Policy Brief: Ballast Water Exchange

BALLAST WATER EXCHANGE AND BALLAST WATER TREATMENT: A POWERFUL DUO

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INTRODUCTION

What is ballast water?
Ballast water is essential for a ships stability and is used to balance out cargo weight [4]. Every year **3-10 billion tonnes** of ballast water is carried by commercial ships and vessels [1]. Ballast water has been a cause for concern because of its contribution to the **spread of invasive alien species** when travelling in foreign waters [3]. Invasive species tend to establish a fast growing population and out-compete native species for resources, altering food webs and the ecosystem and may even cause species to go extinct [6]. The **introduction of aquatic invasive species is among the top 5 threats to the ocean.** Since two-thirds of consumer goods are transported by commercial vessels [7], ballast water from these ships are a severe risk for the transport of invasive species and will continue to **increase the number of invasive species if not dealt with effectively and urgently.**

What current conservation methods are we using to deal with invasive threats caused by ballast water?
Ballast Water Exchange: It requires **coastal water to be exchanged with mid-ocean marine water** (95% volumetric exchange) more than **200 nautical miles from land and 200m deep** [5]**.**

2. Ballast Water Treatment: is where ballast water is **treated with filtration and a disinfecting substance like UV radiation or chlorination to meet the limits on the number of organisms listed in the D2 standard** [3]**.**

Both methods are currently not fully effective and as a result invasive species are still being released into foreign waters **compromising the ecosystem, economy and human health**.

APPROACHES AND RESULTS

In a study conducted by Paolucci et al., they analyzed the effects of BWE, BWT and a combination of both methods on the propagule pressure (species abundance) and colonization pressure (species richness) of organisms in a ballast water tank[1].The results of the experiment **showed flaws in the effectiveness of BWT by showing that the colonisation pressure did not decrease** [1]. However, BWT showed improvement on reducing species abundance with low individual numbers of species [1]. Hence, it worked to reduce propagule pressure. **BWE had similar results to BWT group but was even less effective than BWT** [1]. This study also concluded that the **hybrid approach (BWE+ hypochlorite) was the most successful in reducing the abundance of species and was the only approach that reduced colonisation pressure** [1].

International Maritime Organization Retrieved From: http://www.imo.org/en/MediaCentre/HotTopics/BWM/Pages/default.aspx

SUMMARY

- *Ballast water is a vector for invasive species.*
- *The current methods we utilize are BWE and BWT. However, both methods are typically being used alone and do not prove to be very effective.*
- ***This policy brief argues that while there is no permanent fix to this issue. The IMO should encourage vessels to use both BWE and BWT as a better way to combat invasive threats as they show reduced numbers of potential alien species and lower propagule and colonization pressure.***
- *There needs to be more investment in research for alternative methods since both BWE and BWT are temporary solutions.*

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APPROACHES AND RESULTS

A paper by Briski et al. analyzed BWT and BWT+BWE methods to assess the reduction of phytoplankton and zooplankton via a ship-based evaluation [2]. The authors **proposed that a combined method of BWT and BWE would maximize benefits of both systems** [2]. They hypothesized that BWT would reduce propagule pressure and BWE would be used to interfere with environmental tolerance [2]. They **found that BWE + BWT reduced the number of phytoplankton significantly more than BWT alone** [2].They concluded that the spread of invasive species is dependent on 3 factors (abundance of individuals, tolerance to the environment and assimilation into the biological community) and that **BWE+ BWT is a method that targets two factors instead of one** [2]**.** However, the main drawback from this study was the consideration that the marine species brought into foreign waters may be able to adapt to lower salinity [2]. Consequently, **BWE + BWT is still not a permanent and fully effective method but it is a better temporary solution.**

Another study that supports the dual system is one carried out by First & Drake (2017). This study is focused on the Great Lakes and **proposes the ideal ballast water management strategy is a dual one (BWE + BWT)** [3]**. Similarly to the other studies, they found that a combined approach significantly reduced the number of species released in discharge than BWT alone** [3]**.** They concluded that the combined approach was clearly effective in lowering the chances of an invasion **but they point out that this dual method may not be practical** [3]**.** There may be challenges with conducting additional ballast water approaches within the exchanging borders [3]. This is especially a concern for long BWT processes [3]. Another point of concern is the financial aspect where **BWT and BWE as a dual method is expensive with high operational and maintenance costs** [3]**.**

CONCLUSION

Most commercial vessels are currently using one method for ballast water management. However, a combination of the two methods is significantly more successful at reducing the number of invasive species than using only one. This is because BWE is targeted at interfering with a species ability to tolerate an environment and BWT is focused on reducing propagule pressure. This may explain the additive benefit for using both systems.

International Joint Commission Retrieved From:https://ijc.org/en/great-lakes-ballast-water-collaborative-discusses-successes-challenges-fighting-aquatic-invasives

IMPLICATIONS AND RECOMMENDATIONS

There appears to be a wide consensus in the scientific community that BWE and BWT together is largely effective in reducing invasive species. Therefore, IMO should include a policy that states BWT and BWE should be encouraged to be used until a more permanent solution is found.

Since the dual method still appears to have some faults such as the possibility that some marine organisms may develop a tolerance to lower salinity. Additionally, some species like dinoflagellates show an increase of abundance after the treatment, highlighting the fact that there are species that are exceptions. These flaws suggests that investing in more research to develop a better way to handle ballast water should be important.

It is agreed that for vessels that do possess the financial means to implement BWE and BWT, they should be highly encouraged to do so. For vessels with more financial burden perhaps a financial aid or subsidy should be given out so ships are able to convert to this system in the future.

References

[1] (Paolucci et al., 2017)
[2] (Briski et al., 2015)
[3] (First & Drake, 2017)
[4] (Jung et al., 2012)
[5] (International Maritime Organization, n.d.)
[6] (Canning-Clode, 2015)
[7] (Werschkun et al., 2014)