2011 GUIDELINES FOR THE CONTROL AND MANAGEMENT OF SHIPS' BIOFOULING TO MINIMIZE THE TRANSFER OF INVASIVE AQUATIC SPECIES

Adopted on 15 July 2011

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THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38 of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee relating to any matter within the scope of the Organization concerned with the prevention and control of marine pollution from ships,

RECALLING ALSO that Member States of the International Maritime Organization made a clear commitment to minimizing the transfer of invasive aquatic species by shipping in adopting the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004,

RECALLING FURTHER that studies have shown biofouling on ships to be an important means of transferring invasive aquatic species which, if established in new ecosystems, may pose threats to the environment, human health, property and resources,

NOTING the objectives of the Convention on Biological Diversity, 1992, and that the transfer and introduction of aquatic invasive species through ships' biofouling threatens the conservation and sustainable use of biological diversity,

NOTING ALSO that implementing practices to control and manage ships' biofouling can greatly assist in reducing the risk of the transfer of invasive aquatic species,

NOTING FURTHER that this issue, being of worldwide concern, demands a globally consistent approach to the management of biofouling,

HAVING CONSIDERED, at its sixty-second session, the draft Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species, developed by the Sub-Committee on Bulk Liquids and Gases,

1. ADOPTS the 2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species, as set out in the annex to the present resolution;

2. REQUESTS Member States to take urgent action in applying these Guidelines, including the dissemination thereof to the shipping industry and other interested parties, taking these Guidelines into account when adopting measures to minimize the risk of introducing invasive aquatic species via biofouling, and reporting to the MEPC on any experience gained in their implementation; and

3. AGREES to keep these Guidelines under review in light of the experience gained.

1 INTRODUCTION

1.1 In the adoption of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention), Member States of the International Maritime Organization (IMO) made a clear commitment to minimizing the transfer of invasive aquatic species by shipping. Studies have shown that biofouling can also be a significant vector for the transfer of invasive aquatic species. Biofouling on ships entering the waters of States may result in the establishment of invasive aquatic species which may pose threats to human, animal and plant life, economic and cultural activities and the aquatic environment.

1.2 While the International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001 (AFS Convention) addresses anti-fouling systems on ships, its focus is on the prevention of adverse impacts from the use of anti-fouling systems and the biocides they may contain, rather than preventing the transfer of invasive aquatic species.

1.3 The potential for invasive aquatic species transferred through biofouling to cause harm has been recognized by the IMO, the Convention on Biological Diversity (CBD), several UNEP Regional Seas Conventions (e.g., Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution), the Asia Pacific Economic Cooperation forum (APEC), and the Secretariat of the Pacific Region Environmental Program (SPREP).

1.4 All ships have some degree of biofouling, even those which may have been recently cleaned or had a new application of an anti-fouling coating system. Studies have shown that the biofouling process begins within the first few hours of a ship's immersion in water. The biofouling that may be found on a ship is influenced by a range of factors, such as follows:

.1 design and construction, particularly the number, location and design of niche areas;

.2 specific operating profile, including factors such as operating speeds, ratio of time underway compared with time alongside, moored or at anchor, and where the ship is located when not in use (e.g., open anchorage or estuarine port);

.3 places visited and trading routes; and

.4 maintenance history, including: the type, age and condition of any anti-fouling coating system, installation and operation of anti-fouling systems and dry-docking/slipping and hull cleaning practices.

1.5 Implementing practices to control and manage biofouling can greatly assist in reducing the risk of the transfer of invasive aquatic species. Such management practices can also improve a ship's hydrodynamic performance and can be effective tools in enhancing energy efficiency and reducing air emissions from ships. This concept has been identified by the IMO in the "Guidance for the development of a ship energy efficiency management plan (SEEMP)" (MEPC.1/Circ.683).

1.6 These Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (hereafter "the Guidelines") are intended to provide a globally consistent approach to the management of biofouling. As scientific and technological advances are made, the Guidelines will be refined to enable the risk to be more adequately addressed. Port States, flag States, coastal States and other parties that can assist in mitigating the problems associated with biofouling should exercise due diligence to implement the Guidelines to the maximum extent possible.

2 DEFINITIONS

2.1. For the purposes of these Guidelines, the following definitions apply:

AFS Convention means the International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001.

Anti-fouling coating system means the combination of all component coatings, surface treatments (including primer, sealer, binder, anti-corrosive and anti-fouling coatings) or other surface treatments, used on a ship to control or prevent attachment of unwanted aquatic organisms.

Anti-fouling system means a coating, paint, surface treatment, surface, or device that is used on a ship to control or prevent attachment of unwanted organisms.

Biofouling means the accumulation of aquatic organisms such as micro-organisms, plants, and animals on surfaces and structures immersed in or exposed to the aquatic environment. Biofouling can include microfouling and macrofouling (see below).

In-water cleaning means the physical removal of biofouling from a ship while in the water.

Invasive aquatic species means a species which may pose threats to human, animal and plant life, economic and cultural activities and the aquatic environment.

Marine Growth Prevention System (MGPS) means an anti-fouling system used for the prevention of biofouling accumulation in internal seawater cooling systems and sea chests and can include the use of anodes, injection systems and electrolysis.

Member States means States that are Members of the International Maritime Organization.

Macrofouling means large, distinct multicellular organisms visible to the human eye such as barnacles, tubeworms, or fronds of algae.

Microfouling means microscopic organisms including bacteria and diatoms and the slimy substances that they produce. Biofouling comprised of only microfouling is commonly referred to as a slime layer.

Niche areas mean areas on a ship that may be more susceptible to biofouling due to different hydrodynamic forces, susceptibility to coating system wear or damage, or being inadequately, or not, painted, e.g., sea chests, bow thrusters, propeller shafts, inlet gratings, dry-dock support strips, etc.

Organization means the International Maritime Organization.

Port State authority means any official or organization authorized by the Government of a port State to verify the compliance and enforcement of standards and regulations relevant to the implementation of national and international shipping control measures.

Ship means a vessel of any type whatsoever operating in the aquatic environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft, fixed or floating platforms, floating storage units (FSUs) and floating production storage and off-loading units (FPSOs).

States means coastal, port or Member States as appropriate.

Treatment means a process which may use a mechanical, physical, chemical or biological method to remove or render sterile, invasive or potentially invasive aquatic species fouling a ship.

3 APPLICATION

3.1. The Guidelines are intended to provide useful recommendations on general measures to minimize the risks associated with biofouling for all types of ships and are directed to States, shipmasters, operators and owners, shipbuilders, ship cleaning and maintenance operators, port authorities, ship repair, dry-docking and recycling facilities, ship designers, classification societies, anti-fouling paint manufacturers and suppliers and any other interested parties. A State should determine the extent that the Guidelines are applied within that particular State.

3.2. A separate guidance document, based on these Guidelines, provides advice relevant to owners and/or operators of recreational craft less than 24 metres in length, using terminology appropriate for that sector.

3.3. States should inform the Organization of any relevant biofouling regulations, management requirements or restrictions they are applying to international shipping.

4 OBJECTIVES

4.1. The objectives of these Guidelines are to provide practical guidance to States, ship masters, operators and owners, shipbuilders, ship repair, dry-docking and recycling facilities, ship cleaning and maintenance operators, ship designers, classification societies, anti-fouling paint manufacturers and suppliers and any other interested parties, on measures to minimize the risk of transferring invasive aquatic species from ships' biofouling. It is important that biofouling management procedures be effective as well as environmentally safe, practical, designed to minimize costs and delays to the ship, and based upon these Guidelines whenever possible.

4.2. To minimize the transfer of invasive aquatic species, a ship should implement biofouling management practices, including the use of anti-fouling systems and other operational management practices to reduce the development of biofouling. The intent of such practices is to keep the ship's submerged surfaces, and internal seawater cooling systems, as free of biofouling as practical. A ship following this guidance and minimizing macrofouling would have a reduced potential for transferring invasive aquatic species via biofouling.

4.3. The management measures outlined within these Guidelines are intended to complement current maintenance practices carried out within the industry.

5 BIOFOULING MANAGEMENT PLAN AND RECORD BOOK

5.1. Implementation of an effective biofouling management regime is critical for minimizing the transfer of invasive aquatic species. The biofouling management measures to be undertaken on a ship should be outlined in a biofouling management plan, and records of biofouling management practices kept in a biofouling record book, as outlined below.

BIOFOULING MANAGEMENT PLAN

5.2. It is recommended that every ship should have a biofouling management plan. The intent of the plan should be to provide effective procedures for biofouling management. An example of a Biofouling Management Plan is outlined in appendix 1 of these Guidelines. The Biofouling Management Plan may be a stand-alone document, or integrated in part or fully, into the existing ships' operational and procedural manuals and/or planned maintenance system.

5.3. The biofouling management plan should be specific to each ship and included in the ship's operational documentation. Such a plan should address, among other things, the following:

.1 relevant parts of these Guidelines;

.2 details of the anti-fouling systems and operational practices or treatments used, including those for niche areas;

.3 hull locations susceptible to biofouling, schedule of planned inspections, repairs, maintenance and renewal of anti-fouling systems;

.4 details of the recommended operating conditions suitable for the chosen anti-fouling systems and operational practices

.5 details relevant for the safety of the crew, including details on the anti-fouling system(s) used; and

.6 details of the documentation required to verify any treatments recorded in the Biofouling Record Book as outlined in appendix 2.

5.4. The biofouling management plan should be updated as necessary.

BIOFOULING RECORD BOOK

5.5. It is recommended that a Biofouling Record Book is maintained for each ship. The book should record details of all inspections and biofouling management measures undertaken on the ship. This is to assist the shipowner and operator to evaluate the efficacy of the specific anti-fouling systems and operational practices on the ship in particular, and of the biofouling management plan in general. The record book could also assist interested State authorities to quickly and efficiently assess the potential biofouling risk of the ship, and thus minimize delays to ship operations. The Biofouling Record Book may be a stand-alone document, or integrated in part, or fully, into the existing ships' operational and procedural manuals and/or planned maintenance system.

5.6. It is recommended that the Biofouling Record Book be retained on the ship for the life of the ship.

5.7. Information that should be recorded in a Biofouling Record Book includes the following:

.1 details of the anti-fouling systems and operational practices used (where appropriate as recorded in the Anti-fouling System Certificate), where and when installed, areas of the ship coated, its maintenance and, where applicable, its operation;

.2 dates and location of dry-dockings/slippings, including the date the ship was re-floated, and any measures taken to remove biofouling or to renew or repair the anti-fouling system;

.3 the date and location of in-water inspections, the results of that inspection and any corrective action taken to deal with observed biofouling;

.4 the dates and details of inspection and maintenance of internal seawater cooling systems, the results of these inspections, and any corrective action taken to deal with observed biofouling and any reported blockages; and

.5 details of when the ship has been operating outside its normal operating profile including any details of when the ship was laid-up or inactive for extended periods of time.

5.8. An example of a Biofouling Record Book and information to be recorded is included as appendix 2 to these Guidelines.

6 ANTI-FOULING SYSTEM INSTALLATION AND MAINTENANCE

6.1. Anti-fouling systems and operational practices are the primary means of biofouling prevention and control for existing ships' submerged surfaces, including the hull and niche areas. An anti-fouling system can be a coating system applied to exposed surfaces, biofouling resistant materials used for piping and other unpainted components, marine growth prevention systems (MGPSs) for sea chests and internal seawater cooling systems, or other innovative measures to control biofouling.

6.2. The anti-fouling system used should comply with the AFS Convention, where necessary.

CHOOSING THE ANTI-FOULING SYSTEM

6.3. Different anti-fouling systems are designed for different ship operating profiles so it is essential that ship operators, designers and builders obtain appropriate technical advice to ensure an appropriate system is applied or installed. If an appropriate anti-fouling system is not applied, biofouling accumulation increases.

6.4. Some factors to consider when choosing an anti-fouling system include the following:

.1 planned periods between dry-docking – including any mandatory requirements for ships survey;

.2 ship speed – different anti-fouling systems are designed to optimize anti-fouling performance for specific ship speeds;

.3 operating profile – patterns of use, trade routes and activity levels, including periods of inactivity, influence the rate of biofouling accumulation;

.4 ship type and construction; and

.5 any legal requirements for the sale and use of the anti-fouling systems.

6.5. Consideration should also be given to the need for tailored, differential installation of anti-fouling coating systems for different areas of the ship to match the required performance and longevity of the coating with the expected wear, abrasion and water flow rates in specific areas, such as the bow, rudder, or internal seawater cooling systems and sea chest interiors.

INSTALLING, RE-INSTALLING, OR REPAIRING THE ANTI-FOULING SYSTEM

6.6. Whether installing, re-installing or repairing the anti-fouling system, care should be taken in surface preparation to ensure all biofouling residues, flaking paint, or other surface contamination is completely removed, particularly in niche areas, to facilitate good adhesion and durability of the anti-fouling system.

6.7. For sea chests the following should be considered when installing, re-installing, or repairing their anti-fouling systems:

.1 inlet grates and the internal surfaces of sea chests should be protected by an anti-fouling coating system that is suitable for the flow conditions of seawater over the grate and through the sea chest;

.2 care should be taken in surface preparation and application of any anti-fouling coating system to ensure adequate adhesion and coating thickness. Particular attention should be paid to the corners and edges of sea chests, blowout pipes, holding brackets and the bars of grates. Grates may require a major refurbishment type of surface preparation at each dry-docking to ensure coating durability; and

.3 the installation of MGPSs is encouraged to assist in treating the sea chest and internal seawater piping as part of the biofouling management plan. A careful evaluation of the consequential effects of MGPSs should be made before installation, including potential effects on the ship and/or the environment and the existence of regulations affecting the use of MGPSs.

6.8. Other niche areas can also be particularly susceptible to biofouling growth. Management measures for niche areas are outlined below.

.1 Dry-docking support strips – Positions of dry-docking blocks and supports should be varied at each dry-docking, or alternative arrangements made to ensure that areas under blocks are painted with anti-fouling, at least at alternate dry-dockings. These areas should receive a major refurbishment type of surface preparation and be coated at each dry-docking that they are accessible. Where it is not possible to alternate the position of dry-docking support strips, e.g., in critical weight bearing areas such as under the engine-room, these areas should be specially considered and managed by other means, e.g., the application of specialized coatings or procedures.

.2 Bow and stern thrusters – The body and area around bow, stern and any other thrusters prone to coating damage, should be routinely maintained at dry-dockings. Particular attention should be paid to any free flooding spaces which may exist around the thruster tunnel. The housings/recesses, and retractable fittings such as stabilizers and thruster bodies, should have an anti-fouling coating system of adequate thickness for optimal effectiveness.

.3 Edges and weld joints – Exposed edges on the hull, such as around bilge keels and scoops, and weld joints, should be faired and coated to ensure adequate coating thickness to optimize system effectiveness.

.4 Rudder hinges and stabilizer fin apertures – Recesses within rudder hinges and behind stabilizer fins need to be carefully and effectively cleaned and re-coated at maintenance dry-dockings. Rudders and stabilizer fins should be moved through their full range of motion during the coating process to ensure that all surfaces are correctly coated to the specification of the anti-fouling system. Rudders, rudder fittings and the hull areas around them should also be adequately coated to withstand the increased wear rates experienced in these areas.

.5 Propeller and shaft – Propellers and immersed propeller shafts should be coated with fouling release coatings where possible and appropriate, to maintain efficiency and enable self-cleaning, so that the need for regular in-water cleaning and polishing is minimized.

.6 Stern tube seal assemblies and the internal surfaces of rope guards – Exposed sections of stern tube seal assemblies and the internal surfaces of rope guards should be carefully painted with anti-fouling coating systems appropriate to the degree of water movement over and around these surfaces.

.7 Cathodic protection (CP) anodes – Niche areas for biofouling can be minimized if: anodes are flush-fitted to the hull; a rubber backing pad is inserted between the anode and the hull; or the gap is caulked. Caulking the gap will make the seam or joint watertight. If not flush-fitted, the hull surface under the anode and the anode strap should be coated with an anti-fouling coating system suitable for low water flow to prevent biofouling accumulation. If anodes are attached by bolts recessed into the anode surface, the recess should be caulked to remove a potential niche.

.8 Pitot tubes – Where retractable pitot tubes are fitted, the housing should be internally coated with an anti-fouling coating system suitable for static conditions.

.9 Sea inlet pipes and overboard discharges – Anti-fouling coating systems should be applied inside the pipe opening and accessible internal areas. The anti-corrosive or primer coating selected should be appropriate to the specific pipe material if this material is different to the hull. Care should be taken in surface preparation and coating application to ensure good adhesion and coating thickness.

PROCEDURES FOR SHIP MAINTENANCE AND RECYCLING FACILITIES

6.9. Ship maintenance and recycling facilities should adopt measures (consistent with applicable national and local laws and regulations) to ensure that viable biofouling organisms or chemical and physical pollutants are not released into the local aquatic environment.

These measures include the following:

.1 capturing biological material to minimize the risk of organism survival and establishment and other impacts of biological material being released into the aquatic environment;

.2 treating and/or disposing of captured biological material in an environmentally appropriate manner;

.3 scheduling of ships' arrival and departure at cleaning and maintenance facilities and at locations where ships are moored while waiting for cleaning and maintenance to minimize the risk of fouled ships contaminating other ships and the surrounding environment;

.4 removing biofouling from all underwater surfaces of a ship when in dry-dock, including niche areas; and

.5 lowering or extending retractable equipment such as stabilizers, thrusters, transducers and similar when a ship is in dry-dock or slipped, to permit access for the removal of biofouling from the equipment and its housing.

7 IN-WATER INSPECTION, CLEANING AND MAINTENANCE

7.1. Despite the use of effective anti-fouling systems and operational practices, undesirable amounts of biofouling may still accumulate during the intended lifetime of the anti-fouling system. To maintain a ship as free of biofouling as practical, it may be advisable for the ship to undertake in-water inspection, cleaning and maintenance.

IN-WATER INSPECTION OF SHIPS

7.2. In-water inspection can be a useful and flexible means to inspect the condition of anti-fouling systems and the biofouling status of a ship. In-water inspections should be undertaken periodically as a general means of routine surveillance, augmented by specific inspections as necessary to address any situations of elevated risk. Specific occasions when an in-water inspection may be appropriate, include the following:

.1 before and after any planned period of inactivity or significant or unforeseen change to the ship's operating profile;

.2 prior to undertaking in-water cleaning to determine the presence of known or suspected invasive aquatic species or other species of concern on the ship;

.3 after a known or suspected marine pest or other species of concern is discovered in a ship's internal seawater cooling systems; and

.4 following damage to, or premature failure of, the anti-fouling system.

7.3. It is recommended that ship operators identify niche areas on the ship that may accumulate biofouling to enable these areas to be effectively targeted during inspections. Areas may include the following:

- propeller thrusters and propulsion units;
- sea chests;
- rudder stock and hinge;
- stabilizer fin apertures;
- rope guards, stern tube seals and propeller shafts;
- cathodic protection anodes;
- anchor chain and chain lockers;
- free flood spaces inherent to the ships' design;
- sea chest and thruster tunnel grates;
- echo sounders and velocity probes;
- overboard discharge outlets and sea inlets; and
- areas prone to anti-fouling coating system damage or grounding (e.g., areas of the hull damaged by fenders when alongside, leading edges of bilge keels and propeller shaft "y" frames).

7.4. Dive and remotely operated vehicle (ROV) surveys can be practical options for in-water inspections although they do have limitations regarding visibility and available dive time compared with the area to be inspected, and difficulties with effectively accessing many biofouling prone niches. Such surveys should be undertaken by persons who are suitably qualified and experienced and familiar with biofouling and associated invasive aquatic species

risks and the safety risks relating to in-water surveys. Regulatory authorities may have recommended or accredited biofouling inspection divers.

IN-WATER CLEANING AND MAINTENANCE

7.5. In-water cleaning can be an important part of biofouling management. In-water cleaning can also introduce different degrees of environmental risk, depending on the nature of biofouling (i.e. microfouling versus macrofouling), the amount of anti-fouling coating system residue released and the biocidal content of the anti-fouling coating system. Relative to macrofouling, microfouling can be removed with gentler techniques that minimize degradation of the anti-fouling coating system and/or biocide release. Microfouling removal may enhance a ship's hull efficiency, reducing fuel consumption and greenhouse gas emissions. It is, therefore, recommended that the ship's hull is cleaned when practical by soft methods if significant microfouling occurs. In-water cleaning can also reduce the risk of spreading invasive aquatic species by preventing macrofouling accumulation.

7.6. It may be appropriate for States to conduct a risk assessment to evaluate the risk of in-water cleaning activities and minimize potential threats to their environment, property and resources. Risk assessment factors could include the following:

.1 biological risk of the biofouling organisms being removed from the ship (including viability of the biofouling organisms or the ability to capture biofouling material);

.2 factors that may influence biofouling accumulation, such as changes to the operating profile of the ship;

.3 geographical area that was the source of the biofouling on the ship, if known; and

.4 toxic effects related to substances within the anti-fouling coating system that could be released during the cleaning activity, and any subsequent damage to the anti-fouling coating system.

7.7. Personnel proposing to undertake in-water cleaning should be aware of any regulations or requirements for the conduct of in-water cleaning, including any regulations regarding the discharge of chemicals into the marine environment and the location of sensitive areas (such as marine protected areas and ballast water exchange areas). Where significant macrofouling growth is detected, it should be removed or treated (if this can be done without damaging the anti-fouling system) in accordance with such regulations. Where available, appropriate technology should be used to minimize the release of both anti-fouling coating or paint debris, and viable adult, juvenile, or reproductive stages of macrofouling organisms. The collected material should be disposed of in a manner which does not pose a risk to the aquatic environment.

7.8. For immersed areas coated with biocidal anti-fouling coatings, cleaning techniques should be used that minimize release of biocide into the environment. Cleaning heavily fouled anti-fouling coating systems can not only generate biofouling debris, but prematurely depletes the anti-fouling coating system and may create a pulse of biocide that can harm the local environment and may impact on future applications by the port authority for the disposal of dredge spoil. Depleted anti-fouling coating systems on hulls will rapidly re-foul. In-water cleaning or scrubbing of hulls for the purpose of delaying dry-dockings beyond the specified service life of the coating is, therefore, not recommended.

7.9. Immersed areas coated with biocide-free anti-fouling coating systems may require regular in-water cleaning as part of planned maintenance to maintain hull efficiency and minimize the risk of transferring invasive aquatic species. Cleaning techniques should be used which do not damage the coating and impair its function.

7.10. Any maintenance or repair activities should take care not to impede future in-service cleaning and/or maintenance, e.g., care should be taken to ensure sea chest grates do not become welded shut during repair work.

7.11. Care should be taken to ensure that any MGPSs installed are operating effectively to prevent accumulation of biofouling

7.12. Regular polishing of uncoated propellers to maintain operational efficiency will also minimize macrofouling accumulation. Uncoated propeller shafts may require cleaning at the same time as the propeller. As a ship's routine propeller polishing will involve the use of divers, it is recommended that this opportunity is taken to assess sea chests, and other similar areas, for macrofouling.

7.13. Internal seawater cooling systems need to be regularly monitored to ensure effective biofouling control is maintained. Seawater cooling systems that operate while the ship is in port may be vulnerable to biofouling accumulation, and should be closely monitored. If seawater cooling systems become fouled, they should be appropriately treated. Any discharge of treated water from internal seawater cooling systems should be undertaken in accordance with applicable regulations.

8 DESIGN AND CONSTRUCTION

8.1. Initial ship design and construction offers the most comprehensive, effective and durable means by which to minimize ship biofouling risks. In the design and construction of a ship, or when a ship is being significantly altered, the following should be taken into consideration:

.1 Small niches and sheltered areas should be excluded from the ship as far as practical, e.g., flush mounting pipes in sea chests. Where not practical, these should be designed so that they may be easily accessed for inspection, cleaning and application of anti-fouling measures.

.2 Rounding and/or bevelling of corners, gratings and protrusions to promote more effective coverage of anti-fouling coating systems, and hinging of gratings to enable diver access.

.3 Providing the capacity to blank off the sea chest and other areas, such as moon pools, floodable docks and other free flood spaces, for treatment and/or cleaning.

8.2. Internal seawater cooling systems should be designed and made of appropriate material to minimize biofouling and constructed with a minimum of bends, kinks and flanges in seawater piping.

8.3. To avoid creation of avoidable niches while ensuring effective safety and operation of the ship, where practical, particular attention should be given to avoidance of unfilled gaps in all skin fittings and the detailed design of the items as follows:

.1 sea chests – minimize size and number, and use smooth surfaces to maximize flow efficiency, fit MGPS, and steam or hot water cleaning systems, grills and their opening arrangements designed for in-water inspection and maintenance;

.2 retractable fittings and equipment – avoid external reinforcement (such as stiffeners) where possible, design for in-water inspection and maintenance;

.3 tunnel thrusters – tunnels to be above light water line or accessible to divers, grills and their opening arrangements designed for in-water inspection, maintenance and operation;

.4 sponsons and hull blisters – use fully enclosed in preference to free flooding types, with access provisions made for in-water inspection, cleaning and maintenance;

.5 stern tube seal assemblies and rope guards – design for in-water inspection, cleaning and maintenance; and

.6 immersible and seabed equipment – ensure facilities for equipment washdown during retrieval and enclosed washdown areas for cleaning of equipment on board, if necessary, are provided.

9 DISSEMINATION OF INFORMATION

9.1. States are encouraged to maintain and exchange information relevant to these Guidelines through the Organization. Accordingly, States are encouraged to provide the Organization with the information related to the management of biofouling as follows:

.1 copies of current regional, national and local laws, regulations, standards, exemptions or guidelines;

.2 technical and research information, including any studies on the impact and control of invasive aquatic species in ships' biofouling, and on the efficacy and practicality of environmentally protective in-water cleaning technologies;

.3 education materials such as CD's, DVD's or printed materials; and

.4 the location of and the terms of use for cleaning and maintenance services and facilities for ships and equipment that comply with these Guidelines.

9.2. State authorities should provide ships with timely, clear and concise information on biofouling management measures and treatment requirements that are being applied to shipping and ensure these are widely distributed. Shipowners and operators should endeavour to become familiar with all requirements related to biofouling by requesting such information from their port or shipping agents or competent authorities (i.e. State authorities). State authorities should also provide ships with any available information on particular invasive aquatic species that may be present in a port and could attach to a ship as biofouling (e.g., if a particular species of concern is spawning) in a timely manner.

9.3. Organizations or shipping agents representing shipowners and operators should be familiar with the requirements of State authorities with respect to biofouling management and treatment procedures, including information that will be needed to obtain entry clearance. Verification and detailed information concerning State requirements should be obtained by the ship prior to arrival.

9.4. To monitor the effectiveness of these Guidelines, States, as part of the evaluation process could provide to the Organization details of records describing reasons why ships could not apply these Guidelines, e.g., design, construction or operation of a ship, particularly from the view point of ships' safety, or lack of information concerning the Guidelines.

10 TRAINING AND EDUCATION

10.1. Training for ships' masters and crews, in-water cleaning or maintenance facility operators and those surveying or inspecting ships as appropriate should include instructions on the application of biofouling management and treatment procedures, based upon the information contained in these Guidelines. Instruction should also be provided on the following:

.1 maintenance of appropriate records and logs;

.2 impacts of invasive aquatic species from ships' biofouling;

.3 benefits to the ship of managing biofouling and the threats posed by not applying management procedures;

.4 biofouling management measures and associated safety procedures; and

.5 relevant health and safety issues.

10.2. States and industry organizations should ensure that relevant marine training organizations are aware of these Guidelines and include this in their syllabuses as appropriate.

11 OTHER MEASURES

11.1. To the extent practical, States and port authorities should aim to ensure smooth flow of ships going in and out of their ports to avoid keeping ships waiting offshore so that anti-fouling systems can operate as effectively as possible.

11.2. States may apply other measures on ships within their jurisdiction for the purpose of providing additional protection for their marine environment, or in emergency situations. In managing emergency situations for biofouling, States should consider the guidance document for ballast water emergency situations (BWM.2/Circ.17).

11.3. States should take into account these Guidelines when developing other measures and/or restrictions for managing ships' biofouling.

11.4. Where other measures are being applied, States should notify the Organization of the specific requirements, with supporting documentation, for dissemination to other States and non-governmental agencies where appropriate.

11.5. The application of other measures by States should not place the safety of the ship and crew at risk.

12 FUTURE WORK

RESEARCH NEEDS

12.1 States and other interested parties should encourage and support research into, and development of technologies for:

.1 minimizing and/or managing both macrofouling and microfouling particularly in niche areas (e.g., new or different anti-fouling systems and different designs for niche areas to minimize biofouling);

.2 in-water cleaning that ensures effective management of the anti-fouling system, biofouling and other contaminants, including effective capture of biological material;

.3 comprehensive methods for assessing the risks associated with in-water cleaning;

.4 shipboard monitoring and detection of biofouling;

.5 reducing the macrofouling risk posed by the dry-docking support strips, (e.g., alternative keel block designs that leave less uncoated hull area);

.6 the geographic distribution of biofouling invasive aquatic species; and

.7 the rapid response to invasive aquatic species incursions, including diagnostic tools and eradication methods.

12.2 Potential operational benefits of such technologies should also be highlighted and relevant information provided to the Organization.

INDEPENDENT INFORMATION NEEDS

12.3 Summaries are needed of the different types of anti-fouling systems and other biofouling management measures currently available, how they work and their performance under different operating conditions and situations. This information could assist shipowners and operators when making decisions about the most appropriate coatings and coating systems for their ship type and activity.