

# BULLETIN OF ESTUARINE AND COASTAL SCIENCES



ECSA is an international organisation dedicated to the promotion and advancement of multidisciplinary research into all aspects of estuaries and coasts, and the application of science and technology for their sustainable environmental management.

**ESTUARINE AND COASTAL SCIENCES ASSOCIATION**

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# BULLETIN OF ESTUARINE AND COASTAL SCIENCES

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Welcome to the 125th issue of the Bulletin of Estuarine and Coastal Sciences.

We have re-launched the Bulletin with its new title and look forward to engaging with our readership in the forthcoming issues.



Surveying for native oysters.  
Image - Zoological Society of London

*“The edge of the Sea is a strange and beautiful place”*

- Rachael Carson

This bulletin was edited by Gemma Smith, International Estuarine and Coastal Specialists Ltd.

All papers and correspondence to:

[Gemma.Smith@iecs.ltd](mailto:Gemma.Smith@iecs.ltd)

With great thanks to all contributors.

# A MESSAGE FROM THE PRESIDENT.

Last year we celebrated our 50th anniversary, a milestone at which we decided to relaunch our Bulletin to ensure it continues to be a stimulating publication for our members and the wider estuarine and coastal community.

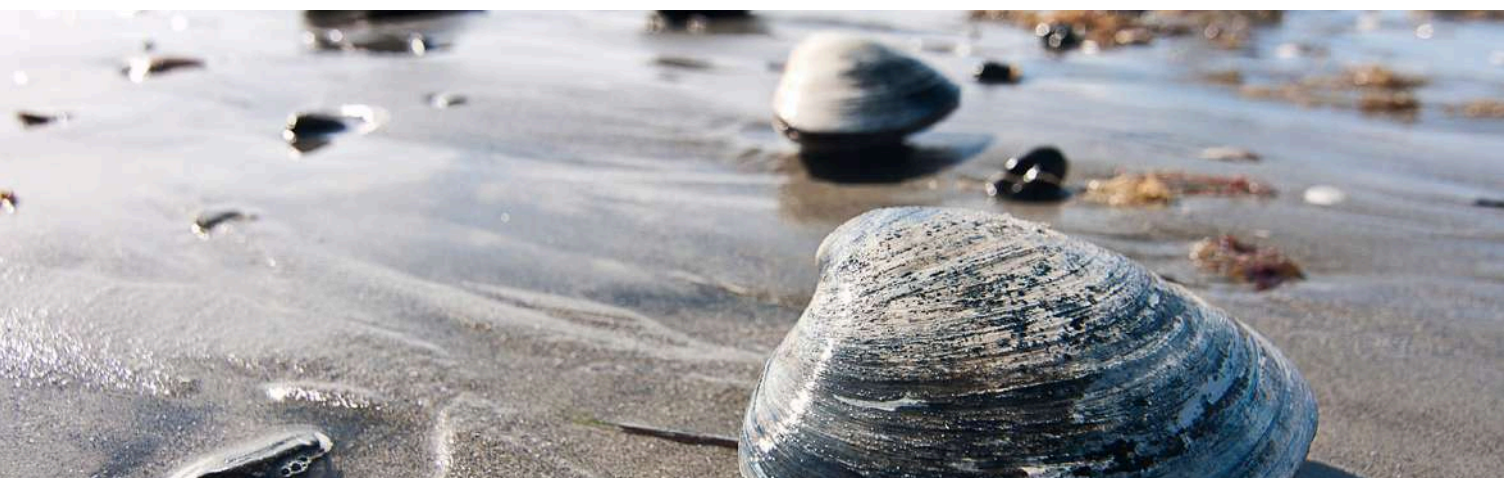
Therefore, I am delighted to introduce this first issue of our new improved and recently renamed Bulletin, and our recently appointed editor Gemma Smith from the coastal consultancy IECS Ltd. Gemma's experience with similar publications has enabled her to introduce innovations of both style and content. While keeping many of the features of its forerunners it includes some new sections and we particularly want to encourage members and non-members alike to submit short but substantive papers as I have done myself for this issue. Remember after 6 months exclusive access by members, each issue becomes available worldwide under our own ISSN number.

Authors retain all rights to their articles and can therefore subsequently develop them further for peer reviewed journals such as our linked Elsevier journal, *Estuarine, Coastal and Shelf Science*, or elsewhere. As you will see in our new guide for authors these papers can range from science to policy and from short reviews to research summaries, project initiation/progress reports to critiques and opinion pieces on topical subjects.

In line with our mission, we value submissions from all countries and continents and while largely a digital publication we can now also provide hard copies of the Bulletin on demand. In recognition of our 50 years of publishing the Bulletin we have also reverted to a simple chronological numbering system, making this issue number 125! We hope you like our new layout and content and would value any suggestions for further innovations from our members.

Best wishes,

*Professor John Humphreys*



## ABOUT THE EDITOR.

Gemma Smith

International Estuarine and Coastal Specialists Ltd.  
Centre for Systems Studies, University of Hull



As a PhD student in Systems Science with an MSc in Environmental Management, Change and Monitoring, and a Bachelor of Law, I have developed interdisciplinary research interests in marine, coastal, and estuarine management. My educational background provides a foundation for my current role as a research assistant working on Horizon Europe Projects for Marine management; contributing to the research in creating a systems approach to understanding and managing complex social-ecological systems.

## 50 YEARS AGO IN THE BULLETIN...

[The Severn Barrage: Its Possible Implications \(T. L Shaw, Bristol University\)](#)

A long history of articles and events associated with ECSA precedes this issue of the bulletin and we invite our readership to reflect on the work that contributed to the bulletin 50 years ago!

This report of a meeting details the cost/benefit considerations to the advantages of a barrage downstream of Cardiff and Weston-Super-Mare. Such an installation was predicted to generate 4000MW.

50 years later the Severn Barrage has never yet been built...

### Reports of Meetings

#### The Severn Barrage: Its Possible Implications

This meeting was organised by the Department of Extra-Mural Studies, Bristol University. Although not an E.B.S.A. meeting, the subject has aroused great interest, and abstracts of the papers presented are given below.

##### 1. T.L. Shaw (Department of Civil Engineering, Bristol University):

###### Operating principles for a Severn Barrage.

Intermittant energy generation from tides is an unattractive proposition. Demand patterns are closely linked to the time of day, day of the week, and to season, with atmospheric temperature a major factor. Daytime requirements are approximately constant between 8 a.m. and 8 p.m. at which level they exceed night-time rates by about 150%. Winter rates are roughly double those in the summer. Any installation for power production must be capable of economic operation according to this schedule otherwise other plant and overall efficiency will be affected.

Although more expensive, some improvement in tidal output is possible by forming two reservoirs in an estuary. However, good regularisation is possible only by making resort to pumping, either elsewhere using tidal energy generated wherever possible, or in the estuary by reversing the duty of the turbines to make pumps and absorbing 'excess' power generated by thermal stations at night. Because of the expected general increase in demand for storage, to increase the efficiency of other plant and improve safety margins with supply, this dual use of an estuary deserves attention. In fact a regularised output is then possible.

Cost/benefit considerations point to the advantages of a barrage just downstream from Cardiff and Weston-Super-Mare, with the smaller reservoir seaward of this line, in deep water. Such an installation could generate at 4000 MW (10% of winter maximum). The large reservoir would operate with a highest level not exceeding normal high spring tide, removing the existing flood hazard. Lowest levels would be fixed according to the balance between both more energy and a more 'normal' water regime, and taking advantage of an immensely improved potential for shipping to existing as well as to new docks. A compromise may be to make present mean water level equal to the new minimum, hence the daily range becomes up to 4 m, i.e. nearly half that occurring at Cardiff at springs and a little less than at neaps. Mean water level would rise about 3 m. Spring currents would be reduced considerably, but neap currents would be little changed. The tidal pattern would then be typical of many other British estuaries. Mixing patterns would be modified, especially within the rivers, where salinity variations would be particularly altered.

GES4SEAS (Achieving Good Environmental Status for maintaining ecosystem services, by assessing integrated impacts of cumulative pressures) is a Horizon Europe and UKRI funded project, which started in September 2022 and will end in August 2026.

Its main objective is to inform and guide marine governance in minimizing human pressures and their impacts on marine biodiversity and ecosystem functioning, while maintaining the sustainable delivery of ecosystem services. This is being achieved through developing an innovative and flexible toolbox, tested, validated, demonstrated and upscaled, in the context of adaptive Ecosystem-Based Management (EBM), to assess cumulative human pressures, the status of seas and the ecosystem services delivered.

This toolbox will allow competent authorities to assess and predict the effect of multiple stressors (including climate change) and pressures from human activities, at the national, sub-regional, regional and European level. This will ensure they achieve Good Environmental Status (Marine Strategy Framework Directive), and support different policies at national,

## GES4SEAS, a European project contributing to understanding and assessment of the effects of human cumulative pressures on marine ecosystems

Angel Borja (AZTI),  
Coordinator of the project

European and global levels (e.g. Birds and Habitats Directives, European Biodiversity Strategy 2030, United Nations Sustainable Development Goals -SDGs-).

This work, done by 20 partners from Europe, Turkey and Canada, is being undertaken by integrating high-level stakeholders and the key competent authorities, including Member States and all Regional Seas Conventions, in a Practitioner Advisory Board (PAB). This PAB is co-creating and validating the toolbox and the EBM approach. In this, we focus on real problems solving and following an iterative and incremental development approach.

GES4SEAS aims to achieve Technological and Societal Readiness Levels 6, since our solutions are being tested and demonstrated at 11 Learning Sites (LSs) covering important regions and environments.



These LSs have been selected to explore geographical specificities, in the four regional seas (Baltic, Atlantic, Mediterranean and Black Sea), with regards to the impacts of cumulative pressures (including climate change) on the functioning of ecosystems, and their capacity for providing ecosystem services, to ensure better management.

This includes LSs to explore transboundary issues and a LS at pan-European scale, to explore comparability and harmonization across regional seas, and gain understanding on the functioning of transverse topics (e.g. invasive species, Harmful Algal Blooms and jellyfish blooms, and top predators). Also, to internationalize outputs, we have included a LS in the French Polynesia, in relation to the SDGs framework and intense extreme events.

In the 2.5 years of the project, we have substantially progressed towards the above objectives. Hence, we have built a high-profile PAB, composed by national competent authorities from five Member States (Spain, Italy, Romania, Germany and Ireland), members from the four Regional Seas Conventions (HELCOM, OSPAR, UNEP-MAP and Black Sea Commission), KCBD, EEA, JRC, DFO-Canada and EuroGOOS.

They are participating actively in the co-creation of tools as well as in the different deliverables already released,

guiding us in shaping the EBM and the toolbox needs. We have revised the EBM approaches available, developing new methods and approaches to address HABs, jellyfish outbreaks, invasive species and decline of top predators, and the guidelines for a Practical Ecosystem Approach. These have resulted in several tools and approaches, which have been started to be tested in LSs throughout 2024.

We have decided on the methods and approaches for ecosystem services assessment, tipping points setting, scenarios modelling, and capacity building, which were collated in a public document. We have built a proof of concept of the toolbox, which was discussed with the PAB and the partners and presented to the MSFD GES Working group.

After the comments and feedback received from the PAB and end-users, the partners prepared a first version of the toolbox, which was released in January 2024, and was tested and challenged by the LSs, during 2024. This served to build a second more advanced version, fitting with the needs of end-users, which will be validated throughout 2025. This project has an important focus in communication and dissemination. We have built six key messages, co-created with the PAB, using successful infographics and animated videos, as well as a Rubik cube to transmit the ideas and key messages in a successful way.

ONGOING PROJECT

We have organized already three summer schools in collaboration with some sister projects, with different topics each year, and a fourth is scheduled for June 2025. The summer schools received the MakeEUBlue Award 2024, to the Best Professional Organisation initiative, by the European Commission. We have published until now 55 papers, contributing to different scientific topics, which have received until now >200 citations. We have organized three twitter/X Massive Open Online Courses (MOOC), as well as many meetings with other EU funded projects and the Ocean Teacher Global Academy (IOC-UN). The latter are being used as means to organize and prepare the educational modules that GES4SEAS will prepare.

An important contribution from GES4SEAS is supporting a self-organizing group of Early Career Researchers (ECR), which is open to other Horizon Europe projects, and meets every month.

With the idea of training ECRs in the new tools we are developing, but also in providing them skills and resources for a successful career in marine ecology.

Finally, under the leadership of GES4SEAS, and in collaboration with 12 Horizon Europe projects, we are organizing the ECSA61 Conference in Brussels, on 24-28th August 2026, with the proposed title “Bridging the gap between science and policy in estuarine and coastal marine biodiversity: the way forward”. The idea is bringing to Brussels most of those Horizon Europe projects ending in 2026, investigating around marine biodiversity, and have the opportunity to discuss results and the future applications with European and international practitioners, the European Commission officers and the policy-makers at the European Parliament.

Additional information about the project can be consulted in [www.ges4seas.eu](http://www.ges4seas.eu)



# Saltmarsh Restoration (Phase 1 trial) - Beneficial Use of Dredged Sediment to Improve Boiler Marsh, Lymington Harbour

The Environment Agency ReMaMeRe Team.

This partnership project, led by Lymington Harbour Commissioners and supported by [ReMeMaRe](#) funding, was delivered in August-October 2024. ReMeMaRe is an ambitious habitat restoration programme to restore our estuarine and coastal habitats.

This saltmarsh restoration trial began at Boiler Marsh in Lymington Harbour.

The aim of the project was to extend and enhance up to 1.6 ha of existing saltmarsh habitat by reusing sediments from historic dredging campaigns. Low impact innovative equipment (a Saltmarsh Restoration Drag Box) was used to move consolidated mud that had previously been dredged from Lymington Harbour and deposit it on the edge of Boiler Marsh. This trial was to confirm a proof of concept to deliver a ‘beneficial use of dredgings’ scheme at scale on an island. The longer-term goal is to restore up to 10 ha over the next 10 years.

Recognising the new drag box technology is still in its infancy, Lymington Harbour Commissioners, ABP Mer and the Environment Agency’s Land and Water team worked together over 18 months (from Spring 2023) to engage with local stakeholders, funders, and regulators to achieve consents for a series of trials at the saltmarsh at Boiler Marsh.



**Phase 1:**  
*Map showing Boiler Marsh, Lymington Harbour. The orange line outlines the 10 ha ‘Beneficial Use of Dredged Sediment (BUDs)’ location which should be delivered within 10 years. The yellow line outline was the Phase 1 BUDs trial area and the black line shows the sediment source site, as in where the sediment was dredged from.*

Phase 2:

*Map showing Boiler Marsh, Lymington Harbour. The orange line outlines the 10 ha 'Beneficial Use of Dredged Sediment (BUDs)' location which should be delivered within 10 years. The yellow line outline was the Phase 1 BUDs trial area and the black line shows the sediment source site, as in where the sediment was dredged from.*



The trials sought to collect previously placed sediments from historic dredging campaigns, located in the deeper tidal waters close to the Marsh, and relocate them higher up the foreshore for habitat restoration. This technique involves drawing a steel ‘drag box’ with load bearing skis along a winch line from the low to the high shore. The winch line is held between pulleys on spud barges. The trials sought to prove the concept that habitat creation could be decoupled from the intensity of dredging operations. This would open up further opportunities for more, large campaigns in the future and crucially allowing the differing environmental and operational windows for dredging and habitat creation to become less constrained.

Boiler Marsh is a large but deteriorating saltmarsh island that is of high conservation importance. It is part of the Southampton Water Special Protection Area (SPA) and Ramsar Site,

the Solent Maritime Special Area of Conservation (SAC) and the Hurst Castle and Lymington River Estuary Site of Special Scientific Interest (SSSI). The saltmarsh islands have become very fragmented and ecologically poor over recent years.

The project aimed to raise the bed levels and expand the footprint of the island, allowing marsh plants to recolonise the area with the goal of increasing the amount of remaining healthy marsh on the island.

If successful, this would enhance local biodiversity by providing valuable habitat for breeding birds which use higher parts of this marsh in large numbers. It would also improve the resilience of the island by reducing the rate at which the marsh is broken up and lost through erosion and sea level rise. The island also provides a natural defence by reducing the storm surge and flood risk to Lymington.

ONGOING PROJECT

Challenges during this project included the following:

- The soft terrain on the marshes, clay platforms and muds meant that working conditions were difficult and that equipment such as the original amphibious excavator could not operate effectively or safely (a replacement excavator was sourced);
- Unseasonably frequent periods of high winds were experienced during the mobilisation and implementation periods which hampered and halted progress. In August, there were 20 days where wind speeds reached Force 6, significantly extending the mobilisation period. There were a further 11 such days in September which hampered works;
- The drag box did not initially operate well on this soft and undulating mud terrain and had to be adjusted to widen the skis and reduce sinking into the substratum. Its tailgate also had to be adjusted to prevent the box hauling back sediments during its return cycle;
- The winching mechanism and rope strength had to be upgraded to account for the strain that was being placed on the equipment from hauling the drag box over a relatively long distance and over an undulating terrain; and
- Work had to stop on 29 September 2024 to adhere to the working period set out in the marine licence. This work could have continued but a maximum working period of four weeks was provided for under the consent.



*Saltmarsh Restoration Drag Box bringing mud onto Boiler Marsh. Courtesy of Lymington Harbour Commissioners.*

ONGOING PROJECT

For these reasons, the amount of sediment that could be moved from the dredge disposal area into the restoration area was relatively small. On completion of the work only 806 m<sup>3</sup> was calculated to have been moved into the restoration area, and the sediment that had been moved to the northernmost areas raised the bed height by up to 1.64 m. This compares with 9,000 m<sup>3</sup> which it had been hoped would be moved on this occasion (from a total resource of around 50,000 m<sup>3</sup> that is potentially available at the dredge disposal location). Most of that sediment was moved in the last few days of the working window once the early difficulties had been overcome.

In conclusion, although the trial successfully increased the elevation of poor-quality marsh, making it more resilient to sea level rise and deterioration, the restored area was significantly smaller than was hoped for. The trial highlighted both the benefits and significant potential of the new technique, but also the challenges of habitat restoration in the marine environment. Arising from this trial several important lessons were learned which will now be taken forward to refine and develop the equipment, work methodologies and the MMO marine licence parameters to enhance outcomes for future projects.

The lessons will be communicated to the national Beneficial Use Working Group and will contribute towards the Environment Agency’s handbooks on Saltmarsh Restoration and [Restoring Estuarine and Coastal Habitats with Dredged Sediment](#).

Looking forward, a multiyear monitoring programme will outline the effectiveness and value of the restoration, marsh recovery, how waterbirds use the restored areas, and will ensure there are no adverse impacts to the designated nature conservation areas.

Restoring Meadow, Marsh and Reef (ReMeMaRe) (pronounced “re-memory”), is an ambitious habitat restoration initiative, so called, as it aims to address baseline shift and reverse centuries of decline of three of our priority estuarine and coastal habitats, seagrass meadows, saltmarshes and European native oyster (*Ostrea edulis*) reefs.



Saltmarsh Holes Bay. Credit: Eve Leegwater





As an early-career researcher at TKM College of Engineering, Kerala, India, I was honored with the Charles Boyden Award by the Estuarine and Coastal Sciences Association to investigate the influence of hydrodynamic factors—namely salinity stratification, suspended sediment concentration, and water currents—on the distribution of microplastics in estuarine environments. I conducted field experiments during spring and neap tidal conditions in both the dry season (March 2024) and the wet season (August–September 2024) in the Ashtamudi Estuary, located on the southwest coast of India. The estuary, a Ramsar site, is renowned for its diverse fish species.

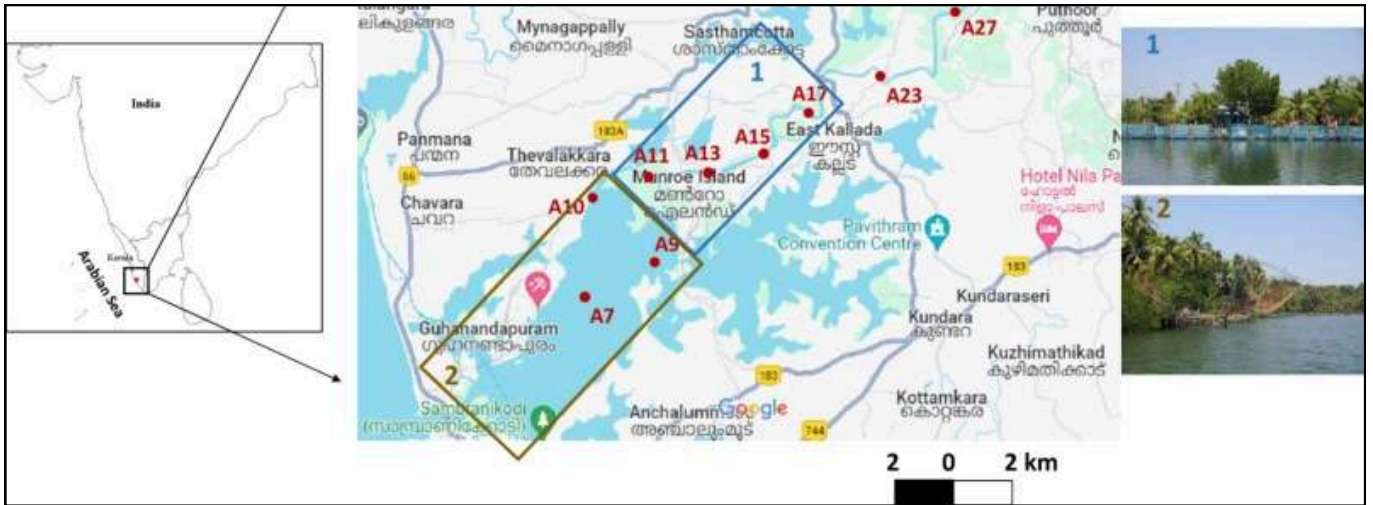
My research focused on studying the longitudinal variations in salinity stratification, suspended sediments, and water currents during these two seasons.

# Microplastic settling in a partially mixed estuarine environment

Priya K L, TKM College of Engineering, Kollam, Kerala, India

Additionally, I analyzed the concentration of microplastics in the water column along the longitudinal and vertical profiles of the estuary and in the bed sediments. The physical characteristics of the microplastics were identified using a zoom stereo microscope, and polymer identification was carried out using an Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) Spectrometer.

The estuary is characterized by three distinct mixing zones: a well-mixed zone in the downstream stretches, covering distances from the estuarine mouth to approximately 9 km upstream; a partially mixed zone in the mid-estuarine reaches, extending from 9 km to about 17 km upstream; and a salt-wedge zone in the upstream reaches. The salinity intrusion limit ranges from 23 km during the wet season to 33 km during the dry season, measured from the mouth.



Source: Priya, et al. (2025)

The estuarine bed sediments exhibit a longitudinal variation in grain size, with sand predominating in the upstream reaches and silt and clay fractions dominating in the downstream reaches.

Near-bottom microplastic concentrations were higher than near-surface concentrations in the partially mixed regimes. The analysis revealed a dominance of low-density polymers in the bottom waters and bed sediments within these zones. Suspended sediment concentration and water currents were found to have a direct and indirect relationship, respectively, with microplastic concentration.

The study highlighted the role of flocculation, induced by water currents and suspended sediment concentration, in the partially mixed zones, making these areas favorable environments for microplastic settling. I conducted a source apportionment study to identify the potential sources of microplastics, followed by a risk assessment analysis. The results indicated that fishing practices are a significant contributor

to microplastic pollution in the Ashtamudi Estuary. The risk assessment, performed using the pollution risk index, suggested that fish farm locations pose a medium to high risk of microplastic pollution in the estuary. This has implications for microplastic contamination in fish and potentially impacts higher trophic levels through the food chain.

I would like to express my gratitude to the Estuarine and Coastal Sciences Association for supporting my research through the Charles Boyden Award. This support enabled me to conduct an in-depth study on the fate and sources of microplastics in the Ashtamudi Estuary. A manuscript based on this work can be located here:

Priya, K. L., Azhikodan, G., Yokoyama, K., & Renjith, K. R. (2025). Analysing the influence of hydrodynamic and sedimentary factors on the microplastic distribution in the Ashtamudi estuary, India. *Marine Pollution Bulletin*, 212, 117537. DOI: <https://doi.org/10.1016/j.marpolbul.2025.117537>.

## Strengthening Coastal Resilience Through Social-Ecological Systems: My ECSA 60 Experience

Gemma Smith  
IECS Ltd. & University of Hull

This year, I attended the 60th biennial international conference of the Estuarine and Coastal Sciences Association, held from 2nd to 5th September 2024 at the Sheraton Grand Hangzhou Binjiang Hotel in Hangzhou, China. The conference focused on "Implementing Science-Based Solutions and Strategies for Coastal Resilience," addressing the challenges faced by coastal zones due to environmental and societal pressures. During the conference, I presented research titled:

"Holistic analysis of marine environments as shared social-ecological systems for integrative ecosystem-based management," which focused on the complexity of marine systems and the value of interdisciplinary approaches to manage them effectively. The approach embraces principles and tools of Systems Thinking to frame a holistic view of a marine system. This research is from the Marine SABRES Project funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101058956.

My presentation emphasised the role of Social-Ecological System approaches, namely the Integrated Systems Analysis in addressing key challenges such as stakeholder involvement and data management in marine management. The feedback and discussions that followed my presentation were very insightful, and I was able to exchange ideas with both senior colleagues and Early Career Researchers.



Attendee group photograph at ECSA 60 Conference.

STUDENT GRANT AWARD

Throughout the week, I had the opportunity to meet and connect with researchers, practitioners, and policymakers from around the world, expanding my professional network and opening doors for future collaborations. I received an award for ‘highly recommended student oral presentation’ which was a big achievement in my professional development as a PhD student in my second year of study. Additionally, the conference was a significant milestone for me, as I gained the opportunity to undertake the role of bulletin editor for ECSA and guest editor for the Ocean and Coastal Management Journal which will allow me to contribute more actively to the association and the scientific community.

Overall, my experience at ECSA 60 was enriching, both in terms of professional development and research impact. The event not only deepened my understanding of the pressing issues surrounding coastal resilience but also provided practical insights from academics and practitioners on how this science is applicable to society.

I am extremely grateful for the support I received from the Charles Boyden grant, which enabled my participation in this event. Furthermore, I appreciate the support and funding provided by the Horizon Europe Marine SABRES project which enabled me to undertake this work and support my attendance and presentation at this conference.

Additional information about the project can be consulted at <https://www.marinesabres.eu/> and the paper presented at the conference at: <https://doi.org/10.1016/j.sftr.2025.100476>



Gemma Smith and Professor Michael Elliott.



Gemma Smith presenting at ECSA 60.

# Bivalves with Benefits: The Ascendance of the Manila Clam, *Ruditapes philippinarum*.

John Humphreys.  
Bournemouth University

*Ruditapes philippinarum* (Adams and Reeve, 1850) (Figure 1) is an infaunal bivalve indigenous to the temperate coasts of East Asia where exploitation of shellfish has been a feature of maritime communities for at least 35000 years. Anthropogenic mid-Holocene shell deposits have confirmed the widespread consumption of bivalves in what is now China, Korea and Japan (He et al, 2023). Fifteen thousand years ago near the entrance to Ariake Bay in Japan, the hunter-gatherer people of the Jomon culture are known to have fished “Asari” clams, (*R. philippinarum*) in large numbers, depositing their empty shells in “kitchen middens” outside their villages (Shimoyame et al 2015).

At Sakatsuji in Aichi Prefecture a 4500 year old midden measuring over 24 meters long, consists almost entirely of *R. philippinarum* shells.



Figure 1. External and internal views of the right valve of the original “*Venus philippinarum*” (= *Ruditapes philippinarum*) type specimen (NHMUK 1968161) from the Natural History Museum, London. (Photograph courtesy of John Taylor)

Adjacent to this midden are over 50 stone “furnaces” believed to be used for boiling the clams prior to the removal and possibly drying for preservation of the soft parts. The Sakatsuji midden is one of seven in the region and, in contrast to the much older Futowo site, does not appear to be located near a settlement. The midden structure and location suggest that people travelled to the site seasonally for the purpose of clam collection and processing. Such discoveries are suggestive of a progressively industrialised Manila clam economy in which, from an original subsistence fishery, the species became a commodity, processed and traded to other communities. (Habu, 2015).

Much of the progressive sophistication of the clam industry remains obscure but there can be little doubt that over the millennia local communities began to take steps to optimise their supply through early forms of aquaculture. Stratigraphic evidence at Ariake Bay indicates that a Tsunami in 1792 changed the fine muddy character of the inner Bay area to a coarser sediment, making it a more suitable substrate for *R. philippinarum*. By around 1830 the species was also to be found on the innermost shores of the bay and it has been suggested that it was introduced there by local communities to develop their coastal shellfishery (Shimoyama et al 2015). Later that century the Manila clam’s global dispersal began.

A first wave of anthropogenic globalisation from about 1880 (Table 1) was triggered by the opening up of east Asian countries which enabled migrations eastward to Hawaii and the western coasts of north America. These migrants took their cultural penchant for bivalves with them,

bringing in Manila clams purposefully, or accidentally with oyster imports. From 1972, a second phase of globalisation (Table 2) was focussed initially on the maritime states of north-west Europe. This phase was not culturally driven but rather consisted of attempts to bolster declining native bivalve fisheries with non-indigenous species such as the Pacific oyster (*Magallana gigas*) and *R. philippinarum* (e.g. Humphreys et al 2014; 2015).

In addition to those countries listed in Tables 1 and 2, further unverified reports include ostensibly indigenous and non-indigenous populations in Vietnam; Cambodia; Thailand; Indonesia; Malasia; Bangladesh; India; Senegal; French Polynesia and Fiji. These locations probably represent unsuccessful introduction attempts or mis-identifications in tropical seas. Considerable doubt also exists about the original nineteenth century Philippine type locality making both the vernacular “Manila clam” and scientific species name “*philippinarum*” misleading (see Humphreys, 2025).

Table 1. Indigenous and phase 1 non-indigenous locations in the globalisation of *Ruditapes philippinarum*.

Country	Coastal Sea Area	Earliest Report	Notes
Indigenous			
Russia	Sea of Okhotsk	Indigenous	North to Strait of Tartary and south Kuril Islands.
	Sea of Japan		
Japan	Sea of Japan & western Pacific	Indigenous	Throughout
Korea	West Sea (= Yellow Sea)	Indigenous	Also, east coast and Jeju Island
China	Yellow Sea; East China Sea	Indigenous	Also, northern part of South China Sea
Introduced Phase 1			
USA, Hawaii	Central Pacific	1880* 1918	* Report anecdotal
USA, Washington	Samish Bay	1924	Now elsewhere around Puget Sound
Canada, BC	Salish Sea	1936	Now north to Hecate Strait
USA, California	San Francisco Bay	1930 or 1946	Also, other Californian sites e.g. Elkorn Slough
USA, Oregon	Netarts Bay	Prior to 1970	

Table 2. Phase 2 non-indigenous locations in the globalisation of *Ruditapes philippinarum*.

Country	Coastal Sea Area	Earliest Report	Notes
France	Atlantic coast	1972	Also, La Manche and Mediterranean coasts
UK	English Channel	1980	Now also southern North Sea coasts
Ireland	Atlantic coast	1982	Now also Irish Sea
Spain	Atlantic coast	1983	Also, Mediterranean coast
Italy	Adriatic Lagoons	1983	Introduced later in west coast and Sardinia
Portugal	Bay of Biscay Atlantic coast	1984	Notably Tagus estuary and Ria Aveiro
Norway	NE Atlantic	1987	No evidence of naturalisation.
Slovenia	Adriatic lagoons	1993	
Netherlands	Wadden Sea	1995	
Tunisia	Mediterranean Sea	1996	No evidence of naturalisation
Turkey	Sea of Marmara	2004	Also, northern Aegean Sea

The Manila clam has shown itself capable of providing a high-value seafood. In many areas, clam hatcheries have been established to enhance supply by providing seed clams for laying on the seabed. Conservation legislation in the UK allowed this only on the assumption that, while juvenile clams were capable of good growth, prolonged cold winter temperatures were such as to prevent successful reproduction and therefore naturalisation. But this assumption proved incorrect. In both north America and Europe *R. philippinarum* has naturalised and spread widely through a combination of natural and anthropogenic dispersal.

While the literature commonly asserts oysters to be the most commercially important cultured bivalves, this is based on an aggregation of the landings of a number of different oyster species and as such obscures the worldwide pre-eminence of the Manila clam. Such has been its success that in recent years the reported annual market value of *R. philippinarum* reached over US\$ 6 billion,

making it the world’s most economically significant cultured molluscan shellfish (FAO, 2021). Figure 2 gives some indication of the scale of the Manila clam industry in just one fishing port in China.

The global significance of the Manila clam merits an explanation. What has contributed to its global success? The answer to this is multi-layered and based above all on a set of characteristics which have pre-adapted the species for a form of species-level mutualism with *Homo sapiens*. In return for food, we have cultured the species from spawning to maturity and expedited its dispersal and naturalisation across the temperate coasts of the northern hemisphere.

Nevertheless, we must rule out any idea that it is some sort of super species. Like many infaunal bivalves, despite its great fecundity, it is prone to considerable variations in its annual cycle of recruitment. High and sometimes mass mortality is a feature of many populations, sometimes attributable to one or combinations of



Figure 2: Clam fishing boats at Hong Dao China. Clam dredges can be seen either side of the superstructure on the left and centre boats. These polyvalent vessels harvest Manila clams scattered as juveniles for fattening over about 100,000 hectares of shallow seabed ranging about 5nm offshore. (Photograph: John Humphreys)

disease, predator pressure, over fishing, or sometimes extreme variations in natural environmental variables such as salinity or temperature. Nevertheless,

comparative studies suggest that within the scope of its intertidal and estuarine sediment niche, it can be highly effective, not least due to its energetic commitment to reproduction and growth.

In Europe comparisons with the similar native *Ruditapes decussatus* show greater growth rate, faster spring gonad maturation, and greater reproductive activity (Laruelle et al., 1994; Delgado and Pérez-Camacho, 2007). Moreover, where the two species are sympatric the Manila clam has also demonstrated a greater tolerance of salinity and temperature stress (Domínguez et al 2021). Nevertheless, while in northern Adriatic lagoons it has been thought of as invasive (Breber, 1985), it is largely not, either in the sense of competitive exclusion of native species or disruption of ecosystem function.

In Spain for example, it is thought that salinity and temperature, rather than competition, are key determinants in the differing distributions of the two species within particular estuaries (Juanes et al, 2012; Bidegain et al, 2015).

This raises a more general question on the suitability of temperate estuaries as available sites for infaunal non-native naturalisations, not least by *R. philippinarum*. The estuarine sediments and tidal flats into which the species is anthropogenically introduced have long been recognised as geologically young (rarely exceeding 10,000 years), physiologically demanding, relatively sparse in species, and often below carrying capacity in terms of benthic invertebrates. On tidal flats round the north German island of Sylt for example (the northern limit of current *R. philippinarum* distribution in Europe) Reise (1985) observed the naturalisation of three exotic molluscs with no corresponding decline in native molluscs (see also Reise et al 2023). In such circumstances the naturalisation of the Manila clam can be both ecologically and economically advantageous.

Caldow et al (2007) showed that, in Poole Harbour UK, naturalised *R. philippinarum* reduces the overwintering mortality of protected wading birds, while also providing a significant economic benefit. The Manila clam demonstrates that attitudes to non-native species arrivals should be calibrated by a careful assessment of their ecology in the context of the characteristics of recipient habitats, especially where economic benefit for coastal communities can accrue. Clearly some new arrivals can have positive consequences, perhaps increasingly so when warming seas cause the retreat of indigenous fauna northwards.

This paper is an edited extract from the forthcoming book

*Humphreys J (2026). The Manila Clam: Science & Significance of a Globalised Species Amsterdam: Elsevier. For enquires contact the author at: jhc@jhc.co*



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*Images courtesy of the author showing the Philippine fish market Panay Island (Left side picture) and a Korean fish market (Right side picture)*

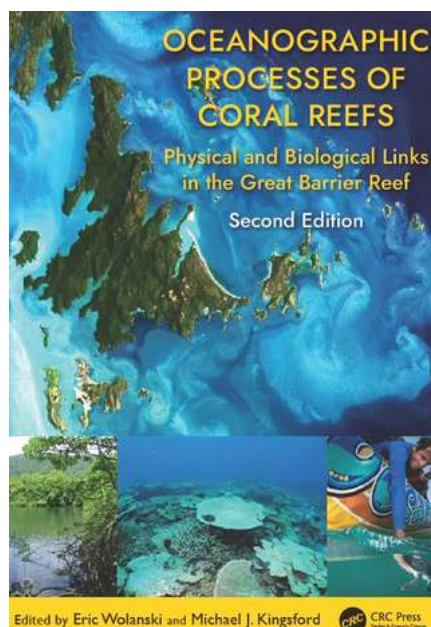


## Book Review of Oceanographic Processes of Coral Reefs: physical and biological links in the Great Barrier Reefs.

Michael Elliott  
IECS Ltd. and University of Hull

This outstanding book covers a wide range of topics, such as oceanography, land-sea connectivity, and biophysical oceanography, among others. It was edited by two globally recognised researchers, Professors Eric Wolanski and Michael J Kingsford, with 88 authors contributing to the 29 chapters.

The authors highlight the importance of the Great Barrier Reef (GBR) for both natural and human systems, discussing the intersection of Western science and indigenous culture. The book also explores the threats and pressures that the GBR faces, including both natural and human causes, such as cyclones, bleaching incidents, litter and other contaminants, and the pressures caused by human activities.



**Book Details:**  
**Editors:** Eric Wolanski, Michael J. Kingsford  
**Title:** Oceanographic Processes of Coral Reefs  
**Physical and Biological Links in the Great Barrier Reef**  
**First Published:** 2024  
**Published By:** CRC Press  
**Language:** English  
**DOI:** 10.1201/9781003320425  
**Price:** £97.99

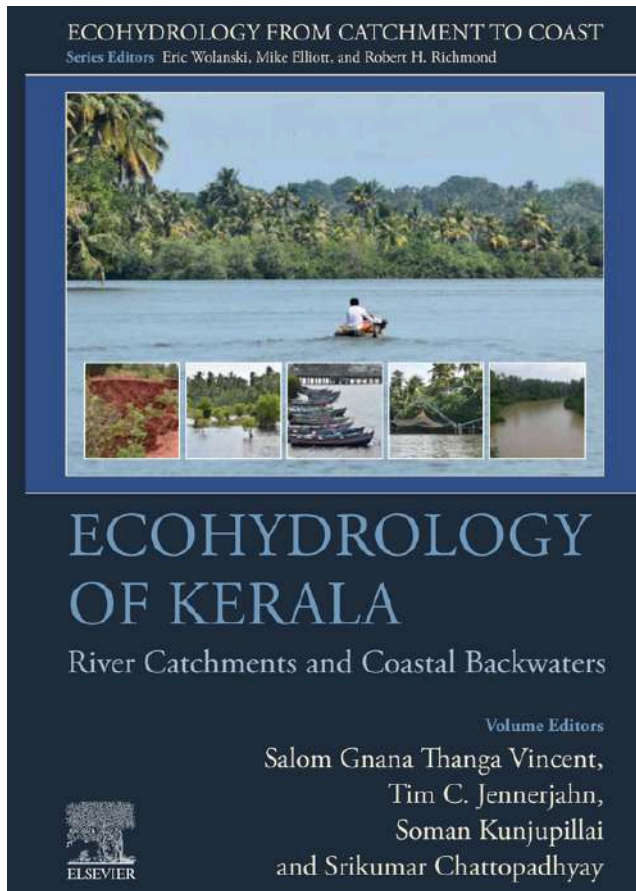
[Link to Website](#)

It provides valuable information for those who are already familiar with the GBR system, as well as those who are not. The book includes a variety of case studies and practical examples, making it a valuable resource for both students and researchers. It also has superb illustrations, although some axes and legends could be clearer. The book shows the importance of inputs as fluxes and management options for solid and liquid contaminants from land and sea which are delivered into the Great Barrier Reef.

The information on geo-engineering for climate change mitigation is widely relevant and mirrors the GESAMP WG41 focussing on ocean adaptation techniques. There is an emphasis on value-based management using eco- and geo-engineering and emphasising the need for long term mitigation with lessons for wider areas. However, although very comprehensive, it would benefit from more inputs by social scientists, perhaps with a dedicated section on ecosystem services and societal goods and benefits.

Overall, the book is an important contribution to the field of coral reef science and is a must-read for anyone interested in the functioning of coastal and marine systems. Professor Wolanski and Kingsford are to be congratulated on pulling together this book. However, most notably, the book is also a tribute to many researchers but especially the late Professor John Brodie of James Cook University who sadly left us far too early but after leaving a huge legacy of work on the GBR.

This review is adapted from Mike's contribution in The Marine Biologist, Issue 33 January 2025, ISSN 2052-5273, p41.



*Front Cover of the book.*

This book is one of the series “Ecohydrology: From Catchment to Coasts” (Edited by Eric Wolanski, Mike Elliott and Robert H. Richmond) and is concerned with the state of Kerala in India. Kerala, known as “God’s Own Country” has 44 rivers with relatively small river catchments, 41 of which drain into the Arabian Sea. In addition, the long coastline of 590 km and associated coastal ecosystems, including the backwaters, make these ecosystems an attraction for tourists.

Nevertheless, these ecosystems are subject to multiple pressures due to natural and anthropogenic factors. Urgent conservation actions are necessary to address the issues raised by anthropogenic pressures on the ecohydrology and related issues in a sustainable manner.

# “Ecohydrology of River Catchments and Coastal Backwaters in Kerala, India”.

Editors S.G.T. Vincent, T.C. Jennerjahn, K. Soman, S. Chattopadhyay

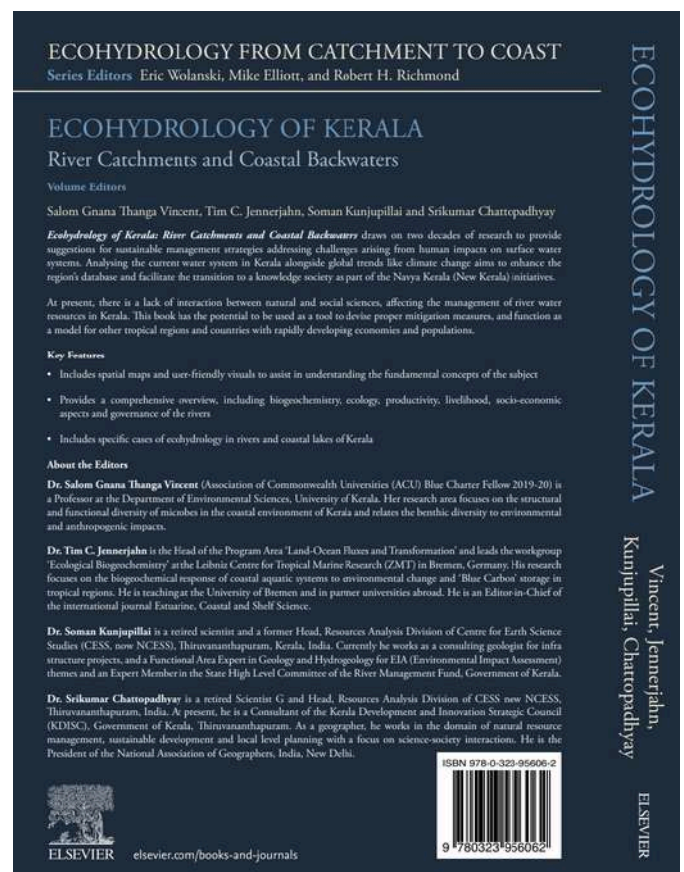
This necessitates a thorough investigation of these issues from an integrated perspective, taking into account all relevant elements, including biology, chemistry, geology, and socioeconomic aspects. The goal of this book is to compile all the studies on the ecohydrology of Kerala's rivers from their origin in the mountains up to the coastal environment, where they finally drain. The chapter of the book addresses the issues covering the whole state of Kerala, and there are also some chapters dealing with specific cases. As a whole, this book addresses various components of ecohydrology and hence, this book is timely and pertinent to researchers who aspire to pursue research in the field of Ecohydrology.

The book encompasses 18 chapters, and the first chapter is an introduction and synthesis of the ecohydrology-related issues in Kerala, highlighting the salient features of all other chapters.

The remaining 17 chapters are organized into three sections: The first section is “Environmental setting and natural control factors”, which includes nine chapters and topics such as the geomorphic setting and geologic features and their link to ecohydrology of Kerala; Hydrological setting, drivers of summer monsoons of Kerala; Diversity, ecological functions and restoration of the riparian vegetation in Kerala’s river basins; Biodiversity of forests in the western ghats of Kerala; Distribution and characteristics of the acid-saline soils of Kerala; Insights on the biota of the submarine groundwater discharge ecosystem; Structural and functional diversity of bacteria and archaea; and Biogeographic pattern of methanogenic archaea.

The second section is concerned with “Human activities and their impact on environmental health, which includes five chapters and topics relating to Land use/ land cover change detection for climate-smart sustainable management of river basins; Assessment of submarine groundwater discharge and nutrient fluxes in the south-west coast; Biogeochemistry of suspended particulate organic matter; Trophic status and the fate of nutrients and organic matter relating to land use; and identification of pollution potential zones using GIS.

The third section relates to “The Way Forward: Coastal Zone Management and Governance”, which includes three chapters on topics such as Integrated coastal zone management practices; Collaborative evolutionary governance; and Challenges of water governance related to human-induced nutrient input from case studies in India, Indonesia and Germany.



**Book Details:**

Authors: Salom Gnana Thanga Vincent, Tim C. Jennerjahn, Soman Kunjupillai, Srikumar Chattopadhyay.

Title: Ecohydrology of Kerala

First Published: Elsevier

Language: English

ISBN: 9780323956062

Price: \$130

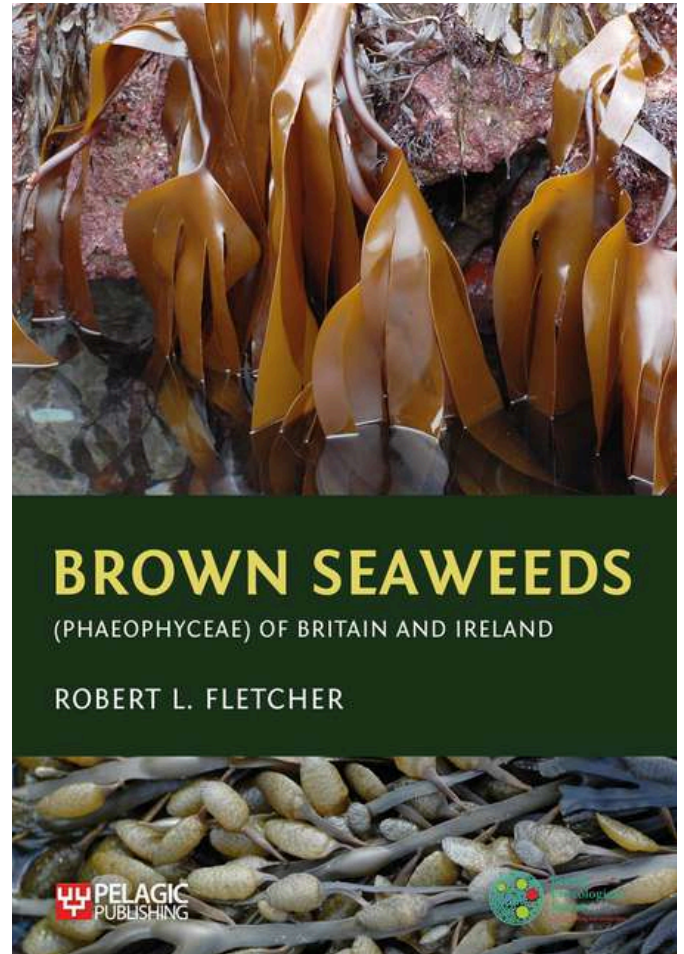
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## Book Review of Brown Seaweeds (*Phaeophyceae*) of Britain and Ireland by Robert L. Fletcher

Martin Wilkinson  
Heriot-Watt University

This is an outstanding account of the brown seaweeds of the British Isles. It is an incredibly detailed and up-to-date identification work. Effectively it completes the series “Seaweeds of the British Isles” which was an initial project of the British Phycological Society, some decades ago, to give a series of books that would enable correct and detailed identification of all seaweeds on British shores. The reviewer has been compiling complete seaweed surveys of British shores for over 50 years but has always had a problem with the diversity of small brown seaweeds in those surveys. This book is a great answer to that problem.

The book covers more than just identification. There is an introduction to brown seaweeds, covering 51 pages, which describes their cell structure, both microscopic and fine-structural, the organization of the plants and environmental effects on their structure and growth.



Front Cover of the book.

These effects include light climate, temperature, salinity, interaction with grazers and effects of substratum type. Reproduction and life-histories are described, again with discussion of environmental effects on these, particularly that of light which can control seasonal aspects of some seaweed life-histories.

The introductory review also summarizes community ecology of these seaweeds on the seashore followed by a summary of the totals of brown seaweeds around different parts of the North Atlantic in which Britain comes second with a high total of 188 species.

This total is backed by a current checklist of all the brown seaweeds of the British Isles. The main intent of the book is to be a very detailed, complete and up-to-date identification work.

The comprehensive description of the 188 species covers 606 pages. That is very detailed but before that puts off any one who is looking for a simple work let's look at the identification keys which precede the descriptions. These are two keys which are presented at different levels of detail. The first one is a Quick Generic Key, phrased in simple English, which will help the less experienced but also, this reviewer feels, will be a great and quick help to the more experienced who might otherwise struggle with the diversity of simple filamentous brown seaweeds. This is followed by a Full Generic Key with much more detail. The species descriptions, which occupy most of the book, are lavishly illustrated by both photographs and line drawings.

The photographs are both photomicrographs showing cell features and arrangements and, for the larger species, whole plant photographs. The black and white line drawings which show such features as cell shapes, branching patterns and plant organization are of exceptionally good quality.

The reviewer has seen superficial criticism of the photographic illustrations for not being coloured. One needs to remember that the information for this book has been collected throughout the author, Robert Fletcher's, 50 year study of brown algae where many of the photomicrographs would have been taken in days when black and white was standard. With larger seaweeds it is good to see the detail given on habitat variation of furoid seaweeds, including salt-marsh forms, and the inclusion of detailed descriptions of more furoid taxa than many conventionally record.



In the species descriptions in the book there are detailed reference lists to the biology and distributions of the species. The keys and genus and species descriptions are good, but for anyone who may find the odd algal terms used difficult, there is a seven page glossary of the terms used.

This is an outstanding and authoritative reference and identification work which deserves to be widely used in shore surveys in Britain. Such is the detail in this book that it will be of interest and value to phycologists elsewhere in Europe and around the North Atlantic and world-wide.

In the “Seaweeds of the British Isles” series there had been a previous volume on brown seaweeds in 1983 which only covered part of the group, the remainder never having been covered.

The present volume being reviewed replaces and updates that 1983 publication as well as completing the coverage of all currently recognized brown seaweeds on British shores.

Some may think the price a little high but when one sees the size and depth of this publication it is understandable. It is worth pointing out that the reviewer has seen the recent availability of two means of obtaining discounts on this worthwhile volume. One is a discount to members of the British Phycological Society which has supported the preparation of this work financially. The other is a generous general discount on Pelagic Publishing’s works available to subscribers to the publisher’s monthly email newsletter.

#### Book Details:

Author: Fletcher Robert L.

Title: Brown Seaweeds (Phaeophyceae) of Britain and Ireland

Format: Hardback

First Published: 2024/08/17

Published By: Pelagic Publishing

Language: English

ISBN: 9781784272470

Price: £100

[Link to Website](#)

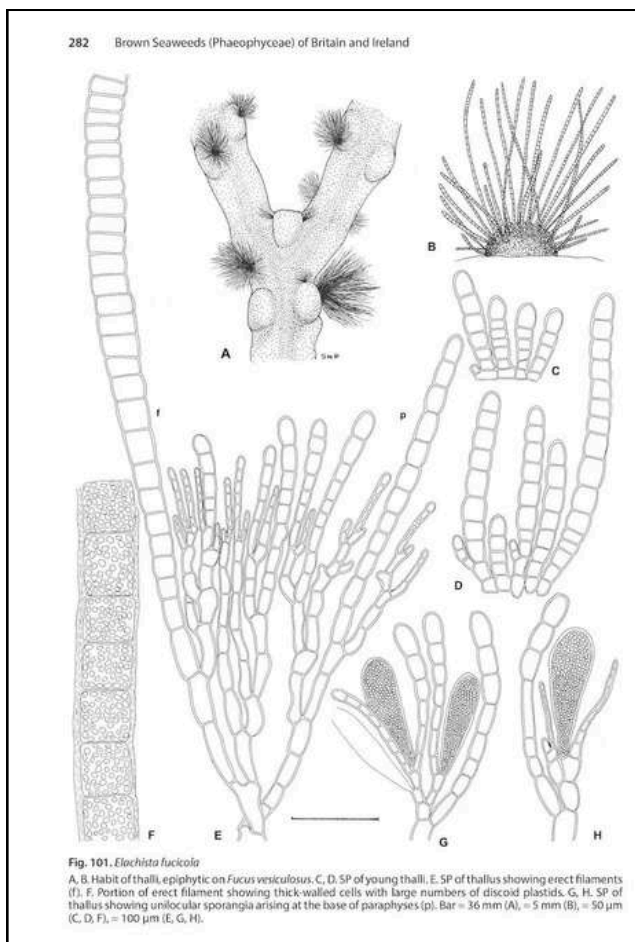


Figure 1: Preview of a Illustrative page in the book.

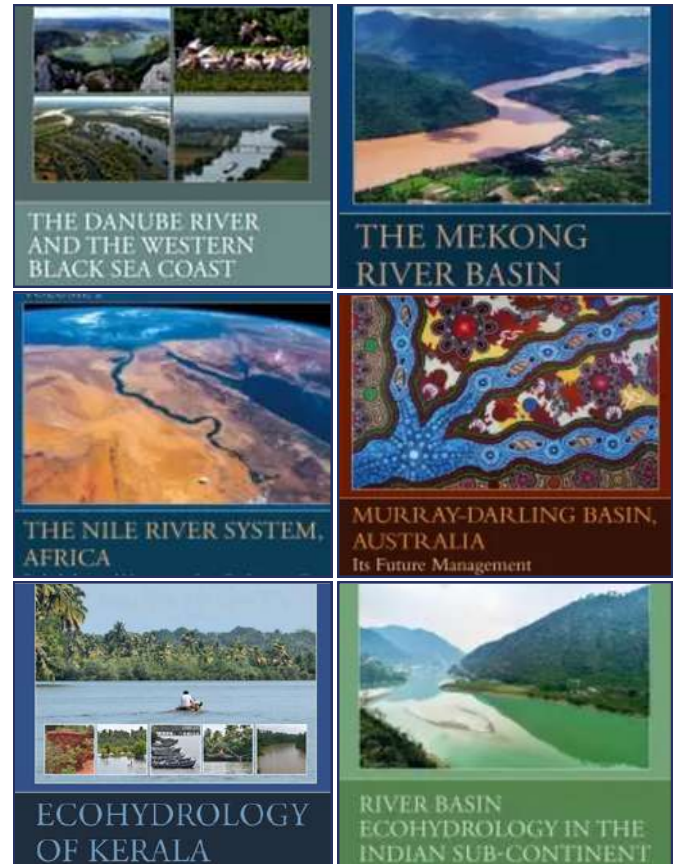
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ECSA has a long running successful relationship with Elsevier, so far this has included Elsevier organizing the Estuarine & Coastal Sciences Association Conference, which occurs every other year and the international journal Estuarine Coastal and Shelf Science, which Elsevier publishes in association with the ECSA.

The Estuarine and Coastal Sciences series pictured below is devoted to the analysis of saline and brackish water phenomena ranging from the outer edge of the continental shelf to the upper limits of the tidal zone. The series provides a unique forum, unifying the multidisciplinary approaches to the study of the oceanography of estuaries, coastal zones, and continental shelf seas.

The series Editor is ECSA, led by Steve Mitchell and Mike Elliott. Each volume is edited or authored and includes contributions from worldwide experts in the field.



The Catchment to Coast Series pictured above is edited by Eric Wolanksi, Michael Elliott, and Robert H Richmond.

No country so far has established integrated management of its water resources from the catchment to the coast due to socio-political compromises. During the 20th Century, coastal scientists studied these water problems and issues. Now, in the 21st Century, they must focus on how to solve these problems and issues through better management and innovative approaches. The book series aims to lead the field worldwide by addressing this problem, showing solutions to the increasing problems worldwide of a water crisis.

Please visit the linked web pages to find out more about these publishing opportunities and details on how to propose your book! Please Note the Catchment to Coast Series is not in collaboration with ECSA.

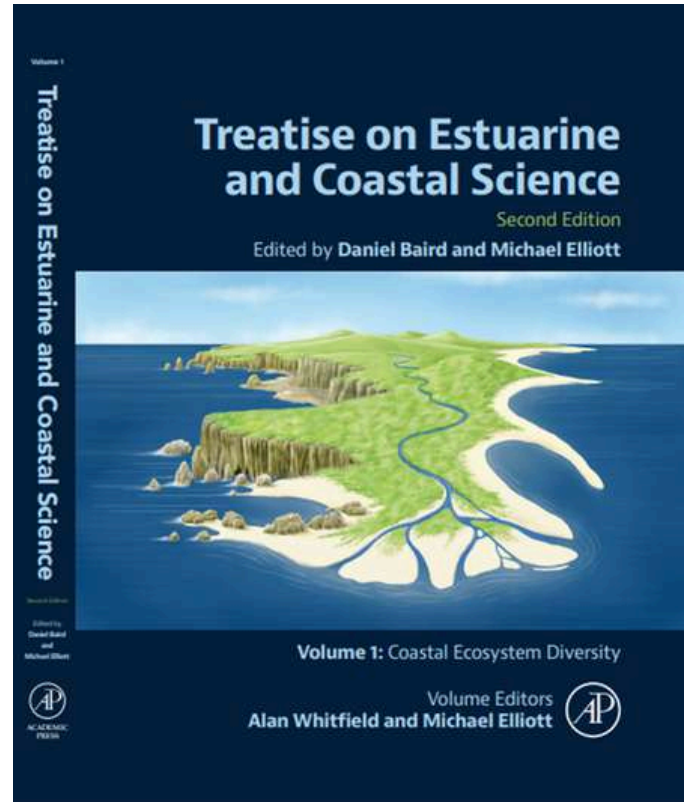


# Treatise on Estuarine and Coastal Science 2nd Edition 2024

Editors-in-Chief Daniel Baird and Michael Elliott

Treatise on Estuarine and Coastal Science, Seven Volume Set is the most up-to-date reference work for system based coastal and estuarine ecosystem science and management. It addresses the big issues facing the estuaries and coastal zone; in particular how to best use multi- and inter-disciplinary science to ensure the sustainability of the environment. It focusses on the need to protect and maintain the natural functioning of the estuaries and coasts worldwide while delivering the ecosystem services from which society extract goods and benefits.

Structured chapters, written by leaders in the field, include reference lists and additional reading, copious diagrams, case-studies, and especially provide synthesis diagrams and conceptual models of complex issues.



Front Cover of the book.

The Treatise covers both the natural and social sciences, serving a wide audience which ranges from undergraduate students to established researchers and practitioners. The work avoids autecological studies but focusses on inter-linked physical-chemical-biological-ecosystem processes and associated socio-economic issues in the coastal zone. It examines estuaries and coasts, and their interactions and feedbacks with humanity, from the inland catchment/river basin to the ocean shelf.

**Book Details:**

Editors-in-Chief: Baird, D., Elliott, M.

Title: Treatise on Estuarine and Coastal Sciences, 2nd Edition, 7 Volumes

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Published By: Academic Press

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eBook ISBN: 9780323910422

[Link to Website](#)

- 1. Coastal Ecosystem Diversity (Classification of Estuarine and Near-shore Coastal Ecosystems).  
Volume Editors: Alan Whitfield and Michael Elliott
- 2. Physical Aspects (Water, Solute and Sediment Transport, Geology and Geomorphology).  
Volume Editors: Steve Mitchell, Reg Uncles and Jon French
- 3. Biogeochemical Cycling (Land-Ocean Interaction and Biogeochemical Cycling of Elements in Estuarine and Coastal Waters and Sediments).  
Volume Editor: Tim Jennerjahn
- 4. Structure and Function of Biological Communities and Coastal Ecosystems (Biological Communities and Trophic Relationships in Coastal Ecosystems; Functioning of Ecosystems at the Land-Ocean Interface; Aspects of Ecolhydrology).  
Volume Editor: Daniel Baird
- 5. Modelling and Prediction (Estuarine and Coastal Ecosystem Modelling).  
Volume Editors: Ursula Scharler and Daniel Baird
- 6. Problems, Solutions and Restoration (Human-induced problems; Human Population in the Coastal Zone; Impacts and Restoration).  
Volume Editors: Michael Kennish and Michael Elliott
- 7. Management, Governance and Socio-economics (Values and Benefits of Estuaries and Coasts; Estuarine and Coastal Governance).  
Volume Editors: Bruce Glavovic and Nicola Beaumont

Volumes in the Treatise



*The Atomium - a landmark building in Brussels.*

There is an urgent need to address the challenges of the triple planetary crisis: climate change, biodiversity loss and pollution. Marine scientists and policy-makers worldwide have emphasized that in particular threats to biodiversity are the major challenge for both the health of the planet and the welfare of human societies.

These threats are relevant on local to global scales and require international collaborative action. Therefore, in all maritime areas attention is placed on assessing and managing such threats and planning for future initiatives to ensure a sustainable use of estuaries, coasts and seas.

We invite you to participate in ECSA 61 and contribute your recent findings in all aspects of coastal and estuarine sciences. Building on the results of several Horizon Europe projects it is a

## **ECSA 61: Bridging the gap between science and policy in estuarine and coastal marine biodiversity: the way forward**

**Location:** The Square, Brussels  
**Date:** 24-27 August 2026.

unique opportunity to show the most recent advances of coastal marine research and their applications for European and international policies. For this purpose, ECSA 61 brings together a global multi-disciplinary community of researchers and professionals.

ECSA invites delegates to a 'Science-meets-Policy' day (24 August 2026), during which you have the chance to discuss research findings and applications for a sustainable future of coasts with managers and decision-makers from Europe and all over the world, and the ways in which these can be used in current monitoring and assessment policies.

You have the chance to shape the program of this conference. Besides the below-mentioned General Sessions, you can suggest additional Special Sessions. Please submit your Special Session proposal by Monday, 8 December 2025.

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### ECSA NEWSLETTER

The ECSA electronic newsletter is e-mailed to members three times yearly (Spring, Summer and Autumn/Winter) and available on the ECSA website to spread information on ECSA Activities.

**Short descriptions of items such as:**

- Forthcoming events
- Courses
- Webinars
- Grants
- Job opportunities

**Deadlines for contributions are:**

- 10th March, for publication in the Spring issue (March/April)
- 10th July, for publication in the Summer issue (July/August)
- 10th November, for publication in the Autumn/Winter issue (November/December)

For more information and to view past editions of the newsletter scan the QR code or click the link.



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### ECSA BULLETIN

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The Bulletin is published twice yearly and welcomes diverse perspectives: research, policy updates, opinions, and reviews.

**Contribution categories:**

- Science Reports/Papers
- Coastal Policy & Management:
- Opinion Pieces
- Book Reviews
- Early Career Researchers/ Practitioner articles
- ECSA Activity Reports
- Details of recent, commencing, or ongoing projects on estuarine and coastal sciences.

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- To promote excellence in estuarine and coastal marine science, technology and management;
- To focus on promoting young scientists and early-career academics;
- To actively engage in global outreach with an emphasis on developing countries;
- To enhance the privileges of membership.

We have four types of membership - student, annual, institutional and sponsoring. Students get a three-year membership for a one-off payment of only £30. This enables you to apply for small grants and is excellent value.

We have reduced rates for people from certain countries, taken from the OECD Development Assistance Committee (DAC) list (see here for further information :

<https://ecsa.international/joining-ecsa-membership-renewal>).

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- Online access to the journal Estuarine & Coastal Shelf Science for an additional £65 per annum. Please note this is only available to individuals, not organisations.
- Small grants to help with attendance at meetings
- Various awards for students or early career workers
- Reduced rates for students and annual members from OECD DAC countries.
- Reduced registration rates to ECSA meetings, where advertised.
- Bi-yearly bulletins, quarterly newsletters, social media posts.
- Membership of a world-wide scientific community.

Our membership year runs from 1st April to 31st March, but people can join at any time. This is most easily done through the website, where payment can also be made via Paypal or credit/debit card. Information is also provided on standing orders or bank transfer payment. If you're not already a member, please join us at the QR code or click the link.





**Estuarine & Coastal  
Sciences Association**

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