


# World Fish Migration Day Connects Fish, Rivers, and People – From a One-Day Event to a Broader Social Movement

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Celebrating World Fish Migration Day 2016 in Mongolia.  
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Widespread declines in migratory fish highlight the need for increased global efforts to raise awareness of their value and abate threats they face. World Fish Migration Day (WFMD), coordinated by the World Fish Migration Foundation, is a biennial global celebration of open rivers and migratory fish achieved through locally organized events with the common theme of connecting fish, rivers, and people. Since 2014, over 1,200 events have been organized in 80 different countries across all inhabited continents. Here we provide an overview of the WFMD social movement, highlighting its ability to raise awareness surrounding the plight of migratory fish. We provide pertinent case studies to illustrate the creative events held throughout the world intended to build the public and political will to enable protection and restoration of migratory fish populations. From a coordination perspective, there are several key principles that underlay the success of WFMD, including taking an optimistic approach, identifying change-makers in the community, and carefully timing the growth of the movement. By reflecting on the approach and growth of WFMD, we feel this perspective piece will prove useful to other groups and organizations considering using the power of social movements to achieve common goals related to environmental conservation.

## INTRODUCTION

Approximately 2.5% of fish species globally are classified as migratory (diadromous, potamodromous, oceanadromous), though nearly every species of fish migrates at some point during its life cycle (Binder et al. 2011; Brink et al. 2018) depending on the definition of migration that is used (Dingle and Drake 2007). These species maintain important ecological roles (e.g., nutrient transfer; Willson and Halupka 1995) and have a pronounced impact on human culture and economy (Barlow et al. 2008; Baran and Myschowoda 2009). Despite their human value, migratory fish, which use freshwater at some point during their life, have become increasingly at-risk to human disturbance in the current Anthropocene era (Dugan et al. 2010; Hardesty-Moore et al. 2018; Walters et al. 2019), and have seen a 41% decline in abundance between 1970–2012 (Living Planet Index; WWF 2016). Most of these declines are a direct result of damming approximately half of global river volume (Grill 2015), putting at risk some of the world's most biodiverse fish communities (Winemiller et al. 2016). Riverine systems are subject to fragmentation or flow regulation from the 57,985 registered large dams and countless other small dams that exist worldwide (McCully 1996; ICOLD 2018). It is now estimated that only 37% of rivers longer than 1,000 km remain free flowing over their entire length (Grill et al. 2019). The need to stimulate restoration and conservation efforts for migratory fish and their habitats has never been more urgent, given the state of freshwater ecosystems (Dudgeon et al. 2006; Carpenter et al. 2011; Reid et al. 2019) and plans to dramatically expand hydropower in the decades to come (Zarfl et al., 2014).

Conservation is most successful when changes can be instilled in human behaviour through communication, awareness, and education to shift social norms (Schultz 2011; Barata et al. 2017; Abrahamse and Matthies 2018). Coordinated social movements have proven to be an effective means of bringing about awareness for a range of environmental initiatives (Yearley 2013), from Earth Day (Rome 2010), to the blue box recycling program in North America (Lounsbury et al. 2003). They have been most successful when they redefine personal norms (sense of obligation) in individuals that lead to support and action. This generally occurs when an individual accepts the values of the movement, believes that those values are at-risk, and believes that their actions can help recover those values (i.e., value-belief-norm theory; Stern et al. 1999). This theory can explain the underlying success of the “Keepemwet Fishing” movement, which first raised awareness on the value of recreational fish species, outlined the impacts of irresponsible recreational fishing practices on targeted fish, and identified actions that can be taken by the individual to contribute to solutions (Danylchuk et al. 2018).

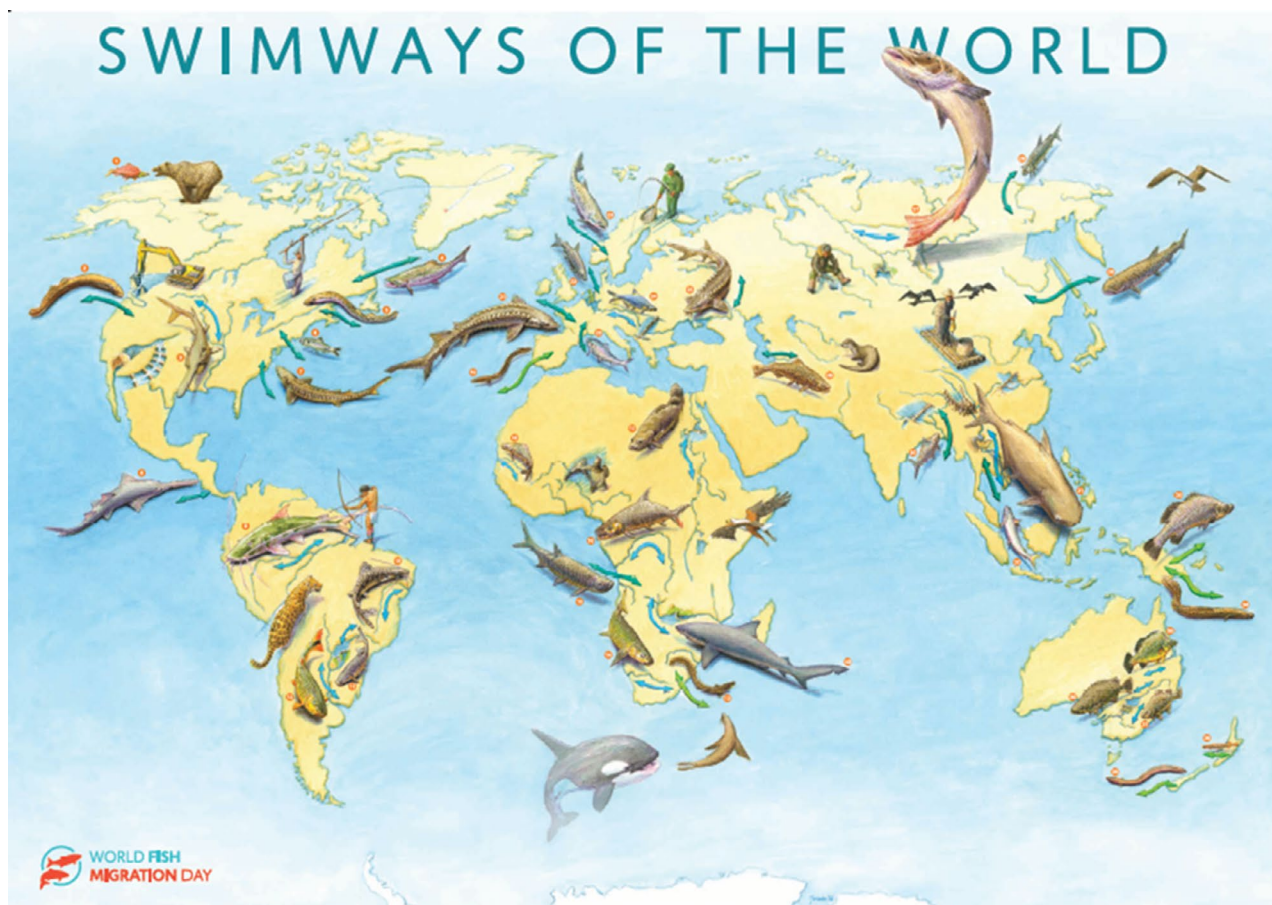
This paper examines World Fish Migration Day (WFMD), a celebration of diadromous and potadromous (hereafter freshwater) migratory fish and free-flowing rivers on a global scale, spearheaded by the World Fish Migration Foundation (<https://www.worldfishmigrationfoundation.com/>). This paper reflects on the goals of WFMD, its global impact, approach, and its trajectory, moving from a single day of celebration to an ongoing social movement and community with sustained and growing opportunities to engage. Illustrative examples of WFMD events are outlined that highlight the creative, engaging activities that have been completed as part of this movement. Increased public awareness can lead to tangible changes (Chawla and Cushing 2007; Cooke et al. 2013) and it is important to consider how initiatives such as WFMD can contribute to this goal of awareness. It is our hope that by revealing the development and success of WFMD, that this article will provide important insights for other groups attempting to build social movements related to the environment.

## APPROACH

World Fish Migration Day is a biennial series of local events with the common theme of connecting fish, rivers, and people. It engages participation from individuals and organizations around the world, to bring global attention to the challenges and solutions for freshwater migratory fish and free-flowing rivers and their importance for nature and people. The main benefit of WFMD is to provide an umbrella for local individuals and organizations to host events in order to raise awareness, share success stories, pride, connections, and lessons learned, and to create a greater understanding and appreciation for migratory fish among the general public, policymakers, and policy influencers in their regions. These local organizers are generally universities, research centres, non-profit environmental organizations, or angling associations, but in some cases are simply concerned individuals. Through these events WFMD intends to attain the following goals:

- 1) Increase the rate and quality of restoration and protection of free-flowing rivers that support robust freshwater migratory fish populations in river systems worldwide;
- 2) Inspire a broader spectrum of our society (ecologists, engineers, teachers, students, artists, river managers, politicians, decision makers, etc.) to appreciate and advocate for free migration of fish populations in their region;
- 3) Provide a rallying point to motivate citizens and colleagues around the world to work together to protect and restore migratory routes (swimways) of migratory fish (Box 1);
- 4) Increase the creation and exchange of information among professionals and lay people about migratory fish life histories, threats, the benefits of free-flowing rivers, river-based food se-





**Swimways** are a network of habitats used by migratory fish to fulfill their lifecycle. This image was created to highlight some of the world's most impressive swimways. Some fish species like the European Eel *Anguilla anguilla* have a swimway of over 10,000 km. The concept of the swimway is akin to that of the "flyway," which has helped raise awareness for unobstructed avian migrations (Boere and Stroud 2006). The poster was first launched at a WFMD 2016 event in South Africa organized by the University of KwaZulu-Natal and Aquatic Ecosystem Research Programme and can be downloaded in 6 languages at [www.swimway.org](http://www.swimway.org)

curity, transportation needs, and the benefits and cautions of fish passage infrastructure and dam removal concepts;

- 5) Facilitate better communication among the global fish migration community to directly address the needs of key decision and policymakers (water managers, etc.); and
- 6) Educate people about the impacts of barriers to ecosystems and the importance of free-flowing rivers for healthy ecosystems and human communities, effectively normalizing river restoration in society.

The WFMD team is centrally coordinated in the Netherlands and is guided by a steering committee of eight organizations from around the world, which includes: the World Fish Migration Foundation, The Nature Conservancy, World Wildlife Fund (WWF), the International Union for Conservation of Nature Freshwater Fish Specialist Group, OAK Consultancy, Regional Water Authority Amstel, Gooi and Vecht, the University of Nevada, and the Dutch Angling Association. Together the team invites organizations to hold WFMD events (Table 1), coordinates WFMD activities globally, helps bring attention to local events, communicates broadly with the WFMD network and public, develops and designs branding, and provides direction for future WFMD

events. The WFMD team encourages organizations to register their WFMD event online and helps communicate these activities globally through social media, newsletters, and press-releases. Local organizations are engaged through personal emails, social networking, and phone calls and are often encouraged to become official supporters of WFMD. Official supporters of WFMD have applied to be listed as such, and have either actively raised awareness about WFMD at a national or international scale, or have contributed financially. Many organizations benefit from WFMD by having their existing initiatives leveraged through increased exposure, gaining brand identity, and by linking local initiatives with a broader global movement. Various media outlets carry WFMD content including TV, radio, newspapers, magazines, and social media. The coordination team relies on local organizations to take initiative and thus prioritizes the development of strong relationships with core people and organizations/institutions in different countries. In this way, WFMD has developed an unparalleled network of supporters around the world, who help the coordination team reach out to even broader communities from their local and remote networks.

Table 1. Examples of the structure of World Fish Migration Day events held by various organizations throughout the world to raise awareness for and to celebrate migratory fish. For each event structure, specific events are highlighted including the location, organizations involved, and overarching WFMD goals (i.e., goals 1–6 identified in the Approach section) that were attained during the event. The proportion of each event type among all WFMD event types (WFMD 2016, 2018) are noted in parentheses.

Highlighted events	
<i>Seminars, workshops, lectures, and conferences (17% of all events)</i>	
<p>Event: WFMD2018 Location: Barrancabermeja, Colombia Organizations: Multiple universities, NGO's, and government departments Activity: An organized seminar titled "Encuentro de saberes para la defensa de nuestros ríos y sus peces migratorios" that pointed out the critical importance of fish migrations for daily life and to call for solutions to recover species that are threatened locally (~90% of all species). The event highlighted that the whole community is affected when migrations decline. For example, school attendance drops for children as parents do not have the economic resources to pay school fees. Goals reached: 2, 3, and 5.</p>	
<i>Projects inaugurations or river visits (31% of all events)</i>	
<p>Event: WFMD2014 Location: Kuma River, Japan Organization: Executive Committee of local citizens' group Activity: A non-profit organization and local communities celebrated the first dam removal done in Japan on the Kuma River. For WFMD2018, 60 fishway visits took place in countries like Austria, Australia, Canada, France, Germany, and USA. Goals reached; 3, 4, and 6.</p>	
<i>Recreation (angling, running, boating, kayaking, snorkeling, etc.; 8% of all events)</i>	
<p>Event: WFMD2014 Location: Amazon Basin, Brazil Organizations: Neotropical Consultoria Ambiental (consultancy), WWF Activity: A consultancy led a boat trip for locals on the Madeira River and an NGO led an expedition about migratory fish on the Juruena River.</p>	
<p>Event: WFMD2016 Location: Ethiopia Organizations: Addis Ababa University, and Bahir Dar University Activity: The general public and policy makers came together through the event "Save Lake Tana's Unique Fish from Extinction," which included a running competition and papyrus (reed) boat paddling competition. Goals reached: 2, 3, 4, and 6.</p>	

(Continues)





Table 1. (Continued)

Highlighted events	
<i>Community outreach and science (17% of all events)</i>	
<p>Events: WFMD2016, 2018  Location: Netherlands  Organization: Reptile, Amphibian &amp; Fish Conservation Netherlands (RAVON)  Activity: A national non-profit organization in the Netherlands coordinated over thirty events held by angling associations to carry out volunteer-based eel monitoring at different river barriers throughout the country on the same night.</p>	
<p>Events: WFMD2014  Location: Penobscot County, Maine United States  Organization: The Nature Conservancy  Activity: A bus tour to five restoration sites along the Penobscot River, meeting fisheries biologists and fish at each stop, with reception and children's art at the Bangor Discovery Museum.  Goals reached: 1, 2, 4 and 6.</p>	
<i>Festivals, films, museums, aquaria, zoos, expositions, school activities (16% of all events)</i>	
<p>Event: WFMD2016, 2018  Location: Amur Basin, Asia  Organizations: WWF in China, Mongolia and Russia, with the collaboration of nine nature reserves, five national parks, two student nature protection brigades, eight public organizations and three research institutes.  Activity: Organized activities for multiple events in different locations in the Amur Basin under the slogan "Save the rivers for fish and people." In 2018, an EU funded children's book was launched.  Goals reached: 2, 3, 4 and 6.</p>	
<i>Influencing national policy on fish passage (&lt;1% of all events)</i>	
<p>Event: WFMD2018  Location: New Zealand  Organizations: NZ Fish Passage Advisory Group, Department of Conservation, Ministry of the Environment New Zealand  Activity: Various government departments launched the <i>New Zealand Fish Passage Guidelines</i> that outlined a consistent national approach for fish passage and management of freshwater fish.</p>	

(Continues)

Table 1. (Continued)

Highlighted events	
<p>Event: WFMD2018  Location: Finland  Organizations: National and local authorities, NGO's, and celebrities  Activity: Participated in a seminar in Finland called "The Future of Rivers in Finland 2" to take action to improve their fish and rivers. After the event, the Finnish government developed a new river restoration policy, which, for the first time in history, includes the option to remove dams and a fund of €20 million to make that happen.  Goals reached: 1, 4, 5, and 6.</p>	
<p><i>River restoration actions and river cleanups (4% of all events)</i></p> <p>Events: WFMD 2014  Locations: Turkey, Ethiopia, Poland, and Costa Rica (among others)  Organizations: Universities, fishing clubs, and waterkeepers.  Activity: River restoration (e.g., improvement of spawning grounds, riparian tree planting, invasive river plants eradication) and river and coastal cleanups.  Goals reached: 1 and 3.</p>	

\*6% of events would be classified under several event types.

### HISTORY AND GROWTH

World Fish Migration Day events are generally held in April or May (when many species are migrating), accounting for major holidays worldwide that may limit participation when selecting the specific day. The first WFMD was held on May 24, 2014 when there were over 270 events in more than 50 countries involving over 1,000 organizations (World Fish Migration Day 2016). The events were often coupled to projects that were already underway that benefited from public awareness, communication with policymakers, recruitment of volunteers, and international exposure. For example, Danube Sturgeon Task Force drew on WFMD to attract attention for sturgeons in Romania and The Institute of Natural Research in South Africa held a WFMD event to launch a new national tool to monitor fish behaviour and water variables to contribute to the management of their rivers (O'Brien et al. 2014). Following WFMD2014, surveys indicated that many participating organizations were enthusiastic about the results of their events, highlighting that additional awareness needed to be raised more effectively in the political world (World Fish Migration Day 2016). The incredible responses from participants in 2014 provided the impetus to form the World Fish Migration Foundation; an overarching organization created to improve dialogue among practitioners, increase communication, and advocate for education and restoration projects related to free-flowing rivers. This, in turn, influenced the formation of Dam Removal Europe, the publication of *From Sea to Source 2.0*, and among other projects, the 5-year European AMBER Project to develop a pan-European map of river barriers and strategies and metrics for river restoration throughout the EU member states.

On May 21, 2016, the second WFMD almost doubled previous success with 450 events in 63 countries. The WFMD

communication campaign was developed under the slogan "Fish can't travel like we can" to highlight that fish are restricted to in-water movements that demand connectivity. Brand identity was further developed through production of videos, updated products, and a growing social media presence and press network. That year, WFMD exposure benefited from the introduction of global ambassadors, such as international television presenter Zeb Hogan, who helped raise the media reach substantially (World Fish Migration Day 2018). Support from society's role models and heroes contributes to connecting people with shared values (Muda et al. 2012). Indeed, media reach increased dramatically for the second WFMD from approximately 2 million people in 2014 to 70 million people in 2016 (a sum of all figures provided by each social media outlet on the number of people reached, and the reach reported to participants by newspapers, journals, TV, and radio outlets that featured WFMD). National TV and radio programs proved to be effective at reaching the general public (e.g., 7 million people reached on prime-time Netherlands TV). While scientific magazines worked well reaching scientists (e.g., *Nature*), newspapers were best for reaching policymakers (e.g., *The New York Times*, *The Guardian*). A significantly greater number of high-level political delegates and organizations (e.g., in the USA: watershed groups, and state and federal agencies such as the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and Natural Resources Conservation Service) that participated in and endorsed WFMD was evidence of the growing interest for WFMD around the world. Recognition of the day was also evidently growing, as many major events occurred on the actual day (rather than close to the day). For example, 10 European Commission LIFE projects all communicated their activities on WFMD to raise public awareness

Table 2. Growth of the World Fish Migration Day movement since its inaugural celebration in 2014.

	2014	2016	2018	2020 (GOAL)
Events	273	450	570	1,000
Countries	53	63	63	100
Organizations	1,200	2,000	3,000	5,000
Visitors	50,000	82,000	200,000	400,000
Media reach	2 million	70 million	50–70 million	100 million

Reaching WFMD 2020 goals may be impacted by COVID-19. Nonetheless, a webinar was held on the intended date for WFMD 2020 that attracted viewers from at least 104 different countries. WFMD 2020 events are now being scheduled for October 24, 2020.

and foster stronger connections. Further, eel citizen science projects from different regions in Europe and the USA coordinated their activities and shared their data on WFMD.

On April 21, 2018, WFMD boasted 116 more events than in 2016 (Table 2; World Fish Migration Day 2019). Although events were still dominant in Europe and USA, there was an increasing number of events from countries such as Mongolia, Gabon, Bolivia, and India (Figure 1). Part of this growth can be attributed to the creation of several short videos that various organizations made in their native languages to highlight the events they had completed in previous years for WFMD. That year the theme was “Happy Fish,” which was intended to symbolize the unity of people, organizations, and projects that aim to ensure free migration for fish populations. A key message communicated during this event was the importance of dam removal to reconnect rivers and provide free passage for fish, with celebrations in Spain, Estonia, Switzerland, and USA. Based on social media, newspaper, TV, and internet attention, this edition had a global reach of 50 million people. The global reach was less than in 2016, because in that year some event hosts were able to cover their stories in national newspapers and TV stations (e.g., in Cambodia 10 million people were reached through the media). The increasing interest from larger organizations and television icons such as Jeremy Wade (Host of “River Monsters” on Animal Planet; 90,000 video views, several million reached on social media), further contributed to connecting with a wider audience. Overall, events hosted by local participants from 2014–2018 played a key role in helping us reach goals

1–6 listed above (i.e., increasing restoration effort, inspiring a broader spectrum of our society, creating a rallying point, connecting professionals and lay people, facilitating communication with policymakers, and fostering education). Thus far, the most common event type has been “project inaugurations or river visits” (31% of all events), while events focused on river restoration actions and river cleanups have been less common (4%; Table 1). Moving forward, WFMD will aim to transition from an event that raises awareness, to an event that fosters direct actions and, therefore, impact. This will be achieved by putting increased emphasis and recognition towards events that result in these actions (e.g., restoration activities, community science). Events that produce data through community science could help provide critical information on river health to inform restoration (McKinley et al. 2017), and potentially lead to a more engaged community with sustained programs that extend beyond WFMD.

#### FROM ONE DAY TO SUSTAINED IMPACT AND ENGAGEMENT

Since its inception in 2014, the number of people visiting WFMD events has increased 4-fold, media reach has increased 25-fold (50 million people in 2018), and the number of events has doubled. Events now take place over 6 weeks leading up to and including the date we select for WFMD each year, allowing the movement to have a sustained presence in the public discourse and foster positive long-term impact and engagement. This also allows greater flexibility for events in places with fish migrations that occur in the month before the established WFMD date. Based on the tens-of-millions of people reached, awareness among government agencies and at global conferences, and the many events held for children, it is evident that WFMD has raised public awareness and improved public perceptions, increased political will, developed communication and collaboration networks, and inspired future generations with respect to freshwater migratory fishes and free flowing rivers. Before 2014, practitioners around the world did not have an international umbrella to celebrate their successes and challenges, but now around 3,000 organizations take part in the biggest awareness event around the globe to save migratory fish. The impact of WFMD has not gone unnoticed, as the World Fish Migration Foundation has received several prominent awards, including the President’s Fishery Conservation Award from the American Fisheries Society and a fellowship from the Mulago Foundation (recognition of “organizations built around a big

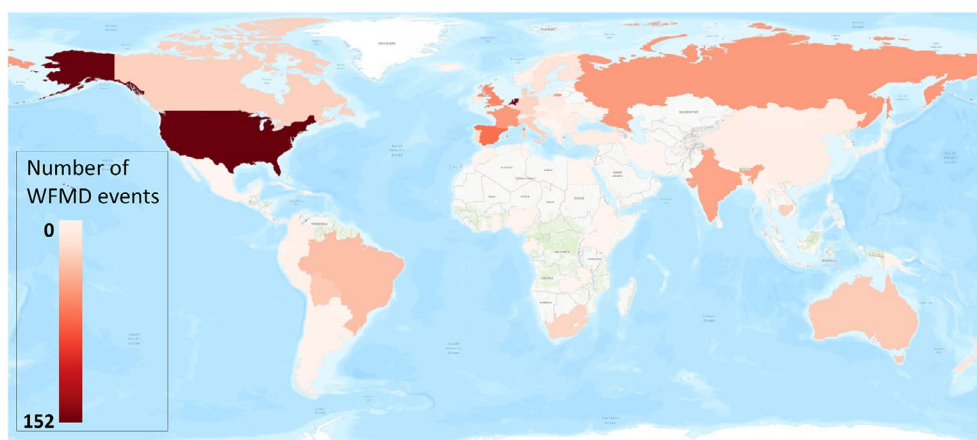


Figure 1. The location of the 1,293 World Fish Migration Day events that took place between 2014 and 2018. Events have been hosted in 80 countries worldwide.



idea and focused on maximum social impact” in addition to having a priority problem, scalable solution, and capacity to deliver).

Through worldwide engagement with WFMD, a strong community of motivated organizations and individuals has been developed. Many WFMD events involve collaborations with multiple partners, from a few to as many as 15 partnering organizations. This approach allows individuals or small interest groups to participate and collaborate with larger organizations and create more meaningful broad-reaching events. These partnerships also foster longer-term relationships that extend beyond WFMD. Growing the community that supports migratory fish helps drive and stimulate relevant policy changes (as has been observed for environmental legislation in the United States; Agnone 2007). Indeed, there are instances where positive political changes have been made in response to global concern (e.g., United Nation’s Sustainable Development Goals) to prioritize ecosystem services derived from fish and free-flowing rivers. Organizations use the WFMD platform to put pressure on policymakers, as well as launch environmental policies, like in 2018, when the government of New Zealand launched a new National Fish Passage Plan on WFMD. Similarly, after WFMD2018, the Finnish Government developed a new river restoration policy, which, for the first time in history, includes dam removal as a restoration approach, and a fund of €20 million to support the policy (Finnish Government 2019). WFMD has also contributed to educating the future generation by reaching out to schools and focusing on events for children. Environmental education can lead to positive changes in knowledge and behaviour (Siemer and Knuth 2001) and can promote a more “nature-related” population (Liefländer et al. 2013), which will undoubtedly benefit migratory fish in the long term as more people become advocates for rivers (Schultz 2001). In turn, connections with healthy rivers will enrich more people’s lives (Postel and Richter 2012).

#### REFLECTIONS ON THE WFMD SOCIAL MOVEMENT

The following principles have been instrumental to the WFMD initiative and may be applied to other social movements seeking to raise public interest and participation. This list is intended to reflect the most important principles to the success of WFMD, but is not intended to be inclusive. While these principles underlay the success of WFMD, a number of other principles may be relevant to environmental initiatives operating at different scales.

##### Simple, clear messaging

The broad theme of WFMD is to connect fish, rivers, and people, with the aim of highlighting the needs of migratory fish and free-flowing rivers, their importance for nature and people, and the challenges fish encounter. These goals have remained consistent, and messaging within the media has remained simple and clear, which is generally considered a best practice for communication campaigns (discussed in Maibach et al. 2008). For example, the message for WFMD2020 is “Love flows” to emphasize that freshwater migratory fish migrate beyond country borders, across oceans, and along rivers to spawn. These messages transcend languages and cultures.

##### Timing the growth of your initiative and identifying change-makers

The WFMD movement began at a local scale in the Netherlands, progressed to the national scale, and became an international event for the first WFMD in 2014. Success came

by identifying change-makers (i.e., leaders in the community) at different scales (local, national, international) and creating connections among them. This helped build capacity and allowed the initiative to organically develop to larger spatial scales.

##### Remind people of their interest in the initiative

A key strategy of WFMD is showing people their inherent admiration for fish that has persisted in human cultures for millennia, and is nurtured by visiting aquaria, fishing, snorkeling, popular media, celebrated food, etc. This strategy involves reminding people of these connections as well as experiences and relationships other people/communities have with fish. The idea here is to increase exposure and bring fish “up out of the water,” giving fish a voice.

##### Global presence, local involvement

WFMD has developed into an international event with global recognition that fish do not have political borders and that we are all connected in facilitating their conservation (see swimways in Box 1). The global nature of the event makes individual participants feel part of a larger collective action (and puts their event on the global stage) and can also increase social pressure for other groups or individuals to get involved with the movement. While the event is global, contact with local groups is personalized, and WFMD staff reach out to these groups to help plan individual events. Local engagement and personal connection are key to achieving successful funding applications and implementing policy changes.

##### Flexibility and accessibility

There are no true rules or regulations surrounding WFMD local events beyond that the events raise awareness and excitement around migratory fish and free-flowing rivers (e.g., education or restoration). This increases the ease with which people can participate and, therefore, the number of people and organizations that host events. There are also no restrictions on the type of groups or organizations that can get involved, so long as they are interested in participating. The inclusive nature of the event creates a network of people and understanding, which is needed to address natural resource issues that span across jurisdictional boundaries (Scarlett and McKinney 2016; e.g., migratory fish). Most events are hosted by multiple organizations.

##### Optimistic approach

The WFMD movement is underpinned by a generally optimistic approach that involves highlighting success stories to get people excited, motivated, and proud of the work they are doing. Conservation professionals have recently been categorized as more optimistic on conservation issues than the public (Papworth et al. 2019), which may contribute to positive actions towards conservation by this group. It is therefore relevant to share this optimism with the public so they feel equally encouraged to inspire change.

##### Celebrity endorsement

Inclusion of fishing celebrities has helped peak public interest in the WFMD movement. Celebrities allow people to connect over shared values (Muda et al. 2012; Turcik 2020) and can be valuable assets to social movements. Collaborating with a celebrity broadens the audience to an often wide and diverse following. When participants see appreciation of the values associated with an initiative it increases the visibility and credibility of both the movement and celebrity (discussed in Erdogan 1999).



### Restricting funding to global coordination

WFMD allocates most of its funds to global coordination and awareness, rather than providing funding to individual groups and events. This strategy substantially decreases the funding requirements WFMD needs to operate. However, through development of global recognition for WFMD, it is believed that local participants will have increased opportunities from funding agencies and foundations.

### CHALLENGES ASSOCIATED WITH COORDINATION OF WFMD

Despite the success of World Fish Migration Day, ensuring its continued recognition worldwide is not without its challenges. We discuss these here, recognizing that this list is not inclusive.

While WFMD has had events in many countries of varying socioeconomic status, raising awareness about WFMD remains difficult in certain parts of the world with limited communication channels. This re-emphasizes the importance of the principle above “Timing the growth of your initiative and identifying change-makers” as change-makers are key to creating impact and spreading the word about WFMD in seemingly hard to access regions. Currently, WFMD has a growing, but relatively small core team of change-makers that help find organizations to participate each year, yet there are clearly many more people and organizations that WFMD could inspire.

Accounting for the full value of WFMD has also proven challenging. Each WFMD year, the number of events, organizations, attendees, and media reach are recorded, though the socioecological implications of these events are difficult to quantify (a common difficulty for social movements; Giugni 1994; Holland and Correal 2013). For example, how has WFMD contributed to fish passage improvements or the removal of dams globally? Thousands of new hydropower dams are planned or are under construction (Zarfl et al. 2014), so clearly there is more work to be done. On the other hand, the dam removal movement is growing (Ding et al. 2019), and while enumerating WFMD’s contribution to that growth is dubious, we believe the influence of WFMD events is nonetheless a positive one. Lastly, maintaining funding for operating this lean organization has challenges when most commonly funds are directed at projects and not long-term support of a mission or movement.

### SUMMARY

Social movements are an important means of achieving common goals related to the environment and conservation. There are many such movements related to the conservation of fish, with WFMD reflecting one such movement (focusing on the connection between fish, rivers, and people around the world) that has become successful over a relatively short period of time. On a local scale, WFMD takes place over a single day, though the global coordination of these local events leads to sustained impact and engagement on behalf of freshwater migratory fish and free-flowing rivers. While the long-term influence of social movements is difficult to quantify, we know that the 1,293 events celebrated worldwide to date for WFMD have contributed positively to public and political awareness, and inspired multiple restoration programs for freshwater migratory fish and free-flowing rivers. A number of broad principles underpin the traction of WFMD that can be useful to the genesis of other social movements, including taking a local-global approach, maintaining conservation optimism, and identifying change-makers at various scales of operation. Given that conservation is often contingent on

changes in human behaviour, we advocate for social movements that increase communication, awareness, and education to ultimately shift social norms and collective action. World Fish Migration Day 2020 has been rescheduled from May 16 to October 24 due to COVID-19. For more information, visit <https://www.worldfishmigrationday.com/>.

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### REFERENCES

- Abrahamse, W., and E. Matthies. 2018. Informational strategies to promote pro-environmental behaviour: changing knowledge, awareness and attitudes. *Environmental Psychology Chapter* 21:223–231.
- Agnone, J. 2007. Amplifying public opinion: the policy impact of the U.S. environmental movement. *Social Forces* 85:1593–1620.
- Baran, E., and C. Myschowoda. 2009. Dams and fisheries in the Mekong Basin. *Aquatic Ecosystem Health and Management* 12:227–334.
- Barata, R., P. Castro, and M. A. Martins-Loução. 2017. How to promote conservation behaviours: the combined role of environmental education and commitment. *Environmental Education Research* 23:1322–1334.
- Barlow, C., E. Baran, A. S. Halls, and M. Kshatriya. 2008. How much of the Mekong fish catch is at risk from mainstream dam development. *Catch and Culture* 14:16–21.
- Binder, T. R., S. J. Cooke, and S. G. Hinch. 2011. The biology of fish migration. Pages 1921–1927 in A. P. Farrell editor. *Encyclopedia of fish physiology: from genome to environment*, volume. Academic Press, San Diego, California.
- Boere G. C., and D. A. Stroud. 2006. The flyway concept: what it is and what it isn't. 40–47 pages in G. C. Boere, Galbraith C. A., and Stroud D. A. editors. *Waterbirds around the world*. The Stationery Office/Edinburgh, UK.
- Brink, K., P. Gough, J. Royte, P. P. Schollemma, and H. Wanningen. 2018. From sea to source 2.0. Protection and restoration of fish migration in rivers worldwide. World Fish Migration Foundation, Groningen, the Netherlands.
- Carpenter, S. R., E. H. Stanley, and M. J. Vander Zanden. 2011. State of the world's freshwater ecosystems: physical, chemical, and biological changes. *Annual Reviews* 36:75–99.
- Chawla, L., and D. F. Cushing. 2007. Education for strategic environmental behavior. *Environmental education research* 13:437–452.
- Cooke, S. J., N. W. R. Lapointe, E. G. Martins, J. D. Thiem, G. D. Raby, M. K. Taylor, T. D. Jr Beard, and I. G. Cowx. 2013. Failure to engage the public in issues related to inland fishes and fisheries: strategies for building public and political will to promote meaningful conservation. *Journal of Fish Biology* 83:997–1018.
- Danylchuk, A. J., S. C. Danylchuk, A. Kosiarski, S. J. Cooke, and B. Huskey. 2018. Keepemwet fishing—an emerging social brand for disseminating best practices for catch-and-release in recreational fisheries. *Fisheries Research* 205:52–56.
- Ding L., L. Chen, C. Ding, and J. Tao. 2019. Global trends in dam removal and related research: a systematic review based on associated datasets and bibliometric analysis. *Chinese geographical science* 29:1–12.
- Dingle, H., and V. A. Drake. 2007. What is migration? *BioScience* 57:113–121.
- Dudgeon, D., A. H. Arthington, M. O. Gessner, Z. I. Kawabata, D. J. Knowler, C. Lévêque, R. J. Naiman, A. H. Prieur-Richard, D. Soto, M. L. J. Stiassny, and C. A. Sullivan. 2006. Freshwater biodiversity: Importance, threats, status and conservation challenges. *Biological Reviews* 81:163–182.
- Dugan, P. J., C. Barlow, A. A. Agostinho, E. Baran, G. F. Cada, D. Chen, I. G. Cowx, J. W. Ferguson, T. Jutagate, M. Mallen-Cooper, G. Marmulla, J. Nestler, M. Petrere, R. L. Welcomme, and K. O. Winemiller. 2010. Fish migration, dams, and loss of ecosystem services in the Mekong basin. *Ambio* 39:344–348.

- Erdogan, B. Z. 1999. Celebrity endorsement: a literature review. *Journal of Marketing Management* 15:291–314.
- Finnish Government. 2019. Inclusive and competent Finland – a socially, economically and ecologically sustainable society. Programme of Prime Minister Antti Rinne's Government 6 June, 2019. Available: <https://bit.ly/2VFOzBJ>.
- Giugni, M. 1994. The outcomes of social movements: a review of the literature. Center for Studies of Social Change, New School for Social Research, New York.
- Grill, G., B. Lehner, A. E. Lumsdon, G. K. MacDonald, C. Zarfl, and C. R. Liermann. 2015. An index-based framework for assessing patterns and trends in river fragmentation and flow regulation by global dams at multiple scales. *Environmental Research Letters* 10:1.
- Grill, G., B. Lehner, M. Thieme, B. Geenen, D. Tickner, F. Antonelli, S. Babu, P. Borrelli, L. Cheng, H. Crochetiere, H. Ehalt Macedo, R. Filgueiras, M. Goichot, J. Higgins, Z. Hogan, B. Lip, M. E. McClain, J. Meng, M. Mulligan, C. Nilsson, J. D. Olden, J. J. Opperman, P. Petry, C. Reidy Liermann, L. Sáenz, S. Salinas-Rodríguez, P. Schelle, R. J. P. Schmitt, J. Snider, F. Tan, K. Tockner, P. H. Valdujo, A. van Soesbergen, and C. Zarfl. 2019. Mapping the world's free-flowing rivers. *Nature* 569:215–221.
- Hardesty-Moore, M., S. Deinet, R. Freeman, G. C. Titcomb, E. M. Dillon, K. Stears, M. Klope, A. Bui, D. Orr, H. S. Young, A. M. Ter Kuile, L. F. Hughey, and D. J. McCauley. 2018. Migration in the Anthropocene: how collective navigation, environmental system and taxonomy shape the vulnerability of migratory species. *Philosophical Transactions of the Royal Society B: Biological Sciences* 373:rstb.2017.0017. Available: <https://bit.ly/2KAHeNz>.
- Holland, D., and D. G. Correal. 2013. Assessing the transformative significance of movements and activism: lessons from a postcapitalist politics. *Critical Practice Studies* 14:130–159.
- ICOLD (International Commission on Large Dams). 2018. General synthesis – large dams. Available: <https://bit.ly/2Y8quVE>.
- Liefländer, A. K., G. Fröhlich, F. X. Bogner, and P. W. Schultz. 2013. Promoting connectedness with nature through environmental education. *Environmental Education Research* 19:370–384.
- Lounsbury, M., M. Ventresca, and P. M. Hirsch. 2003. Social movements, field frames and industry emergence: a cultural-political perspective on U.S. recycling. *Socio-Economic Review* 1:71–104.
- Maibach, E. W., C. Roser-Renouf, and A. Leiserowitz. 2008. Communication and marketing as climate change-intervention assets. *A Public Health Perspective* 35:488–500.
- McCully, P. 1996. *Silenced Rivers. The ecology and politics of large dams*. Zed Books, London.
- McKinley, D. C., A. J. Miller-Rushing, H. L. Ballard, R. Bonney, H. Brown, S. C. Cook-Patton, D. M. Evans, R. A. French, J. K. Parrish, T. B. Phillips, and S. F. Ryan. 2017. Citizen science can improve conservation science, natural resource management, and environmental protection. *Biological Conservation* 208:15–28.
- Muda, M., R. Musa, and L. Putit. 2012. Breaking through the clutter in media environment: how do celebrities help? *Procedia. Social and Behavioral Sciences* 42:374–382.
- O'Brien, G. C., F. J. Jacobs, I. F. Botha, and M. O'Brien. 2014. Manual to monitor fish behaviour and water variables remotely in real time in South African inland aquatic ecosystems. Water Research Commission report no. K8/1042, Pretoria, South Africa.
- Papworth, S., R. L. Thomas, and S. T. Turvey. 2019. Increased dispositional optimism in conservation professionals. *Biodiversity and Conservation* 28:401–414.
- Postel, S., and B. Richter. 2012. *Rivers for life: managing water for people and nature*. Island Press, Washington, D.C.
- Reid, A. J., A. K. Carlson, I. F. Creed, E. J. Eliason, P. A. Gell, P. T. J. Johnson, K. A. Kidd, T. J. MacCormack, J. D. Olden, S. J. Ormerod, J. P. Smol, W. W. Taylor, K. Tockner, J. C. Vermaire, D. Dudgeon, and S. J. Cooke. 2019. Emerging threats and persistent conservation challenges for freshwater biodiversity. *Biological Reviews* 94:849–873.
- Rome, A. 2010. The genius of Earth Day. *Environmental History* 15:194–205.
- Scarlett, L., and M. McKinney. 2016. Connecting people and places: the emerging role of network governance in large landscape conservation. *Frontiers in Ecology and the Environment* 14:116–125.
- Schultz, P. W. 2001. Assessing the structure of environmental concern: concern for self, other people, and the biosphere. *Journal of Environmental Psychology* 21:1–13.
- Schultz, P. W. 2011. Conservation means behavior. *Conservation Biology* 25:1080–1083.
- Siemer, W. F., and B. A. Knuth. 2001. Effects of fishing education programs on antecedents of responsible environmental behavior. *The Journal of Environmental Education* 32:23–29.
- Stern, P. C., T. Dietz, T. Abel, G. A. Guagnano, and L. Kalof. 1999. A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review* 6:81–97.
- Turcik, P. J. 2020. World Fish Migration Day: an interview with Zeb Hogan. *Fisheries* 45(1):46–48.
- Walters, C., K. English, J. Korman, and R. Hilborn. 2019. The managed decline of British Columbia's commercial salmon fishery. *Marine Policy* 101:25–32.
- Willson, M. F., and K. C. Halupka. 1995. Anadromous fish as keystone species in vertebrate communities. *Conservation Biology* 9:489–497.
- Winemiller, K. O., P. B. McIntyre, L. Castello, E. Fluet-Chouinard, T. Giarrizzo, S. Nam, I. G. Baird, W. Darwall, N. K. Lujan, I. Harrison, M. L. J. Stiassny, R. A. M. Silvano, D. B. Fitzgerald, F. M. Pelicice, A. A. Agostinho, L. C. Gomes, J. S. Albert, E. Baran, M. Petrere, C. Zarfl, M. Mulligan, J. P. Sullivan, C. C. Arantes, L. M. Sousa, A. A. Koning, D. J. Hoeinghaus, M. Sabaj, J. G. Lundberg, J. Armbruster, M. I. Thieme, P. Petry, J. Zuanon, G. T. Vilara, J. Snoeks, C. Ou, W. Rainboth, C. S. Pavanelli, A. Akama, A. V. Soesbergen, and L. Saenz. 2016. Balancing hydropower and biodiversity in the Amazon, Congo, and Mekong. *Science* 351:128–129.
- World Fish Migration Day. 2016. World Fish Migration Day 2014 Report. Available: <https://bit.ly/2YbKcJC>.
- World Fish Migration Day. 2018. World Fish Migration Day 2016 Report. Available: <https://bit.ly/3aLTTHY>.
- World Fish Migration Day. 2019. World Fish Migration Day 2018 Report. Available: <https://bit.ly/30DfINY>.
- World Wildlife Fund. 2016. Living Planet Report 2016. Available: <https://bit.ly/2W1Qol1>.
- Yearley, S. 2013. Social movements and environmental change. Page 19 in T. Benton, and M. Redclift, editors. *Social theory and the global environment*. Routledge Press, Abingdon-on-Thames, UK.
- Zarfl, C., A. E. Lumsdon, J. Berlekamp, L. Tydecks, and K. Tockner. 2014. A global boom in hydropower dam construction. *Aquatic Sciences* 77:161–170. **AFS**