

# EVALUATION OF HABITAT FOR ECOSYSTEM IN IRIOMOTE ISLAND USING GIS AND REMOTE SENSING

**Tomoe SAITO\***

**Susumu OGAWA\*\***

\*Faculty of Geo-Environmental Science, Rissho University

1700 Magechi, Kumagaya, Saitama 360-0194 JAPAN

Phone: 81-48-539-1652 Fax: 81-48-539-1632

E-mail: 001W00108@ris.ac.jp

JAPAN

\*\*Faculty of Geo-Environmental Science, Rissho University

1700 Magechi, Kumagaya, Saitama 360-0194 JAPAN

Phone: 81-48-539-1652 Fax: 81-48-539-1632

E-mail: 001W00108@ris.ac.jp

JAPAN

KEY WORDS: Iriomote cat, Crested serpent eagle, JERS-1, ASTER, urban development

ABSTRACT: The total ecosystem of land and ocean spaces was evaluated with GIS and remote sensing. The objective area was Iriomote Island in Okinawa Prefecture. Target areas were the land of the island and the coral reef of its circumference ocean space. The satellite data were the JERS-1 and ASTER. The digital map 25,000 and the digital elevation model with a 50-m grid were used. The habitat of index animals was extracted from the satellite data with GIS, and then the ecosystem of the land was evaluated. The Iriomote cat and the crested serpent eagle were for the index animal. The degree of cover for coral reef was also identified for evaluation of its habitat.

## 1. INTRODUCTION

In late years, in Okinawa, an influence to forest by urban development became a problem. Deforestation has destroyed the ecosystem of forest. Furthermore, it has an influence on the peripheral ecosystem of forest. Nutrient of forest flows into the sea via a river, and makes ecosystem of the sea wealthy. However, the nutrient decreased when the forest decreased. Besides, in heavy rainfall, from the fields with deforestation and development, large quantity of red soils flow ed into the sea. Red soils gave a coral reef big influence. In addition to a land level, it is required to evaluate its peripheral ecosystem to evaluate such an ecosystem. Therefore, the total ecosystem of land and ocean spaces was evaluated

with GIS and remote sensing data. The objective areas were Iriomote Island and a coral reef of its peripheral sea area .

## 2. METHOD

On a land space, the ecosystem was evaluated by extracting the habitat of index animals. Satellite data were JERS-1 of December 21, 1996 (VNIR). The supervised classification was with the satellite data and the digital elevation models 25000, and the land cover classification was carried out. Moreover, the ecology of an index animal was referred from the Red Data Books of the Ministry of Environment. The parameters for habitat presumption were based on them. The parameters used this time are the altitude, the distance from the waterside and urban area. Those parameters were used and buffer analysis was also performed. The Iriomote cat and the crested serpent eagle were selected as an index animal.

In ocean space, from satellite data, the land cover classification was carried out and the coral reef was extracted. The satellite data were ASTER of May 8, 2000 (VNR). The degree of cover for a coral reef was identified based on the coral reef investigation which the Environment Agency investigated from 1990 to 1992. The total evaluation was performed in accordance with ecosystem evaluation of these land and ocean spaces.

Table1 Satellite Data

Satellite	Data	Land cover
JERS-1	Dec. 21, 1996	Vegetation
ASTER	May 8, 2000	Coral

## 3. RESULTS

In a land area, the habitats of an Iriomote cat and a Crested serpent eagle were estimated. Both species inhabiting the areas where the altitude is comparatively low. Moreover, they live through the rivers. In an ocean area, the coral reef was extracted and the degree of cover was identified. The coral reef covered most the sea area outskirts where the rivers flowed in. The nutrient via a river from the forest flows into the sea and has close relation to the degree of cover for a coral reef. In addition, the area had easily the influence of development because a human being was near living.

## 4. DISCUSSION

### 4.1. THE ESTIMATION OF HABITATION AREA

It turns out that the habitation region of index animals are not the heart of the mountains but an area comparatively near a urban area. A living is the richest area if it applies to a mountain zone from the hilly country where index animals live. Almost all the animals of the Iriomote Island seemed to live. It was

presumed that the Iriomote cat and the crested serpent eagle inhabited this area. Many animals and insects used this area for food.

However, since a habitation region is close to agricultural fields, it may be easily influenced of human activities. With the land development in Okinawa Prefecture, forest decreased and the habitation regions of an Iriomote cat or a crested serpent eagle was destroyed. Therefore, the case that an Iriomote cat and a crested serpent eagle encountered a traffic accident increased by the circumference road of the island. Moreover, by deforestation, humus flowed out as the nutrient of a coral reef, and red soils were exposed. Red soils flowed into the sea through the river, whenever heavy rain fell, and it has had great influence on the coral reef.

Table2 Habitat Conditions

Species	Water	Food	Reproduction	Cover
Iriomote Cat	Less than 200m from a river	Mouse, Bird	Hole of a tree	Evergreen
Crested serpent Eagle	Less than 100m from a river	Snake, Frog	12-m-high tree	Evergreen

#### 4.2. DEGREE OF COVER FOR CORAL REEF

Developing areas of a coral reef is off the eastern part of the Iriomote Island mainly. Because nutrient flows into the sea from the forest of Iriomote Island via a river. A coral reef is distributed widely over the sea in eastern part of the Iriomote Island. There is the degree of covers for the coral reef in an area with more than 50%. For an ocean current, the degree of covers of a coral reef is high in the sea area. An ocean current flows through the north and south sea areas of Iriomote Island. Therefore, nutrient is accumulated in the sea area.

On the other hand, there was the area without a coral reef. Coral reef does not exist off the southern part of Iriomote Island. An ocean wave is so rough from the Pacific that the growth of coral is disturbed. In addition, the area without a coral reef has no river to carry nutrient.

However, a residential area and the agricultural fields are distributed over the outskirts of a river. Red soils and pesticide seemed to begin to flow from those areas. Therefore, a coral reef might have a big influence.

#### 5. CONCLUSIONS

The Total ecosystem of land and ocean areas was evaluated with GIS and remote sensing. The objective areas were Iriomote Island and a coral reef of its peripheral sea area. The habitat of index animals was extracted, and then the ecosystem of the land was evaluated. The Iriomote cat and the crested serpent eagle were used for the index animal. The degree of cover for coral reef was also identified for evaluation

of its habitat. In land space, it turns out that an Iriomote wild cat and a crested serpent eagle inhabit in the area where the altitude is comparatively low. In ocean area, the coral reef had developed into the ocean area the nutrient substance is flowing into the sea through a river. The area where the index animals tend to inhabit is that of a rich ecosystem in the forest. Abundant nutrient substances are flowing into the sea there. Changes of forest have instead of among close with changes of a coral reef.

## REFERENCES

- 1) Ministry of the Environment Natural Environmental Bureau, Wildlife Section, Wildlife with fear of the extinction of revision / Japan- Red Data Book -1 Mammals, 2002.
- 2) Matsunaga, Hoyano, Izawa, Mizukami, Initial examination about environmental monitoring of subtropical zone, Proceedings of the 30th conference of the Remote Sensing Society of Japan, p241-242, 2000.
- 3) S. Yasuma, Ryukyu chain of islands –Biodiversity and birth of Ryukyu chain of islands, Tokai Library, 2001.
- 4) M. Tsuchiya, A coral reef is an abnormal situation - A key word of maintenance is balance-, Okinawa marine Publication, 1999.
- 5) K. Matsunaga, If a forest disappears, the sea is lifeless: Ecology to connect the land with the sea, Kodansha, 1993.

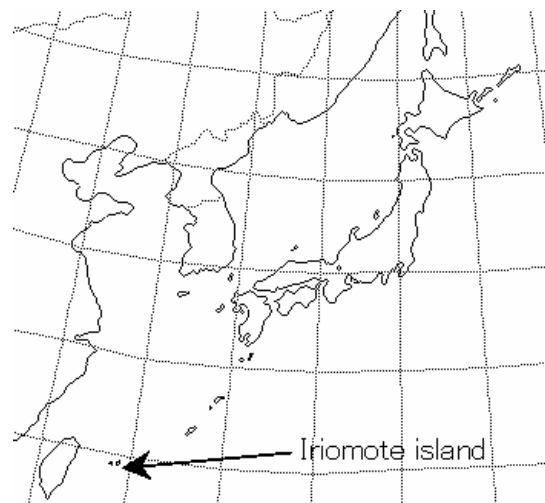


Figure 1 Position of Iriomote Island



Figure 2 Photograph of Iriomote cat



Figure 3 Photograph of Crested serpent eagle

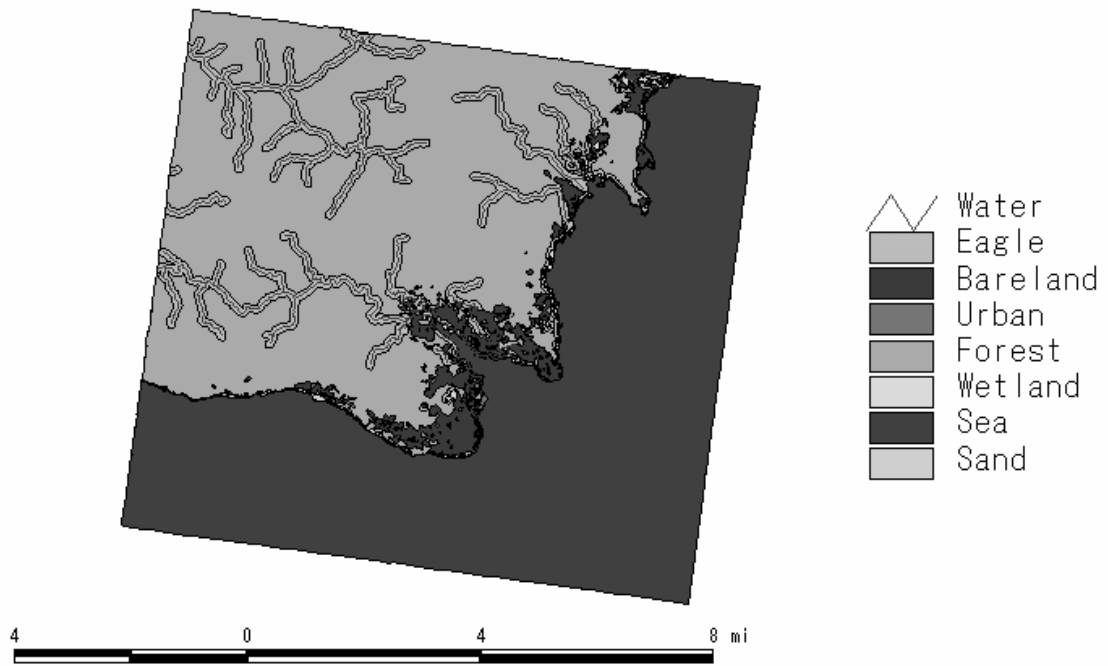


Figure 4 Estimated habitation area of Iriomote cat

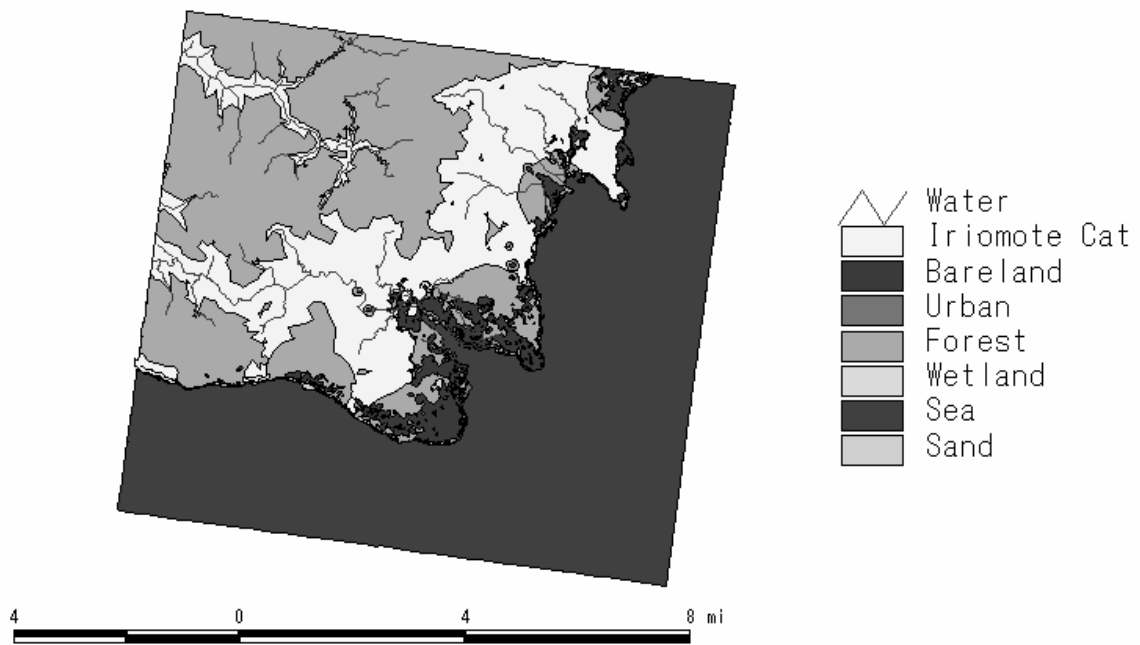


Figure 5 Estimated habitation area of Crested serpent eagle

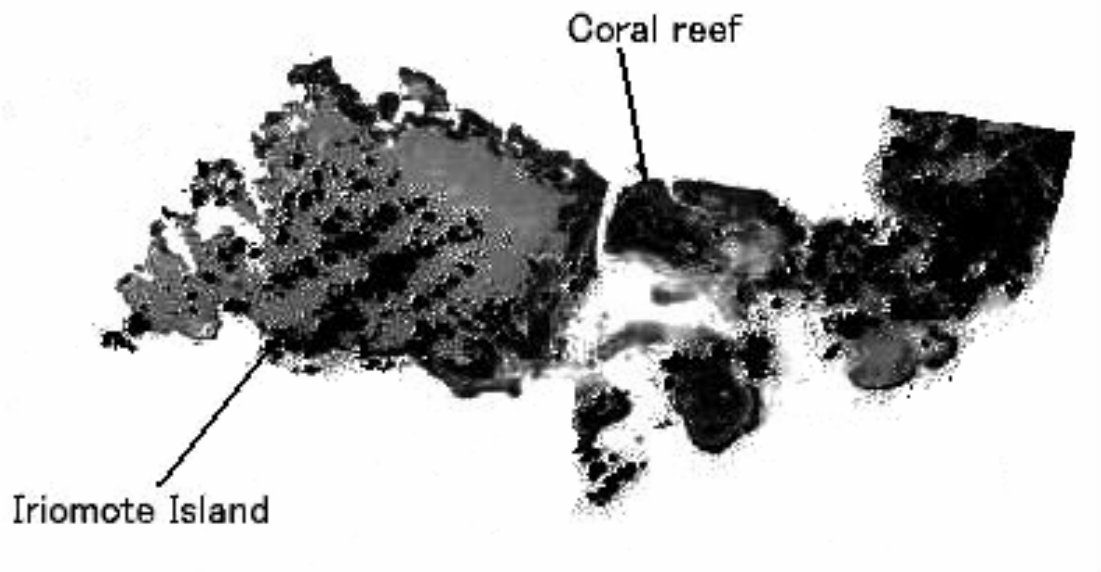


Figure 6 Cover distribution of a coral reef

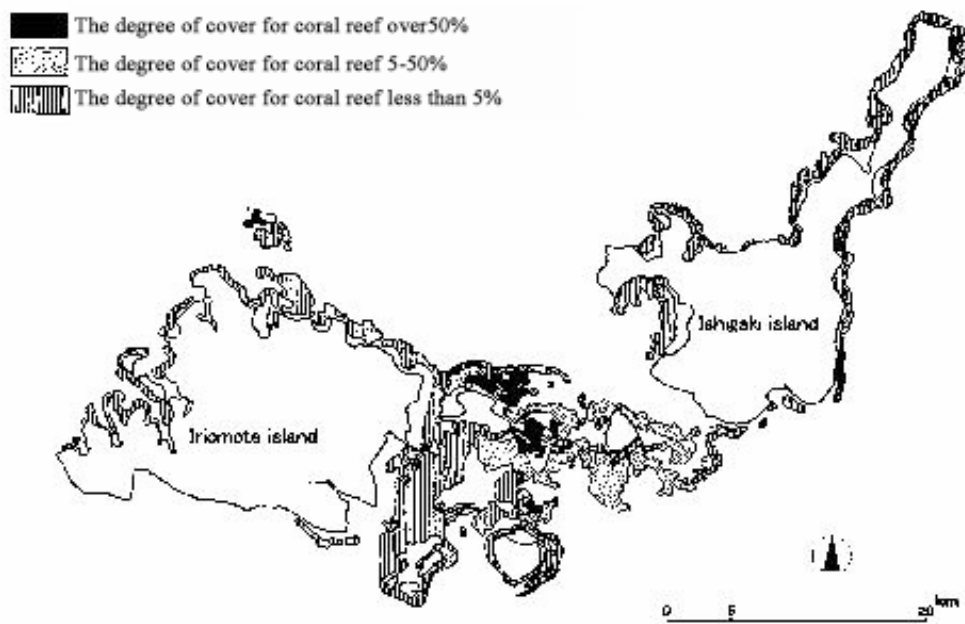


Figure 7 Degree of cover distribution for a coral reef