A Summary of Research on Artificial Reefs Monitoring Technology

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\textbf{Abstract}

In this paper, the status of oceanic pasture and artificial reefs are introduced. The development of oceanic pasture and artificial reefs monitoring in the world is presented. Development of monitoring technology is divided into three stages according to the history. The first stage is that divers observing the ocean and obtain information about marine organisms. The second stage is using sensor such as sonar, cameras, to observe the ocean and obtain information about marine organisms. The third stage is deploying underwater vehicles in the monitoring tasks. Finally we propose that underwater vehicles will be the future trend of artificial reef monitoring based on the advantages of underwater vehicles in monitoring.

\textbf{Keywords:} Oceanic pasture; Artificial reefs; Monitoring; Underwater vehicle; Observing

\section*{Status of Artificial Reefs}

Currently, Artificial reefs are built around the world: Australia has built Artificial Rocky Reef Fish Communities in Botany Bay, New South Wales [1] French has but artificial reef in golfe juan marine protected area [2]. The United States has built artificial reefs from east and west coasts to the southern gulf of Mexico [3]. Japan’s reef construction has a long history over three hundred years. National and local governments invest 60 billion yen per year on the construction [4] China has set up artificial reefs in Zhejiang province, Jiangsu province, Shandong province, Guangdong province, Guangxi province and other places. In order to observe the construction of artificial reefs and growth status of fish in reefs, we commonly use some methods, such as underwater naturalist, underwater photography, sonar, surface buoy and underwater vehicles and so on.

\section*{Oceanic Pasture and Artificial Reefs Monitoring at Home and Abroad}

Since the complex environment of underwater, it is dangerous for diver to dive in the ocean. Researchers considered a more secure and effective way to monitor ocean. In the second stage, the researchers relied on sensor such as sonar, cameras, to observe the ocean and obtain information about marine organisms. Shyue [4] made research on the distribution of artificial reefs by using multi beam echo sounder. Tian [5] investigated the physical status of artificial reefs by means of a side-scan sonar system. Cuevas [6] introduced the managed Artificial Reefs in Mississippi by using utilizing Side Scan Sonar. Decologne [7] described a technological project to observe submarine that was deployed an autonomous bottom moored acoustic observatory within Bay of Biscay coastal zone. Takahashi [8] made quantitative surveys of fish assemblage at a high-rise artificial fish reef by stationary underwater cameras. Sarria [9] used acoustic communications which placed inside artificial reefs to detect the presence of the species while they are inside. Collins [10] introduced subsea wireless technology which transmitted wirelessly between a seabed sensor and a surface buoy to monitor seabed. Huang [11] calculated indexes of fish resource, through method based on dual-frequency identification sonar. The use of sensor greatly improved the researchers’ understanding of artificial reefs and oceanic pastures.

designed a set of video systems for real-time monitoring of oceanic pastures. Shi [17] monitored water quality in the South China Sea by using surface buoy. Wang [18] proposed a complete set of submarine cable online observation system for oceanic pastures located in Weihai XiXiakou oceanic pastures to online monitor ecological environment. However, there are no researchers in China designed and manufactured underwater vehicles specifically for artificial reefs monitoring.

**Conclusion**

In this paper we introduced the development of oceanic pasture and artificial reefs monitoring in detail. This general technology may exist obvious disadvantages in monitoring. We suppose that the underwater vehicles are better tools for monitoring and underwater vehicles will be widely used in future for artificial reefs monitoring.

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**References**