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An International Society for Fish Biology
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Mobula ray aggregations in the Gulf of California, Mexico

By Mariana Arguero-Tejeda, Jens Krause, Hector Villalobos

The aggregations of Munk's mobula rays (*Mobula munkiana*) in the Gulf of California, Mexico, are a natural phenomenon that is becoming increasingly known throughout the world. Many nature documentaries show these groups of up to 15,000 individuals with individuals jumping out of the water. This natural spectacle attracts thousands of tourists who travel to Mexico each year to witness it. This activity has become very important socioeconomically for the local community. But the lack of regulations means that sometimes more than 20 boats approach the same group of animals, causing the groups to disperse or dive. Little is known about how mobulas use these aggregations and what their biological function is. This is extremely important, as tourism could have direct implications for key processes such as reproduction or the energetics of the species. These are topics Mariana Arguero addresses in her doctoral project, under the supervision of Hector Villalobos from the Interdisciplinary Centre for Marine Sciences (CICIMAR-IPN), Mexico, in collaboration with other scientists such as Paolo Domenici, Jens Krause (Leibniz Institute for Freshwater Ecology and Inland Fisheries, Berlin, Germany) and Marta D. Palacios.

Previous studies on Munk's ➤

Mariana Arguero-Tejeda and Hector Villalobos.

mobula rays have shown that aggregations occur between March and August and coincide with the species' reproductive period (Palacios et al., 2023a; 2023b). During this time, mobulas form mating trains, in which a female is followed by several males. This behaviour can last for several hours and may culminate in copulation. These dynamic interactions can involve sudden changes in direction, acceleration, and repeated attempts by males to approach a female.

Although mating trains have been observed within aggregations, it is still unknown whether they actually originate within them. Confirming this would help determine whether aggregations play a fundamental role in the reproductive success of individuals and would reinforce the need to protect them from external disturbances. This question is particularly important because mobula rays have one of the lowest reproductive rates among elasmobranchs: females produce a single offspring after approximately 12 months of gestation, followed by a reproductive resting period that can last between two and seven years (Deakos 2011; Marshall & Bennett 2010). Any disturbance that interferes directly or indirectly with reproduction could therefore have serious consequences for the species.

In addition to the reproductive dimension, the project explores whether aggregations may also serve an energetic function. Preliminary observations suggest that individuals sometimes change position within the group. This raises the hypothesis that mobulas may obtain hydrodynamic benefits by swimming together, similar to birds flying in formation, where individuals rotate positions to reduce energy expenditure.

If mobulas gain energetic advantages from group dynamics, aggregations may represent an adaptive strategy that allows individuals to reduce the energetic costs of movement. Understanding this potential benefit would provide further insight into the ecological importance of aggregations and their sensitivity to disturbances.

Understanding the function of mobula aggregations is crucial for conservation and management. If these gatherings are confirmed to play key roles in reproduction or energy conservation, disturbances caused by tourism could have important consequences for the species. Currently, the increasing popularity of mobula watching has outpaced the development of clear management guidelines. In some cases, many boats may approach the same group simultaneously, potentially altering mobula behaviour. Without scientific information on how aggregations function and how mobulas respond to disturbance, it is difficult to design effective regulations. By generating robust behavioural data, this project aims to provide a scientific basis for management strategies that

A mobula aggregation photographed from a drone.

Observing a mobula aggregation with a drone.

allow tourism to continue while minimizing its impact on this remarkable natural phenomenon. The Gulf of California hosts one of the most well-known seasonal aggregations of this species, making the region particularly important for understanding mobula ecology and developing responsible tourism practices.

The methodological approach of the project consists of aerial recordings of mobula groups using drones. This technology provides a unique perspective for studying mobula aggregations, allowing researchers to observe group structure, individual movements, and behavioural interactions without disturbing the animals. From an aerial viewpoint, it becomes possible to track how individuals position themselves within the group, how aggregations form and disperse, and how mobulas respond to the presence of boats or swimmers.

Mobulas are most active after sunrise and before sunset, so field trips are conducted early in the morning, before the start of the tourist window (which begins approximately between 8:00 and 9:00 a.m.), to record their natural behaviour without human interaction. During 2025, multiple field trips were conducted for this purpose. During the 2026 aggregation season, we plan to incorporate an analysis of the effect of tourism, recording the behaviour of mobulas during their interaction with people and documenting behavioural changes.

This project is also a community-focused initiative, with the active participation of the government, the local community—particularly tourism service providers—and the scientific sector, promoting collaborative and evidence-based management. Field activities have been funded by The Rufford Foundation and Misión Tiburón.

Mobula leaping from an aggregation as seen from a drone.

Deakos MH (2011) The reproductive ecology of resident manta rays Manta alfredi off Maui, Hawaii, with an emphasis on body size. Env Biol Fish 94: 1–14

Marshall AD and Bennett MB (2010). Reproductive ecology of the reef manta ray Manta alfredi in southern Mozambique. J Fish Biol 77: 169–190

Palacios, M. D., Stewart, J. D., Croll, D. A., Cronin, M. R., Trejo-Ramírez, A., Stevens, G. M., ... & Galván–Magaña, F. (2023a). Manta and devil ray aggregations: conservation challenges and developments in the field. Frontiers in Marine Science, 10, 1148234.

Palacios, M. D., Trejo-Ramírez, A., Velázquez-Hernández, S., Huesca-Mayorga, S. A., Stewart, J. D., Cronin, M. R., ... & Croll, D. A. (2024). Reproductive behavior of three mobulid species *(Mobula mobular, Mobula thurstoni* and *Mobula munkiana*) in the Southern Gulf of California, Mexico. *Marine Biology*, 171, 12.

Editorial

There is much in the news about drones, mostly in the context of war. In Ukraine the war against the Russians has been dominated by the clever use of drones which have become more and more sophisticated and lethal. It makes a change to see drones put to a more positive use in the article by Mariana Arguero-Tejeda, Jens Krause, Hector Villalobos who illustrate how drones can be used in pursuit of a marine species that are otherwise very hard to observe. Jens Krause and his colleagues have also used drones to study swordfish behaviour in ways that could never be imagined before.

This use of drones is also seen in films where now it is almost obligatory to have drone shots of the scene where events are taking place. The big advantage of a drone is that one can follow events as they happen in environments where it would be impossible to go in any other way. No doubt there will be many more studies carried out with these buzzing objects. In some cases, their presence might become yet another disturbance of the natural environment, for example the idea that drones could be used to deliver parcels for Amazon.

The advances that can be made using drones can be contrasted to the methods available to the scientists on board HMS *Challenger* as discussed in the book review of the three year voyage of the vessel. Although the ship had a steam engine, it was very hard for the vessel to hold station whilst depth soundings were made and the amount of hard work that went into determining the depth of the Challenger deep would leave most modern oceanographers aghast. The same was true for the *Discovery* off South Georgia in the 1920s. These sailing vessels with several masts and abundant rigging made the vessels very vulnerable to wind which would soon move the vessel off the station where soundings or plankton hauls were being made. Fish biologists now have so many wonderful methods available to help investigate both the fish and their environment and it is good to appreciate how lucky we are.

Paul J B Hart
Leicester, May 2026
Next deadline: 1st August 2026

David McKenzie (FSBI Hon President) reports on attendance at the Japanese Society of Fishery Science 2026 Spring Meeting

The Spring Meeting of the Japanese Society of Fishery Science (JSFS) was held over four days, from March 26 to 29 2026, at Tokyo University of Marine Science and Technology, Shinagawa Campus, in the centre of Tokyo. The FSBI has a Cooperation Agreement with JSFS and we send representatives (Officers and/or early career researchers) to each other's annual meetings. This year is the second time I have been lucky enough to attend the JSFS and I was accompanied by Maisie Evans, our excellent representative of the FSBI PhD scholars (see her independent report).

Since 2019, the JSFS International Exchange Committee has organised an international session in English on the topic of "United Nations Sustainable Development Goals (SDGs) and Fisheries Sciences"and, in 2026, the session took place over two days. It was attended by the President of the American Fisheries Society (AFS), Dr Gary Whelan, the President of the Korean Society for Fisheries and Aquatic Sciences (KOSFAS), Prof Young-Mog Kim, and the Managing Supervisor of the Fisheries Society of Taiwan (FST), Dr Hsin-Ming Yeh. We were all invited to give short remarks, and emphasized the importance of the collaboration agreements between JSFS and our respective societies, and the enduring interest and timeliness of the session topic – the UN and the SDGs seem under ever greater challenge by current global events.

In terms of SDGs, like in 2025 the main attention was on SDG2 Zero Hunger and SDG14 Life below Water, while the ethos of the session contributes to SDG17 Partnerships for the Goals. The session was truly international with presenters from France, Indonesia, Korea, Malaysia, the Philippines, Taiwan, the UK, and the USA, plus many Japanese research groups. There was a broad range of talks, the first morning focused on nutrition and food science, the afternoon on management of fisheries and marine protected areas, while the second day presented diverse talks in aquaculture-related research in the morning, and on aspects of fisheries biology in the afternoon. Organisms studied went far

Group photo at the conclusion of the International Session on the topic of "United Nations Sustainable Development Goals (SDGs) and Fisheries Sciences", with officers of JSFS, members of the JSFS International Exchange Committee, representatives of sister societies, and local organisers. Photo credit: Yumi Terashima.

beyond our favourite animal, the fish, to include phytoplankton, seaweeds, krill, the helmet crab, various echinoderms and cephalods, and more. A majority of presentations were by early career researchers and the session organisers have a pleasing chairing system whereby each speaker chaired the session for the subsequent talk. This worked well and contributed to a very pleasant, friendly and informal atmosphere.

Our hosts were absolutely charming and made us feel very welcome, in particular Dr Tadashi Tokai the JSFS President, Dr Fumiya Furukawa and Dr Yoshitaka Sakakura of the JSFS International Relations Committee, and Ms Yumi Terashima from the JSFS Editorial Office. At the conference banquet the food was varied and delicious, as was the beer and sake, and officers from sister societies were invited to make brief remarks where we all emphasised again the importance of our collaboration agreements with JSFS.

The conference was held on the pleasant leafy campus of Tokyo University of Marine Science and Technology, which was founded in the 19th Century as the Imperial Fisheries Institute. Just outside the gates of the campus is the very bustling Shinagawa neighbourhood of Tokyo, with lots of bars and izakayas (a casual Japanese drinking establishment), and the vast Shinagawa station complex with huge crowds of shoppers and hurrying commuters. A high point of the conference was an invitation by the JSFS ➤

A social evening in a restaurant in Shinagawa, Tokyo. Photo credit: Fumiya Furukawa.

International Relations Committee to a very pleasant and convivial dinner. My two visits to the JSFS Spring Meeting as an FSBI Officer have been unforgettable, I thank the JSFS for their really marvellous hospitality. I look forward to welcoming the JSFS representatives, Prof Waka Sato-Okoshi and Prof Yao Wang, to the FSBI Symposium in Southampton.

Maisie Evans, an FSBI PhD student at the University of East Anglia, also represented the FSBI at the JSFS meeting in Tokyo

Maisie Evans with iconic cherry blossom.

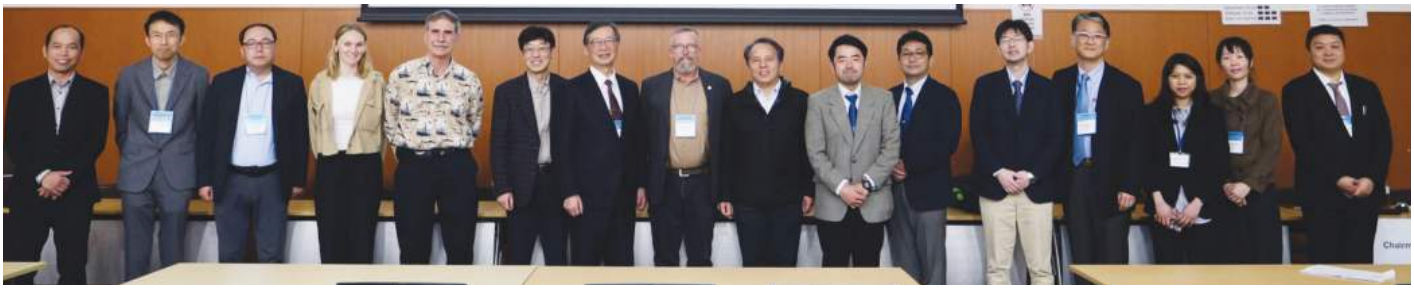
I was delighted to attend the Japanese Society for Fisheries Science (JSFS) Spring Meeting on behalf of the FSBI. Following many interesting talks under the topic of the sustainable development goals, I am thankful to the JSFS and FSBI for giving me this opportunity to meet other researchers focusing on fisheries science and welcoming me into this meeting.

We were invited to attend a get-together for representatives of all the fisheries societies hosted by the president of the JSFS Professor Tadashi Tokai before the meeting started. This consisted of an incredible evening forging connections across societies (and eating delicious food). Much of the conversation revolved around the cherry blossoms which were beginning to bloom and the Sakura festivals were happening across parks in the region before we left Tokyo which were amazing to join.

The sustainable development goals (SDGs) have been the overarching theme of the Spring Meeting for a couple of years and allow all the speakers to place their work in step with global objectives and progress. Held at Tokyo University for Marine Science and Technology, the presentations typically covered SDGs 13 and 14, Climate Action and Life Below Water, so it was great to hear what other researchers are focusing on within these broad categories. Projects ranged from experiments investigating the impact of solar panels on farmed fish to building models to support fisheries research in both species behaviour and fish health.

It was a privilege to give my first keynote talk alongside representatives from the Japanese, British, Korean, Taiwanese, and American fisheries societies. This was an exciting opportunity to provide an overview of the outputs from my FSBI-funded PhD on an international stage. My talk focused on porbeagle shark (*Lamna nasus*) and how I have been assessing interactions between the Northeast Atlantic stock and commercial fisheries on the Northwest European shelf. My project centres on using available data and trialling methods to increase understanding of data-limited species which can be applied to other elasmobranch stocks. It was an incredible opportunity to discuss these as Japanese fisheries interact with this particular stock in the wider Atlantic falling under similar regulations (and therefore dealing with the same issues around incidental catch) as the UK. I also gained new perspectives for application of my research to both porbeagle and other shark stocks within the Pacific Ocean.

This opportunity has provided me with new insights into my own research as well as forge international connections with fisheries scientists. Sharing my research has reminded me of the place my project holds within global fisheries science which is an important perspective I will incorporate into both my PhD and future work. I would therefore like to take this opportunity to thank the FSBI and JSFS for facilitating this exchange and contributing towards my professional development within fisheries research.



Contributors to the English language session held under the heading of Sustainable Development Goals.

Joris Philip, an FSBI PhD student at the University of Glasgow reports on the Nordic Workshop for PhD and Post-Doctoral fellows working on Anadromous Salmonids, held in Iceland in March 2026

The International formerly Nordic Workshop for PhD and Post-Doctoral fellows working on Anadromous Salmonids (NoWPaS) is undeniably one of the most prestigious conferences on salmonid ecology at the international level. The workshops have helped facilitate the sharing and dissemination of salmonid science for more than 20 years. They have also been instrumental in initiating new international collaborations, as well as in identifying novel and timely research topics for the future. The first NoWPaS workshop was held in 2005 in Norway, and was followed by others in Sweden, Finland, Denmark, England, Scotland, France, Canada, Wales and Iceland. Although it started out as a European initiative, due to the global distribution and migratory nature of salmonids, it has grown into a global meeting with North American early-career researchers also regularly attending.

Each year NoWPaS is composed of an organising committee of volunteers. Last year in Halifax (Nova Scotia, Canada) the committee for NoWPaS 2026 consisted of its chair Vebjørn Kveberg Opsanger with members Aglaé Lambert, Anthony Fontaine, Gabrielle Ladurée, Peter Betts, Phoebe Kaiser-Wilks, Samantha Crowley and myself. Together for a year we held regular meeting and focused our efforts to obtain a budget from generous sponsors such as the FSBI. Indeed, the conference is free for all delegates, and it is the responsibility of the committee to make this possible. In doing this committee members gain valuable experience in reaching out to sponsors, applying for grants and collaborating with institutions. To make this feasible NoWPaS is small by design and the limited number of people also enhances the networking, making it natural for all delegates to interact with everyone throughout the five days of the conference.

In 2026, NoWPaS was held in Iceland at Hólar University between the 1st and the 5th of March. For the last 40 years Hólar has been a hub for local and international scientists investigating the patterns of postglacial ecological speciation and conservation in salmonids. We were excited to be able to bring together both early-career salmonid researchers and more established keynote speakers alongside research and charity sponsors, to discuss our research, future possibilities, and collaborations as we gathered in for what was a fascinating and rewarding 21st NoWPaS Meeting. A total of 31 early-career researchers and four keynote speakers (Prof. Chris Harrod, Prof. Eva Enders, Prof. Arnar Pálsson and Dr. Jessica Rodgers) headlining the following four sessions: *Ecology, Movement and management, Evolutionary ecology and genetics* and *Conservation*. Indeed, more recently, NoWPaS has welcomed scientists from the field of evolution and genetics to widen the lens of management efforts, as salmonid conservation requires acknowledging the diversity across but also (and most importantly) within-species.

The 2026 committee of the Nordic Workshop for PhD and Post-Doctoral fellows working on Anadromous Salmonids.

We all met in Reykjavik on the first day for a visit to the Marine and Freshwater Institute led by Dr. Christophe Pampoulie. Afterward, the organising committed held its first crisis meeting as the bus that was supposed to bring most of our delegates 322 km up north to Hólar was cancelled due to a potential yellow weather alert. Nevertheless, we manage to sort out a backup plan and everyone arrived safely at Hólar in the evening, excited by the prospect of being able to relax in the private university hot spring. The next day, Prof. Bjarni K. Kristjánsson Head of Department at Hólar opened the meeting and was followed by the keynote lecture from Prof. Chris Harrod (director of the Scottish Centre and the Natural Environment) on "Using stable isotopes as tools to solve the Rumsfeld matrix in salmonid ecology". I will not enumerate every talk in each session, but I would like to note that all delegate presentations were excellent and most notably, the session prize winners. These were: Kelsey Stansberry on "Effects of prey predictability on resource defence behaviour in juvenile Arctic charr" in the Ecology session, Kenedy Annejulee Williams on "Nursery grounds ➤

of anadromous Arctic charr in Icelandic rivers: where to go when rivers warm?" for the Movement and Management session, Hallie Arno on "Combined genomic impacts of climate change and aquaculture introgression in wild Atlantic salmon populations" for the Conservation session and myself on "The genetic and molecular basis of phenotypic plasticity in benthic-limnetic divergence across salmonids species" on the Evolutionary Ecology and Genetics session. Being the only PhD student within the FSBI cohort working on salmonids I was also at the meeting as an FSBI representative and was happy to bridge the long-lasting collaboration between the FSBI and NoWPaS once more this year. NoWPaS and the FSBI are two essential organisations working and supporting scientist to promote salmonid conservation. The meeting ended with a special session in which senior scientists from the Department of Aquaculture and Fish Biology at Hólar University presented their research. This session provided a valuable opportunity to highlight the past and current research on salmonid ecology and evolution locally. A central theme of this session was that biodiversity within species, expressed through variation in morphology, behaviour, and life histories, can equal or exceed differences among species. This point was repeatedly made throughout the meeting.

To conclude, the NoWPaS 2026 conference in Iceland showcased the latest integrative research on salmonids, highlighting their ecological, physiological, evolutionary, and conservation significance. A central message across sessions was that understanding salmonid populations requires connecting genetic processes with ecosystemlevel dynamics. Presentations demonstrated how behaviour, physiology, and ecology interact to shape responses to environmental change, supported by advances in telemetry and genomics. Research on evolutionary ecology emphasised the value of intraspecific diversity, local adaptation, and phenotypic plasticity for resilience, while conservation studies underscored the growing pressures of climate change, habitat fragmentation, and other human impacts. Together, the findings stressed that effective management must combine ecological and evolutionary perspectives and account for variation within and between species. Strong interdisciplinary contributions, including those from Icelandic scientists, reinforced the importance of ecoevolutionary approaches. These findings will be published as a meeting review in Biology Open (The Company of Biologists), work that is collectively led by the past and current committee (Betts et al., 2026 – in prep). The conference also reaffirmed the need for collaboration, innovation, and support for earlycareer researchers. A new organising committee co-chaired by Phoebe Kaiser-Wilks and myself was formed and composed of Anna Silverstein, Hayleigh Pogmore, Håvard Frafjord, Eliot Boulaire and Sean Neville. With us NoWPaS will continue with another meeting in 2027 and hopefully help maintain and expand this valuable research network.

Delegates enjoying the conference dinner.

Dr Anna Sturrock, University of Essex and FSBI Symposium Liaison Officer and Sustainability Officer writes on Classroom to Coral Reefs: Finding Hope in the Next Generation of Ocean Advocates

Our fourth and final flight to get to Baubau in Sulawesi, Indonesia.

Soon after returning to the UK and starting my lectureship at Essex, I was lucky enough to receive a UKRI Future Leaders Fellowship. It allowed me to grow my research lab, and while I'm not going to pretend I was heartbroken about the reduced marking load, I did miss teaching. So as my fellowship time started to taper, I was excited to design and deliver my first module this spring and teach on a remote marine field course in Indonesia. When I was asked to write about it for the FSBI newsletter I was more than happy to oblige!

While I know Brits are not meant to brag, I am genuinely proud of my module! It is called 'Translational Ecology' and focuses on working with stakeholders to co-design sustainable solutions to environmental problems. Inspired by translational medicine, the course blends theory (e.g. adaptive management, decision-making analysis, and conflict resolution) with real-world stories from guest speakers. Speakers included academics, government and industry scientists, film makers and even supermarket retailers. Each speaker told us a story about how they had tried (and sometimes failed) to work with stakeholders and translate their science to solve issues including wildfires, pollution, dams, restoration, and flooding.

I promised I would mention something 'fishy' so I will highlight the lecture given by Cefas scientists Grant Stentiford and Kieran Hyder. Grant gave us an amazing global picture on aquatic food production and how One Health thinking can help realise a 'blue transformation', then Kieran explored fisheries management with a wonderful case study on European sea bass.

With perhaps the exception of Will Perry(!), most of us could do something to improve our science communication skills, so we finished the course with incredible masterclasses by director Eleanor Church (Lark Rise Pictures) and Professor Jules Pretty exploring how to use different storytelling and filmmaking techniques to inspire change and reach different audiences.

Days later I gave my children a long hug goodbye and jetted off to Baubau in Sulawesi, Indonesia for almost three weeks. The diving and in-country logistics were organized by Operation Wallacea, so myself and the other lecturers 'just' had to do the teaching and chaperone 30 students there and back (89-hour round trip!). Only one passport lost and zero hospital visits! ➤

Beach clean in the searing heat.

Result! It was an incredible trip. I had forgotten just how amazing it feels to be weightless. I spent hours marvelling at 'fields' of *Acropora*, at reef sharks zipping past us, cowfish snarfing the sediments, gobies keeping watch while the shrimp busily burrowed, huge titan triggerfish, crocodile flatheads, trumpetfish, morays and scorpionfish. While there was quite a bit of bleaching and damage, there were also thriving reefs that gave us hope.

Sadly, there was also a shocking amount of plastic pollution, both on land and at sea. We did a huge beach clean-up, but the number of single-use plastic cups everywhere reminded us just how important it is to stem production.

But to finish on a high note, probably the best thing about the trip was the students. Many had never left the UK before and I prepared myself for high drama and moaning, but they were simply brilliant. Resilient, thoughtful, kind and curious. Enthusiastically practicing their Bahasa Indonesian on passersby, picking nappies off the beach in 38-degrees heat, carefully working on their buoyancy and underwater signalling, helping each other with code and revision cards. They gave me a renewed sense of optimism for the future of ocean conservation.

On that note I encourage you to revisit our 'Reasons for Optimism' film from the 2023 FSBI Symposium (http://tinyurl.com/fishyoptimism) and to consider greener travel options for the upcoming conference in Southampton (https://fsbi.org.uk/symposium-2026/). There will be prizes for the greenest journeys, and the best stories... Stay tuned! #FSBIGreenTravel

Late night coral reef ecology lecture.

A grumpy scorpionfish. Photo by Elena Bollati (University of Essex).

Book reviews

Gillen D'Arcy Wood. (2025). The wake of HMS *Challenger*. How the legendary Victorian voyage tells the story of our oceans' decline. Princeton University Press. ISBN 978-0-691-23324-6. 311pp. Hbk. GBP 25.00. USD 33.79.

Readers who have visited Bergen on the west coast of Norway, may have seen the three masted bark, *Statsraad Lehmkuhl*, moored in the harbour. Although built in 1914 as a sail training vessel it has recently been active sailing round the world pursuing marine science. Its activities will be a relatively small contribution to marine science, given that researchers the world over are investigating aspects of ocean biology, physics and chemistry. The same was not true at the end of 1872 when HMS *Challenger,* a Pearl class corvette, left the English coast on a three year trip around the world to investigate the depths of the ocean. At that time little was known about the deep sea as most marine biology up to then had been pursued from the shore and from small boats which could not stray far from the safety of harbours.

After the *Challenger* returned to port in 1876, with 4,700 new species discovered and numerous measurements of depth and temperature throughout the world's ocean, scientist began the laborious task of identifying the new species and evaluating the oceanographic findings all of which were eventual published in 50 volumes. Summarising these results in a book such as D'Arcy Wood's was not remotely feasible so he focuses on thirteen animal groups or oceanographic phenomena with each being given a chapter. He uses this framework to not only discuss the findings of the expedition, but also to ruminate on the present state of the ocean ecosystem and how it has been changed by human activity since the *Challenger* returned. As expected, the outlook is gloomy in that the ocean ecosystem has continued to be exploited and is in a poorer state now than in the last third of the 19th century. D'Arcy Wood considers that the event that is most remembered is the discovery of the now named Challenger Deep. He writes 'For all the thousands of new marine species discovered by the expedition, and breakthrough insights like the calcite compensation depth, the *Challenger* name is best remembered by the popular imagination for this one fluky feat – their discovery of the deepest place on earth, the Challenger Deep' (p181).

The narrative is entertaining and well written. D'Arcy Wood is Professor of Liberal Arts and Sciences at Illinois University, with an academic background in English but with a strong interest in environmental issues.

The book persuades the reader that the *Challenger's* voyage changed our view of the ocean. A similar book, but one written by a cruise participant rather than a distant observer, is Alister Hardy's *Great waters*, which is a masterly summary of the *Discovery* expedition to the South Georgia in the mid 1920s which was designed to create a better understanding of the factors that affected whales, which were at that time, heavily exploited. The expedition also produced a many volumed account of the findings and Hardy, having taken part in the expedition, was able to give a very thorough presentation of the results. For anyone interested in the history of marine science I can recommend the book which is illustrated by Hardy's superb water colour paintings. It was on this trip that Hardy developed a prototype version of what is now known as the Continuous Plankton Recorder, a device which is still in use 91 years later to monitor the plankton community, mostly in the North Atlantic.

Marian Stamp Dawkins (2026). *Who is conscious? A guide to the minds of animals.* Oxford University Press. 150pp. Hbk, ISBN: 9780197818626. GBP16.99, USD 22.96. Can also be downloaded free from OUP doi: 10.1093/9780197818657.001.0001.

Marion Dawkins is well known for her work on animal welfare, particularly chickens. I admire her position on the topic because she does not go beyond the evidence that can be gathered from observing what animals do when given a choice. The assumption is that if an animal chooses one set of conditions over another, then the first must be preferred. There is no requirement for the animal to be conscious to make the choice observed but, sadly in my view, there are many who cannot resist imputing consciousness to their subjects. This situation has now got to the point where consciousness is being attributed to many crustacea, honeybees and even plants.

Dawkins does not deny that some non-humans could be conscious but she expresses the view that scientists working on non-humans, particularly those removed by considerable phylogenetic distance, are too keen to attribute consciousness to them without considering alternative explanations. As Dawkins points out this approach is not best practice as a scientist. As she explains, as scientists we should adopt Karl Popper's approach to hypotheses and do our best to find reasons for rejecting them. One chapter in the book is particularly instructive in this way by asking 'Could a computer do that?'. In this chapter she considers behaviours such as integrating information, motivational trade-offs, protecting the body from injury, self-medication, mind-reading and self-recognition in a mirror. For all these behaviours and more, which at first glance an observer might feel that consciousness is required, could just as well be achieved with a simple computer programme.

Dawkins is very clear on how easy it is to confuse the meanings of words when interpreting animal behaviour. For example the word 'fear' is used by those studying aspects of a fish's response to a stimulus such as a simulated predator. This usage could be just meant as shorthand for the avoidance reaction of the subject fish. The problem arises because we as humans associate feelings with the word 'fear', which is clearly appropriate in the human case but not necessarily for the fish. We don't know if the fish feels as we do and it is not helpful to assume that it does.

I must declare my sceptical stance on the topic of consciousness in fish. In my judgement many are too ready to attribute consciousness to them and this book should, I hope, at least make fellow scientists think carefully about how they interpret the behaviours they are observing. It is at least vital that they bear in mind that hypotheses should be constantly tested with new evidence, rather than immediately assuming that the fish in question is conscious.

Paul J B Hart
University of Leicester

Notices

Lauren Nadler outlines details of the FSBI symposium

We are delighted to host the 2026 Fisheries Society of the British Isles Annual Symposium at the University of Southampton, centred on the theme "Breaking silos in fish biology". Fish biology and fisheries science span a wide range of disciplines, from taxonomy and ethology to conservation and economics. As researchers, we often fall victim to sticking to what we know, creating silos that separate key factions in our community, including academics and policy makers, researchers in related disciplines, and practitioners focused on diverse but interconnected taxa. This meeting aims to foster discussion and knowledge exchange across traditional boundaries, encouraging novel approaches to strengthen the resilience of fish communities in diverse habitats.

Southampton is a coastal city at the confluence of two chalk streams that flow into the Solent Estuarine System, and thus has a strong connection to both marine and freshwater environments. The University of Southampton is a centre of excellence in fish biology and fisheries science, with expertise spanning ecophysiology, ecological engineering, and beyond. Its inherently interdisciplinary research culture, alongside a growing community working across traditional boundaries, makes it an ideal venue for this symposium. The event is supported by a dedicated local organising committee representing a range of career stages, as well as an interdisciplinary Scientific Advisory Committee from institutions across the UK.

Abstract submission closed in February, attracting an impressive 163 submissions. Following a thorough review process, all presenters were notified of decisions by late February. Presenters are encouraged to confirm attendance as soon as possible using the instructions provided in the decision email. Registration is open, with early bird rates available until 27 May.

The symposium will feature a diverse scientific and social programme. The first day includes three excursions: a research cruise aboard the R.V. *Callista* from the National Oceanography Centre Southampton; a visit to the Aquatic Research and Conservation Centre at Sparsholt College, showcasing freshwater fish research and industry collaboration; and a field visit to the River Itchen, an iconic chalk stream and habitat for Atlantic salmon, where stakeholders will discuss conservation efforts. The afternoon will include workshops on topics such as science communication and collaborative review development, followed by a Welcome Reception.

The main scientific programme will run from Tuesday to Friday at the university's Highfield campus. We have seven silo-breaking sessions planned (see the meeting website for details: https://fsbi.org.uk/symposium-2026/), complemented by social events including a fish quiz, a spawning run, and a poster session. We will have our gala dinner on the final evening at the Harbour Hotel Southampton, which features panoramic views over the Solent estuary towards the Isle of Wight.

The meeting will culminate in a special issue of the *Journal of Fish Biology* (submission deadline 15 January 2027), highlighting research that advances interdisciplinary understanding across habitats, scales, and disciplines. Submissions that strengthen links between science, management, and policy are particularly encouraged. This special issue aims to support collaborative research that informs effective management and policy in a changing world.

Information Desk

For all membership enquires please contact the FSBI office at:

Fisheries Society of the British Isles

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