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An overview of biofouling and ballast water management by IAATO Operators, 2024-25

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Information Paper submitted by IAATO

Summary

This paper presents an overview of the biofouling and ballast water management practices employed by IAATO vessels in the 2024-25 season. It is in response to a request by the CEP as part of its continued work to understand and address the environmental risks associated with the introduction of non-native species to Antarctica.

Background

Marine non-native species have been shown to travel to Antarctica through human-associated activity, such as vessel traffic, and natural mechanisms, such as kelp rafting. The risk of successful marine non-native species invasions is predicted to increase as human activity grows and more opportunities for non-native species to establish are also provided by a changing climate[1]. Ballast water and biofouling are two of the primary mechanisms through which vessels can inadvertently transport non-native species.

As part of its ongoing work to understand and address the environmental risks associated with the introduction of non-native species to Antarctica, the Committee for Environmental Protection (CEP) requested that IAATO and COMNAP provide up-to-date advice on the ship biofouling and ballast water management practices employed by their members (CEP XXV Report para 167, 2023). The CEP has previously welcomed input from IAATO and COMNAP on this topic.

The International Maritime Organization (IMO) is working towards providing a globally consistent approach to the management of ballast water and biofouling by shipping to protect the marine environment. Resulting regulations and guidelines are relevant to the IAATO fleet and summarised up until 2023 in a review presented to the CEP by Australia, New Zealand and the United Kingdom ATCM XLV (2023) WP014 *Review of International Maritime Organization (IMO) and Antarctic Treaty system (ATS) guidelines and agreements concerning ship biofouling and ballast water management).* Progress made by the IMO since 2023 includes a requirement by ships to meet specific standards under the Ballast Water Management Convention and adoption of the revised *Guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species* (Biofouling Guidelines) in 2023 (MEPC.378(80)). In April 2025 (MEPC 83), the IMO's Marine Environment Protection Committee (MEPC) agreed to further the development of a legally binding instrument for the control and management of biofouling and adopted new in-water cleaning guidance. From 2018 to 2025, the IMO has also been leading an international project, GloFouling Partnerships, to develop and share solutions for biofouling, such as building capacity in developing countries, fostering research and promoting best practice, including the IMO Biofouling Guidelines.

IAATO is pleased to contribute to the CEP request for information on ballast water and biofouling management, recognising that the threat of invasive and non-native species is one of the most pressing global conservation concerns. It remains committed to supporting CEP discussions about environmental issues as required. This is in line with its mission to promote the practice of safe, environmentally responsible private-sector travel to Antarctica.

IAATO maintains an extensive vessel database with details about the number of operators, vessels, and voyages, which is updated annually. Details about activities and areas of operation can be found in the annual ATCM 47 (2025) IP032 *IAATO Vessel Overview of Antarctic Tourism: The 2024-25 Season, and Preliminary Estimates for 2025-26* and also ATCM 47

(2025) IP034 *A Five-Year Overview and 2024-25 Season Report on IAATO Operator Use of Antarctica Peninsula Landing Sites and ATCM Visitor Site Guidelines.*

IAATO submits information and statistics annually to the CEP and ATCM to facilitate discussions on the management of human activity. This includes information specifically related to vessel operations and actions taken by the association to manage for growth. For the purposes of this CEP request, IAATO identified additional questions that would enhance biofouling and ballast water management information in the vessel database and asked operators with vessels active in the 2024-25 season to provide the additional details.

This Information Paper provides insight into the biofouling and ballast water management practices reported by IAATO members in the 2024-25 season for the CEP.

IAATO Vessel Survey, 2024-25 season

All IAATO Operators with vessels active in the 2024-25 Antarctic season were requested to answer questions about their biofouling management practices and if their vessels have an approved Ballast Water Management System (BWMS, Annex 1).

As in previous years, the vast majority of tourism voyages (98%) operated in the Antarctic Peninsula region during the seven-month austral summer season (October to April). Vessels departed primarily from Argentina or, to a lesser extent, from other Antarctic gateway ports, including Chile and New Zealand.

IAATO groups its vessels into four categories. For the purposes of this Information Paper, 'ship' refers to International Convention for the Safety of Life at Sea (SOLAS) ships categorized as Category 1 (13-200 passengers), Category 2 (201-500 passengers) or Cruise Only (501+ passengers). 'Yacht' refers to vessels carrying a maximum of 12 passengers and includes motor yachts and sailing vessels.

In total, survey responses were obtained for 76 vessels (60 ships and 16 yachts). This represented 94% of the IAATO fleet operating in Antarctica during the 2024-25 season (77 vessels total, as listed in ATCM 47 (2025) IP032 *IAATO Vessel Overview of Antarctic Tourism: The 2024-25 Season, and Preliminary Estimates for 2025-26),* including all 58 ships plus 14 yachts (8 motor; 6 sailing). Four operators also voluntarily completed the survey for two ships and two sailing yachts that are in the IAATO database but did not operate in Antarctica during the 2024-25 season.

Ballast Water Management Practices

Eight ships in the IAATO fleet reported being exempt from installing a Ballast Water Management System (BWMS) because they do not carry ballast water or they use an enclosed system. Exemptions are approved by the vessel's classification societies and flag state. The remaining ships were equipped with an approved BWMS.

Biofouling management practices

Hull cleaning

IAATO Operators were asked specifically about the frequency of hull cleaning and if this included niche areas (e.g., sea chests and rudders).

Under SOLAS, passenger vessels are required to have their hulls inspected annually with two inspections being conducted in dry-dock within a five-year period. Vessel owners usually take advantage of their mandatory annual and dry-dock inspections to remove marine growth from hulls as this improves efficiency of the hull through the water. When asked to provide the date of their last dry-dock hull cleaning, six ships reported being new, so they had not yet been required to dry-dock. All of the remaining 54 IAATO ships surveyed had been dry-docked

within the previous three years, with 34 (57%) dry-docked in 2024, the majority of which were in the months just prior to or after the Antarctic season (Fig. 1).

Of the 16 yacht respondents, 14 had been dry-docked since 2022, with 12 of those in 2024. The remaining two yachts did not provide a date but instead stated that "in-water cleaning is conducted as needed, based on hull inspections and operational conditions, typically once or twice a year to manage biofouling effectively".

Vessel owners and operators reported cleaning regularly between their dry-dock schedules. Twelve ships and six yachts stated their hulls were routinely cleaned every 12-18 months. Two of these yachts noted they were cleaned "once in the middle of the [Antarctic] season then again when annually hauled out". A further 24 ships and four yachts reported that the frequency of cleaning depended on their mandatory annual inspection, operational conditions, including water temperature, and itinerary.

Ships and yachts were asked to provide dates of last in-water clean, if applicable. 34 (45%) vessels conducted an in-water clean in 2024 (Fig. 1), seven in 2023 and one in 2022.

Drivers for cleaning (outside of dry-docking) can include the vessel's management plan, improving energy efficiency and/or regulatory requirements, depending on area of operation. Two ships reported that their hull biofouling is minimised because they operate in fresh water between polar seasons. Marine growth can be killed by exposure to fresh water. In additional discussions, Operators stressed the importance of having access to suitable, good-quality in-water inspection and cleaning services across a wide range of ports. Damage to anti-fouling systems and coatings when cleaning can reduce their efficacy.

70 (92%) ships and yachts confirmed that hull cleaning included niche areas. Two new build ships reported that cleaning was not yet needed. A sailing yacht stated it had no niche areas, but as it is highly unlikely that any vessel has no submerged niche areas relevant in this context, this may indicate a misunderstanding of the subject-specific terminology.

Anchor locker cleaning is done at every dry-dock as a minimum with 35 (46%) ships and yachts reporting they do it annually or more often, including every month or before/after the season. A ship reported that the anchor locker is not cleaned during the Antarctic season because they use dynamic positioning only.

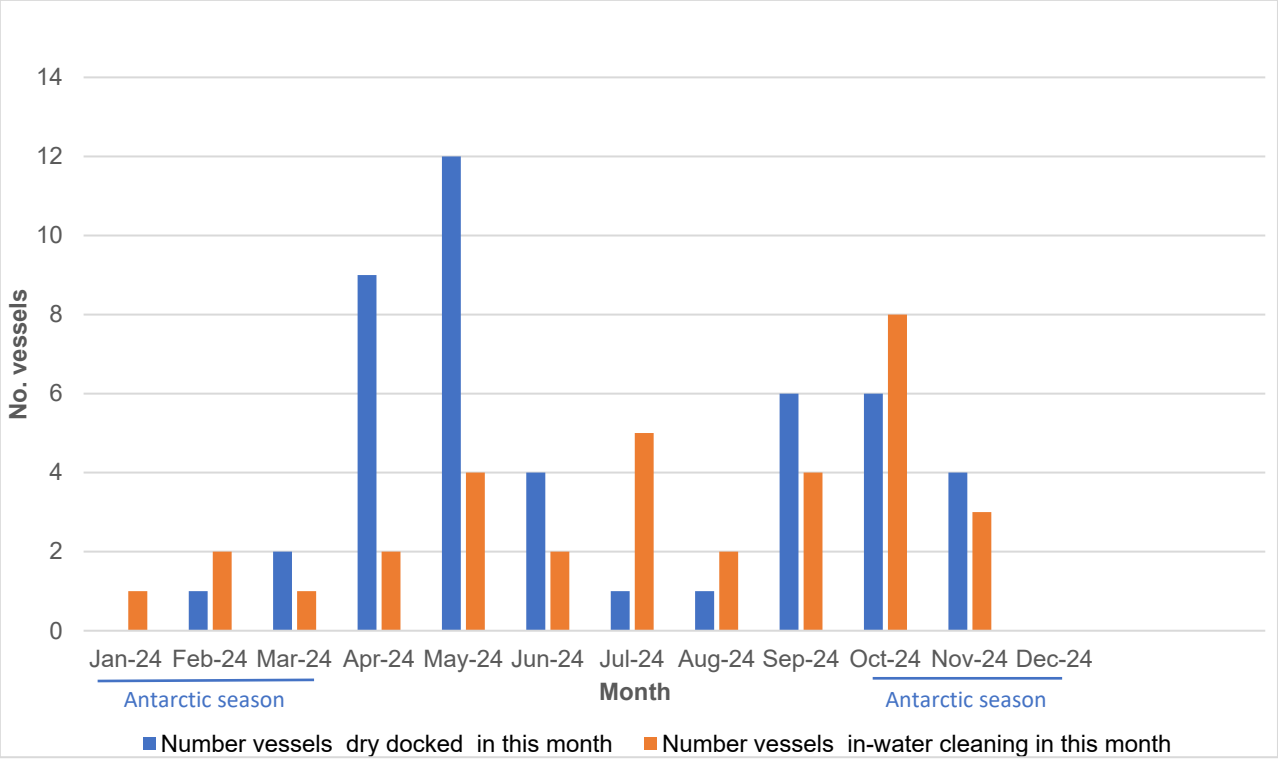

Figure 1. Graph showing number of ships and yachts in dry dock (46 vessels) or having in-water cleans (33 vessels) to remove biofouling by month in 2024.

Anti-fouling Systems

For IAATO ships and yachts surveyed, biocidal anti-fouling coatings were the most reported (44 (73%) ships, 7 (88%) motor yachts and 5 (63%) sailing vessels). Two ships and one motor yacht reported using foul release coatings. For 13 ships and yachts, the information submitted was not sufficient to determine what type of anti-fouling coating was used.

Seven ships reported having additional Marine Growth Prevention Systems (MGPS) that are commonly used to protect internal seawater systems, including sea chests, known hotspots for fouling. The systems reported were impressed current cathodic systems and electrolysis systems. No other types of MGPS were reported.

Biofouling Management Plans

The original IMO Biofouling Guidelines adopted in 2011 (MEPC 207(62)) introduce the biofouling management plan and record book procedures. The updated 2023 guidelines (MEPC.378(80)) include recommendations to identify an officer responsible for implementing the plan, more detailed guidance on the efficacy and use of anti-fouling systems, how biofouling risk can be monitored, and procedures for reactive cleaning when triggered by inspections. A limited number of states and regions also require or recommend the use of biofouling management plans.

To gain insight into the implementation of the voluntary IMO Biofouling Guidelines in the IAATO fleet, ships and yachts were asked if they had a biofouling management plan (BMP) and, if so, if it aligns with the IMO or other (e.g. national or regional) guidelines. They were also asked if they use a biofouling management record book (BMRB).

61 (80%) of the ships and yachts surveyed reported having a BFP and BMRB. Of the 58 active ships in 2024-25, only four stated that they did not have a BMP. Of those four, three are IAATO Category 1 expedition ships owned and operated by the same Operator who informed IAATO that they implement biofouling management on a schedule approved by their classification society.

All ships with a BMP stated that it aligned with IMO or other national/regional requirements. Only one stated that it did not also have a BMRB.

Of the 16 yacht respondents, three motor yachts and two sailing vessels stated they had a BMP and BMRB.

Age of the fleet in relation to the IMO Biofouling Guidelines

The IMO Biofouling Guidelines emphasise the importance of ship design and construction in minimising biofouling. Key recommendations include minimising niche areas and designing them to be smooth and easily accessible for more effective cleaning and maintenance.

Of the ships surveyed, 50% have been built since the adoption of the IMO Biofouling Guidelines in 2011 (Table 1). Design and construction of ships are influenced by a wide range of factors, some of which may organically support recommendations made in the IMO Biofouling Guidelines, such as designing and constructing ships for improved energy efficiency and operational performance. IAATO does not have specific information detailing how new ships may have incorporated the guidance, but is aware that its members stay abreast of new technologies, including AFS, which are improving in quality and effectiveness.

Table 1: **Years when IAATO vessels were built based on vessels surveyed in 2024**.

Year built	Ships (60)	Yachts (21)
1911-1960		2
1961-1970	1	1
1971-1980	2	2
1981-1990	5	4
1991-2000	9	4
2001-2010	12	4
2011-2020	15	2
2021-present	15	2

Conclusion

Information gathered from IAATO vessel operators and owners in the 2024-25 season shows compliance with the Ballast Water Management Convention and indicates an integrated approach to manage biofouling that is tailored for the unique operating profile of each vessel. While the nature of passenger vessel operations in Antarctica rarely requires the exchange of ballast water in the Treaty Area, all active ships in 2024-25 have a ballast water management system installed or an approved exemption. IAATO will follow the ongoing review of the Ballast Water Management Convention at the IMO by the MEPC.

For biofouling management, vessels are generally implementing preventative measures such as anti-fouling coatings and marine growth prevention systems, combined with annual inspections, in-water cleaning as needed and routine cleaning during mandatory dry-dock periods.

IAATO Operators and vessel owners take advantage of mandatory dry-dock inspections to regularly remove marine growth from hulls, including niche areas, and assess anti-fouling systems and coatings. The annual inspections are also used to determine if additional cleaning is required.

A further incentive to implement routine hull cleaning is to reduce the vessel's drag in water: cleaner hulls lead to enhanced energy efficiency and lower greenhouse gas emissions. This is acknowledged by the IMO and reflected in their 2022 Guidelines for the development of a Ship Energy Efficiency Management Plan (resolution MEPC.356(78)).

The global itinerary of vessels outside of the Antarctic season may increase the risk of transferring non-native species[1]. However, passenger ship operations are generally active compared to other shipping sectors[2], with few prolonged idle periods outside of dry-dock and in-water inspection schedules. This may reduce the risk of biofouling accumulation, especially of highly invasive species, which ports tend to be a hotspot for. Regular dry-dock and in-water cleaning may reduce the risk of transfer, depending on the operating profile between cleans and time between cleaning and entering the Antarctic region.

IAATO Operators use a variety of anti-fouling coatings and marine growth prevention systems that are chosen based on various factors, including the vessel's typical use and areas of operation. Further details on the use and effectiveness of these systems, especially in relation to ice scour and niche areas, could provide further insight.

Almost all ships reported having a Biofouling Management Plan and Record Book, demonstrating high awareness of the IMO Biofouling Guidelines, which are voluntary, and a commitment by operators to implement them. Challenges communicated by IAATO Operators included issues such as the availability of good-quality in-water inspection and cleaning services across a wide range of ports. The new in-water cleaning guidance adopted at MEPC 83 in April 2025 may be helpful in this regard. It aims to support the shipping community in safely planning and conducting in-water cleaning operations, while addressing risks to the environment and the anti-fouling coatings of vessels. At the same meeting, the MEPC also

agreed to work on developing a legally binding biofouling Convention that could provide a unified framework for addressing biofouling management globally. IAATO's Marine Committee will follow these developments closely.

IAATO will continue to collate data from its fleet to better understand the biofouling management practices implemented by its member operators. It encourages all Antarctic stakeholders, including those from gateway port countries, to continue sharing information to facilitate a pragmatic approach to the monitoring and management of biofouling to minimise the risk of non-native species to the marine environment.

References

1. McCarthy A.H, Peck L.S, & Aldridge D.T (2022), Ship traffic connects Antarctica's fragile coasts to worldwide ecosystems, Proc. Natl. Acad. Sci. U.S.A. 119 (3) e2110303118, https://doi.org/10.1073/pnas.2110303118
2. Scianni C, Lubarsky K, Ceballos-Osuna L, Bates T (2021) Yes, we CANZ: initial compliance and lessons learned from regulating vessel biofouling management in California and New Zealand. Management of Biological Invasions 12(3): 727–746, https://doi.org/10.3391/mbi.2021.12.3.14.

Annex 1: Biofouling and ballast Water management survey questions for IAATO vessel operators active in the 2024-25 season.

- Is the ship equipped with a Ballast Water Management System (BWMS)?
- What type of anti-fouling coating or marine growth prevention is used on the vessel's hull?
- Does the vessel have a Biofouling Management Plan (BMP)?
- If yes, does the BMP align with IMO or other national/regional guidelines?
- Does the vessel have a Biofouling Management Record Book?
- How frequently is the vessel's hull cleaned for biofouling?
- Does cleaning involve niche areas?
- When was the anchor chain locker last cleaned?
- How frequently is the anchor chain locker cleaned?
- Date of last dry-dock hull cleaning
- How frequently is in-water cleaning conducted on the vessel?
- Date of last in-water clean