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MARITIME CAMPUS

A QUARTERLY MAGAZINE OF
BANGABANDHU SHEIKH MUJIBUR RAHMAN
MARITIME UNIVERSITY, BANGLADESH

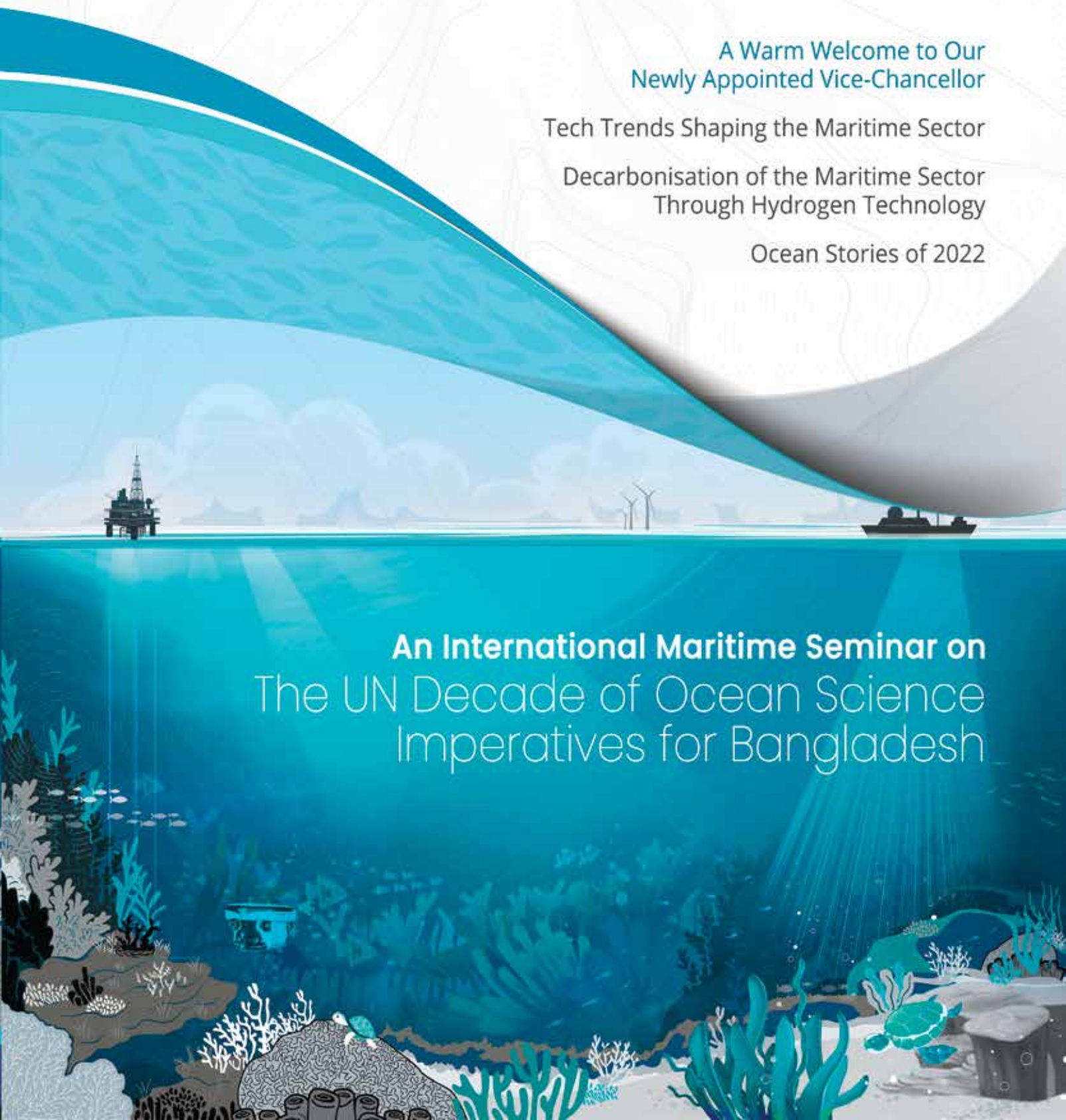
A Warm Welcome to Our
Newly Appointed Vice-Chancellor

Tech Trends Shaping the Maritime Sector

Decarbonisation of the Maritime Sector
Through Hydrogen Technology

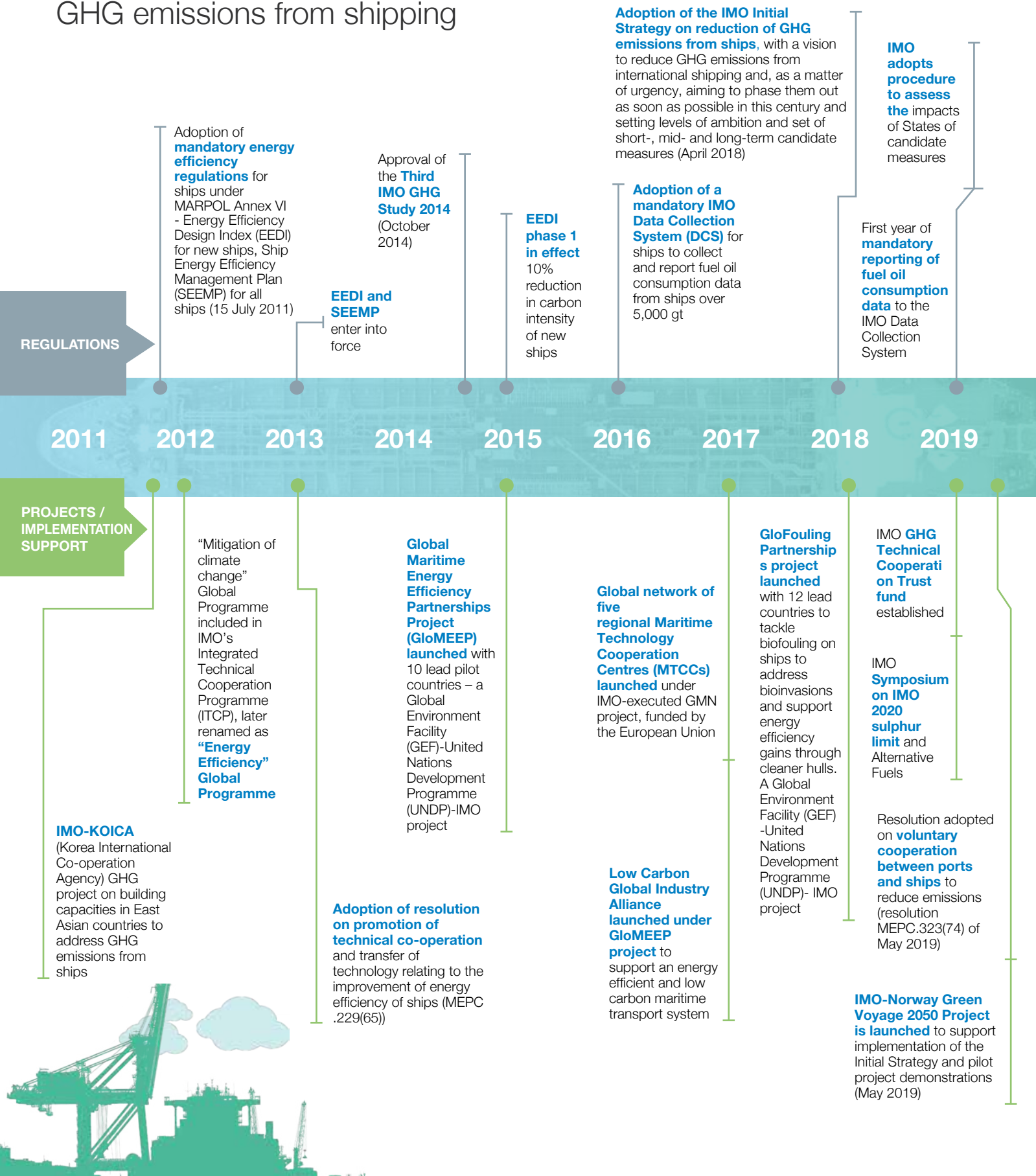
Ocean Stories of 2022

**An International Maritime Seminar on
The UN Decade of Ocean Science
Imperatives for Bangladesh**



Addressing climate change

A decade of action to cut GHG emissions from shipping



Maritime Campus

A Quarterly Publication of Bangabandhu Sheikh Mujibur Rahman Maritime University, Bangladesh

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Editorial

The Blue Economy of Bangladesh Will Benefit From the UN Decade of Ocean Science

Bangladesh is in an advantageous state to be a key player in the governance of the ocean because it has a long coastline and a sizable population that depends on it for their livelihoods. The UN Decade of Ocean Science: Imperatives for Bangladesh was the topic of an international maritime seminar hosted by Bangabandhu Sheikh Mujibur Rahman Maritime University to examine the opportunities and difficulties ahead. In order to study the specific problems facing Bangladesh's ocean environment and to consider alternatives for sustainable ocean governance, this event brought together experts, decision-makers, and stakeholders. The seminar provided an essential starting point for a coordinated effort to protect the ocean's resources for coming generations. Understanding the relevance of the UN Decade of Ocean Science concerning the Bay of Bengal, which has the potential to boost Bangladesh's Blue Economy initiatives significantly, is a major focus of the lead article in this issue.

The Vice-Chancellor position at Bangabandhu Sheikh Mujibur Rahman Maritime University has been filled by Rear Admiral Mohammad Musa, OSP, NPP, rcds, afwc, psc, PhD. On January 31, 2023, he assumed his position as the third Vice-Chancellor of this specialised university. Before that, he was the very successful Chairman of the Mongla Port Authority. We are proud to have Rear Admiral Musa as the Vice-Chancellor, and we wish him all the best in his new role. We have an article in the Focus section congratulating him on his appointment, so make sure to check it out and join us in welcoming Rear Admiral Musa to the BSMRMU family!

The maritime industry is developing quickly with improvements in shipbuilding, high-tech materials, smart shipping, propulsion, robots, big data, and sensors. As a result, operating in the world's oceans is becoming simpler. Yet, to stay competitive, ship engineers must continue to learn and become experts in these technologies. Our article's Trends section examines how technology breakthroughs are changing the maritime sector and stresses the value of continued professional development to maintain a qualified workforce prepared to handle future challenges.

As highlighted in the Perspective section of our magazine, a diverse approach is required to fulfil and exceed the challenging objectives set forth by the International Maritime Organisation (IMO). The shipping sector will benefit significantly from renewable energy sources like wind and solar power. Still, it's also critical to research new technologies and considers alternate fuels like hydrogen power. The maritime industry can only expect to meet the IMO target of decreasing greenhouse gas emissions by at least 50% by 2050 by adopting a comprehensive sustainability strategy that considers everything from alternative propulsion systems to operational efficiency.

Furthermore, the 'Campus Canvas,' 'Maritime Bangladesh,' and 'Around the World' sections will keep you updated on all significant maritime events and developments in the last quarter of 2022.

Finally, I'd like to thank the Chief Patron and Honourable Vice-Chancellor for his invaluable support in bringing this issue to light. I'd also like to thank all the departments for cooperating in providing information about their individual departments' activities.

Finally, thank the members of the Editorial Board for their tireless efforts to get this magazine published as soon as possible.

Thanking you

Captain A T G M Sarker, (TAS), psc, BN (ret'd)

Editor and Controller of Examinations

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An International Maritime Seminar on The UN Decade of Ocean Science Imperatives for Bangladesh

Bangladesh is positioned to play a pivotal role as a nation with a long coastline and a sizeable section of its population relying on the ocean for their livelihoods. On 17 November 2022, at the Krishibid Institution Bangladesh Complex (KIBC), Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU) hosted an international maritime seminar with the title “The UN Decade of Ocean Science: Imperatives for Bangladesh” to discuss the potential and difficulties that lie ahead.



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A Warm Welcome to Our Newly Appointed Vice- Chancellor

Rear Admiral
Mohammad
Musa,

OSP, NPP, rcds, afwc, psc, PhD has been appointed as the new Vice-Chancellor of Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU). As the third Vice-Chancellor, he assumed duties of this specialised university on 31 January 2023.

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Decarbonisation of the Maritime Sector Through Hydrogen Technology

A multifaceted strategy is required to meet existing goals established by the International Maritime Organisation (IMO) and far beyond them. Of course, renewable energies like wind and solar power will be necessary, but so will developing new technologies and utilising hydrogen power.

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Ocean Stories of 2022

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Tech Trends Shaping the Maritime Sector

The job in the world's oceans is becoming more straightforward thanks to advancements in shipbuilding (megaships), high-tech materials, smart shipping, propulsion, robotics, big data, and sensors. Ship engineers should be informed and skilled in these technologies to improve the workforce.

A Warm Welcome to Our **Newly Appointed Vice-Chancellor** Rear Admiral Mohammad Musa



Rear Admiral Mohammad Musa, OSP, NPP, rcds, afwc, psc, PhD has been appointed as the new Vice-Chancellor of Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU). As the third Vice-Chancellor, he assumed duties of this specialised university on 31 January 2023.

Before that, the Admiral served as the Chairman of Mongla Port Authority. Despite the Covid-19 pandemic, the port handled a record number of ships and cargo, thereby making a new record of earning revenue (Tk. 340 crores), the highest in the history of Mongla Port. During his tenure, the Admiral worked relentlessly to develop the port and transform it into an international standard port, ultimately making it a Southwestern gateway and a hub for regional connectivity.

According to a notification issued by the Ministry of Education, President Abdul Hamid, also chancellor of the university, appointed him for the next four years. He replaced Rear Admiral M Khaled Iqbal (ret'd), the former VC of BSMRMU.

Rear admiral Musa joined Bangladesh Naval Academy on 27 January 1985 with 85 A Batch, which is the contemporary of 15th BMA Long Course, and on 01 July 1987, he was commissioned in the Executive branch of Bangladesh Navy. He has earned the confidence and high acceptability among the ranks and files of the Navy for his high level of professionalism, integrity, vision, decision making and leadership qualities.

Outside the Navy, the Admiral has served as the Director of the Blue Economy Cell of Govt and as Directing Staff (Navy) Armed Forces War Course at National Defence College from 2010 to 2013.

Rear Admiral Musa is an alumnus of Defence Services Command and Staff College, Mirpur, French Inter Forces War College, National Defence



Visionary maritime expert Rear Admiral Mohammad Musa assumes the chair of Vice-Chancellor of BSMRMU, guiding the university towards excellence and global impact in maritime education, training and research



Farewell Ceremony
Newly appointed VC of BSMRMU handing over a Token of Memento to the Outgoing VC

College, Royal College of Defence Studies (RCDS), UK and King's College, London. In his Academic credentials, he achieved four Master's degrees in War Studies, English Literature, International Relations and Business Administration. Here, it is mentioned that he completed MA in "International Security and Strategy" from Kings College, London and completed M Phil from Bangladesh University of Professionals in 2015. On January 2021, the Admiral completed PhD from Jahangirnagar University. The title of his research is "Maritime Domain Awareness: Bangladesh Perspective"

While a sea-going Commander by heart, the Admiral is passionate about research on core maritime issues, particularly Maritime Law, Ocean Policy, Sustainable Blue Economy, Coastal Zone Management and regional maritime partnership issues. He has a number of research publications in reputed journals to his credit. Admiral has attended various national and international seminars and symposiums. He also represented Bangladesh in the State Party meeting at the United Nations in 2013. Admiral Musa attended Senior Executive Decision-Making Programme at Institute for Security Governance in California in 2019 and the 12th Regional Sea Power Symposium in Italy and delivered a lecture on 'Shaping of Navies in the Blue century'. His interviews and articles were published in international defence & Security Journals.



As the Captain of the BN flagship, he received 'National Standard' from the Honourable Prime Minister for outstanding contribution at naval and national levels. While performing the duties of Commander Khulna Naval Area, BNS TITUMIR received the prestigious 'National Standard Award' from Honourable President. The Admiral has also received 'Oshamanno Seba Padak', 'Nou Parodorshita Padak' and the newly introduced 'National Integrity Award' for outstanding performance. As recognition of his extraordinary service to the Navy, Admiral Musa has received the Chief of Naval Staff's commendation award three times during his glorious career.



Top Photo: New VC and Outgoing VC with Faculty Members of BSMRMU

Centre: Newly Appointed VC and Outgoing VC with BSMRMU officers



Former Vice-Chancellor and the newly appointed Vice-Chancellor in a formal transfer of authority and responsibility signing

Rear Admiral M Khaled Iqbal has retired as Vice-Chancellor of Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU) after years of devoted service. Under his direction, BSMRMU became the leading university for maritime studies, leaving behind a legacy of academic quality and innovation. Rear Admiral Iqbal is a highly decorated graduate of multiple military academies with experience commanding Bangladesh Navy warships. Before joining BSMRMU, he was Chairman of the Chittagong Port Authority, where he gained knowledge of port operations and the shipping sector.



An International Maritime Seminar on The UN Decade of Ocean Science: Imperatives for Bangladesh

Maritime Campus desk

Introduction

The ocean is an essential part of our world's ecosystem, providing food, transportation, and a vast array of other resources. Yet, a number of problems, such as overfishing, pollution, and climate change, are putting the world's oceans' health in danger. The United Nations has designated the period from 2021 to 2030 as the Decade of Ocean Science in recognition of the vital role that the ocean plays in our lives. This initiative encourages scientific study and innovation to improve ocean knowledge and preserve ocean health.

Bangladesh is positioned to play a pivotal role as a nation with a long coastline and a sizeable section of its population relying on the ocean for their livelihoods. On 17 November 2022, at the Krishibid Institution Bangladesh Complex (KIBC), Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU) hosted an international maritime seminar with the title "The UN Decade of Ocean Science: Imperatives for Bangladesh" to discuss the potential and difficulties that lie ahead. In order to examine the specific issues affecting Bangladesh's ocean environment and to consider options for sustainable ocean

governance, this event brought together experts, decision-makers, and stakeholders.

The Rationale for the Seminar

The Father of the Nation Bangabandhu Sheikh Mujibur Rahman, recognised the enormous importance of the oceans, estuaries, and river systems for our national prosperity and well-being. During his entire struggle for the freedom of Bengalis, he left his footsteps in every flowing river and rivulet of our land. Soon after our independence, Bangabandhu left no stone unturned in revitalising the marine industry, taking substantial measures for the exploration of our sea resources through the application of the ocean's scientific research. Our Honorable Prime Minister Sheikh Hasina has taken excellent steps to harness the potential of the Blue Economy in order to realise Vision 2041, Sustainable Development Goals 2030, and Bangladesh Delta Plan 2100. She has done this on the solid foundation that Bangabandhu left behind.



The United Nations General Assembly formally announced the UN Decade of Ocean Science in 2017, which is programmed to run from 2021 to 2030. Practically all of the countries of the world now recognise the enormous importance of ocean science in achieving national wealth and sustainable development. The fundamental goal of this Ocean Decade is to promote initiatives to break the cycle of ocean health decline and unite ocean stakeholders from all around the world behind a framework that will enable ocean scientists to support nations in improving circumstances for sustainable ocean development. In fact, sustainable development depends critically on a scientific understanding of how the ocean reacts to stresses and management decisions. In order to forecast the effects of change, develop mitigation strategies, and direct adaptation, ocean observations and research are also crucial. The International Oceanographic Commission (IOC) of UNESCO will oversee the Decade's preparations as required by the UN General Assembly. It will invite the international ocean community to prepare for ocean science and technology to produce "the Science We Need for the Ocean We Want" jointly.

As the first maritime university of Bangladesh, BSMRMU provides undergraduate and graduate-level courses and programmes in various ocean-related fields, including oceanography, marine biotechnology, marine fisheries, safe shipping management and administration, naval architecture and marine engineering, offshore engineering, environment and climate change, etc. It serves as the focal point for Bangladesh's efforts to inform the next generation about many aspects and advantages of the ocean and to build relationships with other maritime organisations worldwide to advance maritime research and higher education. For an occasion to align with the UN Decade of Ocean Science, BSMRMU took a very timely initiative of hosting the country's first international maritime seminar on the UN Ocean Decade and releasing an illustrative Journal named "Ocean Science: Sailing towards Sustainable Development".

The Inaugural Session of the Seminar

The inaugural session of the international maritime seminar on the UN Ocean Decade started with the registration of guests in the lobby on Level-1. Guests took their seats in the seminar hall, and the Chief Guest arrived at 9:30 am. The recitation from the Holy Quran followed, and an audio-visual presentation was shown to the audience. The seminar theme was then introduced, and the Chief Guest and other dignitaries took their seats on the stage. The Vice-Chancellor of BSMRMU, Rear Admiral M Khaled Iqbal (retd), delivered a welcome speech, followed by a keynote presentation on "Ocean Science - Gateway to Sustainable Development" by Rear Admiral Md Khurshed Alam (retd), Secretary, Maritime Affairs Unit, Ministry of Foreign Affairs, Bangladesh. Special Guest Ms Zuena Aziz and Chief Guest Barrister Mohibul Hassan Chowdhury, MP, Hon'ble Deputy Minister, Ministry of Education, Bangladesh, delivered speeches. The illustrative journal on Ocean Science was unveiled, and souvenirs were handed over. A photography session was held before opening the Poster Presentation in the Ground Floor Lobby, Level G.

Plenary Session – I

With the theme 'Riding the Waves of Challenges of Our Weary Ocean', the Plenary Session - 1 was held in KIBC-Auditorium, Level 1.

Bringing together the brightest minds in Ocean Science - A powerful exchange of ideas at the International Maritime Seminar

Lead Story

An International Maritime Seminar 'On The UN Decade of Ocean Science: Imperatives for Bangladesh'



Rear Admiral Md Khurshed Alam (ret'd) and Rear Admiral M Khaled Iqbal (ret'd) attentively listening to the speaker as part of the engaged audience at the event



Barrister Mohibul Hassan Chowdhury, M.P. and Rear Admiral M Khaled Iqbal (ret'd) join other esteemed dignitaries for a group photo at the seminar event, showcasing their commitment towards advancing maritime education in Bangladesh

The Plenary Session-1 of the international maritime seminar on the UN Ocean Decade began with the introduction of the session by Mr Fakrul Ahsan, Chief Technical Advisor, UNDP, Bangladesh. He welcomed the distinguished guests and introduced the session's theme. The first plenary talk was delivered by Professor Harilal Bhaskara Menon, Vice-Chancellor, Goa University, India, who spoke on "Reversing the Planetary Crisis of Climate Change with Ocean Science". He highlighted the crucial role of ocean science in mitigating climate change and reversing its impact on the planet.

The session chair, Mr Fakrul Ahsan, shared his comments on Professor Menon's presentation. Professor Deborah M Power delivered the second plenary talk from The Algarve Centre for Marine Sciences (CCMAR) University of Algarve, Portugal. She spoke on "Capitalising Marine Biotechnology for Sustainable Blue Economy" and emphasised the potential of marine biotechnology in promoting sustainable development.

Mr Fakrul Ahsan, the session chair, shared his comments on Professor Power's presentation. The third plenary talk was delivered by Professor Dr Mostafa A R Hossain, Department of Fisheries Biology and Genetics, Bangladesh Agricultural University, Mymensingh, Bangladesh, who spoke on "Endangered Fish Species – Hindrance to a Productive Bay of Bengal". He highlighted the importance of conserving endangered fish species for the sustainable development of the Bay of Bengal.

Mr Fakrul Ahsan, the session chair, shared his comments on Professor Hossain's presentation. The fourth and final plenary talk was delivered by Assela Pathirana, Associate Professor, Water Infrastructure Asset Management, IHE-Delft Institute for Water Education, Delft, Netherlands, who spoke on the "Importance of Climate and Oceanographic Research of Coastal Cities and Deltas". He emphasised the need for climate and oceanographic research to sustain coastal cities and deltas.

The session was followed by an open forum, where participants could ask questions and share their thoughts on the presentations. Plenary Session-1 concluded with a break, providing participants with the opportunity to network and exchange ideas with each other.

Plenary Session -2

The Plenary Session-2 of the international maritime seminar on the UN Ocean Decade began with the "Rethinking Ocean Science for Sustainable Development" theme in the KIBC-Auditorium, Level 1: the Session Chair, Dr Md. Niamul Naser, Professor & Chairman, Department of Zoology, Dhaka University, Bangladesh, introduced the session at 12:50 pm.



Memorandum of Understanding (MoU) signed between Professor Harilal Bhaskara Menon, Vice-Chancellor of Goa University, India, and Rear Admiral M Khaled Iqbal (ret'd), the then Vice-Chancellor of BSMTMU, for collaboration and mutual exchange of knowledge and resources in the field of maritime education and research

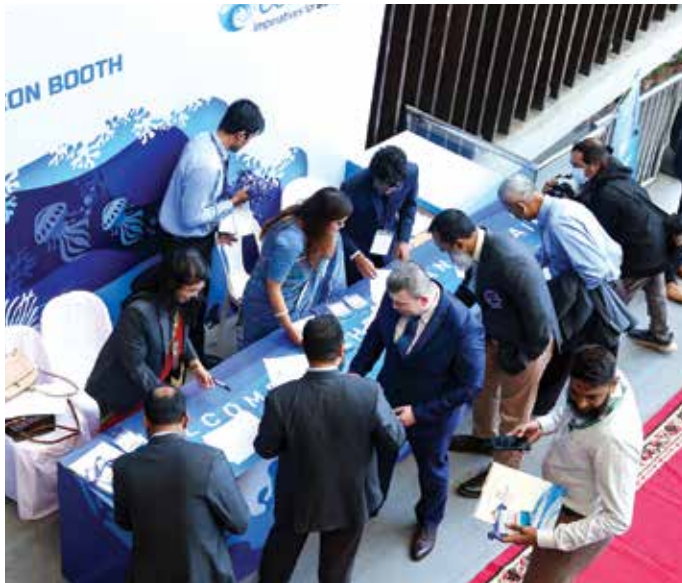


Expert panelists from home and abroad assemble for the international maritime seminar, ready to share insights and knowledge on the latest trends and developments in the maritime industry



Attendees from diverse backgrounds eagerly learning about the latest advancements in oceanographic research and exploration at the seminar

// Lead Story //



A view of the registration booth of the seminar

Adson Hofman, STC International Maritime and Logistics, Rotterdam, Netherlands, presented the first plenary talk on “Green Technology in Sustainable and Resilient Port Development.” The speaker discussed the need for environment friendly and resilient port development to support sustainable growth.

Dr Badrul Imam, Honorary Professor, Geology at Dhaka University, Bangladesh, presented the second plenary talk on “The Ocean as a Critical Enabler for Energy Security of Bangladesh.” The speaker highlighted importance of ocean science in ensuring Bangladesh’s energy security.

Narsinh L. Thakur presented the third plenary talk, CSIR-National Institute of Oceanography, Goa, India, on “Linking Marine Chemical Ecology with Bio Prospecting: A Case Study of Sponges.” The

The venue for the international maritime seminar was beautifully decorated with an ocean theme, which made it a happy place for the young BSMRMU students who were there. The presence of these students added to the positive energy of the event



Chief Guest Barister Mohibul Hassan Chowdhury, M.P., discusses maritime education with Professor Harilal Bhaskara Menon, Vice-Chancellor of Goa University, India, and Rear Admiral M Khaled Iqbal (ret'd), the then Vice-Chancellor of BSMRMU, at the international maritime seminar

speaker talked about the significance of marine chemical ecology in identifying potential pharmaceuticals from sponges.

These discussions were followed by comments from the session’s chair, Dr Md. Niamul Naser.

The fourth and final plenary talk of Plenary Session-2 was presented by Professor Pierre Failler, Director of the Centre for Blue Governance, The University of Portsmouth, United Kingdom, on “Catching Up with the UN Decade of Ocean Science – EU Perspective.” The speaker provided insights into the European Union’s perspective on the UN Decade of Ocean Science and how they plan to contribute towards achieving its goals. The session ended with an open forum where the attendees could ask questions and share their thoughts on the plenary talks.

Professor Deborah M. Power of University of Algarve, Portugal received a seminar crest in recognition of her expertise and valuable contribution to the international maritime seminar on Ocean Science



Parallel Technical Sessions

After the lunch break, the international maritime seminar on the UN Ocean Decade continued with three parallel technical sessions at different locations in the KIBC.

The technical session at KIBC TRAINING ROOM-1 (Level-5) focused on Marine Biotechnology and Biodiversity. Dr Mohammad Nazir Hossain, Head of the Department of Genetic Engineering & Biotechnology at BSMRMU, chaired the session. Attendees had the opportunity to learn about the latest developments in marine biotechnology and how they can contribute to biodiversity preservation.

A technical session on Oceanography and Energy was held at KIBC-AUDITORIUM (Level-1). The session chair, Dr Aftab Alam Khan, Head of the Department of Oceanography and Hydrography at BSMRMU, moderated the discussions about how oceanography can be used to harness energy from the ocean. The session featured various experts who discussed their research on renewable energy sources, such as tidal and wave energy.

Besides, a technical session focused on Marine Aquaculture and Fisheries in the KIBC 3D SEMINAR HALL (Level-4). Dr Maria Zaman, Head of the Department of Marine Fisheries and Aquaculture at BSMRMU, chaired this session. Attendees learned about the latest techniques in sustainable marine aquaculture and fisheries management, as well as the industry's challenges. Experts shared their insights on the industry's current state and how it can be improved to meet the growing demand for seafood while preserving the ocean's resources.

Overall, the parallel technical sessions allowed attendees to delve deeper into specific topics related to the UN Ocean Decade and engage with experts in their respective fields.

The Concluding Session

It was a long day filled with numerous technical sessions jam-packed with enlightening talks, presentations, discussions, and arguments.

Yet the fight still needed to be done. The delegates gathered once more as dusk fell for the closing session of the international maritime seminar on the UN Ocean Decade.

The Best Poster Awards were announced to start the Concluding Session. The contestants awaited the judges' arrival as they scanned the audience before announcing the winners. The hall reverberated with audience acclaim as the deserving victors accepted their prizes. They were honoured to receive the award before their peers because it was a testament to their effort and commitment to a sustainable and responsible maritime industry.

A Vote of Thanks was then led by Commodore Sheikh Firoz Ahmed, Registrar of BSMRMU. He extended his profound appreciation to everyone who participated, including the presenters, session chairs, judges, and the organising committee, for their tireless efforts to make the event successful. He commended the participants for participating actively in the technical sessions, which he thought would significantly impact the advancement of ocean science and the maritime sector in the upcoming years.

Commodore Ahmed said that the international maritime seminar on the UN Ocean Decade set a new industry standard. The seminar was a platform for experts, scholars, and industry leaders to come together to share their knowledge, experiences, and ideas.

End Thoughts

The seminar included a wide range of subjects, including oceanography, energy, marine aquaculture, fisheries, marine biotechnology, and biodiversity. In conclusion, all those involved in the event's preparation demonstrated their dedication and contributions to its success. Participants hoped that the BSMRMU's international maritime seminar would motivate young people in Bangladesh and elsewhere to continue their efforts to advance sustainable ocean science and the maritime industry. Everyone who attended the seminar found it to be exciting. As the final session concluded, the attendees left with renewed dedication to the UN Ocean Decade.

Dignitaries proudly hold illustrative maritime journals on Ocean Science, unveiling them to the audience as a valuable resource for understanding the ocean





Tech Trends Shaping the Maritime Sector

Maritime Campus desk

There is technology in practically every aspect of human life. Technology is also a significant factor in the maritime sector, especially when it has more autonomy. Autonomous technology and smart ship are two examples of innovations in the modern marine industry.

The job in the world's oceans is becoming more straightforward thanks to advancements in shipbuilding (megaships), high-tech materials, smart shipping, propulsion, robotics, big data, and sensors. Ship engineers should be informed and skilled in these technologies to improve the workforce.

The marine industry may now be more environmentally friendly while still controlling the growth of the worldwide market thanks to technological advancement.

Current trends in the maritime industry

Some of the technological advances that benefit shipping firms are discussed in the following few sections. Technology must be used if ocean industries are to change. Planning a maritime space strategy and managing maritime traffic can both benefit from it. The challenges and trends facing maritime management are being set up by technology. Smart fleet management and autonomous vessels have potential.

"To meet ambitious CO₂-reduction goals, even more, profound changes will be needed. A major part of the solution will be taking advantage of the growing number of technologies and operational strategies to increase ship efficiency."

- The International Council on Clean Transportation, Reducing Greenhouse Gas Emissions from Ships

1. Artificial Intelligence

Artificial Intelligence (AI) can eliminate monotonous tasks and raise the standard of the transportation sector. Logistics is a field that AI can drive. Artificial Intelligence aids in decision-making, automation, safety, and route optimisation. Above all, AI assists in dispersing cargo among the hundreds of ships passing through ports while reducing traffic.

According to the McKinsey Global Survey, there has been a considerable increase in the number of organisations using AI across various business operations in recent years, with the adoption of AI in everyday business activities growing by about 25% annually.

Technological advancement in transport communication showcased in this photo, as people utilise the latest digital devices to stay connected and informed in real-time, even on the go



2. Sensor Technology

Nowadays, sensor technology is one of the most sophisticated and well-developed technologies. Very common in sectors related to transportation. Several human jobs, such as equipment inspection on ships, have been replaced by sensor technology.

Marines and ship technicians benefit from connecting all equipment to sensors. Wireless connectivity allows for precise monitoring of a machine's operational state. As a result, they may analyse the maintenance required at regular intervals and their overall operability aboard ships.

Machine learning and AI can communicate with sensors. This enables them to connect to distant facilities, analyse data, and send out alarms if any of the ship's components require maintenance. When appropriately calibrated, sensor technologies can increase ship efficiency.

3. Robotics and 3D Printing

Several industries, including maritime, are benefiting from advanced robotics. Industrial robots already perform security, maintenance, and inspection of vessels. They can carry out activities including packing, delivering, inspecting, and combating fires.

Robots can also assist in hazardous circumstances when a human's life is in danger by piloting and spinning the ship. Certain robotic systems use sensors to locate, record, and analyse the ship's data. Drones are another technology that supports the maritime sector in addition to robotics. They can assist with remote inspections, security, surveillance, and delivering supplies to vessels.

The shipping industry is also affected by 3D Printing since it helps make spare parts on board ships more readily available when needed. The use of human labour may decline in the future and be replaced by robotic technology.



4. Big Data and IoT

Information from extensive operation systems, like ships and ports, is checked by data analytics. It contains information about container kinds, weights, and destination. Additionally, it can analyse ship data (trim, stability, engine performance and communication).

Big data on ships can obtain results about historical container patterns and maritime conditions. The ship reacts to numerous shifting weather conditions. Analysing several metrics helps improve efficiency and overall performance.

The Internet of Things (IoT) also permits remote control of some objects. It functions with a GPS and a cloud-based database that keeps all the information gathered by equipment on the ship. IoT can connect all other equipment and shipments, such as robots, via wireless networks.

5. Autonomous Control

Autonomous technology assists in decision-making on land based on the route. The assistance includes seeing other vehicles, pedestrians, and traffic lights and securing the vehicle to stay on the road. Shipping automation makes it possible to deliver goods without any hindrance. Autonomous systems function effectively. It enables material detection, improved heat mapping, and the elimination of human error risks.



Smart technologies enable ships to maintain course without requiring regular skipper input. Thanks to the real-time route information, fast action can be taken if any problem arises.

6. Augmented Reality

Today, Augmented Reality (AR) is used in many different businesses. As a technical advancement, Augmented Reality is primarily used by seafarers. Nonetheless, several marine training facilities have also begun to use it. AR technology allows students studying marine biology to have access to realistic scenarios.





A hydrogen-fueled future takes shape when a state-of-the-art ship powered by hydrogen fuel cells can make a major milestone in the maritime industry's shift towards clean and sustainable energy

Also, AR aids in effective maintenance and vessel inspections. Many maintenance activities can be completed with guiding software and equipment that enable image visualisation. There is no requirement for technician assistance.

The process of designing and manufacturing ships also involves AR. It mimics virtual projects and aids in the resolution of some technological challenges. It enables people to envision the creation before it is actually made.

7. Ship Propulsion Systems

The improved ship propulsion systems benefit the ecology and give the ship superior control. With the shift of propulsion system control to smart technology, a gadget can now make precise decisions and control machinery.

The captain and marine engineers can check the condition of the marine diesel engines. The software demonstrates and confirms that they consistently stay within the permitted operating ranges.



8. Advanced Materials

The environment is negatively impacted by ships, and gas, oil, and waste spills increase pollution and environmental harm. This is why investing in alternative energy management technologies is crucial. It can aid in lowering the emission of greenhouse gases, including carbon and sulphur.

We needed to adopt a green strategy since maritime issues are significant. Megaships, for instance, are constructed using various, more environmentally friendly materials, such as fibre-reinforced plastic. In addition to carrying a lot of cargo, it also contributes to traffic and carbon reduction.

"73% believe fuel availability will strongly drive the market's decision to adopt alternative energy management solutions. Other notable drivers included heavy fuel oil (HFO) price and the capital and/or infrastructural investment required to support alternatives."

- IMarEST, technology in shipping

What is the role of technology in the maritime industry?

Considering all the developments listed above, these are only a few instances of how technology impacts the maritime sector. New technologies significantly impact commercial shipping, particularly in terms of ship design and operation. Incorporating smart ship development improves productivity, advances research, and offers a less expensive oil substitute.

Several firms rely on the maritime sector to supply commodities, grow, or advance the global economy. Ships and shipping firms must concentrate on new technology if trade services are to be effective.

Technological developments in the shipping industry contribute to a reduction in greenhouse gas emissions. They also offer substitutes for fossil fuels (fuel cell boats). They are currently the most widely used form of energy in ships. In conclusion, the primary function of technology is to create a secure environment and aid in the growth and improvement of businesses.

BSMRMU conducts 'Port & Shipping Studies' short course



Honourable Vice-Chancellor of the BSMRMU participated in a photo session with the short course 'Port & Shipping Studies' trainees.

A short course titled 'Port & Shipping Studies' was held in Bangabandhu Sheikh Mujibur Rahman Maritime University Bangladesh (BSMRMU) from 07–15 December 2022. The course was conducted under the Institute of Bay of Bengal & Bangladesh Studies (IBBBS) to advance higher education and research, with a focus on the transportation and unloading of goods, safe and uninterrupted supply, and management of goods in the maritime sector. For 20 sessions, renowned resource people led this course. Twenty-two trainees attended the course from various government and private institutions, and many more have expressed interest in continuing their training after this. At the closing ceremony, the then Honourable Vice-Chancellor of the university, Rear Admiral M. Khaled Iqbal, NBP, BSP, ndc, psc (retd), was the chief guest and gave away certificates among the

participants. The chief guest stated that the trainees taking the course would be able to contribute significantly to the overall growth of the nation's potential port management and shipping sector. At least once in a year, the Port & Shipping Studies short course will be offered.

Activities of affiliated Academies/Institutes

Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU) is the only specialised maritime university in Bangladesh, which has a range of affiliated marine academies and institutes that offer specialised training in various fields of the maritime industry. These affiliated institutions have a vital role in providing quality education and practical training to the cadets, and preparing them for lucrative careers in the maritime industry.

Combined Marine Cadet Admission Test



Proud moment for the Shipping Ministry as officials gather to celebrate the successful candidates of the Combined Marine Cadet Admission Test for the 2022-2023 session. Congratulations to all the future maritime leaders!

Combined Marine Cadet Admission Test of 2022-2023 session was held under the supervision of the Ministry of Shipping. 610 Cadets of Nautical and Engineering branches are admitted to various government and private marine academies.

Seminar on "Corruption Challenges in the Maritime Sector of Bangladesh and Way Ahead" held by BSMRMU

A seminar on "Corruption Challenges in the Maritime Sector of Bangladesh and Way Ahead" was arranged on 18 December 2022 by BSMRMU. The respected Commissioner (Enquiry) of the Anti-Corruption Commission, Bangladesh, Dr. Md. Mozammel Haque Khan graced the occasion as the Chief Guest, and the then Vice-Chancellor of BSMRMU, Rear Admiral M Khaled Iqbal (retd) attended as Special Guest. BSMRMU and Maritime Anti-Corruption Network, Bangladesh, jointly organised the seminar. Prof Captain Kazi Ali Imam, Chairman of Port and Shipping Management, BSMRMU, delivered the welcome speech. A good number of maritime experts and academicians from Denmark, Nigeria and host Bangladesh presented their papers at the seminar. Representatives from various ministries, different universities and maritime organisations were also present. The faculty members, students and officials of BSMRMU also attended the seminar.



Governing Body Meeting of BMA, Barishal



A glimpse of the 2nd Governing Body Meeting of Bangladesh Marine Academy, Barishal

The 2nd meeting of the Governing Body Bangladesh Marine Academy, Barishal, was held on 22 November 2022 at the Ministry of Shipping, Bangladesh Secretariat, Dhaka. Inspector (Academy/Institute) of BSMRMU attended the meeting.

2nd Foundation Training Course Certificate Distributed at BSMRMU

On 10 November 2022, certificates were distributed among the course participants of the 2nd Foundation Training Course organised by the Academic Quality Assurance and Evaluation Department of Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU). Prof Dr Dil Afroza Begum, UGC's Chairman (Addl. Charge), graced the occasion as the Chief Guest, and the university's Vice-Chancellor, Rear Admiral M Khaled Iqbal (ret'd), attended as the Special Guest. Treasurer, Registrar, deans, faculty members, officers, and staff participated in the programme. A total of 18 faculty members and officers of the university participated in the training course. The six weeks Foundation Training Course started on 02 October 2022. After distributing certificates, the Chief Guest and the Special Guest visited the university library, Liberation War Corner, and a few specialised Labs.



BSMRMU observes Victory Day



BSMRMU observed Victory Day-2022 on 16 December 2022 by hoisting the National Flag at sunrise. The then Vice-Chancellor, Rear Admiral M Khaled Iqbal (ret'd), graced the occasion as the Chief Guest. Documentary screening on Victory Day, poem recitation, and essay competition were held to observe the day. Alongside, BSMRMU Cultural Club organised a splendid cultural programme to mark the day. Later, prizes were distributed among the winners of all the competitions. Treasurer, Registrar, deans, teachers, students, officers and staff attended the programme. The event was streamed live on BSMRMU's official Facebook page.

BSMRMU Observes "Martyred Intellectuals Day"



As a part of observance of Martyred Intellectuals Day, a delegation of BSMRMU paid homage to Martyred Intellectuals by placing floral wreaths at the Memorial of Martyred Intellectuals at Rayerbazar in Dhaka on 14 December 2022. After placing the wreath, the team stood in solemn silence to show their profound respect for the martyred intellectuals. Furthermore, a discussion session was organised at the university auditorium. The university's treasurer delivered a speech gracing the occasion as the Chief Guest. In addition, photo and book exhibitions were organised in memory of the martyred intellectuals. Faculty members, students, officers, and university staff were present there. The event was streamed live on BSMRMU's official Facebook page. Later, a special prayer was offered for the eternal peace of the martyred intellectuals.

Workshop on E-Nothi Held at BSMRMU



A workshop on E-Nothi was held at Bangabandhu Sheikh Mujibur Rahman Maritime University on 1 October 2022. Prof Dr Dil Afroza Begum, Chairman (Addl. Charge) of the University Grants Commission of Bangladesh, graced the occasion as the Chief Guest by being present virtually. The then Vice-Chancellor of BSMRMU, Rear Admiral M Khaled Iqbal (retd), Member of UGC Professor Dr Md. Sazzad Hossain and Secretary of UGC Dr Ferdous Zaman attended as Special Guest. BSMRMU Officers and Staff of all levels participated in the workshop. As a part of building Digital Bangladesh and to ensure transparency and smoothening the official working process, the workshop was held in two batches.

On 57th Batch Cadets of BMA, Chattogram

A meeting was held at the Ministry of Shipping, Bangladesh Secretariat on 18 December 2022 regarding sending the 57th batch cadets of Bangladesh Marine Academy, Chattogram, to the sea-going ships 06 months before the training schedule. Inspector (Academy/Institute) participated in the meeting.

Bangladesh Naval Academy applied for BSMRMU affiliation

Bangladesh Naval Academy applied for affiliation (BBA in Logistics and Management and BSc (Hons) in Maritime Science programme) under BSMRMU. A committee has been formed for physical inspection at Bangladesh Naval Academy to check the capability and verify the application with attached documents as per BSMRMU college, academy & institute affiliation regulation, 2018.

On Pre-Sea Ratings Passing Out Ceremony



On 14 November 2022, the 7th Batch Pre-Sea Ratings Passing Out Ceremony was organised by International Maritime Academy, Gazipur. Inspector (Academy/Institute) attended that ceremony.

3rd Governing Body Meeting at Marine Fisheries Academy, Chattogram

The 3rd meeting of the Governing Body of Marine Fisheries Academy, Chattogram, was held on 28 November 2022. Inspector (Academy/Institute) was present at the meeting on behalf of BSMRMU.



Charting a course towards excellence in fisheries education: The 3rd meeting of the Governing Body of Marine Fisheries Academy, Chattogram, brings together key stakeholders to steer the academy towards producing highly skilled and competent fisheries professionals. Exciting times are ahead for the academy and the future of sustainable fisheries.

COMMON OCEANS FACTS

Tuna and Deep Sea Fishing in the Areas Beyond National Jurisdiction (ABNJ) - our Common Oceans



Approximately

7,000,000

tonnes of tuna
and tuna-like species
are landed yearly



Approximately

150,000

tonnes of deep-sea
species are landed yearly

Source



Food and Agriculture Organization
of the United Nations



95%

of the water in our oceans is located in the **ABNJ**

ABNJ take up

40%

of the planet

ABNJ cover

62%

of the oceans' surface



There are

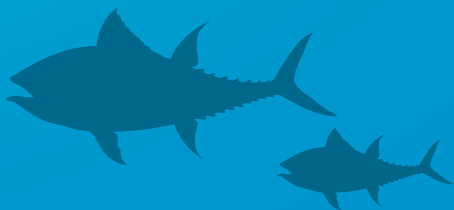
5

tuna Regional Fisheries Management Organisations

96

countries

are involved in the conservation and management of tuna



There are

8

deep-sea Regional Fisheries Management Organisations

30

countries

are involved in the conservation and management of deep-sea fisheries



The Prime Minister inaugurates the country's first metro rail system



Prime Minister Sheikh Hasina formally inaugurated the country's first metro rail on 28 December 2022. She opened a section of the Mass Rapid Transit (MRT) Line-6 by unveiling a plaque at the playground of Uttara sector-15 at 11:04 am. The section of MRT Line-6 connects the capital's Agargaon to Uttara North. The PM's younger sister Sheikh Rehana waved to the audience after the plaque was unveiled.

Prime Minister Sheikh Hasina highlighted the four milestones in the country's development that the inauguration of the metro rail has brought about.

The PM said that the metro rail in Bangladesh is a big achievement. Another milestone is that the trains will be run on electricity, making the project an environment-friendly one. The trains can be run remotely, and that is a milestone in the path towards a Smart Bangladesh. It will also mark the advent of high-speed trains in Bangladesh, she said, adding that the trains can reach a

speed of 110 kilometres per hour. She said the first phase of the metro rail has been inaugurated, and the rest will be inaugurated soon.

Apart from the PM, Bangabandhu's younger daughter Sheikh Rehana; Road Transport and Bridges Minister Obaidul Quader, Rawshan Ara Mannan, chairman of the parliamentary standing committee on road transport and bridges ministry; local AL MP Mohammad Habib Hasan, Road Transport and Highways Division Secretary ABM Amin Ullah Nuri, DMTCL Managing Director MAN Siddique; MRT Line-6 Project Director Aftab Uddin Talukder; new Japanese Ambassador to Dhaka Iwama Kiminori and JICA Chief Representative in Bangladesh Ichiguchi Tomohide took seats on the stage.

State Minister for Shipping sought support for the country's greener maritime industry projects



State Minister for Shipping Khalid Mahmud Chowdhury has called on the International Maritime Organisation (IMO) and major maritime partners to strengthen their support for Bangladesh's initiatives towards a greener maritime industry in the country by 2050.

"To transition to a greener maritime industry, Bangladesh, landlocked developing countries (LLDCs) and small island developing states (SIDS) require financial, technological, and knowledge support from the IMO and major maritime partners," the state minister said at the "50 Years of Bangladesh Maritime Industry: The Road to Decarbonisation" organised by the Bangladesh High Commission in London during the 128th IMO Council held in IMO headquarters in the same city on 2 December 2022.

Bangladesh High Commissioner to the UK and Permanent Representative of Bangladesh to the IMO Saida Muna Tasneem said, "The government under the pro-climate leadership of Prime Minister Sheikh Hasina has set a vision and a mission for decarbonisation of the country's shipping sector by 2050 in line with initial IMO GHG reduction strategy."

At the event, IMO Secretary-General Kitack Lim commended the Bangladesh government for improving the country's ship recycling, environmental and safety standards. He also assured the IMO's continuous support to Bangladesh in its transition to a greener shipping industry.

Secretary of the Ministry of Shipping, Ports and Waterways and the head of the Indian delegation to the IMO Council Sanjeev Ranjan called for the full restoration of water connectivity between Bangladesh and India, which would be a significant step forward towards decarbonisation.

Bangladesh Commodore Md Nizamul Haq, director-general of the Department of Shipping, presented the keynote paper on Bangladesh's roadmap to achieving a greener shipping industry.

A multifunctional dike will be built at the Cox's Bazar Sea beach

Plannings are underway to construct a multifunctional dike at Cox's Bazar to protect the sea beach from erosion, like the one the Dutch had built at Rotterdam in the Netherlands, according to a source to the parliamentary standing committee on the ministry of civil aviation and tourism.

Earlier the parliamentary committee recommended taking steps to modernise the design for protecting the sea beach and increasing the width of the beach. Later the ministry informed the committee that according to the prime minister's words, sustainable and coordinated development designs have been prepared for the construction of multipurpose dikes following the IWM feasibility study.

Another recommendation put forth by the parliamentary committee asked for providing a lasting solution for the break of the sea beach taking into consideration the actions taken by other developed countries utilising technology. After reviewing the different steps taken by the developed countries to hold back the sea, it was decided to build dikes at several points in Cox's Bazar like the multifunctional dike built at Rotterdam in the Netherlands.



The Indo-Pacific Outlook of the IORA has been adopted

The 22nd Council of Ministers (COM) meeting of the Indian Ocean Rim Association (IORA) has adopted the 'IORA's Outlook on the Indo-Pacific' (IOIP) which would guide the enhancement of IORA's engagement in the Indo-Pacific region.

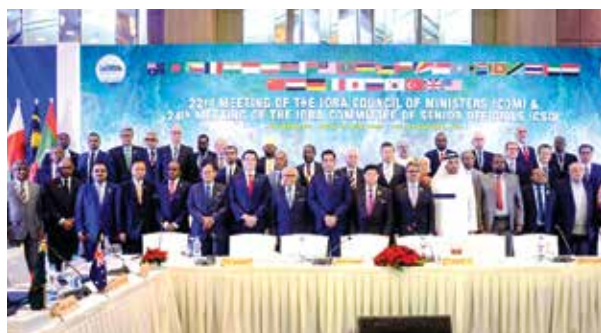
India led the process of development of the IOIP. The ministers also endorsed India's candidature for IORA Vice-Chair for the period 2023-25. The IORA Dhaka Development Initiative is now renamed as IORA Development Initiative.

"There is good progress to establish the initiative. We hope that it will be finalised by early next year," said Foreign Minister Dr AK Abdul Momen.

The Ministers met Prime Minister Sheikh Hasina jointly on 25 November 2022. India participated in the 22nd COM meeting of the Indian Ocean Rim Association (IORA) held in Dhaka on 24 November.

The Indian delegation was led by Minister of State External Affairs Dr Rajkumar Ranjan Singh.

IORA is the largest and pre-eminent organisation in the Indian Ocean Region with 23 members and 10 dialogue partners.



The government is striving to save rivers and the environment: State Minister for Shipping



State Minister for Shipping Khalid Mahmud Chowdhury MP said Prime Minister Sheikh Hasina had taken steps to protect the rivers around Dhaka from encroachment and pollution in

1998. But after the elections in 2001, no further steps were taken to protect the river and the environment. Bangladesh has been affected by this. Rivers and the environment of Bangladesh have been damaged.

The state minister made these remarks in his speech as the Chief Guest at the National Workshop on the Draft Report on 'Shifting Dockyards along Buriganga River to Appropriate Places' at CIRDAP Auditorium in Dhaka on Monday.

Khalid Mahmud said Prime Minister Sheikh Hasina has taken many steps to maintain the navigability of the rivers in the last 14 years. Various types of dredgers and special dredgers have been procured, large-scale projects have been undertaken. The country is progressing in all the indicators. The waterways, shipyards and dockyards need to be environmentally friendly and of international standards.

After 21 years, Awami League came to power in 1996 and, as the founder, Sheikh Hasina began talking about rivers and the environment.

Secretary of the Ministry of Shipping Md. Mostofa Kamal and Chairman of the National River Conservation Commission (NRCC) Dr Manjur Ahmed Chowdhury also spoke on the occasion. Chairman of BIWTA Commodore Golam Sadeq presided over the meeting.

Bangladesh and Sri Lanka will improve maritime connectivity and cooperation



The second secretary-level meeting between Bangladesh and Sri Lanka on maritime cooperation will be held in Colombo within the quickest possible time to identify the possibilities and areas of cooperation in maritime connectivity. The information was revealed at a bilateral meeting between the two countries at the conference room of the Shipping Ministry at the Secretariat.

State Minister for Shipping Khalid Mahmud Chowdhury and visiting Sri Lankan Foreign Minister MUM Ali Sabry led the delegations of their respective sides at the meeting.

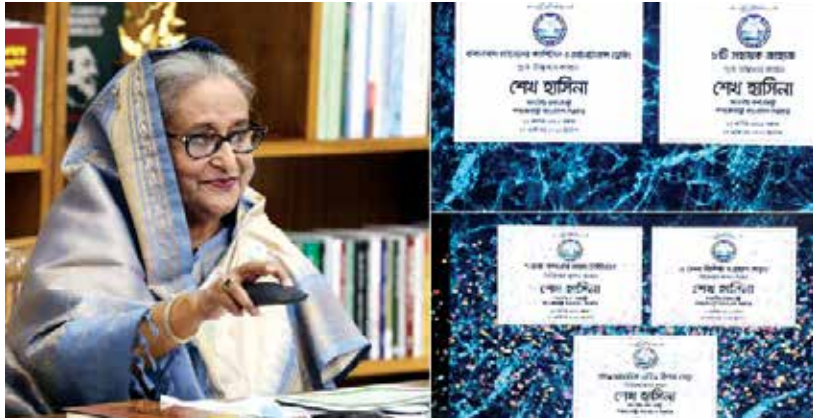
The meeting was apprised that Bangladesh and Sri Lanka are working together to increase maritime connectivity and expand maritime cooperation by determining the scope of mutual benefit.

In the meeting, discussions were held on the Coastal Shipping Agreement between Bangladesh and Sri Lanka and Standard Operating Procedure (SOP) for launching feeder services between Sri Lankan Shipping Corporation and Bangladesh Shipping Corporation.

Earlier, the first secretary-level meeting between Bangladesh and Sri Lanka on maritime cooperation was held in Dhaka in 2019. But, the second meeting has been delayed due to the Covid-19 pandemic.

Shipping Secretary Md Mostafa Kamal, Sri Lankan High Commissioner in Dhaka Professor Sadharshan Seneviratne were present at the meeting, among others.

PM launches development plans for Payra Port



On 27 October 2022, Prime Minister Sheikh Hasina inaugurated and laid the foundation stones of several development schemes involving Tk11,072 crore at the Payra Port to make the port into a world-standard facility.

From her official Ganabhaban residence, she virtually inaugurated the development schemes that include capital dredging of the port, launching of eight ships, the first terminal and construction of a six-lane approach road and a bridge.

The capital dredging of the seaport's Rabnabad channel will create a 75km-long, 100-125 metre-wide and 10.5-metre-deep channel, building a capacity to dock 40,000 tons of cargo or 3000 container-laden ships at the port.

The capital dredging channel will cost an estimated amount of Tk4,950 crore while Belgium-based dredging company Jan De Nul will carry out the dredging work.

After completion of the construction work of the first terminal at a cost of Tk4,516.75 crore, three foreign ships carrying containers or bulk cargo will be able to dock simultaneously at the Payra Port. It will be open for operation by December 2023. The 6.35km-long six-lane approach road is being constructed by the Roads and Highways Department (RHD).

A 1,180-metre-long bridge will be built at a cost of Tk740 crore over the Ancharmanik river to transport goods to the Payra Seaport. The bridge is expected to be constructed in 30 months (two and a half years).

The Prime Minister inaugurated the Payra Port on 19 November 2013 and so far, 236 sea-going ships have arrived at the port, through which about Tk548 crore in revenue has been earned.

State Minister for Shipping Khalid Mahmud Chowdhury, MP, Shipping Secretary Md Mostafa Kamal and Payra Port Authority Chairman Rear Admiral Mohammad Sohail spoke at the function held at Payra Port, Kalapara in Patuakhali.

Six more sailor training centres will be established: State Shipping Minister

The state minister for shipping Khalid Mahmud Chowdhury has said six more educational and training institutes would be established to produce trained and skilled sailors. He said this while speaking as the Chief Guest at the golden jubilee and ex-cadets' reunion at the Deck and Engine Personnel Training Centre (DEPTC) at Sonakanda of Narayanganj on 23 October 2022.

Khalid Mahmud Chowdhury said, Prime Minister Sheikh Hasina has built many DEPTCs, marine academies and the National Maritime Institute (NMI). Currently, we have three DEPTCs at Narayanganj, Barisal and Madaripur. Two more DEPTCs would be established at Kurigram and Gaibandha, he added.

In addition to Chittagong, the Awami League government established an NMI at Madaripur while construction of another NMI at Kurigram is currently underway.

The shipping minister said, over the last 14 years prime minister Sheikh Hasina has transformed the country into 'Sonar Bangla' as predicted by Bangabandhu. She has expanded Chittagong port, built Payra port in the southern region while building of a deep-sea port at Matarbari is currently underway.

Principal of DEPTC Captain Md Shahjahan presided over the ceremony. Present among others were BIWTC Chairman Ahmed Shamim Al Raji, BIWTA Chairman Commodore Golam Sadek and Director General of Shipping Department Commodore Md Nijamul Haque.



Government and ADB signed \$628m deals for infrastructure, coastal development and climate projects

The government and the Asian Development Bank (ADB) on 26 December 2022 signed loan and grant agreements worth \$628 million for the implementation of three infrastructural development and climate resilience projects.

The ADB will provide \$278 million in loans for the "Third Public-Private Infrastructure Development Facility (Tranche 2)", \$100 million for the "Greater Dhaka Sustainable Urban Transport Project (BRT-Gazipur)", \$246 million for the "Coastal Towns Climate Resilience Project" and a grant of \$4 million for the "Coastal Towns Climate Resilience Project".

Alamgir Morshed, executive director and CEO of Infrastructure Development Company Limited, Quazi Muhammad Ferdous, chief engineer of Bangladesh Bridge Authority, and representatives of designated municipalities were present at the signing ceremony.

Bangladesh signs four bilateral instruments with Brunei



Bangladesh and Brunei Darussalam have signed four instruments on cooperation in the areas of energy, aviation, manpower recruitment and recognition of certificates for two countries' seafarers to take their bilateral relations to a new height.

The documents were signed after the fruitful bilateral talks between the delegations of Bangladesh and Brunei Darussalam at the Prime Minister's Office in Dhaka on 16 October 2022. Prime Minister Sheikh Hasina led the Bangladesh delegation at the talks, while the Brunei Darussalam delegation was led by visiting Brunei Darussalam Sultan Haji Hassanal Bolkiah Muizzaddin Waddaulah.

The agreement is related to the air services while the memorandums of understanding (MoUs) are on employment and recruitment of Bangladeshi workers, cooperation in the supply of LNG and other petroleum products, and recognition of certificate issued under the provision of the International Convention on Standards of training, certification, and watch-keeping for seafarers. Prime Minister Sheikh Hasina and Brunei Darussalam Sultan Haji Hassanal Bolkiah Muizzaddin Waddaulah witnessed the signing ceremony.

Bangladesh State Minister for Civil Aviation and Tourism Md Mahub Ali and Brunei Minister at the Prime Minister's Office and Minister of Finance and Economy Dr Amin Abdullah signed the agreement on air services. Besides, Expatriates' Welfare and Overseas Employment Minister Imran Ahmad and Minister of Home Affairs Ahmaddin Bin Haji Abdur Rahman put pen to the MoU on Employment and Recruitment of Bangladeshi Workers. State Minister for Power, Energy and Mineral Resources Nasrul Hamid and Brunei Minister at the Prime Minister's Office and Minister of Finance and Economy Dr Amin Abdullah signed the MoU in the field of cooperation in the supply of LNG and other petroleum products. Besides, an MoU on 'Recognition of Certificates Issued Under the Provisions of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 as Amended' was signed. The MoU was signed by Bangladesh's State Minister for Shipping Khalid Mahmud Chowdhury and Brunei's Prime Minister's Office Minister and Finance and Economy Minister Amin Abdullah.

Patenga Container Terminal opens its doors to protect food safety

The Patenga Container Terminal (PCT) of Chittagong Port Authority (CPA) started its operational activities temporarily by berthing a ship loaded with rice on 16 November 2022.

The vessel MCL-19, loaded with 2,650 tonnes of rice imported from Myanmar, was berthed at the PCT.

The unloading of food grains from the ship started formally after a prayer.

The agent of the ship is Seven Seas Shipping Lines Limited and the stevedore is W Khan Company Limited.

Chairman of CPA Rear Admiral M Shahjahan said, "We berthed a ship loaded with food grains at the PCT last evening. The unloading of food grains (rice) started on 16 November. We are temporarily operating the PCT to unload the food grains as per a directive from the Prime Minister's Office to take necessary action for importing food grains through Chittagong port on a priority basis. So, we are berthing the ships loaded with food grains at the PCT now."

He added, "The PCT is ready for inauguration, and it is handling bulk carriers on the first day and geared container vessels thereafter on a priority basis."

Construction work of the PCT has just been completed at a cost of Tk12,995.8 million, funded by the CPA. A total of three container ships 190 metres in length and 9.5 meters in drafts can be berthed at the PCT at a time. Besides, one oil tanker of 290 metres in length can be berthed at the Dolphin Jetty of the PCT.

Maersk set to launch Bangladesh-India inland services after successful trials



Pilot runs on four inland waterways, intended to establish the feasibility of using Bangladesh ports as a transit point to and from landlocked East India have been successful.

Maersk has no definite timeline for the start of services, but said the company was in discussions with potential customers.

Kolkata Port (SMPK) led the project, under the purview of a "government-to-government inland water transit and trade protocol", which included partnership arrangements with Maersk Line (India) and Gurugram-based CJ Darcl Logistics.

Of the four trials, the Mongla-to-Tamabil and Mongla-to-Bibirbazar legs were made with Maersk, and the other two, Chittagong-to-Sheola and Tamabil-to-Chittagong, were carried out with CJ Darcl, the port authority said.

Officials at SMPK said backhaul trials also yielded positive results, allaying industry concerns about the long-term sustainability of this project.

In parallel, the Danish carrier is cementing its landside infrastructure in Bangladesh as that cross-border regional push takes a final shape, including a new 9,300 sq metre warehousing facility, announced yesterday.

Maersk Signs Green Methanol Deal with SunGas

Fisheries and human rights observers in Indonesia are calling for a revamp of the country's fisher training programme ahead of a scheduled evaluation of measures to protect maritime workers at home and overseas. Maersk has signed a letter of intent to offtake green methanol from SunGas Renewables' US production facilities. Maersk intends to offtake full volumes of green methanol from multiple facilities US-based SunGas Renewables will develop, Maersk's ninth-such green methanol deal globally.

SunGas' first facility is expected to begin operation in 2026 and will have an annual production capacity of 390,000 tons; the company announced the development of further facilities to support its partnership with Maersk. The partners define green fuels as those with a 65%-95% reduction in lifecycle CO2 emissions compared to fossil fuels. SunGas will use residues from forestry and wood production as feedstocks for its facilities, using sustainable sourcing methods, it said.

"Securing green marine fuels at a global scale within this decade will require rapid scale-up of green methanol production capacity using a variety of technology and feedstock pathways. We are very pleased to welcome SunGas Renewables as a strategic partner in our efforts to achieve our goal of net zero greenhouse gas emissions in 2040 across our entire business, and to ensure meaningful progress is made within this decade in line with the Paris Agreement", says Emma Mazhari, Head of Green Sourcing and Portfolio Management, A.P. Moller - Maersk.

Maersk has 19 methanol-fuelled containerships on order and has struck methanol supply deals with SunGas, Carbon Sink, CIMC ENRIC, Debo, European Energy, Green Technology Bank, Orsted, Proman, and Wastefuel.



Saudi Arabia and Egypt Sign MoU on Mutual Recognition of Maritime Certificates



The Kingdom of Saudi Arabia, represented by the Transport General Authority (TGA), signed a memorandum of understanding on mutual recognition of seafarers' certificates between the government of the Kingdom and the government of the Arab Republic of Egypt.

The memorandum of understanding was signed by the Acting President of TGA, Dr Rumaih bin Mohammed Al-Rumaih, and from the Egyptian side, Chairman of the Board of Directors of the Egyptian Authority for Maritime Safety (EAMS), Rear Admiral Hussein Mustafa Al-Jaziri, in the presence of the Saudi Ambassador to Egypt, Osama bin Ahmed Naqli.

During the signing ceremony for MoU, the Saudi Ambassador to Egypt exchanged documents ratifying the agreement concluded between the two fraternal countries in the field of maritime cooperation.

The signed MoU comes with the aim of recognising the education, training and qualifying certificates for seafarers working on ships between the Kingdom and Egypt, and to implement the provisions of the International Convention (STCW) of 1978 and its amendments regarding levels of training, certification and shift work for seafarers, and to ensure the efficiency of officers and seafarers working on board ships belonging to the two countries and their eligibility to carry out and carry out their duties in order to achieve optimal standards of maritime safety, property protection, preservation of the marine environment, and the fulfilment of the requirements related to the duties of each of them while carrying out their work on board ships, the memorandum will also enhance aspects of coordination and joint work between the two countries in setting the frameworks and legislation necessary to implement its requirements and provide educational and training programmes and evaluation mechanisms to grant certificates to seafarers of the two countries.

MOU Signed Between SSA and ClassNK to Establish Framework for Cooperation on Cyber Security Research Activities



Singapore Shipping Association (SSA) and ClassNK have signed an MOU (Memorandum of Understanding) to establish a framework for cooperation in cyber security research activities.

Cyber security has been acknowledged by the maritime industry as a key element to keep ships safe during operations, and to ensure its solid and steady digital transformation in coming years. Singapore, being a global maritime hub that connects regional and global markets, is ideally positioned for such research activities that eventually contribute to reinforcing the cyber resilience of the global supply chain to be launched.

With the signing of the MOU, the two parties will conduct joint basic research concerning establishing vessels' cyber security operation centres that provide crew members with support from onshore in monitoring and responding to cyber events onboard. Based on expertise and

experience gained from this research, SSA and ClassNK will work on drafting a joint white paper on the finding of the research and developing education and training plans for personnel to work for vessels' cyber security operation centres jointly.

Remote-controlled Microscopes Bring Complex Biology Education to Students Worldwide



In many communities around the world, students' ability and enthusiasm to pursue STEM fields in their high school and college careers are limited by a lack of resources which prevents them from accessing complex, project-based curricula like their

peers. The COVID-19 pandemic has exacerbated these existing educational inequalities, requiring new solutions to democratise access to this field.

UC Santa Cruz researchers have developed a method for using remote-controlled, internet-connected microscopes to enable students anywhere in the world to participate in designing and carrying out biology experiments.

A new study in the journal *Heliyon* details this novel and scalable framework for bringing project-based STEM education to students who otherwise would not have access. The researchers implemented the microscope technology in the biology classrooms of several Latinx communities in the United States and Latin America and found their technology to be an effective and scalable approach for giving students underrepresented in STEM the ability to conduct complex experiments remotely.

"We are allowing students to do experiments that are normally not feasible for schools around the world, either because the materials are hazardous or because the equipment is expensive or requires specific training for both the teachers and the students," said Mohammed Mostajo-Radji, the senior researcher on this study.

Arctic Ocean Acidifies Up to Four Times Faster Than Other Seas

A new peer-reviewed study published in *Science* concludes that parts of the Arctic Ocean are absorbing CO₂ at a shockingly high rate up to four times faster than other oceans. The researchers correlate this rapid acidification to the melting of sea ice.

The Arctic Ocean is commonly considered a bellwether for how climate change and rising temperatures are affecting the planet and its ecosystem. Research has long suggested that the Arctic is warming at around four times the rate of the rest of the planet.

A new study by researchers at the Polar and Marine Research Institute at Jimei University, China, and the School of Marine Science and Policy at the University of Delaware in the US, now adds another dimension to how the changing climate is affecting the region, suggesting that large parts of the Arctic Ocean have been absorbing CO₂ up to four times faster than the global oceans.

Researchers identified sea ice loss as the primary cause for this development and outlined several mechanisms through which the ocean absorbs CO₂ at an accelerated rate as the ice melts.

The study uses data sets derived from 47 Arctic research voyages between 1994 and 2020 to examine how sea ice loss and increased CO₂ in the atmosphere have resulted in enhanced acidification in the Arctic.

World Maritime University Celebrates 2022 Graduation

On October 31, 2022, the global maritime leaders of tomorrow graduated from the World Maritime University (WMU). The Class of 2022 has received the education required to contribute to maritime and ocean matters in their home countries and more broadly to the implementation of the United Nations Sustainable Development Goals (UN SDGs). Overall, the graduating class includes 276 graduates from 70 countries and sets a record of 94 women graduates.

WMU President Dr Cleopatra Doumbia-Henry delivered welcome remarks highlighting the return of the first "normal" graduation since 2019 due to the COVID-19 pandemic. She congratulated the graduates and highlighted the importance of the WMU alumni network which will be particularly crucial in the years to come as there are only eight years left to achieve the United Nations 2030 Sustainable Development Goals. "You will have battles to fight, you will need to be careful and strategic in accomplishing your goals. But, together you will be able to make change happen, and the world will be a better place, thanks to your efforts," she said.

The Guest of Honour was Mr Emanuele Grimaldi, President and Managing Director of Grimaldi Euromed and Chairperson of the International Chamber of Shipping (ICS). He spoke of the urgent and serious environmental issues and the responsibility of the entire shipping sector to demonstrate the ability to turn the tide in addressing decarbonisation and contributing in a significant way to the United Nations Agenda for Sustainable Development. "Only a common global solution can solve a common global problem," he said.

Of the 276 graduates, 131 are from the Malmö MSc programme, and 63 graduates from the China programme, making a total number of 194 MSc graduates in 2022; four PhD graduates; 2 MPhil graduates, and 76 graduates from the distance learning programmes including 8 LLM graduates. The 2022 graduation ceremony brings the total number of WMU graduates to 5,910 from 171 countries.



UNGA Lauds Success of Law of Sea Convention but Deplores Sea-Level Rise, Lack of Support for Small Island Nations, Increased Maritime Risks



Celebrating the forty years of marine multilateralism ushered in by the adoption of “the constitution of the oceans,” speakers in the General Assembly today underscored the need to continue that tradition with a binding instrument on sustainable use of marine biological diversity of areas beyond national jurisdiction.

In opening remarks, General Assembly President Csaba

Kőrösi (Hungary) reminded delegates that the United Nations Convention on Law of the Sea has given the international community a common language on the management of oceans, from navigational rights to maritime borders. The document represents multilateralism done right, he said, also calling on States to elaborate the text of a legally binding instrument under that Convention for the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. As a Māori proverb puts it, he reminded delegates that “we are all in the same canoe”.

The Convention is more relevant than ever, António Guterres, Secretary-General of the United Nations, said, noting its near-universal acceptance. Calling on the international community to end the false dichotomy between profit and protection of the ocean, he said that developing countries, especially small island developing States, must be supported, as they balance the need for thriving coastal economies with the need to preserve the ocean and its seas for future generations.

Delegates also heard from Albert Hoffmann, President of the International Tribunal for the Law of the Sea, who said the Convention continues to be relevant to new challenges because of its comprehensive definition of pollution and system for the compulsory settlement of disputes. Michael Lodge, Secretary-General of the International Seabed Authority, reminded delegates that from the outset, the Convention was a “package deal”. Expressing concern over States parties promoting visions that radically change the rules of engagement, he stressed that such behaviour risks undermining the law of the sea.

Biofuels Use in the Shipping Industry Could Soon Gain Traction

The use of biofuel blends in the shipping industry could become the norm in the following years, as they seem to make a lot of sense, as a stop-gap solution, until fossil fuel alternatives are available at a larger scale. In its latest weekly report, shipbroker Gibson said that “liquid biofuels are expected to have an important role to play in meeting future fuel requirements as the energy transition progresses and petroleum demand begins to come under pressure. Increasingly, these required biofuels will be from second and third-generation biofuels based on non-food crops, nonarable land, and waste products, whilst fourth-generation biofuels will expand the possibilities even further through production optimisation improving yields, reducing production emissions, and improving chemical performance through genetic engineering. The EU Fit for 55 packages of policies makes it clear that future biofuel supply must be at least from second-generation blends not competing with food supply”.

According to Gibson, “in terms of potential growth areas, the most promising sectors in terms of demand are likely to be the shipping and aviation sectors, given the specific fuel requirements of those sectors with respect to logistics and practicality. In contrast, road fuel demand most likely will be supplanted by electric vehicles (EVs). In its World Energy Outlook (WEO), the IEA is forecasting liquid biofuel demand to grow from 2.2 million barrels of oil equivalent per day (boepd) in 2021 to 3.4 million boepd in 2030 and 5.3 million boepd by 2050 under the IEA Stated Policies Scenario (STEPS), which reflects current policy frameworks. However, forecasted demand increases under their Announced Pledges Scenario (APS) and Net Zero Emissions by 2050 Scenario (NZE), where the speed and progress of the energy transition are assumed to move at an accelerated pace versus the current trajectory”.

Acta Marine Turns to Castor Marine to Integrate Starlink



Shortly after the announcement of Castor Marine being an Authorised Starlink Reseller, the company signed a contract to outfit Acta Marine’s Walk-to-Work vessels with Starlink connectivity. This includes the two Methanol MDO/HVO-powered DP2 Construction Service Operating Vessels (CSOVs) that Acta Marine ordered earlier in 2022. Castor Marine already manages Acta Marine’s entire fleet connectivity. Starlink will be integrated with the existing onboard communications infrastructure.

Low Earth Orbit (LEO) satellite communications at sea are becoming increasingly important, because of their ability to provide high-speed Internet at very low latency. With this project, Castor Marine’s strategy to offer Starlink to its portfolio is already paying off. The W2W vessels will each get four Starlink antennas and the full Fortinet suite for secure SD-WAN and SD-LAN network connectivity. This means that onboard operational and Crew Internet

traffic is secure and fast, i.e., a download speed of more than 500 Mbps.

Castor Marine already serves Acta Marine’s fleet of offshore and DP2 workboats with VSAT and Iridium Certus services and recently installed the new Internet security infrastructure as well. This is important, as good communication between all parties involved in an installation or maintenance project is the basis of successful and safe offshore operations. This goes especially for Acta Marine’s fleet and crew whose combined capabilities mean that work can be performed around the clock in harsh offshore conditions.



A scuba diver encounters fish swimming around a reef in the Maldives

Ocean Stories of 2022

The biggest saltwater discoveries of the year included astounding ones

Maritime Campus desk

In 2022, the Great Barrier Reef underwent its fourth mass bleaching episode in the previous seven years, and a NASA assessment showed that sea level rise is quickening. The largest marine story of the year was the effects of climate change on the world's seas, but many more incredible saltwater achievements merit recognition. A seagrass was discovered to be the largest plant in the world, and 60 million icefish were discovered to be nested together off the coast of Antarctica. Researchers also observed the record impact of an underwater eruption and helped to solve the mystery of one of the most unusual animal migrations in the world.

From marine conservation efforts to extreme weather events, the world's oceans were at the center of many significant developments this year. In case you missed any of the biggest saltwater happenings,

here's a compilation of the major ocean news of the year, featuring the most noteworthy stories from around the globe.

A slippery eel was pinned down

The European eel population has decreased by 98% since the 1980s, placing it on the International Union for Conservation of Nature's highly endangered list. Fishery management can prevent the eel from going extinct by using any new information about the animal's life cycle (it can live in fresh and saltwater). But the species has long baffled naturalists and biologists.

The eel's complex life cycle has made it challenging for biologists to comprehend its reproductive biology, particularly the rumoured



A European eel swims in the Baltic Sea

mystery of trans-Atlantic migration that all eels make after their lives. This year, five European eels were tracked by satellite tagging as they travelled from the Azores to the Sargasso Sea. The knowledge that eels migrate to the Sargasso Sea was previously based on a 1922 study of their larvae; since the tiniest larvae were found there, it was assumed that this is where they hatch. This discovery is a great success for researchers seeking to comprehend eels to help the animal recover because no spawning eels or eggs had ever been identified in the Sargasso Sea.

Authorities halt a fishing season

The dangers of crabbing were first brought to light by the Discovery Channel television programme “Deadliest Catch,” but the fishing business is now at risk of extinction. Due to a near-decline in the crab

A red king crab. Alaska's snow crab, blue king crab and red king crab seasons were shut down for the 2022-2023 season. NOAA via Wikimedia Commons under CC BY-SA 2.0



population, the snow crab fishing season was suspended for the first time. The disappearance of the crabs is attributed to climate change by National Oceanic and Atmospheric Administration (NOAA) scientists. However, they are still determining whether warming water has caused the crabs to leave their historical habitat, hindered larval development, brought in new diseases, or had some other effect. According to NOAA, the average yearly revenue of the business is over \$100 million, and its demise would leave people who depend on commercial fishing as their main source of income while the season is closed.

Researchers identified the world's largest plant

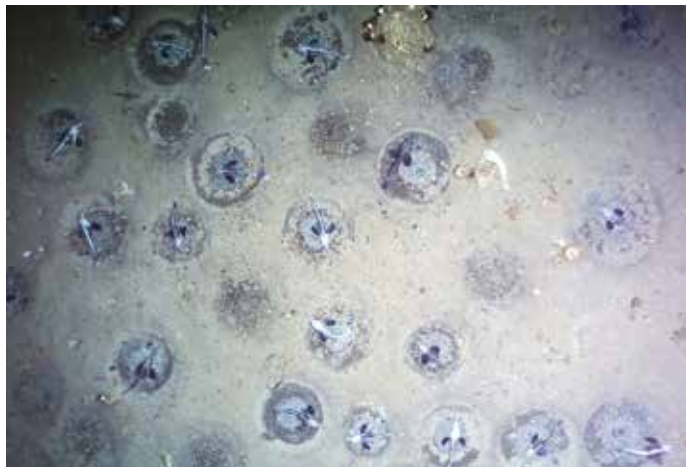
Scientists have discovered that one plant is actually a seagrass bed of Poseidon's ribbon weed (*Posidonia australis*) in the coastal waters of Shark Bay, Australia. The enormous creature occupies 77 square miles. As researchers started examining the genetic makeup of the seagrass bed to ascertain how genetically diverse the seagrasses were, they discovered that every single shoot was genetically identical, making them all clones. This indicates that the seagrass developed from a single seed into a sizable bed over time. The seagrass bed took 4,500 years to reach its present extent since Poseidon's ribbon weed grows at a pace of roughly 14 inches each year.



*The seagrass *Posidonia australis* Rachel Austin via the University of Western Australia*

Scientists discovered a fish metropolis

As described in a report published in *Current Biology* in January 2022, a trip to the ocean's depths off the coast of Antarctica yielded a startling discovery. An area the size of a small city was covered by 60 million icefish nests, according to scientists. Only about 60 nests could be found at previously discovered sites. This region of the Weddell Sea has a substantial upwelling area, where deep water rises to the surface, which first piqued the curiosity of scientists. The seafloor's lowest layer of water is over 3 degrees Fahrenheit warmer than the surroundings. The scientists were astounded by what they discovered after the MV *Polarstern* carried a sizable camera gadget across the ocean floor. As far as the eye could see, there were only fish nests. Experts think that the icefish that are nesting are utilising the warmer water to hasten the incubation of their eggs.



Icefish in the Weddell Sea PS118, AWI OFOBS team

Researchers found Endurance

Following the tragic loss of his ship, the *Endurance*, to an ice floe on a voyage to Antarctica in 1915, Ernest Shackleton is renowned for leading his crew to safety. The ship's fate has been a mystery for more than a century, but this year a dedicated team of explorers located the ruin.

Researchers on the *S.A. Agulhas II* employed two submersibles to examine the seafloor over a 150-square-mile area. Despite being coated in anemones and other deep-sea animals, the ship was discovered after two weeks of searching 9,842 feet below the surface in the centre of the Weddell Sea.

Researchers and explorers around the globe celebrated the discovery, noting the difficulty of such an undertaking in such remote and treacherous waters.



The *Endurance* was last seen by Ernest Shackleton's crew in 1915 before it slipped under the icy surface. Falklands Maritime Heritage Trust and National Geographic

A deadly eruption rocked Tonga

The South Pacific undersea volcano Hunga Tonga-Hunga Haapai erupted in January of this year, sending ash and water 35 miles into the atmosphere—the greatest plume ever seen. An atmospheric shock wave and a tsunami wave were sent worldwide by the enormous eruption. Tragically, six Tonga residents perished, while the explosion's isolated location probably prevented more deaths.

The plume ascended to such heights that it entered the mesosphere. Scientists used stationary weather satellites instead of the conventional way to measure the height of the ash plume, which resulted in more accurate measurements. Only in the past ten years has such technology become available, and it has greatly aided studies of the enormous marine explosion. But compared to their terrestrial counterparts, underwater volcanoes are less well understood, and the creative research helped fill up some knowledge gaps.

COP27 went blue



The Ocean Pavilion hosted about 60 sessions during COP27. Veronique LaCapra, Woods Hole Oceanographic Institution

The effects of climate change on oceans are significant. Our oceans are getting hotter and more acidic, and melting sea ice is raising the sea level worldwide. Many ocean issues and potential solutions were brought to light at the COP27 United Nations Climate Change Conference held in Egypt this November.

No matter how much carbon is removed from our atmosphere, scientists warned that there is a good chance there won't be any sea ice in the Arctic Ocean during the summer months. New shipping routes will be consistently available as a result, but species that depend on sea ice for survival may need to adapt dramatically and may suffer as a result. Hope was also on the menu at the meeting, despite data that emphasised the detrimental effects of a warming climate on the ocean. In order to encourage governments, ports, and businesses to modernise the industry using sustainable practises and green technologies, the United States and Norway created the Green Shipping Challenge. A Mangrove Breakthrough target was also established by the Global Mangrove Alliance and the United Nations Climate Change High-Level Champions to offer a framework for restoring and preserving this crucial ecosystem. The conference included an Ocean Pavilion for the first time so that attendees could learn more about how climate change will affect the ocean.

Scientists fill in details of fish evolution

Two fossils "beds," or deposits, discovered by archaeologists in China are teeming with fossils that help us understand how fish developed. The diverse fossils, which date back more than 400 million years, include the earliest complete jawed fish known to science, a cartilaginous fish related to later sharks and rays with unusual armour-like plates, and a jawless fish with fins that may have served as the ancestor of land animals' arms and legs. These discoveries were made public in a study highlighting the fact that there is still much to learn about the development of jawed vertebrates. We also have a lot more to learn about the maritime ecosystems these organisms live in.

Difference Between the Bay of Bengal & Andaman Sea

Masiat Alam Zubair

The Bay of Bengal and the Andaman Sea are part of the Indian Ocean and situated northeast of the Indian ocean. From a geological point of view, there are some differences between these two water bodies. We can easily differentiate these two from the etymology because one is a bay and the other a sea. The sedimentation, tectonic evolution and the source region of sediments to these water bodies also vary. The Bay of Bengal is a much larger basin than the Andaman Sea. This two occurred very closely. The Andaman & Nicobar Islands are the boundary line between the Bay of Bengal and the Andaman Sea. The Andaman and Nicobar Islands' strait allows water to flow from the Andaman Sea to the Bay of Bengal. Though there are many variations and standard features from physical perspectives, we will find only the geological effects and differences here.

The Bay of Bengal is an extended northern part of the Indian Ocean, located between latitude 20 degrees north to 7 degrees south and longitude 80 degrees east and 100 degrees east. The Andaman Sea is roughly between the Indochina and Malacca peninsulas in the east, a partially contained sea of the Indian Ocean—Sumatra in the south, and the Andaman and Nicobar Islands in the west.



The Map of the Bay of Bengal

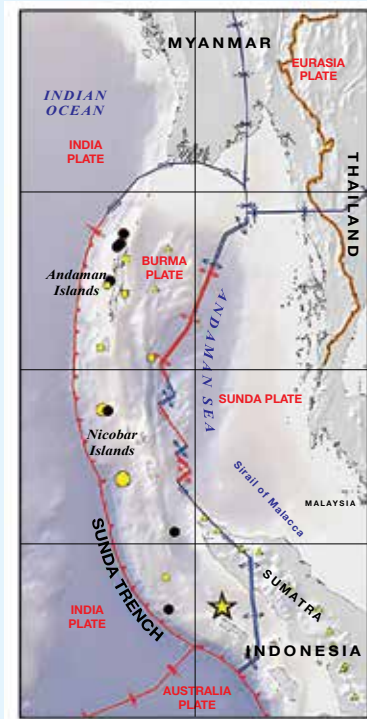
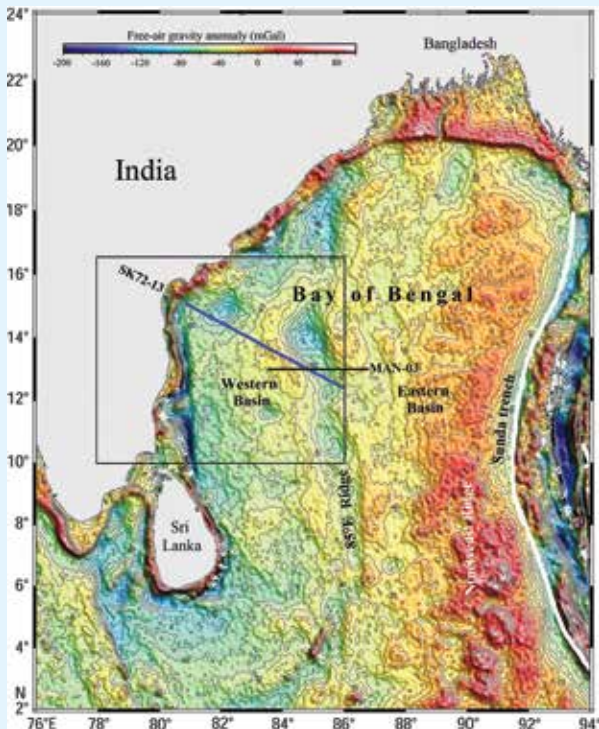
| Characteristics | Bay of Bengal | Andaman Sea |
|-----------------|--|---|
| Type | Bay | Sea |
| Location | 15° N 88° E | 10° N 96° E |
| Surface Area | 2,600,000 sq. km | 797,000 sq. km |
| Maximum Length | 2090 km | 1200 km |
| Maximum Width | 1610 km | 645 km |
| Average Depth | 2600 m | 1096 m |
| Maximum Depth | 4694 m | 4198 m |
| Basin Countries | Bangladesh; India Indonesia; Myanmar Sri Lanka | India; Indonesia Malaysia; Myanmar Thailand |

Formation of the Bay of Bengal & Andaman Sea

The Bay of Bengal is an extended part of the Bengal basin. Bengal basin is the southeastern part of the Indian Ocean. So, to know the formation of the Bay of Bengal, we must know about Indian plate tectonics. As we know Indian basin collided with the Eurasian Plate and formed the Himalayan. But once upon a time,

it was attached to Antarctica and some other plates continents. As days passed, these plates separated and made another continent. The Bay of Bengal is mainly formed by the seafloor spreading of the Indian basin moving to the north. The magnetic anomaly number is a sign that the ocean floor is expanding. The oceanic or basaltic crust makes up the Bay of Bengal, which is primarily divided into two parts. One is the western basin, and the other is the eastern part. The western part formed first when Antarctica and the Indian basin were attached. After the Kerguelen hotspot generation, the Rajmahal volcanos and Sylhet traps formed the eastern basin. The Bay of Bengal started to form about 132 mega annum (Ma). But the main Bay of Bengal is about 62 Ma.

The Andaman Sea is an active back-arc basin lying above and behind the Sunda subduction zone where convergence between the overriding Southeast Asian Plate and the subducting Australian Plate is highly oblique. The effect of the oblique convergence has been the formation of a sliver plate between the subduction zone and a complex right-lateral fault system. The late Palaeocene collision of Greater India and Asia with approximately average convergence started clockwise rotation and bending of the northern and western Sunda Arc. The initial sliver fault, which probably started in the Eocene, extended through the outer arc ridge offshore from Sumatra, through the present region of the Andaman Sea into the Sagaing Fault. With more oblique convergence due to the rotation, the rate of strike-slip motion increased. Extensional basins opened obliquely by combining back-arc extension and the strike-slip motion. These basins in sequence are the Mergui Basin starting at 32



Geographic formations of two basins.

Ma; the conjoined Alcock and Sewell Rises starting at ≈ 23 Ma. East Basin, separating the rises from the foot of the continental slope starting at ≈ 15 Ma. And finally, at ≈ 4 Ma, the present plate edge was formed, Alcock and Sewell Rises were separated by the formation of the Central Andaman Basin, and the faulting moved onshore from the Mentawai Fault to the Sumatra Fault System bisecting Sumatra.

Running in a rough north–south line on the seabed of the Andaman Sea is the boundary between two tectonic plates, the Burma Plate and the Sunda Plate. These plates (or microplates) are believed to have formerly been part of the more oversized Eurasian Plate. However, they were formed when transform fault activity intensified as the Indian Plate began its substantive collision with the Eurasian continent. As a result, a back-arc basin centre was created, forming the marginal basin that would become the Andaman Sea, the current stages of which commenced approximately 3–4 million years ago.

Volcanic Activity of Andaman Sea vs Bay of Bengal

The Western side of the Andaman Sea is a volcanically active region. Within the sea, to the east of the main Great Andaman Island group, lies Barren Island, the only presently active volcano associated with the Indian subcontinent. This island volcano is 3 km (2 mi) in diameter and rises 354 metres (1,161 ft) above sea level. Its recent activity resumed in 1991 after a quiet period of almost 200 years. It is caused by the ongoing subduction of the India plate beneath the Andaman Island arc, which forces magma to rise in this location of the Burma plate. The last eruption started on 13 May 2008 and continues. The volcanic island of Narcondam, which lies further north, was also formed by this process. No records exist of its activity.

On the other hand, the Bay of Bengal no longer contains a volcanically active area. Yet, the Bay of Bengal region, where a volcano once erupted, has 90 east ridges.

Sediment Deposition

At the Andaman Sea, the modern Ayeyarwady (Irrawaddy) and Thanlwin (Salween) rivers deliver >600 Mt/yr of sediment to the sea. Most recent study show:

- 1) Little modern sediment accumulates on the shelf immediately off the Ayeyarwady River mouths. In contrast, a significant mud wedge with a distal depocenter, up to 60 m thick, has been deposited seaward in the Gulf of Martaban, extending to ~ 130 m water depth into the Martaban Depression. Further,
- 2) There is no evidence showing that modern sediment has accumulated or is transported into the Martaban Canyon;
- 3) A mud drape/blanket wraps around the narrow western Myanmar Shelf in the eastern Bay of Bengal. The thickness of the mud deposit is up to 20 m nearshore and gradually thins to the slope at ~ 300 m water depth and likely escapes into the deep Andaman Trench;

4) The estimated total amount of Holocene sediments deposited offshore is $\sim 1290 \times 10^9$ tons. If we assume this has mainly accumulated since the middle Holocene high stand (~ 6000 yr BP), like other major deltas, the historical annual mean depositional flux on the shelf would be 215 Mt/yr, which is equivalent to $\sim 35\%$ of the modern Ayeyarwady-Thanlwin rivers derived sediments;

5) Unlike other large river systems in Asia, such as the Yangtze and Mekong, this study indicates a bi-directional transport and depositional pattern controlled by the local currents that are influenced by tides and seasonally varying monsoons winds and waves.

The sedimentation rate is very high in the Bay of Bengal because of the high sediment flow from the Himalayan orogenic belt. The world's largest delta, the GBM delta, formed at the Bay of Bengal. In this monsoon region, many rain showers occur, and the high rainfall water brings sediment very much, and considerable sedimentation occurred in the Bay of Bengal. The Bay of Bengal has one of the largest continental shelves, about 200km long, and a canyon occurred due to tectonic deformation and slope failure called SONG (swatch of no ground). After that, the largest fan occurred, which was named Bengal Fan.

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The Life Cycle of Foraminifera and its Application in Ocean Science

Kayes Mohammad

Foraminifera is single-celled protozoa that primarily live on or within the seafloor, while a smaller number float in the water column at various depths. They are both planktic or benthic in the mode of life. Fewer are known from freshwater or brackish conditions, and some very few (non-aquatic) soil species have been identified through molecular analysis of small subunit ribosomal DNA. Fully grown individuals range in size from about 10µm to 20cm long. The key elements influencing foraminifera distribution include water temperature, salinity, light,

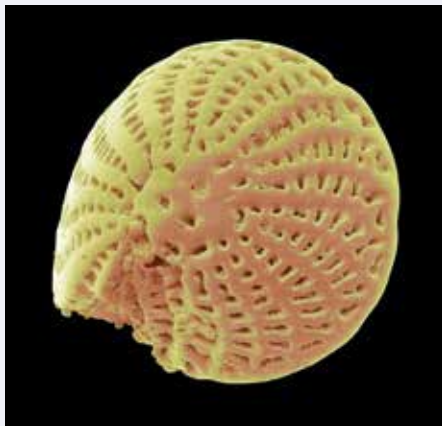


Figure 1 Foraminifera

oxygen, substrate, food, and sediment structure. The algae “grow” inside their shells, and they coexist peacefully. They devour various foods, including bacteria, diatoms, phytoplankton of just one cell, and microscopic organisms like copepods.

Foraminifera is classified primarily by its

composition, ultrastructure, and morphology (shells). They are usually made of several chambers; the arrangement of chambers, shape, and position of apertures are important for classification. Three basic wall compositions of Foraminifera are recognised. They are organic (proteinaceous mucopoly saccharide, i.e. the allogromina), agglutinated, and secreted calcium carbonate (CaCO₃). The grains that makeup agglutinated formations may be chosen randomly or according to their specific gravity, shape, or size. But most of the Foraminifera are composed of secreted CaCO₃. Secreted test foraminifera are again subdivided into three major groups- micro granular, porcelaneous, and hyaline.

Life Cycle of Foraminifera

While being generally similar in structure, the generalised foraminiferal life cycle alternates between haploid and diploid generations. Initially having a single nucleus, the haploid or gamont divides to produce multiple gametes, most of which have two flagella. After meiosis, the multinucleate diploid or agamont divides to create additional gamonts. Benthic creatures frequently undergo multiple cycles of asexual reproduction between sexual generations.

Morphological dimorphism in Foraminifera is connected to their reproductive cycle. The gamont form megalospheric that is proloculus

or first chamber; proportionally large. The gamont is also called the A form. Gamonts typically have smaller overall test diameters than agamonts, despite possessing proloculi that are normally larger. When the gamont reaches maturity, it divides by mitosis to create hundreds of haploid gametes. Each of these gametes discharged from the test into the environment has a complete set of organelles, preserving the integrity of the test. Gametes are not differentiated into sperm and egg; any two gametes from a species can generally fertilise each other.

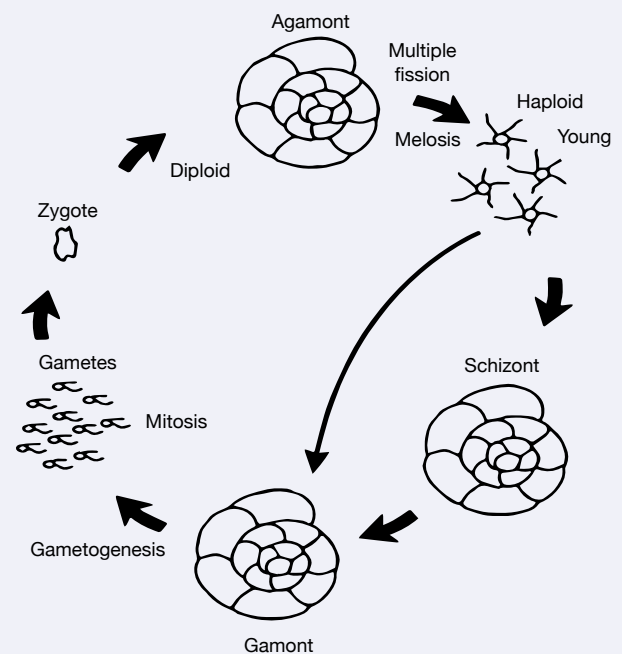


Figure 2 The classical Foraminiferid life cycle

The agamont, or B form, is a multinucleated, diploid cell produced by the union of two gametes. The agamont is microspheric in contrast to the gamont, having a relatively small first chamber but typically a bigger total diameter and more chambers. When a foraminifera reaches adulthood, its protoplasm completely leaves the test and divides its cytoplasm meiotically through multiple fission to produce a number of haploid progeny. This process is known as the agamont. Then, before dispersing, their progeny create their megalospheric initial chamber. The haploid young may occasionally develop into a megalospheric form that reproduces asexually to give birth to further megalospheric, haploid offspring. The first megalospheric form in this instance is known as the schizont or A1 form, and the second is known as the gamont or A2 form. Maturation and reproduction occur more slowly in cooler and deeper water; these conditions also cause it to grow larger. Because there is a lower chance of two gametes effectively interacting with

one another, A forms consistently appear to be considerably more common than B forms. Figure 2 shows the generalised foraminiferal life cycle. There is a great variety of reproductive, growth, and feeding strategies. However, the group exhibits the alternation of sexual and asexual generations, which sets the Foraminifera apart from other Granuloreticulosea members.

Gametes do not transport the algal symbionts during sexual reproduction; they are acquired horizontally. Algal symbionts, on the other hand, are acquired vertically during asexual fission. It is still unknown how bacteria are passed from parents to children and whether people pick up bacteria and algae symbionts from the environment. In Figure 3, the solid red arrow indicates a known transfer route, whereas the dashed black arrows indicate unclear acquisition routes.

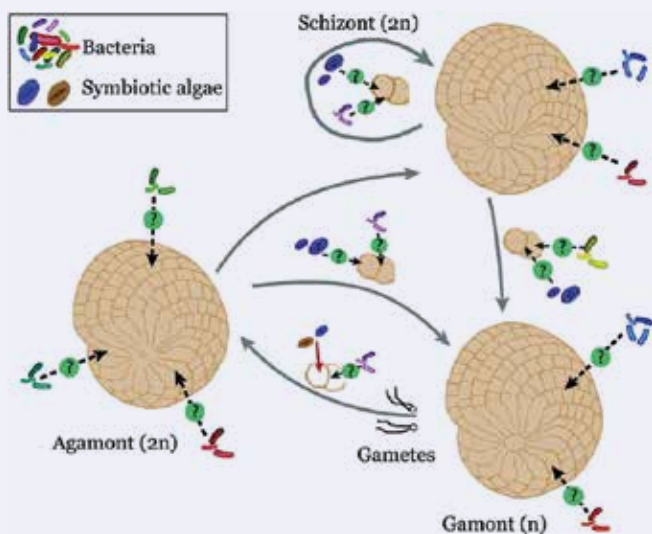


Figure 3 The typical life cycle of large benthic Foraminifera showing potential routes for the acquisition of algal symbionts and bacteria (source: Martina Prazeres)

According to the lunar cycle, planktonic Foraminifera is thought to reproduce sexually every 28 days. Although it is largely believed that they do not reproduce asexually, more research is necessary. According to theory, sexual reproduction (in all Foraminifera) should be favoured in physically variable environments. This is due to the higher adaptive range offered by the increased genetic variability produced by the sexual recombination of genes.

Applications of Foraminifera in Ocean Science

Due to their small size, abundance, widespread distribution, and frequently extreme diversity, Foraminifera is, in many ways, the ideal zonal index for marine rocks. Nowadays, there are about 40 species of planktic Foraminifera in the ocean. About 1% of the foraminifera species still exist (about 99% are benthic). The foundation for significant theories for the intercontinental correlation of Mesozoic (particularly Upper Cretaceous) and Cainozoic rocks is provided by planktonic Foraminifera. Benthic Foraminifera tends to be more restricted in distribution but provides useful schemes for local correlation and sometimes for intercontinental correlation.

Foraminifera is the recorder of the earth's history. Studying the fossils of Foraminifera can help scientists to understand past conditions.

They have been used to map past distributions of the tropics and locate ancient shorelines. They played an essential role in developing our knowledge of the environment and the evolution of life on earth. Foraminifera's earliest fossil record dates back to the Cambrian Era (about 550 million years ago). Scientists also study fossils from known periods of change to observe how Foraminifera responded to particular climate and ocean conditions.

In addition, we can learn about the water's chemistry from the shell's composition. Most significantly, warmer water tends to cause more of the lighter isotopes to evaporate out, impacting the ratio of stable oxygen isotopes. Studies of stable oxygen isotopes in planktonic and benthic shells from hundreds of deep-sea cores worldwide have been used to track global ocean temperature changes during the ice ages. These time series data can help us understand how climate has changed in the past and, thus, how it may change in the future. Foraminifera has many uses in hydrocarbon exploration. It has been used to interpret the ages and paleoenvironments of sedimentary strata in oil wells. Deeply buried agglutinated fossil foraminifera in sedimentary basins can be used to determine thermal maturity, which is a crucial element in the production of hydrocarbons. Overall, they have been found to have a vast array of applications useful to science, industry, and society.

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The Silent Extinction

Understanding the Causes of Sea Turtle Deaths in Bangladesh

Md. Bayzid Mahmud

The coastal waters of Bangladesh have long been home to several species of sea turtles, including Olive Ridley, Green, Hawksbill, Loggerhead and Leatherback. However, the population of these magnificent creatures has been falling at an alarming rate in recent years, with many of them dying due to human activity. This silent extinction of sea turtles in Bangladesh is a significant concern. Understanding the underlying causes of their deaths is essential to take appropriate action to save them.

One of Bangladesh's primary causes of sea turtle deaths is a bycatch in fishing nets. The use of non-selective fishing gears, such as drift nets and trawlers, is widespread in Bangladesh, and many turtles get entangled in these nets and drown before they can surface for air. This is a significant threat to the sea turtle population, and reducing bycatch should be a top priority.

Another significant factor contributing to the decline of sea turtles in Bangladesh is habitat loss. Sea turtles require specific beach habitats for nesting, and with coastal development, this habitat is often destroyed or degraded. The loss of suitable nesting sites can lead to declining sea turtle populations. Additionally, the construction of coastal infrastructure such as ports and harbours and the use of beaches for tourism can also disturb nesting sites, further contributing to the problem.

Pollution is also a significant cause of sea turtle deaths in Bangladesh. Plastic waste and oil spills are hazardous to sea turtles, as they can

get entangled in plastic debris or ingest it, which can cause them to suffocate or starve to death. Oil spills can also damage the sea turtles' habitat and poison them, further contributing to their decline. The prevention of oil spills and the reduction of plastic waste should be given primary attention.

The illegal trade in sea turtles and their products is another significant cause of their deaths. Sea turtles are often hunted for their meat, eggs, and shells, used for ornaments or traditional medicine. Illegal trade can lead to declining sea turtle populations and contribute to their deaths. Addressing the illegal trade in sea turtles and their products is critical to conserving these species.

Finally, climate change can have an impact on sea turtle populations. Rising temperatures can affect the sex of the hatchlings, and changing ocean currents can disrupt their feeding and migration patterns. This can lead to a decline in their population and eventually cause them to die. It is necessary to lessen climate change's consequences and safeguard sea turtle ecosystems from its repercussions.

To protect the sea turtles and make the Bangladesh coast turtle-friendly, we may approach these steps:

Implementing turtle-friendly fishing practices: As mentioned earlier, bycatch in fishing nets is one of Bangladesh's leading causes of sea turtle deaths. Fishermen can adopt turtle-friendly fishing

practices like using turtle excluder devices (TEDs) that allow the turtles to escape from the nets unharmed. These practices can help reduce turtle mortality rates and increase their chances of survival.

Creating protected nesting areas: Sea turtles require specific beach habitats for nesting, and protecting these areas from development, and human activity is essential. Creating protected nesting areas where sea turtles can lay their eggs undisturbed is critical to survival. Additionally, installing signage and barriers can help prevent human disturbance on nesting beaches.

Reducing pollution: Pollution is a significant threat to sea turtles in Bangladesh, and reducing plastic waste and preventing oil spills can help improve their survival rates. Creating awareness campaigns and incentivising clean-up drives can help reduce plastic waste in coastal areas. Additionally, enforcing environmental regulations and holding polluters accountable for their actions can help prevent oil spills and other sources of pollution.

Supporting conservation efforts: Supporting local conservation organisations and initiatives can go a long way in protecting sea turtles in Bangladesh. Donations and volunteering efforts can help fund research and conservation projects, create awareness about sea turtles' threats, and promote turtle-friendly practices among local communities.

Promoting eco-tourism: Eco-tourism can be sustainable and responsible for promoting turtle conservation in Bangladesh. Creating eco-friendly lodges and tour operators that promote turtle conservation and awareness can help support local economies while providing a sustainable way of generating revenue for conservation efforts.

A beautiful sight of nature unfolds as a turtle lays its precious eggs on the sandy shores, highlighting the importance of conservation efforts to ensure the survival of these endangered species for generations to come



A terrified turtle, faced with the grim reality of habitat loss and environmental degradation, serves as a poignant reminder of the urgent need for collective action to protect our planet and its vulnerable species

Encouraging responsible consumption: The illegal trade in sea turtles and their products significantly threatens their survival. Encouraging responsible consumption practices among locals and tourists can help reduce demand for sea turtle products and prevent illegal trade. Additionally, enforcing laws and regulations against illegal trade can help reduce its impact on sea turtle populations.

In conclusion, sea turtles are essential to the marine ecosystem, and their declining population is a significant cause for concern. The silent extinction of sea turtles in Bangladesh is a complex issue for multiple reasons, including bycatch in fishing nets, habitat loss, pollution, illegal trade, and climate change. Addressing these issues will require a coordinated effort from the government, civil society, and the private sector. We need to work together to ensure that sea turtles continue to thrive in the coastal waters of Bangladesh. Otherwise, this silent extinction will continue, and we may lose these magnificent creatures forever.



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Decarbonisation of the maritime sector through hydrogen technology

Maritime Campus desk

Is shipping's "new green age" finally here? While it may have taken us a while to realise how much the maritime sector contributes to carbon emissions, significant progress is finally being made in the western world.

Major retailers committed to only using ships powered by zero-carbon fuel by 2040. In 2023, Maersk plans to deliver the world's first methanol-fueled carbon liner vessel.

But it takes work to reduce emissions from a complicated industry. A multifaceted strategy is required to meet existing goals established by the International Maritime Organisation (IMO) and far beyond them. Of course, renewable energies like wind and solar power will be necessary, but so will developing new technologies and utilising hydrogen power.

The significance of hydrogen as a "super fuel" in the maritime industry

According to the UK government's Hydrogen Strategy, hydrogen, a crucial "super fuel," has a significant role in decarbonising the

worldwide maritime industry. Hydrogen can be produced using renewable energy sources and emits only water vapour.

Hydrogen power is compatible with a considerably more comprehensive spectrum of substances than just those used to power vessels. For instance, ports serve as the intersection of many different businesses since they connect land and sea. Replacing all port activities with renewable energies would tremendously impact carbon emissions in the maritime sector. Hydrogen fuel cell technology could be used to power port logistics, allowing them to take advantage of the "no downtime factor" when removing cargo, etc.

Like conventional fossil fuels, hydrogen may be stored and transported in tanks, and it is easier to retrofit existing vessels with hydrogen technology, like fuel cells. While hydrogen fuel cells require less frequent refuelling and are well suited to power larger ships on longer, international routes, electric batteries are still an excellent choice for vessels with shorter maritime routes.

Other options, such as wind power, do have a role in producing green hydrogen through electrolysis for infrastructure that may run portside, offering the possibility of a future controlled, clean power source for operations and shipping.

With improved economic effectiveness of investing in renewables and aiding in the optimisation of power systems and security of power supplies, investment in hydrogen - together with other green technologies - would also help to build a more stable and varied energy market.

The barriers to hydrogen power

The advantages throughout the maritime business are readily evident, but development could be more active. The biggest obstacles to implementing hydrogen in the maritime industry are a need for more infrastructure, funding, awareness, and government policy, all of which keep the technology from realising its full potential. As a result, hydrogen is more expensive than other fuels.

We face a chicken-and-egg problem regarding maritime hydrogen power, just like when applying hydrogen technologies to other sectors like the automotive and mobility industries. Should the technology for ships or fuel be developed first?

In July 2022, a report from the UK Department for Business, Energy, and Industrial Strategy (BEIS) said that the world needs to fill supply chain gaps to meet projected demand. For example, it requires more manufacturers of hydrogen-qualified line pipes and suppliers who can help with large-scale hydrogen compression for storage.

Health and safety issues are also significantly affected by the compressed or liquid form of hydrogen being stored and transported on boats. Also, it requires extra storage space on board ships (at extremely low temperatures), which means that some space may be lost to additional cargo, albeit a relatively modest amount.

Hydrogen could compete with and replace conventional fossil fuels from an economical and practical standpoint with an increased investment to achieve scalability at pace.

How can the maritime industry's decarbonisation be scaled up?

Decarbonising the maritime sector will need the application of every clean technology currently commercially available. Although the industry has taken steps to reduce emissions, they require greater help from the government and policymakers to be scaled up. The new solutions created must have the necessary safety measures and regulations put in place for their use.

One of the most energy-efficient methods of transporting products is still shipping. For instance, goods transportation consumes five times as much energy yet is excessively energy-intensive due to its near total reliance on fossil fuels. In order to scale up and lower the cost of hydrogen-based fuels, the maritime sector should work with other sectors, such as the energy, heavy transportation, and building heating sectors, to create supply chain networks, safety guidelines, and regulations.

Unlocking hydrogen's potential for maritime usage requires a solid legal and regulatory framework. 80% of hiring managers cite a skills shortage as a significant challenge for the renewable energy sector.



LNG to play a major role in maritime decarbonisation

Besides, cross-fertilisation of information and expertise across industries and governmental organisations is also necessary.

Incentivisation will also be essential to help get early adopters of hydrogen power over the line – and the more adopters, the more that hydrogen will come down in cost.

It is now time to take action

Decarbonising the maritime sector is urgently needed since scientists estimate that if the sector continues to rely on fossil fuels, worldwide carbon emissions from shipping will increase from 3% to 10%.

There is no one solution to the maritime decarbonisation problem. Still, if the global sector is to get within a nautical mile of the IMO emissions limits, a strategy supported by technology and various energy sources is critical. Working with a decarbonisation strategy that excludes hydrogen technology would merely slow, if not stop, the development that is now well along.

The storage and transportation of hydrogen on vessels in its compressed or liquid forms have significant implications for health and safety too





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