Research Article

JELLY-XPLORE: Species Identification of Jellyfish in Targeted Area

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Abstract: *Jellyfish are known to be opportunistic organisms that have been able to survive harsh conditions caused by climate change and environmental degradation for centuries. However, their aggregations can negatively impact affected regions' safety and socioeconomic well-being. Unfortunately, jellyfish tendency for attacks or blooms often go unrecognized beforehand. To address this issue, JELLY-XPLORE has been developed to provide species identification, morphological studies, species diversity, species evenness, and spatiotemporal variation within targeted areas. JELLY-XPLORE also integrates preliminary findings with Geographic Information System (GIS) to visualize the distribution of jellyfish species within the targeted area. By providing preliminary data on the current species residing in the area, JELLY-XPLORE aims to alert local communities, tourists, coastal authorities, and the general public to potential jellyfish-related risks. The goals of JELLY-XPLORE align with the United Nations' Sustainable Development Goals, including SDG 14 (Life Below Water), SDG 3 (Good Health and Well-being), and SDG 13 (climate action), promoting sustainability of coastal area activities and the safety of locals and the public.*

Keywords: Jellyfish Monitoring; Morphological Identification; Species Identification; Species Diversity

1. INTRODUCTION

Jellyfish species are known to be opportunistic species, and this kind of strategy allows them to survive dramatic climate change and environmental degradation through adaptation skills to

worldwide or localized factors. Large medusae, such as *Pelagia noctiluca*, are highly adaptable and can quickly respond to regional and local forcing factors. P. noctiluca is an opportunistic predator that feeds on various prey, including zooplankton, ichthyoplankton, fish eggs, and larvae. In areas with highly variable pulses of organic enrichment, the community of opportunistic species is likely to be resilient at scales exceeding the patches. Although jellyfish populations are increasing, most available evidence suggests that jellyfish abundances fluctuate with climatic cycles, indicating their ability to survive in different conditions (Austen et al., 2002; Mghili et al., 2021; Purcell et al., 2007; Suchman et al., 2012). This finding indicates that jellyfish can adapt and survive in various conditions, making them opportunistic organisms. Due to their survival fitness, they are favoured over finfish, making jellyfish blooms possible.

The blooming of jellyfish could cause a severe impact on the safety and socioeconomic well-being of the impacted region. Jellyfish blooms can significantly impact various aspects of human enterprises, such as tourism, fishing, aquaculture, and power plants (Bosch-Belmar et al., 2020; Purcell et al., 2007; Richardson et al., 2009). The factors that contribute to jellyfish blooms include warming caused by climate changes and power plant thermal effluents, eutrophication, fishing activities, aquaculture, marine structures, changes in the hydrological regime, removal of jellyfish predators, and accidental introductions of non-native gelatinous species into disturbed ecosystems (Hashim et al., 2022; Pitt et al., 2014; Richardson et al., 2009). These environmental changes often coincide, making it challenging to determine the exact cause of jellyfish blooms (Wei et al., 2015). However, human activities in coastal environments and climate changes are likely to increase, leading to a potential increase in jellyfish blooms, causing severe impacts on the safety and socioeconomic of the coastal area. Despite this, the possible jellyfish that could cause blooming or become biological hazards in certain areas are still not adequately recognized.

The baseline information on the potential jellyfish responsible for jellyfish attacks and blooming within coastal areas is still not fully understood. According to previous research, jellyfish stings are more likely to occur at the seashore than in the deep sea. This is because jellyfish tend to drift along the current, becoming stranded onshore and along the coast. However, in most cases, jellyfish species in contact or encounter are not identified due to the murkiness and cloudiness of seawater (Mohd Suan et al., 2016; Mubarak et al., 2021). Therefore, there is a need for jellyfish identification within the targeted area to be carried out. Due to the unforeseen nature of blooming, the potential of the blooming of jellyfish could occur anytime and anywhere if the environmental and natural factors provide opportunities for the proliferation of the jellyfish. Especially in densely operated coastal activities, the impact of jellyfish will be severe and more significant. The local region's socioeconomic will also be negatively impacted as jellyfish will cause disturbance by clogging the net, stinging fishermen, and reducing the fish stock population by predation and competition of juveniles (Purcell, 2003; Purcell et al., 2007; The Star, 2020). As an effort to brace the impact and alleviate the problem, JELLY-XPLORE came into the spotlight.

JELLY-XPLORE is a geodatabase of jellyfish species collected from the coastal region that comprises preliminary findings to alert the locals and hint at coastal management or authorities as one form of biological hazard preparedness. To begin, our innovation project would focus on coastal water regions. The geodatabase contains information such as species names, morphological identification, size, photos, distribution, diversity, and species evenness. The map was precisely digitized using geospatial mapping of GIS technology. The map will be created digitally or printed based on the preference and needs of the consumer.

The objective of this innovative product is to produce a jellyfish map. The development of the database is based on the collection of jellyfish species that are becoming a hindrance to fishermen within the coastal water of Kuala Perlis.

2. METHOD & MATERIAL

JELLY-XPLORE is developed based on the core integration of extensive data collection (Jellyfish data), spatial data (the geolocation of sampling areas), and a geodatabase and software (ArcGIS software). ESRI created and maintained the ArcGIS family of client, server, and online Geographic İnformation Systems.

3. FINDINGS

Finding and discussion will be focused on the novelty and uniqueness, benefit to humankind, and potential commercialization of the JELLY-XPLORE.

3.1 Novelty and Unıqueness

To the author's knowledge, JELLY-XPLORE is one of the products that integrated the source from a multidisciplinary area focusing on the sustainability of the coastal zone by alleviating the problem of uncertainty of species residing and potentially causing blooming in a targeted coastal area. Typically, the finding of jellyfish species is only being reported within academic and non-academic journals. Nevertheless, the harmful jellyfish species information is still not evenly distributed to local coastal communities and the general public. Therefore, it is not an exaggeration to state that JELLY-XPLORE is a double spear-headed solution for coastal communities and the general public to gain knowledge and alert on the harmful stinging jellyfish as they enter the waters.

3.2 Benefıt to Mankınd

Within a heavily dense coastal area, fishing, tourism, and aquaculture are the major operational activities that lead to the improvement of the socioeconomic of the local communities. Coastal communities depended on the yield of the sea. The safety of the breadwinners (local fishermen, aquaculture operators, and recreational water operators) will be ensured by implementing the JELLY-EXPLORE. The coastal economic sustainability will also be preserved as the distribution and safety of the attraction beach or coastal areas are appropriately sustained. JELLY-XPLORE could also hinder and minimise the impact of jellyfish bloom on aquaculture, especially cage aquaculture, which requires extensive cost. Government agencies and environmentalists can use our product to monitor jellyfish attack hot spots, particularly in recreational areas or Exclusive Economic Zones (EEZ), where unwanted encounters of jellyfish are permissible.

3.3 Commercialisation Potential

Potential clients can be expected from locals (fishermen and hotel operators), government bodies (Department of Fisheries, Department of Environment, public universities, research department), non-government bodies (Tourism players, marine culture operators, etc.), tourists, and the general public.

4. CONCLUSION

Overall, JELLY-XPLORE is consistent with the Sustainable Development Goals established by the United Nations SDG 14: "Life below water," SDG 3: "Good health and well-being," and SDG 13: "Climate action."

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