

# The Monitoring and Analysis of The Moye Island Seas Using Situation Based on Remote Sensing

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**Abstract**—Sea Island is important marine resources, which play important role in promoting the development of ocean industry, but with the violent development of island resources, original natural ecological and ocean environment of the island were destroyed. In order to protect the island, the high resolution remote sensing imagery was used to monitor the Moye Island that located in RongCheng of ShanDong province, monitoring content mainly includes shoreline change, sea reclamation increase and the land-use change. The results show that until august 2012, most of the natural shoreline of Moye Island was destroyed, large-scale breeding pools constitute a new artificial shoreline, which directly changes the marine shape, and it also impacts the near bay sea water exchange, as well as self-purification ability, generally, human development activities has had a huge impact on Moye Island and its surrounding seas.

**Key Words**—Sea Island, remote sensing, classification, shoreline, monitor

## I. INTRODUCTION

Recent year, the Chinese marine, in which islands play an important role economy has a rapid development. However, with the intensification of the activities of human development, the Chinese island protection work facing the island ecosystem destruction, island development disorder, island protection efforts and the island's economic and social development lags behind four major problems. Faced with such a situation, the country has carried out a lot of tracking and monitoring work focus on the island's development activities as well as the island natural ecological environment, WeiWei Li do a lot of research on monitoring factors of tourism-type island based on remote sensing in 2012[1]; XiaoFeng Guo research and practice on island ecological fragility assessment based on GIS[2]; Liang Liu study on the assessment method of marine natural resources in uninhabited islands[3]; XinKai Wang studied the relationship between the fractal dimension and percentage of artificial coastlines of islands in ZheJiang province[4]; HangYin Wang evaluated the ecological risk assessment of island exploitation based on landscape pattern[5]; ZhaoZhong Ding preliminary studied on macro evaluation approach of island vegetation ecology based on RS[6]; KongZao Zhuang studied the Chinese and abroad island ecological restoration research and enlightenment[7]; YiLian LI, studied on statistic index system of islands in China[8].

For a clearer understanding of the seas using, remote sensing means was used to carry out comprehensive monitoring Moye Island, to ascertain the impact of the island human development activities, and to provide an important basis for its comprehensive management.

## II. STUDY AREA AND DATA

Moye island located in RongCheng of ShanDong province and its geographical location is between  $122^{\circ}29'E \sim 122^{\circ}32'E$ ,  $36^{\circ}53'N \sim 36^{\circ}56'N$ , shown in figure 1, there are 9 villages on the island. Rarely land on the island, the mainly industry is fishing.

Generally the area of the island is small, 0.5 m panchromatic high-resolution remote sensing image data, which was taken by wordview-01 in 08/20/2012, was used in this work, and the image is no cloud cover, good quality to meet the demand. There are also topographic maps as a secondary data.

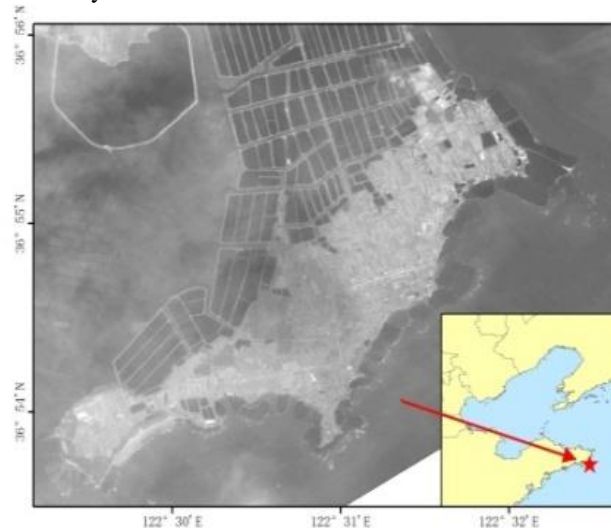


Fig. 1. The location of Moye Island

## III. MONITORING METHODS AND TECHNICAL PROCESSES

To achieve the monitoring and analysis of Moye Island seas use status by remote sensing, Moye island seas type and shoreline change two points were taken consideration, By means of the island remote sensing images, topographic maps

data and other data, combined with semi-automatic classification and interpretation of human-computer interaction way to achieve the seas classified information as well as the coastline of Moye Island information extraction.

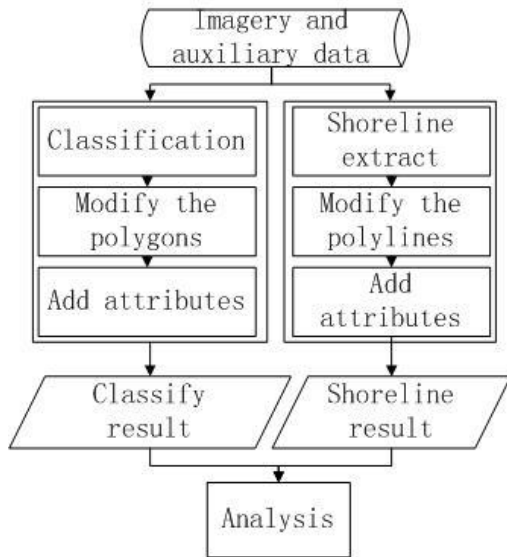


Fig. 2. Monitoring methods and technical processes

#### A. Islands Seas Use Remote Sensing Monitoring Methods

Supervised classification method classification of remote sensing and visual interpretation were combined to complete the interpretation seas use type. The second visual interpretation and confirmation are used to confirm the accuracy of the properties and distribution boundaries of seas the classification results.

1) *Land use classification system*: Land use classification system uses the classification of the Chinese Academy of Sciences National 1:100,000 land use dynamic monitoring system, there are six first level types and 67 second level types.

2) *The seas use of remote sensing monitoring process*: Seas using information was extracted by supervised classification and computer-aided interpretation of human-computer interaction, after some attributes edition the seas status map was generated. The whole classification process mainly includes:

a) *Data source selected collected*: High resolution remote sensing image was selected as the data source of this study and its cloud cover is less than 10%.

b) *Imagery reprocessing*: The image was corrected by a reference image, with the accuracy less than 2 pixels; the image was projected with Abbers positive shaft area of secant conic projection.

c) *Seas using classification*: 15 typical training areas were selected as the sample of the island sea use classification, then supervised classification method was used to classify the Moye Island with maximum likelihood algorithm.

d) *Raster to feature*: The classification result is raster data, for the convenient of modifying and attributes edition, raster to feature conversion was executed.

3) *Attributes edit*: This step includes graphics edit, attribute edit, quality check.

a) *Graphics edit*: The feature data of the island classification result were imported into Arcinfo/workstation. After modification, detection and merger, the topology relationship was established for both features.

b) *Attribute edit*: Two attribute field were added to all of the features, ID was used to identify the class of each feature and AREA is used to calculate the area of the result.

c) *Quality check*: By collecting random points, all of the 15 classes were checked, and the accuracy was higher than 90%.

#### B. The Island shoreline remote sensing monitoring methods

1) *Shoreline classification system*: Island shoreline classification system is divided into four types of artificial coastline, sandy shoreline, muddy shoreline and bedrock shoreline.

2) *The island shoreline remote sensing monitoring technical processes mainly include the following points*:

a) *Remote sensing data collection and processing*: The classification result was used as the data source of coastal line extraction.

b) *Graphics edit*: Based on the island classification result, coastal line was extracted and edited in the ArcGIS environment.

c) *Attribute edit*: Two attribute fields were added to all of the features, ID was used to identify the class of the coastal line and LENGTH is used to calculate the length of the coastal line.

### IV. MONITOR RESULTS AND ANALYSIS

By using the above method, the 2012 Moye Island seas using type distribution and coastal line were achieved, statistical method was used to analysis the impact of human activities on the Moye Island and its surrounding waters, following are the monitoring and analysis results.

#### A. The 2012 Moye Island Seas Use Remote Sensing Monitoring Results

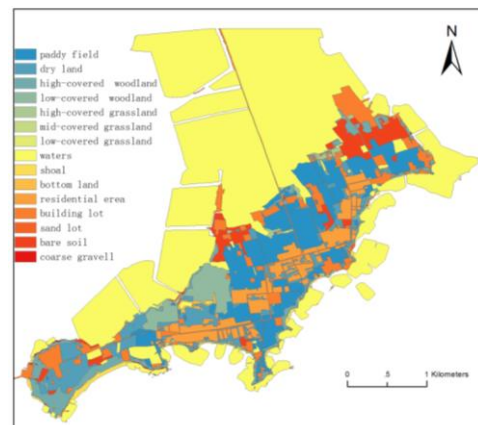


Fig. 3. Moye Island seas using classification

Moye Island contains six first land use types and 15 second land use types (fig.3). According to the remote sensing monitoring result, the 2012 Moye Island area is 9.97 square kilometers (including the breeding ponds area outside the island). The figure illuminates that the yellow occupy the most of the island, and the other types amassed in the middle of the island.

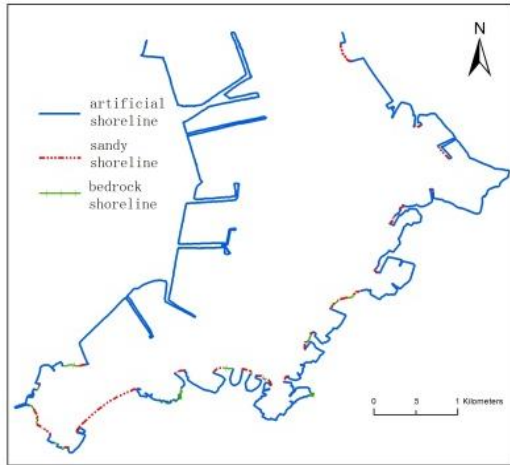


Fig. 4. Moye Island natural shoreline

Based on remote sensing monitoring, the coastline of Moye Island was achieved (fig.4) and the total shoreline length is 36.69 km (table 1). The shoreline of Moye Island is composed by artificial coastline, sandy coastline and bedrock coastline. Fig.4 illuminates that the artificial line occupied the most coastline of the island, the other type coastline just have a small share of the coastline.

TABLE I. THE SHORELINE LENGTH STATISTICS OF 2012 MOYE ISLAND (KILOMETERS)

| Types  | Artificial coastline | Sandy shoreline | Bedrock shoreline | Total |
|--------|----------------------|-----------------|-------------------|-------|
| length | 31.68                | 3.17            | 1.84              | 36.69 |

**B. The 2012 Moye Island Coastline Remote Sensing Monitoring Results Analysis**

1) Using the proportion of various type classification of the total area of  $W_A$  to analyze Moye Island sea use situation, where  $A_i$  is a certain type of area,  $A$  is total area of island:

$$W_A = \frac{A_i}{A} \times \% \quad (1)$$

The largest seas area of Moye Island is waters of 5.73 square kilometers, accounting for 57.49% of the total area of the island, followed by farmland and construction, mining, residential land area of 1.80 square kilometers, 1.31 square kilometers, accounting for 18.00%, 13.12% of the total area of the island. The three together accounted for 88.62% of the total area of the island.

The largest area of the secondary seas use types of Moye Island is ponds of 5.63square kilometers, accounting for 56.46% of the total area of the island, followed paddy fields and building land, with an area of 1.24 square kilometers, 0.73

square meters, respectively, accounting for 12.42%, 7.37% of the total area of the island. The three together accounted for 76.25% of the total area of the island. Fig.5 shows that just the ponds area is more than the other 14 type area.

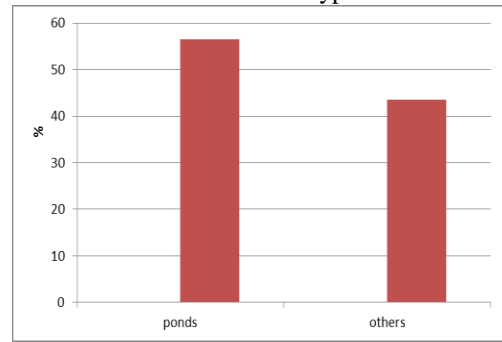


Fig. 5. Proportion of breeding ponds

Summarized from the above the statistical results, ponds occupied by the natural sea area has surpassed Moye Island original land area, the main production activities of Moye Island human has been transferred to the sea area. However, these ponds occupied a lot of natural sea surface which do a lot of harm to the marine ecological.

2) Using the proportion of various type coastline of the total length of  $L_A$  to analyze Moye Island coastline situation, where  $L_i$  is a certain type length,  $L$  is total length of island coastline:

$$W_L = \frac{L_i}{L} \times \% \quad (2)$$

Artificial coastline is 31.68 kilometers, fig.6 shows that it is accounting for 86.35% of the total length of island shoreline; followed by sandy shoreline and bedrock shoreline length with 3.17 km, 1.84 km, accounting for 8.63%, 5.02% of the total length of the island shoreline. This statistic result shows that the island is now almost surrounded by artificial coastline, the sandy shoreline and bedrock shoreline is only distributed in the gap between the breeding ponds. Sandy shoreline is relatively concentrated in the southwest end of the island; the bedrock shoreline scattered mainly in the southeastern part of the island.

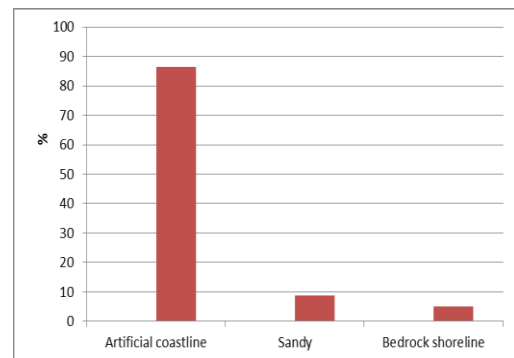


Fig. 6. Proportion of artificial coastline

The island natural coastline was only 16.21km, illuminated in fig.7, from the visual view, the shape shows in fig.4 and fig.7 have changed a lot, and the entire natural coastline has

almost changed to artificial coastline — breeding ponds boundary.

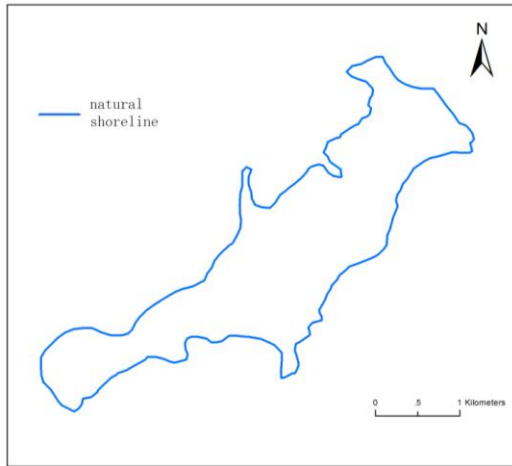


Fig. 7. Moye Island natural shoreline

The above statistics shows that shoreline of Moye Island has been serious interfered by these artificial breeding ponds, the natural coastline was destroyed. In order to protect the island natural coastline ecology system, these breeding ponds must be removed.

#### V. CONCLUSIONS

This article using remote sensing means to achieve the 2012 Moye Island and the surrounding waters usage monitoring and analysis, in which human activity has changed its surrounding marine environment, a large number of aqua culture ponds formed a new artificial area and the shoreline changed a lot, these artificial ponds hinder the surrounding water exchange, and even had an impact on sea water purification capacity. Generally speaking remote sensing means is an effective way to achieve the overall monitoring of

the island, and the results can be basis for the comprehensive management of scientific reference.

#### VI. ACKNOWLEDGMENT

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