

Research Article

Plankton Map: Mapping the Distribution of Plankton in the Aquatic Environment

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Abstract: Many aquatic organisms, including fish, seahorses, clams, and bacteria, depend on plankton because they are an essential component of the aquatic food web. Due to their significance, their distribution in our aquatic environment should be mapped as baseline information. Our new technology aims to create maps of plankton. Our innovative product is called Plankton Map. Our product benefits even more since there is currently no plankton map development, particularly in Malaysia's northern region. In terms of community advantages, Plankton Map will support a wide range of clients, including municipal, governmental, and non-governmental organisations. Overall, Plankton Map is consistent with the Sustainable Development Goals established by the United Nations SDG 14: "Life below water," SDG 2: "Zero hunger," SDG 3: "Good health and well-being," and SDG 13: "Climate action".

Keywords: Aquatic; Geodatabase; Map; Plankton; Sustainable.



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1. INTRODUCTION

From small, single-celled protozoa to bigger crustaceans like krill, plankton includes a wide variety of sizes and types of organisms. All marine ecosystems are supported by plankton, which gives fish, marine animals, and birds the energy that comes from primary production, which occurs when phytoplankton uses sunlight to develop and reproduce (Varpe, 2012).

Plankton reacts quickly and clearly to changes in their environment since humans typically do not harvest them, have little control over how they move, and have short generation times. Due to this, plankton serves as helpful markers of ecosystem change (Richardson, 2008).

In numerous ways, plankton is impacted by climate change. Because they have cold blood, for instance, the temperature has an impact on their metabolism. Their life cycle duration may be shortened in warmer waters, changing the time of yearly seasonal abundance peaks (McKinstry & Campbell, 2018). This then impacts their predators. Another illustration can be seen in ocean chemistry, where shelled plankton like pelagic marine snails may suffer from increased ocean acidity. The ideal conditions for development and reproduction, as well as tolerance levels, vary among plankton species. Each species' chances of thriving will fluctuate as local conditions change, leading to locally varied plankton communities and shifting ranges.

Plastic pollution, which has been growing globally, may have detrimental consequences on the marine ecosystem (Mohd Rizal et al., 2022). Additionally, marine pollution can reduce the number of plankton in the aquatic environment, which can have an impact on the food chain (Hashim et al., 2022; Kamaruddin et al., 2022). Researchers have discovered fewer studies on environmental issues like the impact of water quality on plankton biodiversity in the northern region of Malaysia.

A geodatabase of plankton species collected from the surface water of freshwater and saltwater ecosystems is used to create the Plankton Map. To begin, our innovation project would focus on coastal water regions. The geodatabase now contains information such as species names, sizes, photos etc. The map was precisely digitized using remote sensing imagery. The map that is created can be digital or printed.

This innovative product aims to produce a plankton map that caters to the distribution of zooplankton and phytoplankton species. The development of the database is based on the recent collection of numerous plankton species from the coastal water of Kuala Perlis, Perlis, Malaysia.

2. METHOD & MATERIAL

Plankton Map is developed based on the integration of attribute data (Plankton species), spatial data (the geolocation of sampling areas), and a geodatabase and software (ArcGIS software). ESRI created and maintains the ArcGIS family of client, server, and online Geographic Information Systems (GIS). Plankton was collected using a plankton net and immediately brought into the marine technology laboratory at Universiti Teknologi MARA, Cawangan Perlis, Kampus Arau, 02600, Arau, Perlis, Malaysia. Microscopes were used to identify the species of plankton.

3. FINDINGS

3.1 Novelty and Uniqueness

There has been minimal development of a plankton map, particularly in Malaysia's northern region. Most plankton species were reported in academic and non-academic journals using graphs and smart art. The development of a map based on the distribution of plankton will enhance the understanding of the role of plankton in ecology especially in coastal water.

3.2 Benefit to Mankind

For farmed fish, particularly fry, fingerlings, and juveniles, plankton is a good source of food in the aquaculture industry. For instance, fishermen and marine culture operators will profit from employing our product.

The potential of pelagic fisheries is influenced by the quantity and dispersion of plankton. They thus serve as the primary prey for many adult fishes that consume plankton as well as many fish larvae. Our product can be used by government agencies and environmentalists to monitor plankton hot spots, particularly in Exclusive Economic Zones (EEZ), where most marine species were found and where fishermen could capture them.

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) and non-government bodies (Tourism players, marine culture operators etc.).

4. CONCLUSION

Overall, Plankton Map is consistent with the Sustainable Development Goals established by the United Nations SDG 14: "Life below water," SDG 2: "Zero hunger," SDG 3: "Good health and well-being," and SDG 13: "Climate action".

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