

Tracking the behaviour of large fish in the open ocean. Matt Hansen, Alicia Burns and Jens Krause describe 10 years of billfish research



Jens Krause, Matthew Hansen, Rogelio Gonzalez Armas and Korbinian Pacher at CICIMAR in La Paz

Ten years ago, 2012, in Cancun Mexico, a collaborative effort involving members of three different research groups set out to address a number of basic questions regarding billfish biology. Our team consisted of researchers from three different research groups in animal behaviour (Jens Krause, Humboldt University Berlin, Germany), biomechanics (Paolo Domenici, Italian National Research Council) and fish physiology (John Steffensen, University of Copenhagen). Billfishes have long fascinated fishermen and members of the general public alike, and the fact that they could suddenly be observed at close quarters in the wild created an opportunity to

address long-standing questions, such as “What do they use the bill for?”, “Are they really the fastest fishes in the oceans” and “What, if any, function does the sailfish sail serve?”

For the members of the Domenici and Steffensen labs it was normal to work offshore. However, for those of us more accustomed to shallow rivers and temperature-controlled labs working on guppies and sticklebacks, it was a major re-adjustment to film large predators while snorkeling in the open ocean for long periods. Sea-sickness, bad weather, periods of extreme heat and cold, were just some of the daily challenges. But these were quickly forgotten when

we were able to make the first high-speed recordings of billfish attacking fish schools in the wild.

Immediately one of our first questions was answered – sailfish, *Istiophorus platypterus*, use their bill during attacks on fish schools to slash and tap at fish (Domenici *et al.* 2014). This behaviour had the combined effect of helping catch prey for themselves, whilst also injuring prey to facilitate capture by their groupmates (Herbert-Read *et al.* 2016; Krause *et al.* 2017). Then, using a combination of accelerometers, high-resolution sonar and physiological measurements, we established that sailfish are unlikely to exceed swimming speeds of 40 km/hr (Marras *et al.* 2015) – debunking the long-held myth that they are the fastest fish in ocean at 100 km/hr. However, much like goldfish and their 3 second memory, this claim about being the fastest fish turned out to be one of those zombie-claims which repeatedly comes back to life after being debunked. To this day we are continually asked by journalists whether it is true that sailfish are the fastest fish in the sea. In addition to observing the use of the bill, we were also able to record high resolution video showing very clearly the sail of sailfish being deployed only immediately before the sailfish attacked a school, suggesting



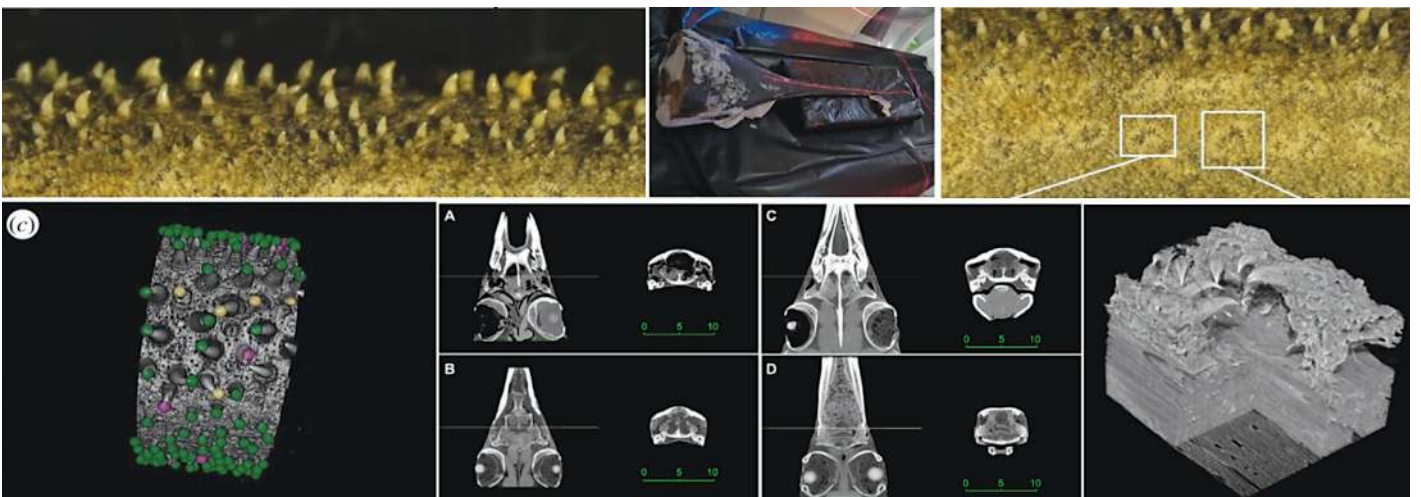
Sailfish (copyright Rodrigo Fryscione Wyssman)

it too plays a role in hunting and attack behaviour. Indeed, once the sail goes up the swinging motion of the head (and bill) is greatly reduced – a highly adaptive trait – because the sailfish often inserts its bill into the fish school where it goes unnoticed until it starts slashing at the fish (Svendsen *et al.* 2016). Finally, given that sailfish usually carry out a single horizontal slash to the right or left to capture fish, we investigated potential handedness and found that indeed some individuals

showed strong preferences for one side and that this is correlated with capture success (Kurvers *et al.* 2017). These initial 3yrs of fieldwork were highly rewarding and were made possible by Rodrigo Fryscione Wyssman and his company (Solo Buceo) under whose captaincy and guidance we conducted these trips and we extend our gratitude to him.

After 2015, sailfish sightings became less frequent around Cancun, but we fortunately found a new location off Magdalena

Bay, Baja California Sur where similarly to the sailfish, striped marlin (*Kajikia audax*) were reliably found at the surface hunting fish schools. Here we started a collaboration with our Mexican colleagues at CICIMAR in La Paz to study the mechanisms used by marlin to herd and attack schools of Pacific sardines. This time, two additional teams from theoretical biology (Romanczuk and Krause S labs) joined the collaboration to model the billfish attacks and identify mechanisms underlying



Billfish bill morphology (copyright Breuker, Zaslansky, Müller, Hansen and Hildebrandt)



Drone shot of striped marlin group pursuit (copyright Alicia Burns)

the predator-prey interactions. We also received support from colleagues (Zaslansky, Müller and Hildebrandt labs) who have access to scanning facilities involving computed tomography and micro-computed tomography to study various aspects of the structure of the bills. These multi-disciplinary

efforts made it possible to integrate billfish behaviour and morphology which showed that striped marlin primarily dash through fish schools unlike sailfish which swim at the same speed as their prey and carefully insert their bill for aimed slashes (Hansen *et al.* 2020). The bills turn out to be

covered in micro-teeth which in sailfish are regularly replaced and particularly long laterally whereas in marlin - which show less bill use in fish captures – they are mostly broken. Other insights concerned the existence of an oil gland at the base of the bill which was first discovered by John Videler *et al.* (2016) in swordfish, *Xiphias gladius*, and which we showed also to be present in sailfish, striped marlin and blue marlin, *Makaira nigricans* (Dhellemmes *et al.* 2020). Its function has been discussed in connection with reduced drag and antibacterial properties. We also found a completely new structure on the bill of sailfish – tiny pits filled with even tinier teeth - which we called “lacunae rostralis” (Häge *et al.* 2021). The function of these pits is unknown, and so our detective work continues, but we speculate that they may contain sensory organs and relate to the unique way the sailfish can insert their bill into the prey school. Most recently, our behavioural work with striped marlin quantified for the first time how a group of pelagic predators divides a school of prey fish between themselves (Hansen *et al.* 2022) and we have also started to explore the nature of striped marlin’s relationship with other top predators, such as California sea lions (*Zalophus californianus*) (Hansen *et al.* 2023).

Our main project for the future is focused on the group-hunting of the striped marlin and the way they collectively chase fish schools in the open ocean. The use of drones makes it possible to obtain the trajectories of the fish schools and the marlin that surround them, and we hope to make some novel contributions to the literature on group-hunting in this context. First efforts show that an intermediate group size of about 10 billfish at a fish school seems to provide the highest capture efficiency for these predators (Herbert-Read *et al.* 2016). Further, working with our new colleagues at CICIMAR La Paz, whose work covers everything ➤



Above, flying the drone from the boat – Matthew Hansen, Captain Carlos, Alicia Burns and Korbinian Pacher. Below, CICIMAR La Paz



Editorial

As Neil Metcalfe writes, John Thorpe was one of our most distinguished fish biologists. He was also a strong supporter of the FSBI. He was Vice President from 1988-1992 when he stepped down to take on the editorship of the *Journal of Fish Biology*. Initially he took on this job temporarily as Alwyne Wheeler had decided he could not devote enough time to the journal after just one year. As editor John was very helpful to authors who were non-native English speakers, helping them to refine their manuscripts with detailed assistance. John was also President for just two years between 2005 and 2007. Again, he took the position to tide the Society over an unexpected gap.

This edition of the Newsletter has a very global feel with the report from Jens Krause and his colleagues about bill fish in the

Pacific, and the call from Juliette Tariel-Adam for help with her project on tool use by fish. I have also been in touch with Ashley Ward (FSBI Medal winner 2011) who is currently in India on a mission to gather information for a planned book on fisheries. He sent this photo of the fish market in Mumbai taken early in the morning



from plankton to ocean currents, has already provided invaluable context and local knowledge to this fascinating system.

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before first light. Ashley reports that not only was it very smelly but also noisy. Most fish markets are noisy and all have a smell which many find unpleasant but it goes with the territory I guess! Note the baskets which would be plastic in the UK and elsewhere in Europe. Ashley also reports that “The thing about the fish market that really surprised me was the number of sharks for sale – all small, around 30-40cm, and including bonnet heads... Also there was a decent sized mobula on the quayside, as well as the usual sailfish, swordfish etc”. This is an issue that Nick Dulvy has been involved in for much of his career as reported in the section on the Society’s medal winners.

Paul J B Hart
Leicester, February 2023
Next deadline: 1st May 2023

What has the FSBI ever done for us? – asks Colin Adams, President of the FSBI



If you are at an early stage in your scientific career, casting around for membership of a learned society, it is a perfectly reasonable to ask the question: why would I consider joining the Fisheries Society of the British Isles?

There is enormous choice amongst the societies out there and it is likely that there will be more than one that appears to overlap with your field of interest. Partly because of this, I myself am a member of four learned societies. So why should you consider the FSBI? I will address this question head-on here.

Although not unique, the FSBI does not represent a single scientific discipline, rather it is founded upon the principal of bringing together scientists from an enormous range of disciplines with one thing in common; that they use fish as models for their science. I am hesitant to describe the FSBI as representing scientists interested in a particular taxonomic group, because as we know, taxonomically there really is “no such thing as a fish” (Gould 1983). What the FSBI does offer, is a very broad scientific church, where ecologists, physiologists, ethologists, parasitologists, molecular geneticists,

immunologists, taxonomists and fishery, evolutionary and developmental biologists (and many more ...ists) can, and do, feel accommodated. As a result our annual symposium very frequently has presentations that cover many of these disparate branches of the life sciences at a single meeting. Similarly our journal, the *Journal of Fish Biology*, carries papers from an equally broad range of disciplines. This is one of the strengths of the FSBI. It forces us to listen, read and think about areas of science outside (but not too far outside) our immediate field of specialism; such opportunities are becoming increasingly difficult to find amongst the highly demanding lives that scientists at all career stages now lead.

The other major strand of FSBI activity that provides so much to its members and to fish biology, is the vast amount of charitable activity that it undertakes. The FSBI is registered as a UK charity and as such it is required to use what resources it has to meet its charitable goals: “to encourage, promote and support all branches of fish biology and fisheries science and conservation”.

In furtherance of these goals, the FSBI supports, both financially and logistically, a scientific symposium every year and since 1969 has published the *Journal of Fish Biology*. But its contributions to the science and the scientists in this field go well beyond that. The FSBI funds PhD studentships, offering both stipend and consumable costs to cover a four year PhD programme. In any one year FSBI is funding eight young scientists beginning their research careers in this way. For scientists one step beyond this career stage, the FSBI funds two post-doctoral travelling fellowships each year.

One for a UK based scientist to travel to an overseas laboratory to gain new skills, develop new contacts and to have the opportunity to conduct a research programme that would not be possible at their home institution. The second is for an overseas post-doctoral scientist to visit a laboratory in the UK.

The FSBI also offer grants for travel to conferences and workshops; for short training courses; for small stand-alone research projects. It also has a grant scheme to support the summary of topical science in a scientific review but where an accessible lay summary is also a developed alongside that more formal review.

Managing and developing all of these facets of the charitable activity of the FSBI is undertaken by members of FSBI Council. Council comprises a group of 20 scientists, drawn from a wide range of career stages who, unpaid, contribute very considerable amounts of time energy and enthusiasm to these charitable activities. Council has recently approved a total expenditure of £535,000 for these schemes for the financial year 2023-24.

If you are reading this article because you are already a member, I hope that the above will remind you why you became a member of FSBI and equally important, galvanise you to articulate the advantages of membership to those colleagues who have not yet made the decision to join.

If you are reading this and are not yet a member, but you have interests in fish biology, then what are you waiting for?
<https://fsbi.org.uk/>

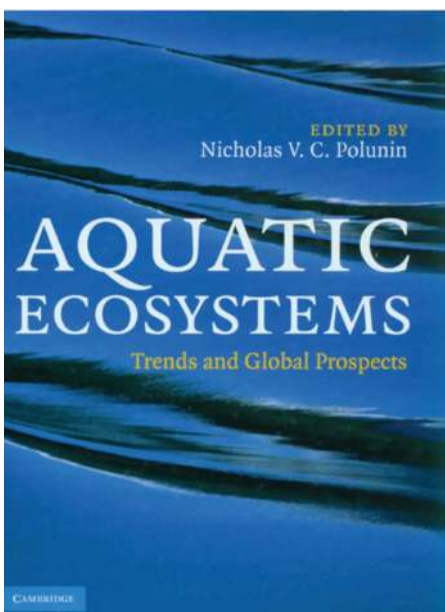
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FSBI announces medals its 2023 winners

Beverton Medal



Nick Polunin's research career at the University of Newcastle, UK, has been truly path breaking, mainly through identifying largescale 'natural experiments' yielding profound insights into ecosystem-scale fish ecology and fisheries impacts in an era of global change. He pioneered the use of underwater visual census techniques on coral reefs, using them to good effect in large-scale fishing gradients across customary marine tenure systems in the Western Pacific Ocean, notably in Fijian qoliqoli, as well as comparisons inside versus outside marine protected areas. With these approaches,



Polunin and his trainees were able to show that even subsistence and artisanal levels of fishing can severely deplete predator and herbivore assemblages unleashing cascading effects on coral reef community structure. These early research campaigns across the Indo-Pacific and Caribbean provided critical baseline data against which subsequent surveys could be used to understand the differential sensitivity of corals and reefs to the emergence of worldwide frequent coral bleaching events. His work pioneering the use of stable isotopes to understand fish feeding relationships profoundly changed marine ecology. This body of work set the stage for a profound revision of 'food web' ecology, showing that marine ecosystems are dominated by size-based feeding interactions rather than species identity – the prevalent view derived from terrestrial ecology.

Nick has mentored 32 PhD students (and numerous post-docs) in coral reef and fisheries science, who have gone on to have influential careers of their own, including four as Professors (Dulvy (see below), Graham, MacNeil, Roberts) and three as world-class government scientists or fisheries policy advisors (Jennings UK, Pinnegar, UK, Williams USA, Wilson AUS). He has exhibited unprecedented academic leadership: leading three briefing papers for the Fisheries Society of the British Isles, 4 years as president of the International Coral Reef Society, 3

years as Vice President of the FSBI, *Editor of the journal Environmental Conservation*, and organizer of four international conferences.

Le Cren Medal



Professor Nicholas Dulvy is a world-leading fisheries ecologist at Simon Fraser University, Vancouver, Canada, has made substantial contributions to our fundamental understanding of fish ecology and conservation, which extend well beyond academia. He discovered how (1) overfishing unleashes trophic cascades in coral reefs, (2) marine fish distributions deepen due to climate change, (3) ecological subsidies from salmon and plankton can shape trophic pyramids, (4) metabolism underlies the diversity of life histories and population dynamics, and (5) loss of biodiversity can be predicted from species life histories and national



macroeconomic attributes.

Professor Dulvy is a recognised authority on marine fish extinction risk, and he co-chaired the International Union for the Conservation of Nature's Shark Specialist Group (SSG) for 11 years. During this time, the SSG trained 350+ scientists, produced four conservation strategies, eight key reports, and produced the first Living Planet and Red List Indices, all of which laid the foundations for the international trade regulation of 38 shark and ray species.

Professor Dulvy led the creation of one of the largest most comprehensive datasets of any class of fishes – Chondrichthyes, the sharks, rays and chimaeras, including all 1,199 species. He led the creation of three major data products: phylogeny, trait database, and extinction risk assessment. His creation of the global phylogeny of all chondrichthyans enabled the creation of EDGE Sharks and Rays (<https://www.edgeofexistence.org/sharks-and-rays/>) which trains young scientists from developing countries to save evolutionarily distinct and globally endangered species. His leadership in the creation of a global trait database "Sharkipedia" provides support for fisheries management and conservation efforts, and enables tests of the generality of hypotheses of vertebrate macroecology and macroevolution. Third, he published the first global IUCN Red List Assessment of all chondrichthyans in 2014 and he recently completed the second assessment of extinction risk and

species distributions in 2021. Under Prof. Dulvy's leadership, these 1,199 Red List Assessments were completed over a nine-year period through 17 workshops that he organized, attended by 353 experts from 71 countries managed by 24 Facilitators. The assessments referenced >5,200 unique sources and were authored by 322 Assessors and 363 Contributors and checked by 118 Reviewers.

FSBI Medal



Dr. Rajeev Raghavan is an Assistant Professor at the Kerala University of Fisheries and Ocean Studies, Kochi, India, and also the South Asia Chair of IUCN'S Freshwater Fish Specialist Group (FFSG). He has been involved in interdisciplinary research that supports conservation decision making in the aquatic ecosystems of South Asia. Rajeev's work cuts across multiple disciplines from systematics to molecular ecology, inland fisheries and conservation policies, and range from local to global scales.

Since completing his PhD in 2011, Rajeev has established himself as a leader in freshwater fish conservation in the South Asian region, having described 21 new species, four new genera and two 'unique families' of freshwater fish, and made significant contributions to the understanding of biology, population status and extinction risk of fishes of the Indian subcontinent. Some of the fish discoveries from Rajeev's group have received international attention – for example, the gondwanan relic and 'living fossil', *Aenigmachanna gollum* (and its subsequent recognition under a brand-new teleost family, Aenigmachannidae), and the discovery of the world's largest cave fish.

Apart from his contributions to the discovery of new taxa, Rajeev has also generated key information that has helped assess the extinction risk of freshwater fishes, and the development and implementation of policy and on-ground conservation action. This has been particularly significant for mahseer (*Tor* spp.), a group of migratory megafish of tropical Asia. Rajeev has helped bring attention on the plight of the world's rarest mahseer (the humpbacked mahseer) and generated a wealth of baseline data to help conserve this species.

For integrating science and knowledge with advocacy and outreach, and for being a strong champion for freshwater fish conservation, Rajeev has received several international recognitions. Since 2012, he is the South Asia Co-Chair (and since 2021, as Chair) of the IUCN FFSG and, since 2014, is the IUCN's Freshwater Fish Red List Authority Coordinator for Asia and Oceania. Rajeev also serves as an advisor/board member of international freshwater conservation organizations including SHOAL Conservation, Fisheries Conservation Foundation, and Freshwater Life.



Britz R, Anoop VK, Dahanukar N & Raghavan R (2019) *Aenigmachanna gollum*, a new genus and species of subterranean snakehead fish (Teleostei: Channidae) from Kerala, South India. *Zootaxa* 4603 (2): 377-388

Obituary – Prof. John E. Thorpe 1935-2022



With the death of John Thorpe at the age of 86 in mid-December 2022, we have lost a great salmon biologist, a generous mentor, and a major supporter of the FSBI. John had an international reputation based on the ground-breaking contributions he made to our knowledge of the developmental and reproductive biology, ecology, behaviour and physiology of Atlantic salmon. He took an unusually broad approach to the study of salmonid biology, which resulted in his being as likely to give a keynote lecture at an aquaculture conference as at one focussed on wild fish. He also played a major role in mentoring and supporting the careers of numerous fish biologists through his extensive, world-wide collaborations.

John was born in Wolverhampton (central England) in January 1935. After compulsory National Service, he studied Zoology at Cambridge University, graduating in 1959. Realising that he was then, in his words, ‘in imminent danger of employment’, he postponed facing that horror by leading a year-long expedition of fellow graduates to British Honduras (later re-named Belize). This multi-disciplinary expedition combined studies of the biology

and distribution of coral reefs with archaeological excavations of Mayan-era buildings. He then obtained a position as an agronomist with Shell, based in Kent, but found the work dull; he therefore took up a position as an experimental officer at the Freshwater Fisheries Laboratory in Pitlochry in 1963, the same year in which he married Judy. Clearly finding the study of fish more stimulating, he stayed at the Pitlochry Lab throughout his career, reaching the Senior Principal Scientific Officer level at the time of his retirement in 1995.

One of his earlier projects was on the International Biological Programme’s major study of the biological production and food web of Loch Leven, which ran from 1966-72. John’s remit was to study the fish in the Loch, primarily brown trout and perch; this resulted in a string of papers on their diet, daily food intake, growth, movements, population size and annual production. He then switched to working on Atlantic salmon, with a focus on understanding the causes of life history variation. He took advantage of the existence of the Fisheries Lab’s Almondbank Smolt Rearing Unit, run by his colleague Mike Miles and his team, and conducted a series of pioneering experiments over the following decades.

An early discovery was that each autumn there is a marked divergence in the growth rates of juvenile salmon, with fish that will undertake their seaward smolt migration in the forthcoming spring growing faster than any fish delaying smolting for another year. This results in a bimodal size distribution of juvenile salmon that is indicative of their subsequent life history trajectories. Importantly, this work revealed that the physiological ‘decision’ to

stay or go is made many months earlier than was previously thought. Later experiments on maturing fish (including the now widely recognised ‘sneaker’ males – John hated the term ‘precocious’ since it implied that these males were somehow odd) showed that the decision to become sexually mature is also made months before it becomes evident from their external appearance. The maturational ‘trigger’ is related to energy reserves; John demonstrated the practical applications of this discovery by reducing the rate of early sexual maturation in farmed salmon through reductions in their rations at key times. His fascination with the environmentally-determined triggers and consequences of life history decisions was a thread that persisted through much of his later work.

John’s interest in smolts was broad, combining physiological studies of osmoregulation, tracking studies of the downstream migration of wild smolts, investigation of the circadian and seasonal photoperiodic cues that trigger migration, and examination of the potential for salmon to be ‘ranched’ (i.e. released into a river at the smolt stage, such that they would imprint onto it and so later return to that river to be captured). This diversity of approach was typical, and was reflected in the diversity of his collaborators, which included physiologists, endocrinologists, reproductive biologists, fish farmers, muscle developmental biologists, chronobiologists, behavioural ecologists and ecological modellers. This gave him a real breadth of vision and depth of knowledge: he regarded himself as a basic biologist who worked in a fisheries lab. However, he knew more about salmon than anyone else I have ever known,

and his knowledge of the literature (including the ‘grey’ literature reports produced by fisheries organisations) was outstanding. An indication of his approach was that on realising that Russian fish biologists were doing interesting work that was unknown in the west, he taught himself Russian so that he could read and translate their papers.

John became a mentor to me when I first started working on salmon as a postdoc. and his effect on my career was transformative, as it was for many others. He was the most stimulating and supportive collaborator one could wish for, and was generous with his advice, time and willingness to give full access to the Lab’s facilities. I remember asking on numerous occasions during our work together if it were at all possible for the Pitlochry Lab or Almondbank to provide X or do Y; he would usually immediately say yes, but if not he would give me the more guarded ‘leave it with me and I’ll see what we can do...’; this latter response signalled that it would be difficult, but I knew he would do everything in his power to make it happen – and it usually did. This generosity extended to him going out of his way to introduce early career researchers to other scientists he

thought they should know.

His published work has been hugely influential, as is evident from the fact that it has received an average of about 80 citations per paper (with many papers cited hundreds of times). John received international recognition, giving many invited lectures, being a Distinguished Lecturer for the Department of Fisheries & Oceans, Canada, and receiving a number of honours such as the Special Medal for Services to Science, University of Łódź, Poland, and our Society’s own Beverton Medal. He was also made an Honorary Professor at the Universities of both Bergen and Glasgow. Towards the end of his career John took over as Editor in Chief of the *Journal of Fish Biology*. This was initially meant as a temporary stand-in, but he ended up doing it for 10 years, during which time the size of the journal (as measured by pages published) increased by 50%. As with all things, John took on this major role with calm efficiency: he invariably spoke quietly and politely, conveying great authority but with the minimum of fuss and no pomposity.

Over the last few years John developed heart problems that restricted his activities, but he remained cheerful, and died peacefully at home, cared for by

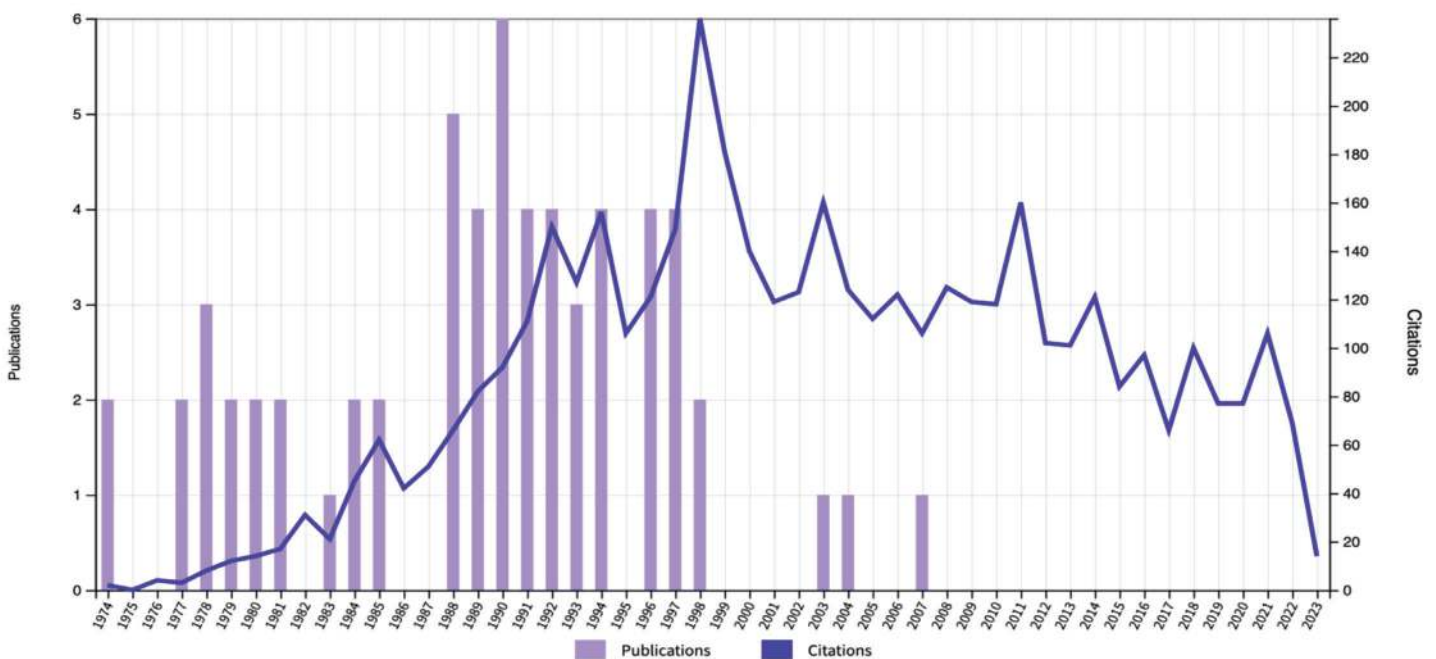
Judy and his beloved collie dogs. He is survived by Judy and his son Peter; his other son Michael predeceased him.

There will be a memorial event for John, celebrating his life as a fish biologist, at the Pitlochry Theatre from 2-4 on Saturday 29th April 2023.

Neil Metcalfe, University of Glasgow, UK. (With the assistance of Colin Adams, Lee Stradmeyer and son Peter Thorpe).

The significance of John Thorpe’s work

Although John worked mostly on salmonids, a fairly narrow field, the significance of his work is shown by the attached graph taken from the ISI Web of Science. Even though John’s major output ceased in 1998 the number of citations of his work have continued to be steady at around 80-140 a year. Also, as made clear in the editorial, John’s editorship of the *Journal of Fish Biology* must have eased the path to publication for a significant number of scientists whose native language was not English. That is not to say that this cohort of authors got favourable treatment but that John worked on the manuscripts to improve the English in a way that is rare these days.



Call for observation on tool use in fish by Dr. Juliette Tariel-Adam, Macquarie University, Sydney, Australia



Did you know that fish can use tools? Archerfish use water as a tool to dislodge prey outside the water. Some wrasses have been observed using rocks as anvils to help them break open hard-shelled prey. In each of these examples, fish use an external “object” to help it access food resources that would otherwise be inaccessible. Tool use has therefore important evolutionary and ecological consequences including fish survival or prey population dynamics. Given the great advantages of tool use, one question remained unanswered: why have not all fish evolved tool use?

I have been awarded a two-year fellowship by the Fyssen Foundation to tackle this question with the Prof. Culum Brown at

Macquarie University. The project focus on anvil use. When using an anvil, the fish grabs a prey in its mouth, swims to a hard surface, and strikes the prey rapidly and repeatedly on the hard surface by a side head movement until the prey breaks. This behaviour has received great public attention and notably has been spotlighted by the BBC documentary Blue Planet II. Individuals from 15 wrasse species (Labridae) have been seen using anvils so far. In each species, the evidence of anvil use is most often based on opportunistic observation of one or two individuals. One part of the project is to determine all fish species which can use rocks as anvils and where they use them. This knowledge will open the door to comparative phylogenetic analyses between tool-using and non-tool-using populations or species, allowing to test hypotheses on the factors driving tool use evolution.

To determine where and which fish species are using tools, we need your help! We are running a citizen science program asking people to report their observations.

- What to look for? A fish uses a hard surface to help it open a prey item.

- Where to look? Wherever there are fish: coral reefs, aquariums, streams...
- What to do? Once you have seen anvil-use behaviour, fill the participation form available at <https://fishtooluse.com> or send an email at juliette.tarieladam@gmail.com. The form will ask you about the location of your observation and the likely species/genus/family of fish you have observed. Any information is helpful, so don't hesitate even if not sure.
- What we do with your data? The location and species observed will be open access. Observations will be anonymous: your name/ email will never be shared, published or associated with the observation.

We are also open to collaboration and feedback on the project, so don't hesitate to contact us at juliette.tarieladam@gmail.com



Example of anvil use in fish. A wrasse (*Choerodon graphicus*) strikes a mollusc on a rock with a side head movement. Observation made at Ilot Maître, New Caledonia. Picture by Joseph Gracia

Notices

FSBI 2023 Symposium

Habitat Ecology in a Changing Climate.
University of Essex,
24th-28th July 2023



***** DEADLINE TO
SUBMIT ABSTRACTS:
28th FEBRUARY 2023 *****

***** DEADLINE TO APPLY
FOR FSBI TRAVEL AWARD OR
FSBI CONFERENCE AWARD:
1st MARCH 2023 *****

The 2023 Symposium, co-convened by the University of Essex and the Centre for Environment, Fisheries and Aquaculture Science, will present the latest science on fish habitat ecology, exploring how fish interact with their environment and how climate change and other stressors impact their behaviour, physiology, diet, and health.

The deadlines to submit your abstract or to apply for financial support are coming up fast! The submission links/further information are provided the conference webpage: <https://fsbi.org.uk/symposium-2023/>. Registration will open late February/early March, and early

bird registration ends 1st May 2023.

The organising committee has been busy planning a productive and exciting week! There will be workshops and special interest groups to brainstorm topics for synthesis papers, fun excursions (choose between freshwater and marine) and lots of social events (including the infamous fish quiz, a BBQ & movie night, an early morning 'spawning run', a drinks reception at Wivenhoe House and a band for dancing after the banquet!). For more details, visit the webpage linked above.

We are also delighted to confirm seven keynote speakers covering the five central themes:

1. *Fish distributions & biogeography* – Steve Campana (University of Iceland) will be giving the Jack Jones Lecture on long-term changes in fish distributions and growth, while David Sims (Marine Biological Association) will be linking fine-scale shark movements to global biogeographic patterns and anthropogenic stressors.
2. *Social-ecological connectivity in fish research* – Bronwyn Gillanders (University of Adelaide) will talk about fish connectivity across life stages and habitats (sponsored by COST Action www.sea-unicorn.com), while Emma Sheehan (University of Plymouth) will be discussing the role of MPAs to support sustainable fisheries.
3. *The role of fish in food webs* – Emma Cavan (Imperial College London) will be presenting on the impacts of fish and fisheries on the global carbon pump
4. *Protecting and restoring critical habitats* – Richard Unsworth discussing the importance of seagrass meadows as fish habitat.

5. *One health* – Baukje de Roos (University of Aberdeen) giving a lecture sponsored by the Buckland Foundation (<https://www.scotfishmuseum.org/the-buckland-foundation.php>) about the importance of fish in human diets.

Finally, our banquet speaker will be Chris Howard (Silverback Films) discussing the importance of film, science and storytelling in animal conservation through his salmon-focused *Riverwoods* documentary (<https://www.scotlandbigpicture.com/riverwoods>), his fishier moments on Springwatch and a new series with Sir David Attenborough.

So please send in your abstracts ASAP, follow us on twitter (@FSBI2023) and help us to spread the word!

If you have any questions email us on fsbi2023@essex.ac.uk.

Fourth Call: Fisheries Society of the British Isles Postdoctoral International Travelling Fellowship Grants (PITF) 2023

The FSBI is pleased to invite applications for our established research funding opportunity: *FSBI Postdoctoral International Travelling Fellowships (PITF)*. The scheme is to support outstanding postdoctoral scientists to undertake research in line with the objectives of the FSBI, and that benefit from international mobility and expertise and/or facilities of the chosen host. The research can comprise experimental studies, development/validation of a methodology, fieldwork, or related activities within an existing programme of activity.

The research will require sufficient coherence to generate explicit quantifiable outputs and with a demonstrated benefit(s) to the career development of the FSBI Fellow.

Two PITFs are awarded each calendar year: **Incoming PITF**, hosted within an appropriate University, research body or industrial partner within the British Isles, and an **Outgoing PITF**, hosted at a suitable institution globally. Each FSBI Fellow (PITF) can apply for up to £20,000, to include travel,

subsistence and accommodation, and eligible research costs, over an approximate duration of 3 months. Click here for full Terms and Conditions, and to download the FSBI PITF Application Form. For further enquiries, please contact the FSBI Administrator, Jane Smith (j.p.smith@bangor.ac.uk).

The PITF are coordinated by a committee of three FSBI Council Members (currently, Katie Longo and Willie Yeomans), and chaired by the Hon. Past President (currently, Professor Gary Carvalho).

Closing date: The closing date for applications to be submitted online via the FSBI website is 23.59 (GMT) 24th February 2023. Interviews (in person or via skype) will depend upon applications received in each round, and with advance notice to secure availability. The outcome is expected around mid-April 2023, and following a period of negotiation, for Fellowships to commence from May 2023 onwards.



Approaching Bear Island in the Barents Sea, March 2013. On board the research vessel Johan Hjort

Information Desk

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