The Application of Satellite Image for Extracting Cultural Grounds of Laver

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ABSTRACT ... This study was to propose the spatial analysis method of extracting the spectral characteristic of cultural grounds of lavers in marine especially ApHae-myeon, ShinAn-gun, JellaNam-do, through using various satellite images.

In addition, the information of cultural grounds of laver such as the existence of illegal cultural grounds of laver distribution was extracted through using satellite images and GIS analysis methods. For the further work, the spatial analysis to extract not only cultural grounds of laver business but also artificial facilities in marine will be proposed.

KEY WORDS: High resolution satellite images, Cultural grounds of lavers, Spectral characteristic, GIS

1. INTRORDUCTION

The cultural grounds in coastal area of our country rapidly increased due to the conversion of recognition from the catching fishery to the breeding fishery, which was caused by reduction in the catch in coastal and offshore, and to the development in breeding technology. Coupled with decline in ocean fishing, it came to possess large weight in production of domestic fisheries.

In particular, the laver is depending mostly on breeding, and is being raised mainly in the western and southern coast. As the authorities supervising the affairs manage cultural grounds in light of a characteristic in aquaculture, the aquaculture is distributed very extensively over the coast due to a geographic condition, thus many technical, time-wide, and economic difficulties are produced.

Also, a similar problem comes to be generated even in new registration of aquaculture and in compensation for damage due to reclamation. Recently, aiming to supplement these problems and manage efficiently, it is being briskly conducted a case and a study that utilized satellite-image data and GIS analysis technique.

The Ministry of Maritime Affairs and Fisheries performed a study that investigates and analyzes the breeding facilities in the domestic coast by using field-survey data and satellite data through a research on a plan for using satellite data aiming at coastal environment survey and management. And, it is offering satellite-image data in cultural grounds of laver to common people and local practitioners in cultural grounds, through the homepage for the Ministry of Maritime Affairs and Fisheries.

Previously, Jeong Jong-cheol and others did detect cultural grounds of laver by using multi-spectral satellite data. And, Gang Jong-ho had ever researched on the estimation of laver-breeding facilities and on a plan for utilization by using satellite image. Also, FAO(2004) and Mouchot(1990) had ever preceded a study of observing the breeding facilities of the coast by using radar image.

This study is aimed to grasp whether or not extracting information on cultural grounds of laver on the basis of diversely satellite-image data(ASTER, IRS, IKONOS, Landsat), and additionally to compare and analyze the spectral characteristics and information on the cultural grounds of laver.

It is aimed to examine into the most properly band combination in classification for cultural grounds of laver by using satellite-image data, and based on this, to present the guideline of utilizing satellite image, which can correctly

extract information on cultural grounds of laver based on the result value that classified cultural grounds of laver by using the unsupervised classification technique.

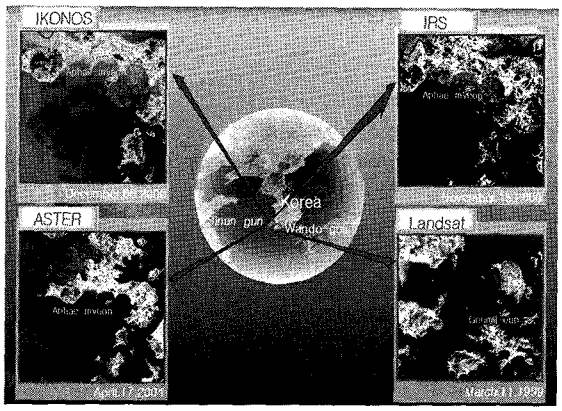

Figure 1. Study area

2. MATERIALS AND METHOD

The research subjects in this study were selected the cultural grounds of laver in the zone of Aphae-myeon, Shinan-gun, Jeollanam-do, and of Geumil-eup, Wando-gun, Jeollanam-do.

By using image-processing software Imagine 8.6 based on Landsat, IRS, ASTER, IKONOS satellite-image data, it carried out image processing. Aiming at efficient classification for the cultural grounds of laver, the part in land was processed masking.

The following are pre-treatment, re-arrangement, and interpolation in image data. The classification technique in the cultural grounds of laver was accepted the unsupervised classification.

Table 1. Satellite image and data processing

Satellite	Shooting day	Spatial resolution	Resampling	Interpolation
ASTER	April.17. 2004	15m(VNIR)	15m*15m	Nearest-neighbor
Ikonos	December.06 .2000	1m	1m*1m	Nearest-neighbor
IRS	November.15 .2000	5.8m	5m*5m	Nearest-neighbor
Landsat	March.11. 1999	30m	30m*30m	Nearest-neighbor

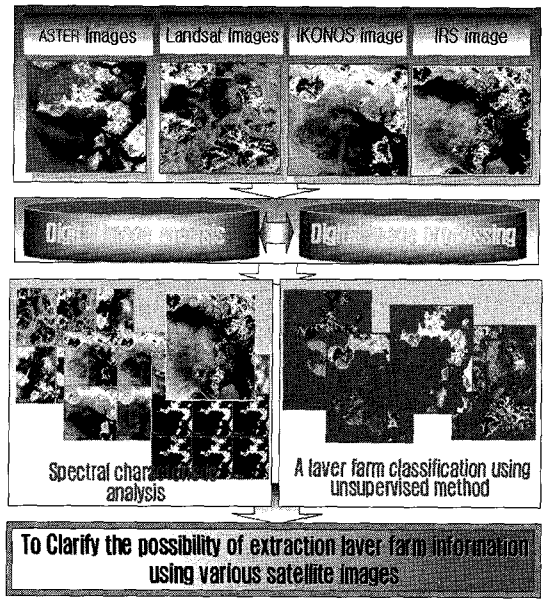

Figure 2. Work chart

3. EXTRACTION IN THE CULTURAL GROUNDS OF LAVER BY USING SATELLITE-IMAGE DATA

The cultural grounds of laver are being primarily carried out between autumn and winter, and the cultural grounds of laver are formed with the latticed pattern in about 10M × 20-30M. Those are in the stereotyped pattern, thereby being easy for classification from satellite-image data. And, those are well displayed in the specific wavelength range, thereby being able to emphasize and extract the cultural grounds of laver given using the efficiently band combination by utilizing its wavelength range.

3.1 Landsat satellite-image based extraction in the cultural grounds of laver

Figure 3 is showing the spectral characteristics in the cultural grounds of laver that are indicated in 6 bands except No. 6 band, which is the band in the Thermal Infrared area, among 7 bands in landsat TM satellite image, targeting the cultural grounds of laver in the zone of Geumil-eup, Wando-gun, Jeollanam-do.

As shown in Figure 3, the cultural grounds of laver are being well displayed in band1(0.45-0.52 ㎛) that is landsat TM blue-spectrum area, band2(0.52-0.60 ㎛) that is green-spectrum area, and band4(0.76-0.90 ㎛) that is the near infrared area.

However, in band4 that is the near infrared area, the division in the cultural grounds of laver is difficult due to stripe noise.

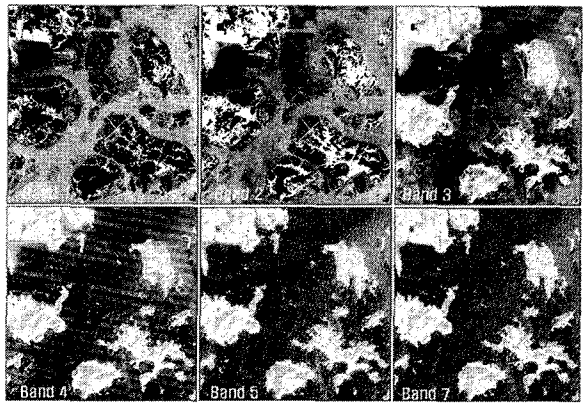

Figure 3. Spectral characteristic of cultural grounds of laver using Landsat bands

3.2 Extraction in the cultural grounds of laver based on ASTER satellite-image data

Figure 4 is showing the spectral characteristics in the cultural grounds of laver that are indicated in 9 bands except No. 6 band, which is the band in the Thermal Infrared area, among 15 bands in ASTER satellite image, targeting the cultural grounds of laver in the zone of Aphae-myeon, Shinan-gun, Jeollanam-do.

It could be seen that the cultural grounds of laver are being clearly shown in band1(0.52-0.60 ㎛) that is green-spectrum area and, and in band3(0.78-0.69 ㎛) that is the near infrared area, in terms of VNIR sensor. And, it could be seen that the cultural grounds of laver are not divided in band4 - band9 that is the short-wavelength infrared area in SWIR sensor.

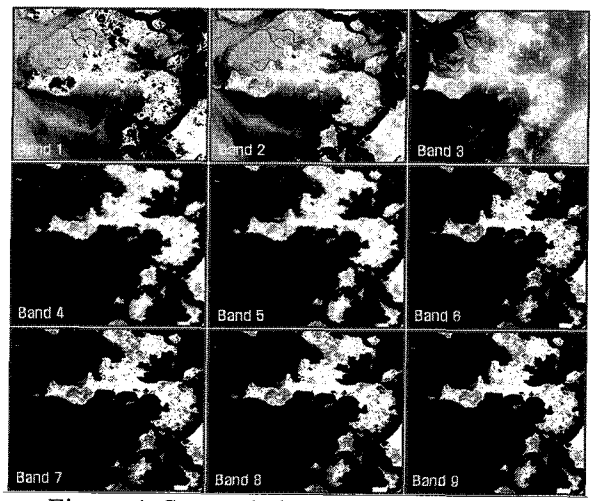

Figure 4. Spectral characteristic of cultural grounds of laver using ASTER bands

3.3 Extraction in the cultural grounds of laver based on IKONOS satellite-image data

The figure 5 examined the spectral characteristics in the cultural grounds of laver by using 9 bands except 5 bands, which are the thermal Infrared area, among 14 bands in IKONOS satellite image, targeting the cultural grounds of laver in the zone of Aphae-myeon, Shinan-gun, Jeollanam-do.

It examined the spectral characteristics in the cultural grounds of laver based on band1(0.45-0.52 ㎛) that is blue-spectrum area, band2(0.52-0.60 ㎛) that is green-spectrum area, band3(0.63-0.69 ㎛) that is the red-spectrum area, and band4(0.76-0.90 ㎛) that is the near infrared area.

As shown in Figure 3, the cultural grounds of laver are being well displayed in band1(0.45-0.52 ㎛) that is the blue-spectrum area, band2(0.52-0.60 ㎛) that is green-spectrum area, and band4(0.76-0.90 ㎛) that is the near infrared area, same as landsat TM.

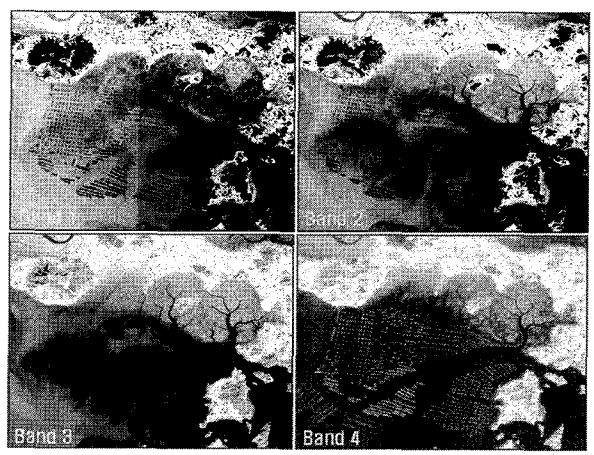

Figure 5. Spectral characteristic of cultural grounds of laver using IKONOS bands

3.4 Extraction in the cultural grounds of laver based on IRS satellite-image data

The figure 6 examined the spectral characteristics in the cultural grounds of laver by using Panchromatic(0.50-0.75 ㎛) band in IRS satellite image, targeting the cultural grounds of laver in the zone of Aphae-myeon, Shinan-gun, Jeollanam-do. As shown in Figure, it can be seen that the cultural grounds of laver are being displayed in image even though being not clear.

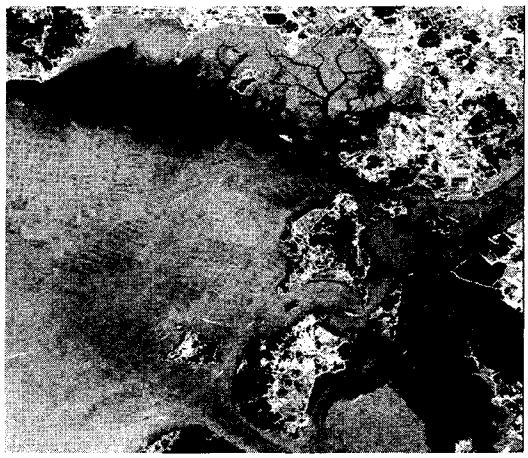

Figure 6. Spectral characteristic of cultural grounds of laver using IRS panchromatic band

4. CLASSIFICATION IN THE CULTURAL GROUNDS OF LAVER BY USING THE UNSUPERVISED CLASSIFICATION TECHNIQUE

It combined only bands in which the cultural grounds of laver are indicated distinctly in images of ASTER, IKONOS, IRS, and Landsat, generated images, and then based on this, extracted the area in the cultural grounds of laver by using the unsupervised classification technique.

When performing the unsupervised classification technique, it carried out classification by equally dividing into 40 classes in terms of class. As a result of that while IKONOS image was classified most distinctly and minutely, the image in Landsat or ASTER was classified the cultural grounds of laver, but was indicated to include an error due to wrong classification. And, IRS image was indicated to be difficult for classification in the cultural grounds of laver due to a result of classification that used the single band.

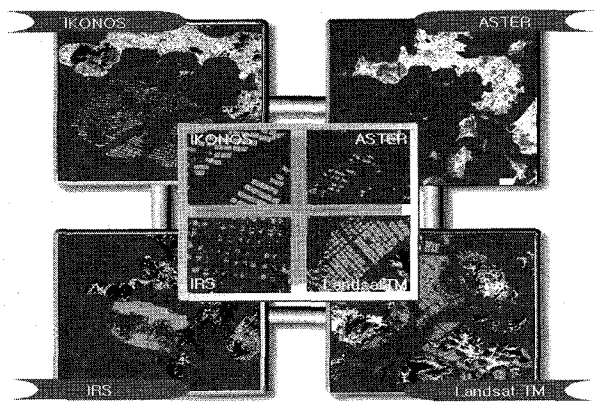

Figure 7. cultural grounds of laver of Classification using various satellite images

5. CONCLUSION

It combined only bands in which the cultural grounds of laver are indicated distinctly in images of ASTER, IKONOS, IRS, and Landsat, generated images, and then based on this, extracted the area in the cultural grounds of laver by using the unsupervised classification technique.

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