "determined to take the bold and transformative steps which are urgently needed to shift the world onto a sustainable and resilient path." The SDGs are integrated and indivisible and balance the three dimensions of sustainable development: economic, social, and environmental. Not surprisingly, fish and fisheries (including aquaculture) feature prominently in the SDGs, although more weight is given to marine systems than the inland realm (Lynch et al. 2017; Reid et al. 2017). Fisheries scientists and managers need to become engaged and share experiences and challenges among jurisdictions. Yet, how do we do so in a meaningful way?

The International Fisheries Section of the American Fisheries Society takes efforts to create opportunities for sharing knowledge and experiences across national boundaries (see https://units.fisheries.org/ifs/). Historically, this has occurred by hosting or sponsoring meetings or supporting the travel of international fisheries professionals (ideally from developing countries) to participate in international meetings related to fisheries science, aquaculture, and management (e.g., Contreras and Hughes 2016). These experiences are often formative but restricted to a relatively small number of people. As such, leadership of the International Fisheries Section has considered a variety of additional strategies for sharing experiences across borders and fostering a global community of fisheries professionals.

A number of years ago one of the authors of this paper (i.e., Cooke) stumbled upon a published paper that describes the state of fish and fisheries in China (i.e., Zhong and Power 1997). We encourage you to read this article; it paints a fascinating picture of the resources themselves, how they are used by the people of China (e.g., cultural connection), and the efforts to understand and manage those fisheries. The authors also detail fisheries training opportunities in China. *Were you aware that there is a university in China dedicated entirely to fisheries and aquatic management?* A recent paper by Sherman et al. (in press) provided an overview on the fisheries and management strategies used in the Bahamas. In general, such comprehensive national level syntheses and perspective articles are rare. Regional or national-level papers do exist that focus on a specific sector, such as changes in fisheries management regimes in Estonia (Vetemaa et al. 2002); marine fisheries management trends in Mexico (Hernandez and Kempton 2003); inland aquaculture in India (Katiha et al. 2005) as well as globally-oriented papers that focus on a specific taxa (e.g., paddlefish and sturgeon biology; Pikitch et al. 2005) or issues (e.g., user participation in fisheries management; Jentoft and McCay 1995). However, these do not give the reader a complete picture of the issues facing fish, fisheries, and fisheries professionals in different countries.

We are pleased to share that starting in 2019, *Fisheries* magazine will begin to publish a series of articles that feature the status of fish and fisheries in various countries around the globe. The author teams recruited thus far have been asked to consider all realms (marine and inland), sectors (commercial, small-scale, recreational, subsistence, and aquaculture),

and aspects (science, management, governance, and policy). The teams have also been challenged to help readers understand the role that fish and fisheries play in their country with specific connections to provisioning and cultural ecosystem services. These are not intended to be exhaustive tomes but rather high-level vignettes. It is our hope that this "Country Profile" series will serve as a means of building understanding (both of the differences and similarities) of the diverse challenges facing fish and fisheries across the globe, fostering opportunities for learning potentially exportable lessons about management techniques in different regions, and helping to understand how fish connect to different peoples and cultures. We see this as yet another step to help fisheries professionals think, collaborate (see Song et al. 2017), and act across international boundaries and a necessary step to foster science-based management in all aquatic systems (Pauly et al. 2003; Cooke et al. 2016) and global initiatives, such as the SDGs. We challenge you, as readers, to read each Country Profile, relate the contents back to your personal experiences, and reach out to the authors (or others) to discuss. These cross-pollination activities across borders will no doubt be professionally rewarding and will surely help improve our ability to conserve and sustainably use our global fisheries resources (Hughes et al. 2016).

REFERENCES

Andrew, N. L., C. Béné, S. J. Hall, E. H. Allison, S. Heck, and B. D. Ratner. 2007. Diagnosis and management of small-scale fisheries in developing countries. Fish and Fisheries 8:227–240.

Bostock, J., B. McAndrew, R. Richards, K. Jauncey, T. Telfer, K. Lorenzen, D. Little, L. Ross, N. Handisyde, I. Gatward, and R. Corner. 2010. Aquaculture: global status and trends. Philosophical Transactions of the Royal Society B: Biological Sciences 365:2897–2912.

Contreras, G. P., and R. M. Hughes. 2016. A brief history of the AFS International Fisheries Section 1987–2016: past, current, and future bridge-building. Fisheries 41:515–518.

Cooke, S. J., E. H. Allison, T. D. Beard, R. Arlinghaus, A. H. Arthington, D. M. Bartley, I. G. Cowx, C. Fuentevilla, N. J. Leonard, K. Lorenzen, A. J. Lynch, V. M. Nguyen, S. J. Youn, W. W. Taylor, and R. L. Welcomme. 2016. On the sustainability of inland fisheries: finding a future for the forgotten. Ambio 45:753–764.

Cooke, S. J., and I. G. Cowx. 2004. The role of recreational fisheries in global fish crises. BioScience 54:857–859.

Cooke, S. J., W. M. Twardek, R. J. Lennox, A. J. Zolderdo, S. D. Bower, L. F. G. Gutowsky, A. J. Danylchuk, R. Arlinghaus, and D. Beard. 2018. The nexus of fun and nutrition: recreational fishing is also about food. Fish and Fisheries 19:201–224.

Henshilwood, C. S., J. C. Sealy, R. Yates, K. Cruz-Uribe, P. Goldberg, F. E. Grine, R. G. Klein, C. Poggenpoel, K. van Niekerk, and I. Watts. 2001. Blombos Cave, Southern Cape, South Africa: preliminary report on the 1992–1999 excavations of the Middle Stone Age levels. Journal of Archaeological Science 28:421–448.

Hernandez, A., and W. Kempton. 2003. Changes in fisheries management in Mexico: effects of increasing scientific input and public participation. Ocean & Coastal Management 46(6–7):507–526.

Holmlund, C. M., and M. Hammer. 1999. Ecosystem services generated by fish populations. Ecological Economics 29:253–268.

Hughes, R. M., C. B. M. Alves, F. Amezcua, J. Claussen, S. J. Cooke, I. G. Cowx, K. D. Fausch, M. T. Ferreira, W. G. Franzin, D. Hall, M. O. Ipinmoroti, R. Ligeiro, N. Mercado-Silva, M. Miller, P. S. Pompeu, D. C. Schmidt, L. G. M. Silva, and B. F. Terra. 2016. Preparing for international research and teaching. Fisheries 41:464–465.

Jarić, I., G. Cvijanović, J. Knežević-Jarić, and M. Lenhardt. 2012. Trends in fisheries science from 2000 to 2009: a bibliometric study. Reviews in Fisheries Science 20(2):70–79.

Jentoft, S., and B. McCay. 1995. User participation in fisheries management: lessons drawn from international experiences. Marine Policy 19:227–246.

Katiha, P. K., J. K. Jena, N. G. K. Pillai, C. Chakraborty, and M. M. Dey. 2005. Inland aquaculture in India: past trend, present status and future prospects. Aquaculture Economics & Management 9(1–2):237–264.

Lynch, A. J., S. J. Cooke, A. Deines, S. Bower, D. B. Bunnell, I. G. Cowx, V. M. Nguyen, J. Nonher, K. Phouthavong, B. Riley, M. W. Rogers, W. W. Taylor, W. M. Woelmer, S. Youn, and T. D. Beard Jr. 2016. The social, economic, and environmental importance of inland fish and fisheries. Environmental Review 24:115–121.

Lynch, A. J., I. G. Cowx, E. Fluet-Chouinard, S. M. Glaser, S. C. Phang, T. D. Jr., Beard, S. D. Bower, J. L. Brooks, D. B. Bunnell, J. E. Claussen, S. J. Cooke, Y.-C. Kao, K. Lorenzen, B. J. E. Myers, A. J. Reid, J. J. Taylor, and S. Youn. 2017. Inland fisheries – invisible but integral to the UN Sustainable Development Agenda for ending poverty by 2030. Global Environmental Change 47:167–173.

Naylor, R. L., R. J. Goldburg, J. H. Primavera, N. Kautsky, M. C. Beveridge, J. Clay, C. Folke, J. Lubchenco, H. Mooney, and M. Troell. 2000. Effect of aquaculture on world fish supplies. Nature 405:1017–1024.

O'Connor, S., R. Ono, and C. Clarkson. 2011. Pelagic fishing at 42,000 years before the present and the maritime skills of modern humans. Science 334:1117–1121.

Pauly, D., J. Alder, E. Bennett, V. Christensen, P. Tyedmers, and R. Watson. 2003. The future for fisheries. Science 302:1359–1361.

Pauly, D., R. Watson, and J. Alder. 2005. Global trends in world fisheries: impacts on marine ecosystems and food security. Philosophical Transactions of the Royal Society B: Biological Sciences 360(1453):5–12.

Pikitch, E. K., P. Doukakis, L. Lauck, P. Chakrabarty, and D. L. Erickson. 2005. Status, trends and management of sturgeon and paddlefish fisheries. Fish and Fisheries 6(3):233–265.

Reid, A. J., J. L. Brooks, L. Dolgova, B. Laurich, B. G. Sullivan, P. Szekeres, S. L. R. Wood, J. R. Bennett, and S. J. Cooke. 2017. Post-2015 Sustainable Development Goals still neglecting their environmental roots in the Anthropocene. Environmental Science and Policy 77:179–184.

Sherman, K. D., A. D. Shultz, C. P. Dahlgren, C. Thomas, E. Brooks, A. Brooks, D. R. Brumbaugh, L. Gittens, and K. J. Murchie. In press. Contemporary and emerging fisheries in The Bahamas—Conservation and management challenges, achievements and future directions. Fisheries Management and Ecology 25:319–331.

Song, A. M., J. Scholtens, J. Stephen, M. Bavinck, and R. Chuenpagdee. 2017. Transboundary research in fisheries. Marine Policy 76:8–18.

Tengberg, A., S. Fredholm, I. Eliasson, I. Knez, K. Saltzman, and O. Wetterberg. 2012. Cultural ecosystem services provided by landscapes: assessment of heritage values and identity. Ecosystem Services 2:14–26.

United Nations (UN). 2015. Transforming our world: the 2030 agenda for sustainable development (A/RES/70/1). New York.

Vetemaa, M., M. Eero, and R. Hannesson. 2002. The Estonian fisheries: from the Soviet system to ITQs and quota auctions. Marine Policy 26(2):95–102.

Welcomme, R. L., I. G. Cowx, D. Coates, C. Béné, S. Funge-Smith, A. Halls, and K. Lorenzen. 2010. Inland capture fisheries. Philosophical Transactions of the Royal Society B: Biological Sciences 365:2881–2896.

Zhong, Y., and G. Power. 1997. Fisheries in China: progress, problems, and prospects. Canadian Journal of Fisheries and Aquatic Sciences 54:224–238. AFS