MNF 2030

A 10-year strategy for the Marine National Facility to guide the use of Australia's dedicated blue-water research capabilities

September 2020

Australia's National Science Agency

Citation

Marine National Facility (2020) MNF 2030. CSIRO, Australia.

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Important disclaimer

Front cover image: Owen Foley

Acknowledgements

CSIRO acknowledges the Traditional Owners of the land, sea and waters of the area that we live and work in across Australia. We acknowledge their continuing connection to their culture and we pay our respects to their Elders past and present.

Artist: Shara Delaney

Shara is an Aboriginal contemporary artist from Quandamooka Country, inspired by stories of her Elders, the generation of One Mile. Her paintings are a reflection of the strong connections that Quandamooka People have with the ocean as Saltwater People.

Quandamooka Country in South East Queensland includes the waters and lands of and around Moreton Island, North Stradbroke Island, the Southern Moreton Bay Island and South Stradbroke Island.

The Marine National Facility commissioned this artwork in 2019 to commemorate a voyage across the northern tip of Australia from Brisbane to Darwin. A print of the artwork takes pride of place onboard Research Vessel *Investigator* and the original is displayed in the foyer at the CSIRO Marine Laboratories in Hobart.

Contents

About the
Marine National Facility

The Marine National Facility (MNF) provides a blue-water research capability to the Australian research community and their international collaborators. The MNF is funded by the Australian Government and owned and operated by CSIRO on behalf of the nation.

The MNF comprises:

- the ocean-class Research Vessel (RV) *Investigator*
- advanced multidisciplinary scientific equipment and instrumentation
- a repository of marine data collected since the MNF's inception in 1984
- operational and technical personnel with the expertise required to manage an ocean-going research platform and support vessel users

The research done on MNF voyages provides important information that supports evidence-based decision-making by government, industry and other stakeholders. Our goal is to enhance the long-term viability and prosperity of the Australian marine environment, industries and society.

Evolution of Australia's blue-water capability

1984 – 2002

Oceanic Research Vessel (ORV) *Franklin*, a purpose-built oceanographic research vessel. *Franklin* operated widely around Australia, largely with oceanographers and geoscientists.

Complement – 26 researchers and crew

55 m

2003 – 2013

RV *Southern Surveyor*, a converted sea trawler, biological, oceanographic and geoscience, and some limited atmospheric research capabilities.

Complement – 29 researchers and crew
Range – 5200 nautical miles

66 m

2014 – Current

RV *Investigator*, multi-disciplinary
Complement – 60 researchers and crew
Range – 10,800 nautical miles
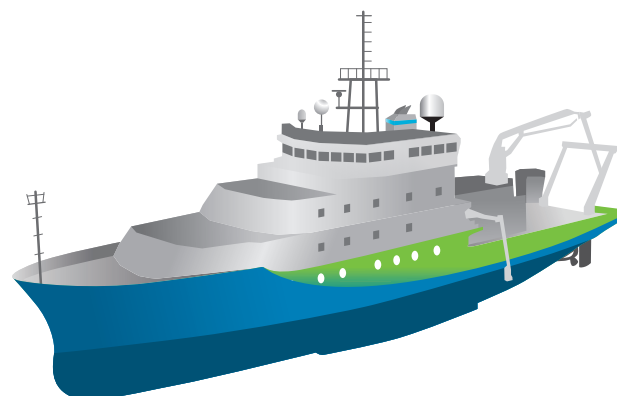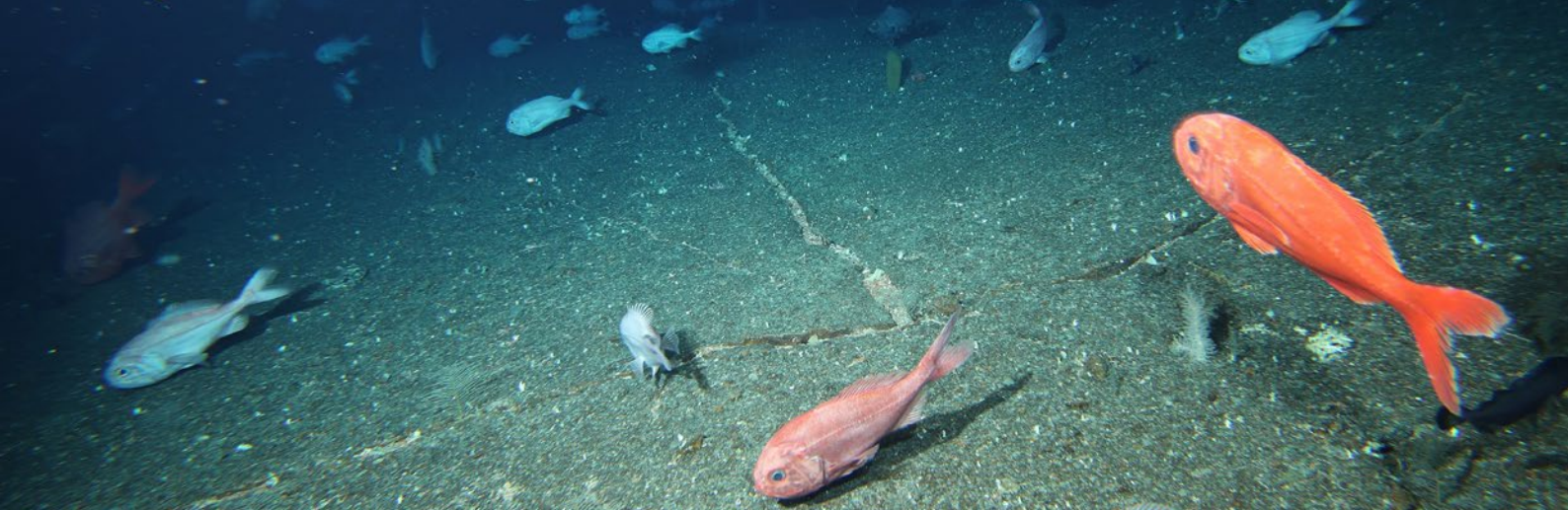
94 m

MNF 2030 – what is changing?

The Marine National Facility is taking a more active role in managing its science capabilities for maximum public benefit and broad access, based on experience operating the state-of-the-art RV *Investigator* since its commissioning in 2014.

The MNF 2030 strategy has been developed in response to a 2019 review of the previous MNF access framework. The review recommended strengthening the alignment of access and use of the MNF with national priorities for marine and atmospheric research. The strategy introduces improvements in the way researchers can access time on RV *Investigator* and in annual scheduling of activities. The strategy also describes the directions the MNF will take in the pursuit of operational excellence, capability improvements and education and outreach opportunities.

Key changes are:

- introducing MNF policy-driven priorities, set and regularly reviewed in consultation with government, the research community and relevant industry stakeholders, to encourage and support high-impact projects (Pillar 1: Maximum impact)

- defining five categories (access streams) for sea-time applications to better reflect the breadth of needs and demands of the Australian research community and encourage new users (Pillar 2: Broad access)

- introducing a more flexible scheduling approach and streamlined digital tools for applicants and researchers coming on board to improve operational efficiencies and reduce administrative burden (Pillar 3: Streamlined operations and optimal use)

- establishing a 25-year capability investment framework to guide capital expenditure and balance short-term operational responsiveness with strategic enhancement of research capabilities (Pillar 4: Advanced capabilities and innovation)

- enhancing the MNF education and training program to include training the next generation of marine researchers and technicians in collaboration with other research / operational agencies and industries (Pillar 5: Training future generations)

- increasing focus on communicating the impact of research delivered by the MNF (Pillar 6: Connecting with Australians and the world).

Image: Thomas Moore, CSIRO

From	To
Researcher-driven impact	priority-focused impact driven by collaborative engagement with government, industry and research
Focus on core marine science disciplines	broad access to meet Australia's research and innovation needs
Rigid 12-month schedules	flexible schedules that optimise resources
MNF-driven short-term capital replacement plan	long-term strategy for investment to enhance capabilities informed by stakeholder consultation
Ad hoc and opportunistic support of training activities	proactive pursuit of programs to develop the next generation of marine researchers and technicians
Profiling our capabilities and the research we deliver	focused effort to tell the story of the impact we make possible

Our mission

We facilitate safe, efficient and excellent marine and atmospheric research aligned with national priorities and addressing Australia's grand challenges for society, the economy and the environment.

Annual MNF Operations Rolling Plan

1	2	3	4	5	6
Maximum impact	Broad access	Streamlined operations and optimal use	Advanced capabilities and innovation	Training future generations	Connecting with Australians and the world

Safe operations for our people and the environment

Our foundation
and strategic pillars

MNF 2030 is structured around six pillars that represent the MNF's key areas of responsibility. The six pillars are supported by a solid foundation of safety, which reflects the commitment the MNF has to the health and wellbeing of its staff and users and to minimising the environmental footprint of its operations.

MNF 2030 sets out our objectives over the next decade under each of the pillars and the actions required to get there.

Our foundation
Protecting our people and the environment

MNF has an excellent safety record and best-practice environmental impact mitigation measures. The pressures and risk profile of our operations mean we cannot afford to rest on our achievements. The MNF is committed to monitoring health, safety and environmental performance, learning from experience and world best practice, and improving our processes and procedures.

Our strategic pillars

1
Maximum impact

The MNF is a valuable public resource funded to deliver maximum positive impact and benefits for Australia. This requires a flexible and adaptive balancing of researcher-driven and user-driven research.

2
Broad access

The MNF aims to extend access to our national research infrastructure to all researchers from academia, government, museums and industry subject to assessment against merit criteria.

3
Streamlined operations and optimal use

Efficiency and effectiveness are a key responsibility of the MNF. They require streamlined workflows and information management to support complex operations, and coordination of demand and deployment with other Australian agencies that operate marine infrastructure.

4
Advanced capabilities and innovation

The MNF will keep pace with emerging technological capabilities and research needs and play an active role in promoting and adopting marine technology innovation.

5
Training future generations

The MNF is committed to inspiring future generations of marine researchers and contributing to building a pipeline of science, technology, engineering and mathematics (STEM) talent to support Australia's growing blue economy.

6
Connecting with Australians and the world

The MNF is a powerful tool to increase public literacy about Australia's ocean and the benefits of marine and atmospheric research on our lives, the economy and the environment.

Protecting our people and the environment

Objective

To continue to improve our health, safety and environmental performance and strive for zero harm in all our operations.

Key actions

F1   Implement the recommendations of the 2019 audit of the MNF health, safety and environment (HSE) framework.

F2   Establish regular reviews of the MNF HSE framework.

F3   Set, monitor and report on ambitious annual performance targets for environmental sustainability.

F1   Implement MNF health, safety and environment framework audit recommendations

MNF operations often take place in very harsh conditions, over long periods and in remote environments. Operations on board typically involve complex deployments of large pieces of equipment, where there is no margin for error and the consequences of mistakes can be catastrophic.

Everyone has a responsibility for safety whether on board or on shore; safety is managed through a formal health, safety and environment (HSE) framework. The HSE framework is intended to ensure compliance and harmonisation among the HSE policies, procedures and systems required under maritime legislation, the CSIRO corporate obligations and any specific requirements of participating institutions (e.g. universities with which voyage participants are affiliated).

The MNF has a strong commitment to the health and safety of its people and the environment and strives for zero harm in all our operations. In 2019, the MNF commissioned an external audit of our HSE framework

against ISO 45001, the newly adopted International Standard on Occupational Health and Safety Systems. The audit found that the framework was well advanced in meeting the standard requirements and identified a positive safety culture and a high level of commitment to safety by MNF leaders and staff. The audit identified a need to clarify roles and responsibilities and to consolidate information spread across ship management, operational support and MNF users. We are committed to meeting the audit's recommendations by the end of 2021 and to implementing an evidence-based, continuous improvement agenda to 2030.

F2   Regular review of MNF HSE framework

The HSE space is highly dynamic, with lessons learned and new knowledge regularly resulting in changes and evolution of policy and practice. The MNF is committed to maintaining an HSE framework that reflects the latest understanding of, and responses to, hazards and risks. We will comprehensively review our HSE framework every three years starting from 2021, with more frequent audits of specific HSE matters implemented as required.

F3   Ambitious environmental targets

The MNF strives to excel and demonstrate leading practice in its maritime operations, ensuring that the environmental footprint for each voyage is understood and minimised.

We are also committed to improving the sustainability of our operations. Therefore, we identify and address areas for improvements ahead of any incident or failure and we keep abreast of innovations that can increase our environmental performance.

The MNF commits to setting ambitious targets for environmental sustainability. The targets will be set through a rolling operational plan (see Implementing the MNF 2030 strategy) and performance against targets will be reported annually in our annual report.

PILLAR 1
Maximum impact

Objective

To deliver maximum return on public investment through strengthening the alignment of MNF-supported research to Australia's policy, strategic, and research and innovation priorities.

Key actions

1.1 Consultatively set and review MNF policy-driven priorities to maximise impact.

1.2 Adopt a robust method for assessing, monitoring and reporting on the value of the MNF to the nation.

1.3 Ensure findable, accessible, interoperable and reusable (FAIR[1]) access to data from RV *Investigator* and report on uptake of MNF-generated data and other research outputs.

1.4 Ensure the MNF underway data collection program targets data gaps and monitoring needs of national priority.

1.1 MNF policy-driven priorities

The Australian Government, through the CSIRO and the National Collaborative Research Infrastructure Strategy, funds the MNF to operate the RV *Investigator* to deliver a full-year research program.

Investment in the MNF's multidisciplinary capabilities supports important marine and atmospheric research to address national and global challenges, such as those identified by the National Marine Science Committee[2] and consistent with Australia's national science and research priorities[3].

The MNF is an enabler of research and has limited direct control over the impact generated through its facilities. Nevertheless, we can facilitate the delivery of national benefit by actively promoting clear alignment of the research delivered by the MNF with government and industry priorities.

Under this strategy we introduce MNF policy-driven priorities, which will be set through consultation with key government and industry end users to define critical needs for data, knowledge and research products such as big-picture research questions to underpin national policy development; a focus on an oceanic region to support sustainable growth of new and emerging industries; contributions to global research programs of strategic national importance; establishment of baselines and ongoing monitoring to directly inform government programs and regulation.

The objective of the MNF policy-driven priorities is to guide the development of sea-time applications under a dedicated access application stream (Stream 1 – policy-driven research; see Multiple access streams), to catalyse the co-design of large, multidisciplinary high-impact research projects.

MNF policy-driven priorities will be published in the annual MNF Operations Rolling Plan, which is released at the time of the call for applications (see Implementing the MNF 2030 strategy). A full and consultative review of the priorities will be done every three years, but there will be flexibility to accommodate more frequent changes in response to emergencies or new critical priorities. Development and review of MNF policy-driven priorities will be transparent and consultative, ensuring effective engagement and endorsement across relevant portfolios. Consultation with representatives from the research community and industry bodies will also be important to capture relevant national science and industry priority needs.

1.2 MNF impact and return on investment

Public investment in the MNF is considerable and future funding decisions must be informed by evidence about its contribution to Australia's society, environment and economy. We will introduce mechanisms that facilitate alignment between access allocation decisions and end users' needs to simplify identification and measurement of impact. Assessment of return on public investment requires nuanced consideration of the diverse benefits made possible by the facility and articulation of plausible pathways to impact for the range of research activities that we support.

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1 Data collected through access to the MNF are governed by Findable, Accessible, Interoperable and Reusable management principles available at https://www.nature.com/articles/sdata201618

2 The 2015 National Marine Science Plan is available at https://www.marinescience.net.au

3 https://www.industry.gov.au/data-and-publications/science-and-research-priorities

The MNF will develop a repeatable approach to assessing the impact delivered through the deployment of RV *Investigator* and other MNF facilities and will explore possible digital solutions for automatic monitoring and reporting of research outputs.

1.3 Data collected on voyages and in transit

RV *Investigator* is equipped with a multitude of sensors to map the seafloor, sample the water column and collect oceanographic and atmospheric measurements. Data collected on voyages and in transit are monitored for quality by CSIRO, following standards-based data management and globally agreed data principles.

All raw data and associated metadata collected on MNF voyages are archived in the enduring CSIRO data access portal. Data and metadata are published through relevant external portals, such as the Australian Ocean Data Network, to facilitate and promote uptake for use and reuse by the national and international research community.

Data represents a key 'currency' in establishing the value of the work undertaken through the MNF and it is important to understand and communicate the rate and patterns of

access to and use of MNF data. The MNF is committed to ensuring and enhancing FAIR access[4] to MNF data through appropriate tools and platforms, especially when data inform policy and research of national importance.

1.4 Maximum benefit from underway data collection

While at sea, RV *Investigator* collects atmospheric, meteorological, oceanographic and seafloor mapping data 24/7. Some atmospheric data is also collected while the vessel is in port. Because underway data collection involves significant investment in technical support and data curation and storage, it should be strategically focused to target data gaps and monitoring needs that are of national relevance.

Access to comprehensive and current information about key data needs will allow the MNF to focus underway activities strategically, optimise transit routes and inform the scheduling of operations at sea in a way that maximises the value of the data collected. The MNF will work with key data end users and partner organisations to ensure that our underway data collection program is strategic and well-coordinated with relevant national data gathering programs.

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4 Data collected through access to the MNF are governed by findable, accessible, interoperable and reusable management principles (see www.nature.com/articles/sdata201618)

PILLAR 2
Broad access

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Objective

To offer broad access to the MNF to researchers from academia, government, museums and industry.

Key actions

2.1 Diversify access opportunities through multiple streams of applications.

2.2 Ensure clarity and transparency in access allocation decisions.

2.3 Apply merit criteria equitably across access streams.

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2.1   Multiple access streams

The MNF must be able to cater for meritorious researchers across a wide range of needs and purposes that rely on our specific capabilities.

Primary projects undertaken on RV *Investigator* and its predecessors have mostly been from 'core' marine and atmospheric disciplines and the MNF processes and language have traditionally targeted users from research and academic organisations with a strong science focus. This focus has the potential to discourage demand for other types of projects such as marine systems engineering and robotics, maritime heritage, marine surveys, environmental baseline and monitoring. It is also at odds with the broader mandate that must apply to a unique, publicly funded facility expected to operate primarily in the national interest.

Under the MNF 2030 strategy, the facility is moving to multiple separate access streams that more explicitly accommodate and support diverse needs and demand. The access streams replace and enhance the three types of use previously described in the 2017 *MNF Principles of access*.

Flexibility in the approach to access is important to respond to new needs, areas of focus and changes in demand over time. That means that access streams could change over the course of the next decade, subject to annual review of needs and demand by the MNF Steering Committee. The access streams that will be considered in any given schedule will be published in the annual MNF Operations Rolling Plan.

The initial implementation of the new, stream-based approach reflects findings from the 2019 review and comprises five streams:

Stream 1: Policy-driven research, for proposals explicitly addressing specific priorities set and reviewed every three years in consultation with key government end users (see MNF policy-driven priorities).

Stream 2: Discipline-driven research, for proposals with the primary purpose of advancing scientific knowledge that do not directly address MNF policy-driven priorities while still delivering national benefits.

Stream 3: Strategic partnerships with national publicly funded programs or institutions that rely on regular access to MNF capabilities to support data and sample collection in the national interest.

Stream 4: Technology and innovation projects, for proposals to develop and test innovative technology.

Stream 5: User-funded research, for proposals that are in the national interest and rely on RV *Investigator*'s specific capabilities.

Streams 1, 2 and 3 are expected to take up most of the sea time available on RV *Investigator*; this is unlikely to change in the foreseeable future.

Stream 1 has been introduced to sharpen the focus on delivering impact against specific contemporary national priorities that are identified by the MNF in consultation with end users such as government agencies with relevant policy, regulatory or programmatic responsibilities and peak marine industry bodies (see MNF policy-driven priorities).

Stream 2 maintains access for discipline-driven projects focused on key knowledge gaps of national interest, and more explicitly caters for both fundamental and frontier research, where the delivery of impact might be less immediate or direct.

Stream 3 strategic partnerships—provides an efficient pathway to accessing regular sea time for established nationally funded research programs delivering long-term, high-quality data to diverse users and/or to meet government priorities. Strategic partnerships facilitate alignment of national priorities and nationally supported activities and, where appropriate, streamline assessment and scheduling of multiple projects within multiyear national programs.
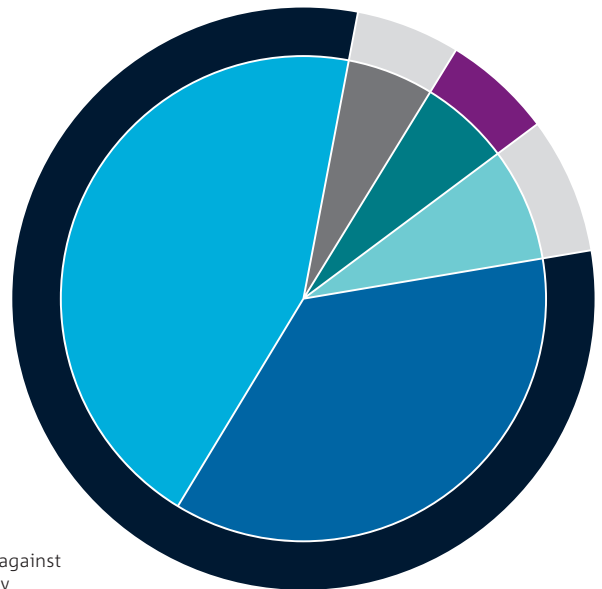
Indicative Stream Allocation

- ■ Policy-driven research
- ■ Discipline-driven research
- ■ Strategic partnerships
- ■ Technology and innovation research
- ■ User-funded research

- ■ MNF-funded
- ■ User-funded
- ■ May be funded by the MNF, the partner organisation or both

Note: the relative proportion of sea time against each stream in the Figure is indicative only

Stream 4 recognises the need to more explicitly encourage access for technology projects that will deliver benefit to future research capability, marine industries innovation and the national interest. This stream is introduced in response to stakeholder feedback into the 2019 review and will test demand and opportunities for partnership with the private sector in this area.

Past demand indicates that user-funded projects, now Stream 5, represent a small and occasional use of the MNF. Stream 5 allows for user-funded access that meets defined eligibility criteria—research that critically depends upon deployment of RV *Investigator*; satisfies set conditions such as in relation to data management and availability; and demonstrates a net benefit for the MNF user community (for example, a Stream 5 voyage might provide additional funding to supplement annual operations through deployment of alternative vessels or to acquire enhanced capabilities). Stream 5 proposals must also undergo merit assessment (see Merit and merit assessment criteria).

2.2   Access allocation framework

Allocation decisions to date have been guided primarily by advice from expert advisory committees on the relative merit of competing proposals, along with advice on operational constraints from the MNF.

Introduction of multiple access streams requires that access allocation decisions also consider the combination of projects that will deliver the greatest impact and operational efficiency, while also ensuring access opportunities are retained for all streams.

Proposals under all streams will be submitted annually and assessed against the same criteria (see Merit and merit assessment criteria). Meritorious proposals will be considered simultaneously to allow the MNF Steering Committee to balance access to the MNF across user groups with full disclosure of the potential benefits and trade-offs.

Objectives for guiding robust and transparent decision-making about sea time allocation across access streams will be published in the annual MNF Operations Rolling Plan, and will include:

- guidance on notional allocation levels for specific streams; for example:
  - aspirational allocation to projects that address MNF policy-driven priorities
  - upper limit to sea time allocated to user-funded proposals and strategic partnerships
- conditions for brokering the use of vessels other than RV *Investigator* where appropriate.

2.3   Merit and merit assessment criteria

Fully funded access to RV *Investigator* is expensive and limited and demand consistently exceeds availability. All supported research should be expected to be of sufficient quality and sufficient benefit, directly or indirectly, to Australia's national interest, to justify investment of MNF resources.

The MNF is reaffirming the importance of research quality and research benefit in defining merit for the purpose of accessing sea time on RV *Investigator* and other MNF capabilities.

Proposals under each of the streams will be assessed against four assessment criteria under each principle:

RESEARCH QUALITY	RESEARCH BENEFIT
Research rationale	Benefit rationale
Research rigour	Outputs
Research feasibility	Path to benefit
Research capability	Delivery capability and education opportunities

PILLAR 3
Streamlined operations and optimal use

Objective

To optimise use of MNF resources and increase efficiency of our operations.

Key actions

3.1 Streamline voyage application, planning and management processes.

3.2 Move to flexible scheduling through a rolling multi-year plan.

3.3 Lead a shift to greater coordination across national marine research infrastructure.

3.4 Facilitate deployment of non-MNF platforms, where appropriate.

3.1 Streamlined operational support processes

Every successful voyage on RV *Investigator* is the culmination of long and complex activity planning and management. The MNF is introducing an online system to streamline workflow and information management and, where possible and appropriate, reduce the administrative burden on research users and technical and operational support personnel.

The MNF marine applications and planning system is a modular digital solution that incorporates:

- a chief scientist portal, from which researchers will apply for voyages or supplementary projects and, if successful, engage in the planning of their voyage

- a voyage participants portal, to support information-gathering and induction training

- a voyage planning module to streamline tasks and generate automatic alerts to assist scientists and support personnel

- a schedule-building and display module with interactive mapping capabilities

- an equipment maintenance and management module fully integrated in voyage planning.

3.2 Flexible rolling scheduling

The MNF will move to a flexible approach to developing RV *Investigator* schedules through rolling annual multiyear outlooks of MNF operations.

The successful proposals from each annual call for applications will be scheduled over a flexible period that accommodates logistical and operational constraints and allows for efficient use of the platform. It will allow highly ranked proposals that cannot be scheduled as requested to be considered for a following year provided doing so works for the research proposal and applicants.

It is important that decisions about flexible scheduling are robust, fair, consistent and transparent. The MNF will prepare and publicise clear rules about how flexibility in scheduling is exercised to avoid unreasonable reductions in opportunities for access.

A shift to a more flexible approach to scheduling at-sea activities will increase efficiency, operational agility and responsiveness, but it will not come at the expense of certainty for users, with the lead time for planning guaranteed between voyage confirmation and departure.

The multiyear outlook of operations, which will include 'locked in' voyage schedules for the short to medium term (1–2 years) and 'provisional' scheduling of activities into later years (3–5 years), will be published in the annual MNF Operations Rolling Plan (see Implementing the MNF 2030 strategy).

Image: Francis Chui, CSIRO

3.3 Coordination across national research vessels

The MNF is part of a portfolio of national marine research platforms and facilities that support Australia's world-leading marine research. Coordination across these facilities is crucial to identifying and taking full advantage of opportunities for greater impact and efficiencies through fit-for-purpose deployments.

Australian organisations operating national research vessels include the Australian Antarctic Division, the Australian Institute of Marine Science and the CSIRO MNF.

Each organisation has specific mandates that guide the deployment and operations of their research vessels. The MNF will seek to collaborate with other agencies to establish flexible, efficient and effective mechanisms to coordinate allocation of sea time across the national fleet where possible.

Significant opportunities can also arise from national and regional equipment-sharing programs and from co-investment in the acquisition or development of technology for use by multiple platforms. The MNF will work with relevant organisations to establish a system for sharing equipment and expertise to support Australian researchers.

3.4 Deploying alternative platforms

The MNF's core operational focus is on delivering voyages aboard the RV *Investigator*, but applications to the MNF are for a suitable, fit-for-purpose research platform. Voyages therefore may be supported by platforms other than RV *Investigator* from time to time, including vessels operated by Australian or international agencies, the private sector or by philanthropic operators.

Circumstances under which the MNF would seek the use of an alternative vessel may include:

- retrieving instruments and equipment deployed on an earlier voyage when the specialised capabilities of RV *Investigator* are not required
- using a different national research vessel because it is more fit for purpose, for example for Southern Ocean voyages that might be enhanced by icebreaking capabilities
- offsetting user-funded access on RV *Investigator* under Stream 5
- delivering a voyage postponed or cancelled from the RV *Investigator* schedule due to unforeseen circumstances.

PILLAR 4
Advanced capabilities and innovation

Objective

To maintain and enhance the MNF research capabilities to accommodate evolving research needs and technology developments.

Key actions

4.1 Implement a 25-year capability investment framework to support strategic investment decisions and deliver advanced blue-water research infrastructure.

4.2 Establish a technology and innovation advisory group.

4.3 Promote innovation in marine systems and technology.

4.1 A 25-year capability investment framework

Australian researchers must have access to the most advanced and fit-for-purpose infrastructure to remain at the forefront of global marine and atmospheric research. One of the key principles of the design of RV *Investigator* is modularity, to support the incorporation of new technology as it develops.

The MNF is responsible for maintaining and upgrading our research capabilities, as well as for expanding in response to new and emerging technologies and needs. The MNF also offers significant opportunities for advancing technology development for novel marine research systems and, more broadly, technological solutions that can support the growing blue economy.

The MNF has developed a 25-year capability investment framework to identify, prioritise, procure and review MNF capital investment through the remaining life of RV *Investigator* and beyond. The framework identifies gaps in marine research infrastructure capability in Australia and proposes a roadmap for securing investment for high-value

strategic capabilities, such as a deep-water remotely operated vehicle, for the benefit of the nation. Importantly, the investment framework recognises that replacing RV *Investigator* following its expected end-of-life in 2039, will take time. Work towards the design and funding model for a 'green' vessel will be well advanced under this Strategy.

4.2 Technology and Innovation Advisory Group

Central to the framework is the establishment of the Technology and Innovation Advisory Group (TIAG) with membership from the research and technology development communities. The TIAG will advise MNF on the evolving demands of research and emerging technologies to guide strategic capital investment. Further, they will ensure that acquisition of new equipment fits the needs of Australia's blue-water research users and is interoperable across the national research fleet where possible. The TIAG will also play a role in assessing proposals for sea time under Stream 4, technology and innovation research.

4.3 Innovation in marine systems and technology

RV *Investigator* provides a platform for testing and, when aligned with national needs, early adoption of the latest innovations in marine and atmospheric research, and potential commercialisation of new technologies.

The dedicated technology and innovation access stream (see Multiple access streams) will allow public sector technology developers to apply for sea time. It is designed to attract proposals that foster development of new marine research technologies and build on Australia's reputation for innovation. Private sector technology developers can also access MNF facilities under Stream 4, either in partnership with research organisations or through fully funding the sea time, as long as their proposals meet the eligibility and merit criteria (see Merit and merit assessment criteria).
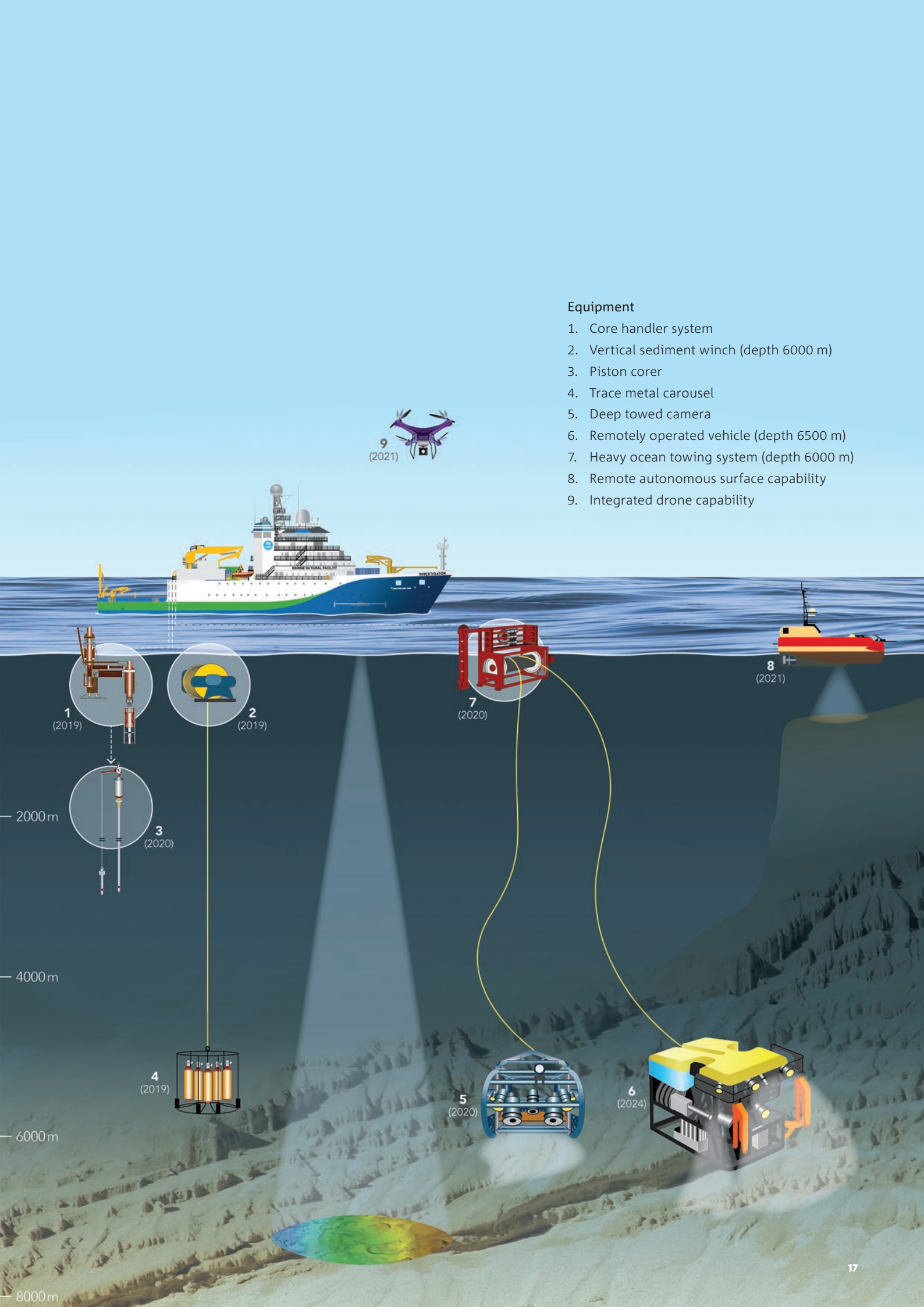
Equipment

1. Core handler system
2. Vertical sediment winch (depth 6000 m)
3. Piston corer
4. Trace metal carousel
5. Deep towed camera
6. Remotely operated vehicle (depth 6500 m)
7. Heavy ocean towing system (depth 6000 m)
8. Remote autonomous surface capability
9. Integrated drone capability

9
(2021)

1
(2019)

2
(2019)

3
(2020)

4
(2019)

5
(2020)

6
(2024)

7
(2020)

8
(2021)

2000 m

4000 m

6000 m

8000 m

17

PILLAR 5
Training future generations

Objective

To deliver education and training activities that help encourage and develop future generations of blue-water researchers and technicians.

Key actions

5.1 Provide opportunities for Aboriginal and Torres Strait Islander STEM students.

5.2 Contribute to the National STEM agenda.

5.3 Train tomorrow's marine researchers and technicians.

5.1 Opportunities for Aboriginal and Torres Strait Islander STEM students

The MNF's Indigenous Time at Sea Scholarship aims to improve education outcomes for Aboriginal and Torres Strait Islander students in science, technology, engineering and mathematics (STEM) disciplines. The program provides support to graduate and postgraduate Indigenous students to join research voyages where they are part of the research team and exposed to the work of leading researchers and cutting-edge research techniques.

The MNF will develop a framework for assessing the effectiveness of this program to ensure we continue to deliver impactful education and training activities for Aboriginal and Torres Strait Islanders.

5.2 Contributing to the national STEM agenda

The Australian Government recognises that high-quality STEM education is critically important for Australia's current and future productivity, as well as for informed decision-making and effective community, national and global citizenship.

Improving Australia's marine science postgraduate training system to meet the needs of the 'blue economy' is a shared goal of the MNF, National Marine Science Committee and higher education sector[5]. The MNF is committed

to contributing to Australia's STEM agenda by offering opportunities for postgraduate students and primary and secondary school teachers to participate in research voyages on board RV *Investigator*. To that end, education, training and capacity-building opportunities are explicitly included in MNF's merit assessment framework.

Alongside supporting education and training activities as embedded components of research voyages, the MNF will continue to run dedicated education and training programs, targeting primary and secondary teachers, as well as undergraduate and postgraduate science students.

The MNF is committed to ongoing engagement with relevant agencies and the higher education sector, and to regular external evaluation of the effectiveness of its education and training programs.

5.3 Training tomorrow's marine technical professionals

The MNF's proactive education and training program aims to support future careers by providing opportunities to engage with our advanced blue-water research capabilities. In addition to targeted opportunities for teachers and science students, there are significant opportunities to promote and support technical training at sea to reverse the national shortage of skilled marine engineers and technicians.

The MNF over the next decade will move to strengthen its role in training the next generation of field technical professionals in collaboration with other research or operational agencies and industry, while also continuing its support for training future marine researchers.

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5   MacKeracher, T. and Marsh. H. 2019. SUMMARY Improving Australia's Marine Science Postgraduate Training System to meet the needs of the 'blue economy'. National Marine Science Committee. Available at https://www.marinescience.net.au/wp-content/uploads/2020/05/NMSC_Postgraduate_Report_SUMMARY.pdf

PILLAR 6
Connecting with Australians and the world

Objective

Deepen the public's understanding of marine and atmospheric research and of the MNF's value and contribution to solving key challenges.

Key actions

6.1   Make research accessible through appealing and creative storytelling showcasing our contribution, impact and value.

6.2   Build opportunities to enable Australians and audiences around the world to engage with our research and people.

6.1   Showcasing our research and impact

The MNF is rich in stories through its delivery of marine and atmospheric research, education and training benefiting the nation. It is a global collaborative research hub.

We have an obligation, as well as an opportunity, to share the work of the MNF, why it is important and how it benefits the world. Importantly, this obligation also brings an implicit responsibility to work towards increasing scientific literacy in the wider community.

The MNF can deliver dynamic, high-impact and accessible science communication via access to world-class technology, knowledge and human resources. RV *Investigator* offers an invaluable tool to support effective

communication, with advanced capabilities allowing real-time engagement between the ship and audiences around the world. We will use these capabilities to create dynamic resources and multimedia that demand attention.

Our approach to communication is collaborative. We aim to expand the reach of communication activities by providing easy access to resources and engaging content, accompanied by guidance on how to use the materials.

6.2   Engaging Australians and the world

The MNF is a national facility and seeks to engage primarily with Australians, but also the broader global community, through stories about our people, partners and work. With at-sea operations taking RV *Investigator* to ports around Australia, the MNF will seek to use the vessel as a hub for community engagement events and capitalise on the invaluable tool the vessel offers to capture interest.

The MNF is committed to working collaboratively to tell the story of our science in dynamic and engaging ways. We will seek to do this in port by making the vessel accessible for tours and public events, and at sea by offering opportunities for both first-hand and virtual experiences, including real-time access for those on shore to engage with those on board.

The MNF will seek to develop and maintain effective communication networks and support outreach programs that bring communicators and media on board to experience our science and help us connect and engage with audiences.
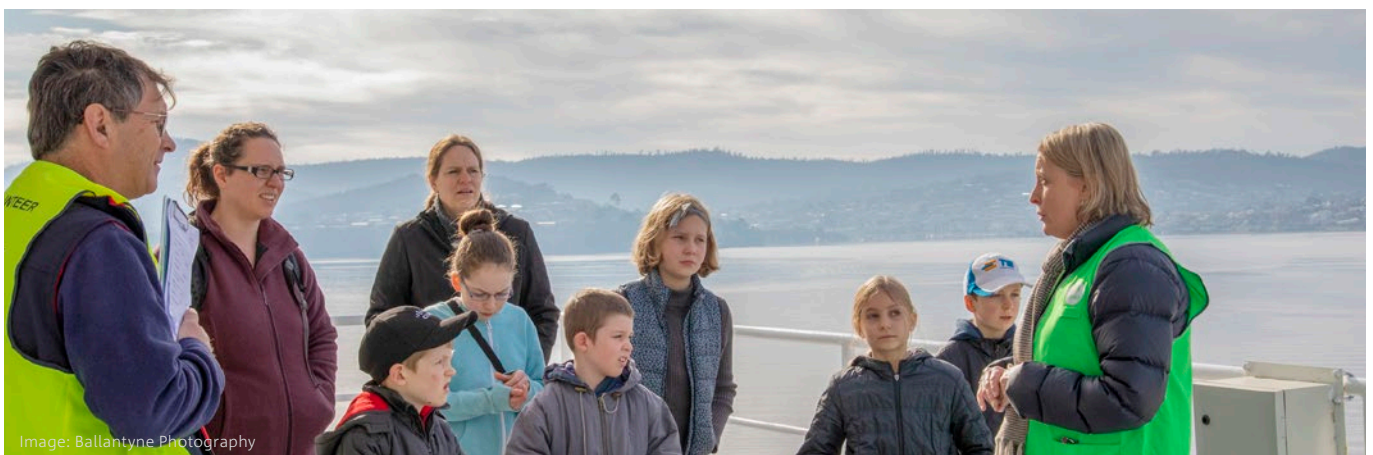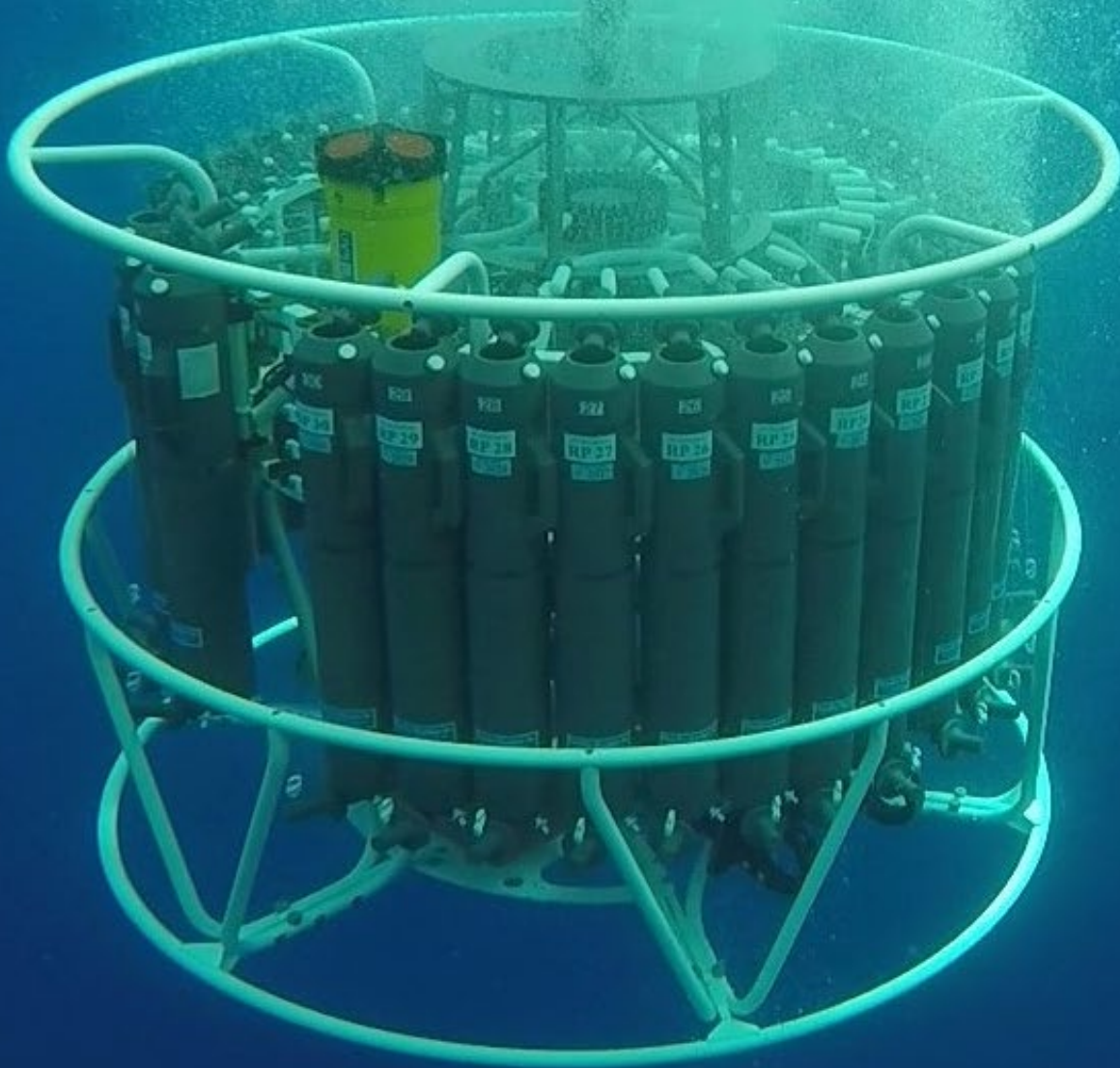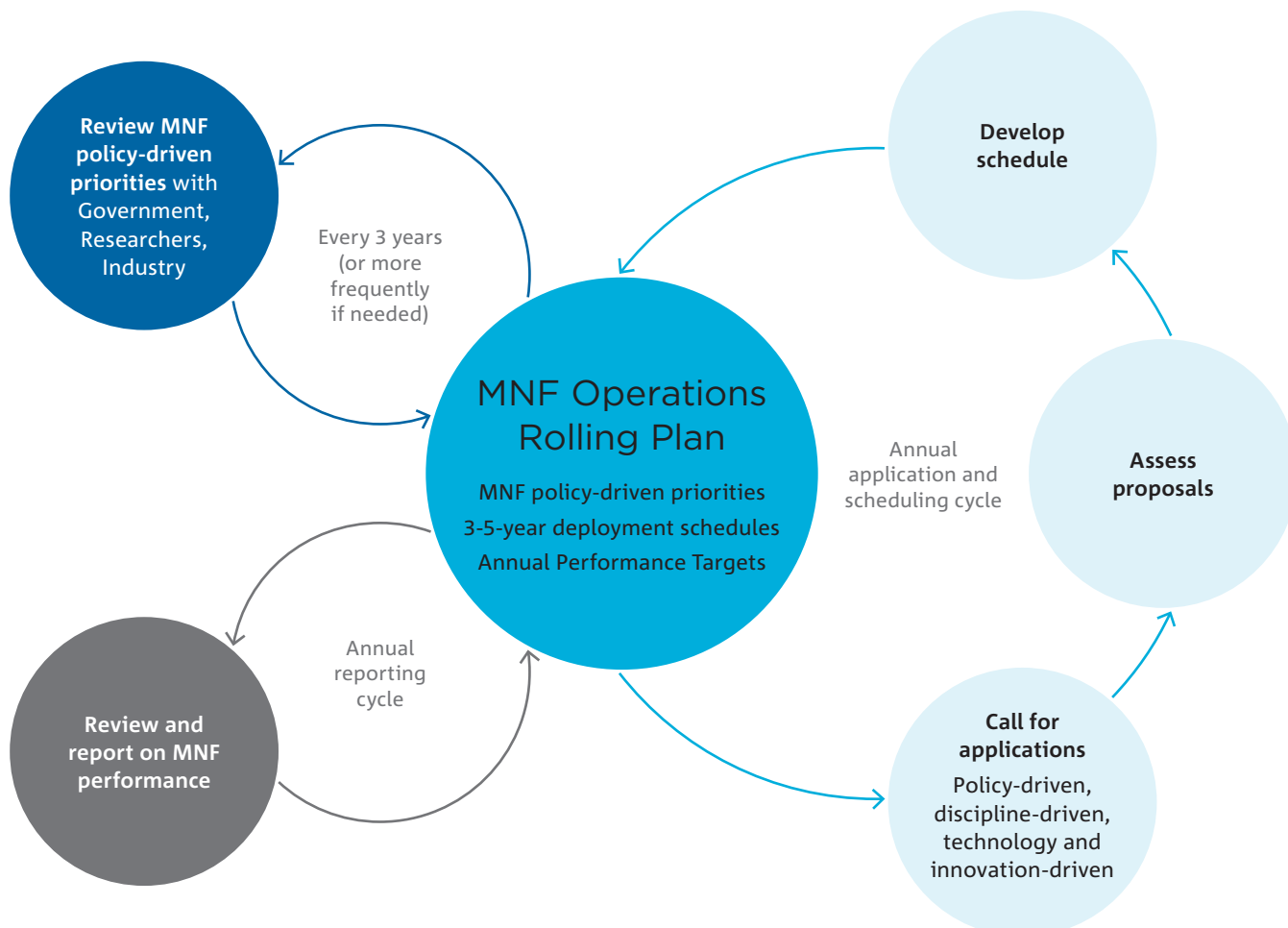

Image: Ballantyne Photography

Implementing the MNF 2030 strategy

Annual MNF Operations Rolling Plan

The primary vehicle to implement MNF 2030 is an annual MNF Operations Rolling Plan. The plan will outline for each schedule:

- the streams for which applications are sought, and any associated allocation targets to guide granting of sea time across the streams
- MNF policy-driven priorities to define the focus for Stream 1 applications
- overview of the operations over the coming schedules, including any multiyear projects as part of strategic partnerships or previous years' applications
- communication and engagement schedules that translate our impact to future generations and the public
- annual operational performance targets.

The plan will be updated each year at the time of the annual call for applications and will help prospective users effectively engage in MNF processes, including developing and submitting proposals for sea time and liaising with next and/or end users of research. The plan will outline the MNF policy-driven priorities to support collaborations among researchers and co-design of proposals with end users to develop relevant interdisciplinary proposals that target needs of strategic importance for Australia.

Review MNF policy-driven priorities with Government, Researchers, Industry

Every 3 years (or more frequently if needed)

Develop schedule

MNF Operations Rolling Plan

MNF policy-driven priorities
3-5-year deployment schedules
Annual Performance Targets

Annual application and scheduling cycle

Assess proposals

Review and report on MNF performance

Annual reporting cycle

Call for applications

Policy-driven, discipline-driven, technology and innovation-driven

Measuring success

MNF 2030 maps out an ambitious course for the MNF over the next decade. The strategic objectives and key actions under each pillar are intended to keep us on course to fulfil our mission to facilitate safe, efficient and excellent marine and atmospheric research that is well aligned with strategic priorities and addresses Australia's grand challenges for society, the economy and the environment.

Our headline performance targets describe the key changes we aim to achieve under each pillar over the course of this strategy. Alongside those, and to check progress along the way, the MNF will monitor key performance indicators under each pillar and report on these in annual MNF Operations Rolling Plans and the MNF Annual Report. Thus, our commitments are:

annually

measure and report on key performance indicators (KPIs)

by 2022

identify efficient metrics and key performance indicators and, where needed, establish performance baselines, to support a fine-scale assessment of our progress

in 2025

undertake a major review of performance against interim targets

in 2030

publish a report of the MNF's performance against this strategy and the impacts delivered by the facility

Image: Doug Thost

Image: Deanna Shanahan

Headline targets

	BY 2025	BY 2030
Safety	Continuous improvement, evidenced and reported against annual KPIs, in the health, safety and environmental performance of MNF operations	MNF recognised as a global leader in marine research for its safety and environmental performance record
Impact	At least 40% of sea-time schedule allocated to projects that directly support the MNF policy-driven priorities	Research enabled by the MNF has demonstrably delivered economic, environmental and social benefits
Access	All streams accessed by Australian marine sector users and allocated sea time	Research demonstrably delivered outcomes in each stream
Operation	300 days of science operations delivered every year (or equivalent proportion to reflect any change in funding)	Nationally integrated approach results in optimal use of national marine research infrastructure
Capabilities	Roadmap, funding model and partnerships established for construction of Australia's first deep-water remotely operated vehicle	Design of new green replacement vessel commenced and funding secured for build to start in 2035
Training	Dedicated education and training berths delivered each schedule	MNF education and training opportunities are program of choice among marine STEM students
Connecting	Annual sentiment survey with MNF demonstrates annual increase in awareness and positive perceptions	We are trusted as the national science agency and have a reputation for world-class blue-water research High awareness and positive perceptions with MNF key audiences

As Australia's national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology.

CSIRO. Unlocking a better future for everyone.