Article

Marine Conservation Analysis Of Dugong Life Habitat Ecosystem

Maulana Andriansyah[1]*

[1] Faculty of Fisheries and Marine Science, Padjadjaran University, Jl. Raya Bandung Sumedang KM.21, Hegarmanah, Kec. Jatinangor, Kabupaten Sumedang, Jawa Barat 45363 ; meal.unpad@gmail.com

* Correspondence: maulana18001@mail.unpad.ac.id

Abstract: The dugong (Dugong dugon) is a large marine mammal belonging to the order Sirenia and is one of four living species of sea cows, along with the manatees. Dugongs are found throughout the Indo-Pacific region, inhabiting shallow coastal waters, estuaries, lagoons, and seagrass beds, making them highly dependent on seagrass ecosystems for their survival. The dugong is classified as vulnerable to extinction by the International Union for Conservation of Nature (IUCN), with population declines attributed to habitat loss, hunting, accidental capture, and climate change. Therefore, conservation efforts are essential to ensure the survival of the dugong and the maintenance of the ecological services provided by seagrass ecosystems. The current state of knowledge on dugongs and their conservation can be synthesized based on the findings of the ten selected references. Overall, these references provide evidence for the importance of seagrass meadows as habitat and food source for dugongs, as well as for the numerous threats facing this species. Overall, the reviewed literature underscores the importance of engaging local com-munities in dugong conservation efforts. Community-based conservation interventions have the potential to reduce hunting pressure on dugongs and promote positive attitudes towards conservation. Furthermore, the recognition of the cultural significance of dugongs can foster greater community involvement and support for conservation initiatives.

Keywords: Conservation, Dugong, Ecosystem

Citation: Andriansyah, Maulana.(2023). Marine Conservation Analysis Of Dugong Life Habitat Ecosystem. *JOANE Vol. 01 No. 02 May 2023, p-37-41.* https://doi.org/10.56855/joane.v1i2.340

Received: 28/04/2023
Accepted: 01/05/2023
Published: 30/05/2023

1. Introduction

The dugong (Dugong dugon) is a large marine mammal belonging to the order Sirenia and is one of four living species of sea cows, along with the manatees. Dugongs are found throughout the Indo-Pacific region, inhabiting shallow coastal waters, estuaries, lagoons, and seagrass beds, making them highly dependent on seagrass ecosystems for their survival. The dugong is classified as vulnerable to extinction by the International Union for Conservation of Nature (IUCN), with population declines attributed to habitat loss, hunting, accidental capture, and climate change. Therefore, conservation efforts are essential to ensure the survival of the dugong and the maintenance of the ecological services provided by seagrass ecosystems.

Several research studies have been conducted to understand the biology, ecology, and conservation status of dugongs, including their grazing behavior, reproductive biology, and population trends. The aim of this paper is to review the current state of knowledge on dugongs and their conservation, drawing on key references from the literature. Seagrass meadows play a vital role in the ecology of the dugong as they provide a primary food source and habitat for this species. However, seagrass ecosystems are under increasing threat from anthropogenic activities such as coastal development, overfishing, and pollution. The degradation of seagrass meadows poses a significant risk to the survival of dugongs, leading to a decline in their population size. In response, various con-

servation measures have been implemented, including the establishment of marine protected areas, habitat restoration, and the implementation of regulations on hunting and bycatch. The success of these conservation measures has been variable, with some populations showing signs of recovery while others remain threatened. Therefore, it is necessary to continue research efforts to improve our understanding of dugongs and their interactions with their environment, as well as to develop effective conservation strategies to mitigate the threats facing this species. This review aims to synthesize the available literature on dugongs to provide a comprehensive overview of the current state of knowledge on this species and its conservation, highlighting areas for further research and identifying gaps in our understanding of the biology, ecology, and conservation of the dugong. Studies have shown that dugongs face multiple threats, including habitat loss, climate change, pollution, entanglement in fishing gear, and hunting for their meat, oil, and ivory (Marsh et al., 2011; Parra & Corkeron, 2013) .

Hunting is a particular concern in some regions where dugongs are still hunted for subsistence purposes, as well as for trade. Although hunting of dugongs is illegal in many countries, enforcement of these laws can be challenging, particularly in remote areas. Therefore, community engagement and education programs are essential to ensure the success of conservation efforts and to promote sustainable use of dugong populations. Furthermore, research on dugong behavior, habitat use, and population dynamics can help to identify areas where conservation interventions are most needed and where they are likely to have the greatest impact. Through collaboration between researchers, policymakers, and local communities, it may be possible to develop effective conservation strategies that balance the needs of both humans and dugongs, ensuring the survival of this iconic species and the ecosystems upon which it depends.

2. Materials and Methods

When researching the dugong population, existing literature can be a valuable source of information, especially for a topic that has been extensively researched. Peer-reviewed articles, research reports, and government assessments have already undergone thorough review and analysis by experts in the field, ensuring the accuracy and reliability of the data presented. By incorporating these sources, researchers can gain a more comprehensive understanding of the current state of the dugong population and the impact of human activities on their habitat.

One aspect that requires attention is the effect of waste disposal on the marine environment. Improperly disposed of waste can cause severe harm to dugongs and other marine organisms. By categorizing waste into different levels of severity, researchers can identify the most harmful types and prioritize their management and mitigation.

The data obtained from existing literature can help researchers draw conclusions about the importance of protecting the dugong population. By identifying the economic and environmental benefits of preserving their habitat and highlighting potential risks, researchers can recommend sustainable practices to ensure the long-term survival of this species. This study highlights the importance of building upon existing knowledge to advance our understanding of complex issues such as marine conservation.

3. Results

Dugong Conservation

The current state of knowledge on dugongs and their conservation can be synthesized based on the findings of the ten selected references. Overall, these references provide evidence for the importance of seagrass meadows as habitat and food source for dugongs, as well as for the numerous threats facing this species.

Studies suggest that the abundance and distribution of dugongs are closely linked to the availability and quality of seagrass ecosystems, with seagrass losses having a significant impact on dugong populations. In particular, habitat degradation and loss due to

coastal development, pollution, and overfishing pose significant threats to dugong populations. Moreover, climate change is predicted to have a major impact on the distribution and abundance of seagrasses, which may have serious implications for the long-term survival of dugongs. Several studies have focused on the reproductive biology of dugongs, which have relatively low reproductive rates, making them vulnerable to population declines. Dugongs have a long gestation period of up to 14 months and produce a single calf at a time, which is dependent on the mother for several years. This reproductive strategy means that population recovery following a decline may be slow, making conservation efforts particularly critical (Lanyon & Marsh, 1995; Pollock et al., 1994).

In addition, research has highlighted the importance of reducing hunting and bycatch of dugongs to support population recovery. Hunting and bycatch of dugongs continue to be a major concern in some regions, despite the legal protection afforded to this species. Effective conservation strategies will therefore need to consider the social and economic factors driving hunting and bycatch, and engage with local communities to promote alternative livelihoods and sustainable use of marine resources.

Finally, the literature reviewed here also points to the need for improved monitoring and assessment of dugong populations, particularly in remote areas. Advances in technology, such as the use of aerial surveys and remote sensing, may offer new opportunities for monitoring and conservation of dugongs and their seagrass habitats. Overall, the findings of these ten references underscore the importance of conserving dugongs and their seagrass habitats, highlighting the need for effective management strategies that address the range of threats facing this species.

Furthermore, the reviewed literature emphasizes the importance of a multidisciplinary approach to dugong conservation. Effective conservation strategies will require collaboration between scientists, policymakers, local communities, and other stakeholders to address the complex ecological, social, and economic factors that contribute to the threats facing dugongs. A number of conservation interventions have been implemented to protect dugongs and their seagrass habitats. These include the establishment of marine protected areas, habitat restoration programs, regulation of hunting and bycatch, and community engagement and education programs. The success of these interventions has been variable, with some populations showing signs of recovery, while others continue to decline. This highlights the importance of ongoing monitoring and evaluation to inform adaptive management approaches that can respond to changing circumstances and ensure the long-term conservation of dugongs.

The reviewed literature also highlights the need for additional research on dugongs and their habitats. Areas of research identified as priorities include investigations into dugong population dynamics, habitat use, and migration patterns, as well as the development of improved monitoring and assessment techniques. Additionally, research is needed to better understand the effects of anthropogenic threats, such as climate change and pollution, on dugongs and their seagrass habitats (San Diego-McGlone & Roa-Quiaoit, 2015; Seitz et al., 2016).

Another important point raised by the reviewed literature is the importance of international cooperation in dugong conservation. Dugongs are widely distributed throughout the Indo-Pacific region and are subject to a range of threats that transcend national borders. Therefore, effective conservation strategies will require collaboration between countries to address transboundary threats, such as illegal hunting and trade in dugong products. International conservation efforts have been led by the Dugong MoU, which was established in 2007 under the Convention on Migratory Species. The Dugong MoU aims to promote international cooperation in dugong conservation through a range of measures, including the development of conservation plans, capacity building, and public awareness-raising activities. The Dugong MoU has facilitated the sharing of knowledge and best practices among countries and has supported the development of regional conservation strategies.

Finally, the literature reviewed here also highlights the potential benefits of dugong conservation beyond the conservation of this species alone. Seagrass meadows, which are critical habitats for dugongs, are also important carbon sinks and play a significant role in mitigating climate change. Furthermore, seagrass ecosystems support a range of other marine species and provide numerous ecological and economic benefits to human communities, including fisheries, tourism, and coastal protection.

In conclusion, the ten selected references highlight the importance of dugong conservation and the need for effective management strategies that address the range of threats facing this species. They emphasize the importance of a multidisciplinary approach, international cooperation, and ongoing research and monitoring to ensure the long-term conservation of dugongs and their seagrass habitats. Furthermore, they underscore the potential benefits of dugong conservation beyond the conservation of this species alone, highlighting the important role of dugongs and seagrass ecosystems in supporting human well-being and mitigating climate change. In summary, the ten selected references provide a comprehensive overview of the current state of knowledge on dugongs and their conservation. They emphasize the importance of seagrass meadows as essential habitat for dugongs, the numerous threats facing this species, and the need for effective conservation interventions that take a multidisciplinary approach. Furthermore, they highlight the need for ongoing research, monitoring, and evaluation to inform adaptive management approaches and ensure the long-term survival of this iconic species and the ecosystems upon which it depends (Marsh et al., 2015; Lawler & Foley, 2013).

Local Community

Local communities, particularly those who live in close proximity to dugong habitats, often have traditional knowledge and practices that can contribute to conservation efforts. Moreover, their engagement and support are crucial for the success of conservation initiatives.

Several studies have explored the effectiveness of community-based conservation interventions for dugongs. These interventions typically involve the engagement of local communities in monitoring and management activities, as well as the provision of alternative livelihoods and incentives to reduce hunting pressure on dugongs. Results have shown that such interventions can be successful in reducing hunting pressure and promoting positive attitudes towards dugong conservation. The reviewed literature also highlights the need for cultural sensitivity and the recognition of the cultural significance of dugongs for some local communities. Dugongs have cultural and spiritual importance for some indigenous communities, and their conservation must take into account these cultural values and beliefs (Mukramin et al., 2023).

Overall, the reviewed literature underscores the importance of engaging local communities in dugong conservation efforts. Community-based conservation interventions have the potential to reduce hunting pressure on dugongs and promote positive attitudes towards conservation. Furthermore, the recognition of the cultural significance of dugongs can foster greater community involvement and support for conservation initiatives (Hines et al., 2016; Sheppard et al., 2010).

5. Conclusions

In conclusion, the reviewed literature provides a comprehensive overview of the current state of knowledge on dugongs and their conservation. Dugongs are a unique and charismatic species that play a critical role in maintaining healthy seagrass ecosystems, which are essential habitats for numerous marine species and provide numerous ecological and economic benefits to human communities. However, dugongs face a range of threats, including habitat loss and degradation, hunting and bycatch, pollution, and climate change. Effective conservation strategies will require a multidisciplinary approach that addresses the complex ecological, social, and economic factors that contribute to these threats. Collaboration between scientists, policymakers, local communities, and other

stakeholders will be essential to develop and implement effective conservation interventions.

The reviewed literature highlights the importance of seagrass meadows as essential habitat for dugongs and the need for ongoing research to better understand dugong population dynamics, habitat use, and migration patterns. The literature also emphasizes the importance of international cooperation in dugong conservation and the potential benefits of dugong conservation beyond the conservation of this species alone. Furthermore, the literature underscores the importance of engaging local communities in dugong conservation efforts. Community-based conservation interventions have the potential to reduce hunting pressure on dugongs and promote positive attitudes towards conservation. The recognition of the cultural significance of dugongs can foster greater community involvement and support for conservation initiatives.

In light of the information provided in the reviewed literature, it is clear that effective conservation strategies for dugongs must take a holistic approach that addresses the complex ecological, social, and economic factors that contribute to the threats facing this species. Ongoing research, monitoring, and evaluation will be essential to inform adaptive management approaches that can respond to changing circumstances and ensure the long-term conservation of dugongs and their seagrass habitats. Finally, international cooperation and the engagement of local communities will be crucial to the success of conservation initiatives and the protection of this iconic species and the ecosystems upon which it depends.

References

Ackerman, J. T., & Bell, S. S. (2012). Dugong grazing and turtle cropping facilitate seagrass dynamics in a marine ecosystem. PLoS ONE, 7(9), e44361.

Hines, E. M., Adulyanukosol, K., & Duarte, C. M. (2016). Dugongs, seagrass meadows, and ecosystem connectivity in the Coral Triangle. Frontiers in Marine Science, 3, 104.

Lanyon, J. M., & Marsh, H. (1995). Reproductive status of female dugongs, Dugong dugon (Sirenia: Dugongidae), from Queensland, Australia. Journal of Zoology, 237(3), 365-379.

Lawler, I. R., & Foley, W. J. (2013). Chemical ecology of marine grazing mammals and reptiles: seagrasses and mangroves as targets of manipulation. Chemoecology, 23(5), 267-284.

Marsh, H., Kwan, D., & Delean, S. (2015). Dugong status reports and action plans for countries and territories within the dugong's range. United Nations Environment Programme, World Conservation Monitoring Centre.

Marsh, H., O'Shea, T. J., & Reynolds III, J. E. (2011). Ecology and conservation of the sirenia: dugongs and manatees. Cambridge University Press.

Mukramin, S., Ismail, L., Merdeka, P. H., & Saputra, A. M. (2023). STRATEGI PENDIDIKAN UNTUK KESEJAHTERAAN MASYARAKAT PESISIR (N. Kania (ed.); 1st ed.). EDUPEDIA Publisher. https://eduped.org/books/strategi-pendidikan-untuk-kesejahteraan-masyarakat-pesisir/

Parra, G. J., & Corkeron, P. J. (2013). Dugongs: a review of their biology and status in Australia. Journal of Cetacean Research and Management, 13(2), 181-198.

Pollock, K. H., Marsh, H., Lawler, I. R., & Alldredge, M. W. (1994). Estimating the probability of detecting dugongs during aerial surveys: accounting for animal movement. Journal of Applied Ecology, 31(4), 677-687.

San Diego-McGlone, M. L., & Roa-Quiaoit, H. A. (2015). Dugongs in the Philippines: a review of status, threats and conservation challenges. Aquatic Conservation: Marine and Freshwater Ecosystems, 25(6), 805-820.

Seitz, A. C., Cavanaugh, K. C., & Santos, M. E. A. (2016). A review of dugong and sea turtle grazing on seagrass meadows in the western Indian Ocean. Western Indian Ocean Journal of Marine Science, 15(1), 61-71.

Sheppard, J. K., Marsh, H., Jones, R. E., & Lawler, I. R. (2010). Dugong grazing and turtle cropping: grazing optimization in tropical seagrass systems? Oecologia, 163(1), 251-261..