Marine Environment Information Clearinghouse Using ArcIMS Metadata Service

Hideki YOSHIDA
The Ministry of Land, Infrastructure and Transport, Japan
Toshihide SAISHOJI, Susumu TAKAGISHI, Hiroshi KADOTA, Koutaro KABA
PASCO Corporation, Japan

Abstract

To reproduce the marine environment of Ariake and Yatsushiro Sea in Japan, The Ministry of Land, Infrastructure and Transport (MLIT) is dedicating much focused effort on cooperation with national and prefectural investigation-research organizations, environmental information sharing and efficiency of information gathering, offering the related information on garbage, water quality, sediment quality and etc., to coastal organizations (self-governing body, academic organization and residents). This paper will present marine environmental information GIS system, which is developed based on ArcSDE, ArcIMS, ArcView, and Oracle database. With the help of the developed system, the web site and database query are incorporated to explore or download related information including water quality, sediment quality, plankton, benthos, etc. Web GIS and the clearinghouse, which is a part of information technique policies for Japan's government, have been looked as a successful case to improve information sharing among coastal organizations.

Introduction

The Ariake and Yatsushiro Sea, located in west Kyushu of Japan, are enclosed coastal seas, covering an area of about 2,900 m^2 with an average depth from 40m to 70m. The tidal current can reach 6-7 knots in the outer ocean, while comparatively smooth in inner bay areas. The high-and low-tide differential is about 6 m and has a significant influence on vegetation and benthos in natural coastlines. In the north of Ariake Sea, the tidal flat is formed by the river inflow and sediment flow from the surrounding land region. In the south of Ariake Sea, there are many lot cays and tidelands, and the rias coast and archipelago are formed in the Yatsushiro Sea.

In this sea area, there are many floras and faunas from which living is not confirmed in Japan, flora and fauna that has misgivings about extermination worldwide also lives in this sea area, such as mudskipper, taenioides cirratus, and Shitimensou, etc. This area is the biggest area for migrant's coming flying ground in Japan, and many regions are specified for birds and beasts sanctuary.

The harbor improvement taking advantage of the surrounding terrain is in progress and the industries centered on it are also developing. Among them, the fishing port is one of most developing industries, and as a base of distribution, trade with Asian countries are also in progress. However, with the economic growth and the centralization of population, air and water pollution also has progressed in this area, and the good environment is being lost.

Various approaches are done among the national and self-governing body, related organizations, NGO/NPO, and citizens aiming to reproduce Ariake and Yatsushiro Sea to a rich sea area. Especially, several regulations such as “Law concerning special countermeasures to reproduce Ariake Sea and the Yatsushiro sea" and "Basic policy concerning the reproduction of Ariake Sea and the Yatsushiro sea", have been implemented to aim at the fishery promotion by the improvement and preservation of marine environment, and the recovery of living aquatic resources etc.

At Kyushu maintenance bureau of MLIT, it has being devoted to the implement, researches and development of reproduction measure, sharing and sending environmental information for the Ariake and Yatsushiro Sea, and it also has being aimed at the maintenance and improvement of the overall sea area environment for environmental problems in the surrounding. As one part of it, the WWW site was constructed in which news information, web site information at the surrounding area, the clearing house collecting the meta data of papers and related materials, environment study, a bulletin board, and other news from Kyushu maintenance bureau are provided to access on the internet. It has been looked as a successful case that provide a new approach for information sharing among coastal area in Japan.

Web Site Configuration

The web site (http://www.ariake-yatsushiro-system.jp) is located at Kumamoto Internet Data Center with a connection of VPN from which the outside access is limited and the administrator uses ArcView 8.3(SU) to update database at MLIT. The web site information is based on the measure data from environmental maintenance ship named Kaiki.
The web site provides the following services.

Table1 Software applications and service names on the servers

Server	Software	Usage
Proxy server	HTTP (Apache 2.0.52)	HTTP communication with client
Map server	HTTP (Apache 2.0.50)	Web server
	Tomcat 4.1.30 (Servlet/JSP container)	Servlet Engine
	J2sdk 1.4.1	JAVA SDK
	Jk2.0.4 （Mod_jk2）	Communication between Apache and Tomcat
	ArcIMS 4.0.1 Application Server	Handles the load distribution of incoming requests
	ArcIMS 4.0.1 Tasker	Performs server cleanup
	ArcIMS 4.0.1 Monitor	Tracks the state of Spatial Servers
Database server	Oracle 9.2.0.4.0	RDBMS Server
	ArcSDE 8.3	ArcSDE application server connection

The wet site works on Apache with Reverse Proxy on Linux OS, and ArcIMS 4.0.1, ArcSDE 8.3, and Oracle 9i work on Windows Server OS which cannot be seen by visitors. Only clients in the Internet data center are set to TRUSTED to access data, and only the port number connected with Reverse Proxy is opened to Firewall.
MLIT is responsible for updating measure data, publishing charts, manipulating metadata, managing web site and bulletin board. The network function in Windows is available between servers and clients with VPN, and partly updates data by using WebDAV.

System architecture

Web GIS

The main data available to the public in Web GIS is marine environment information from Kaiki Ship (Table 2) and sample points. The existing map data such as Digital Map 50000 Image (Geographical Survey Institute), disaster prevention information GIS data of river (River Bureau) and Electronic Navigational Chart (Japan Coast Guard) etc, has been used as background map. In order to open at the early stage the test run was held at the same time when system construction. A part of information in Table 2 was used as the test data for database.

The main system requirements are the following:

Easy to identify the locations of sampling points and browses measure values

Attaches importance to visualization by graphing the data to understand the tendency to the measure values

As a result, the dynamic label display of measure data (Figure 1), the graph making (Figure 2), and information search (Figure 3) are implemented.

Table 2 Items of opening to the public from Kaiki Ship

Investigation	Investigation method	Graph available	Vertical distribution	Time series	Label	Outline table
Water mass structure	Water quality (Equipment)	○	○			
	Water Quality (Sampling)			○	○	
	Phytoplankton	○				○
Runoff and flux	Tide observation	○				
	Water Quality (Equipment)	○	○			
	Water Quality (Sampling)				○	
Sediment quality benthos	Sediment investigation				○	
	Benthos investigation	○				○
	Water Quality (Equipment)		○			
	Water Quality (Sampling)				○	
Continuous observation at fixed points	Tide observation	○				
	Water Quality (Equipment)	○				
	Water Quality (Sampling)				○	
	Phytoplankton					○

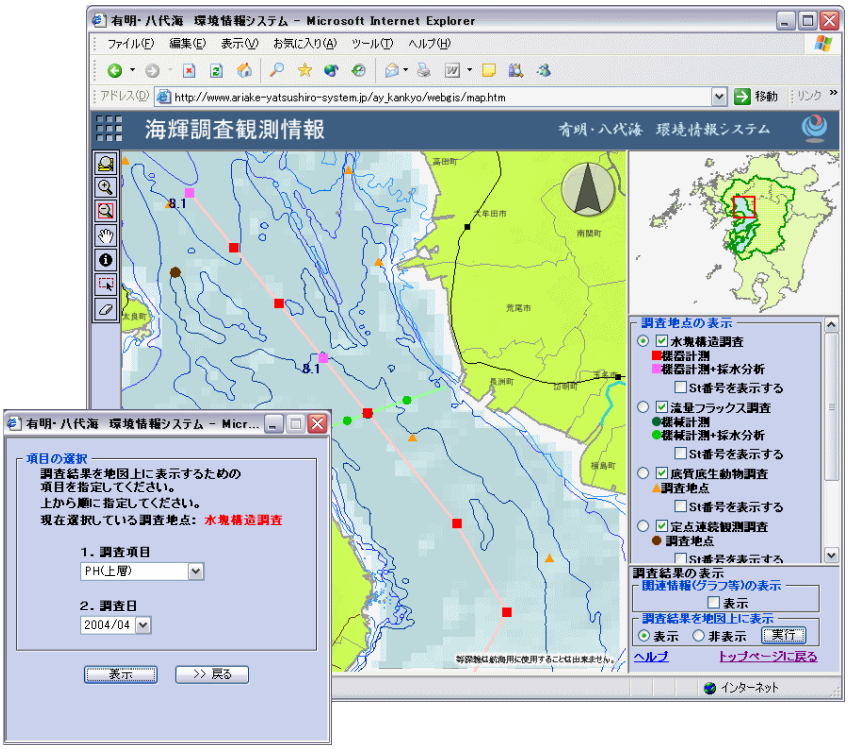


Figure 1　Label display

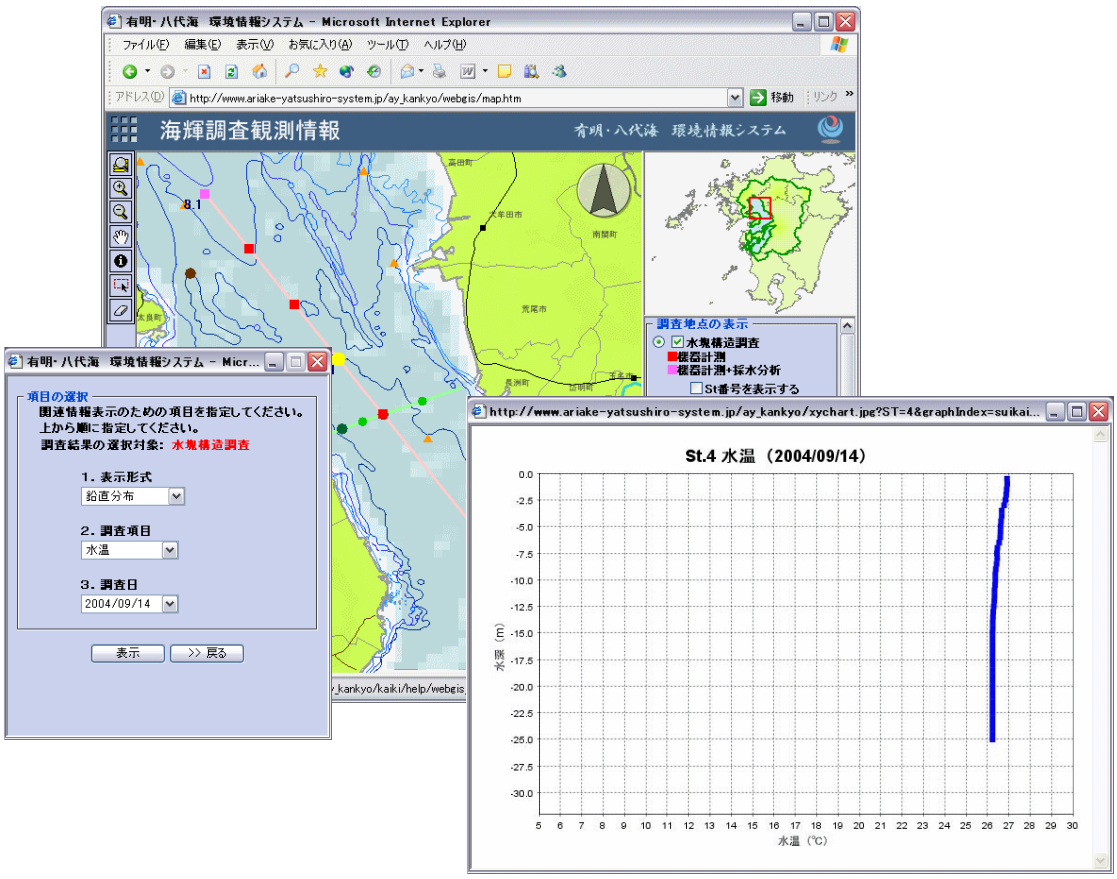
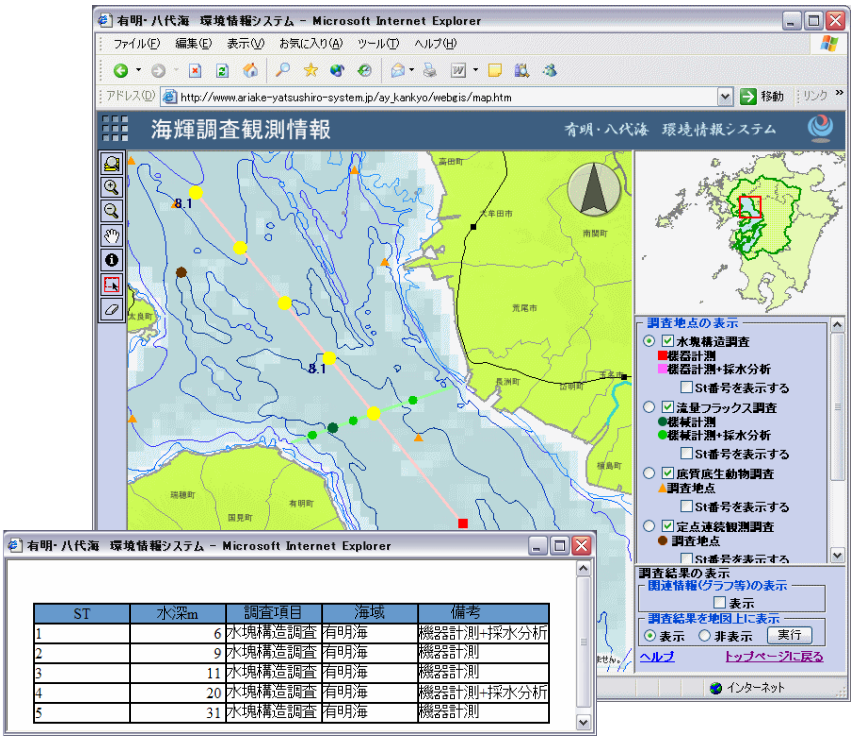


Figure 2　Graph display



ST	水深m	調査項目	海域	備考
1	6	水塊構造調査	有明海	機器計測+採水分析
2	9	水塊構造調査	有明海	機器計測
3	11	水塊構造調査	有明海	機器計測
4	20	水塊構造調査	有明海	機器計測+採水分析
5	31	水塊構造調査	有明海	機器計測

Figure 3　Information search

Clearinghouse

The items of the clearinghouse in accordance with ISO/TC211 and JMP2.0 (Japan Metadata Profile version 2.0) are adopted as metadata items in this system (Table 3). With the cooperation of the related organizations the coast surrounding area, the metadata are collected by the questionnaire method.

Table 3　Metadata items available

Classification	Item
General	Title
	Date and language
	Summary
	Author of metadata
	Contact
	Contact1
Catalog	Catalog of data set
Identification of data set	Theme or classification
	Additional features
Spatial information	Coordinate system
	Spatial domain
	Additional information

Classification	Item
Distribution information	Introduction
	Release data
	Distributor
	Digital distribution
	Distribution1
	Offline distribution
	Offline distribution1
	Order1

About 40 items have been colleted in the current system in which 4 groups of the content type (Figure 4) have been be registered as WebGIS, online map service, downloadable data and investigation result (report, CD, and DVD, etc.) to narrow the search. Based on ISO in the content type and themes, a simple user interface of Geography Network appended to Metadata Service as a sample, is implemented to facilitate the users with the customized date search function. Moreover, help is enhanced so that the beginner might also use it easily.

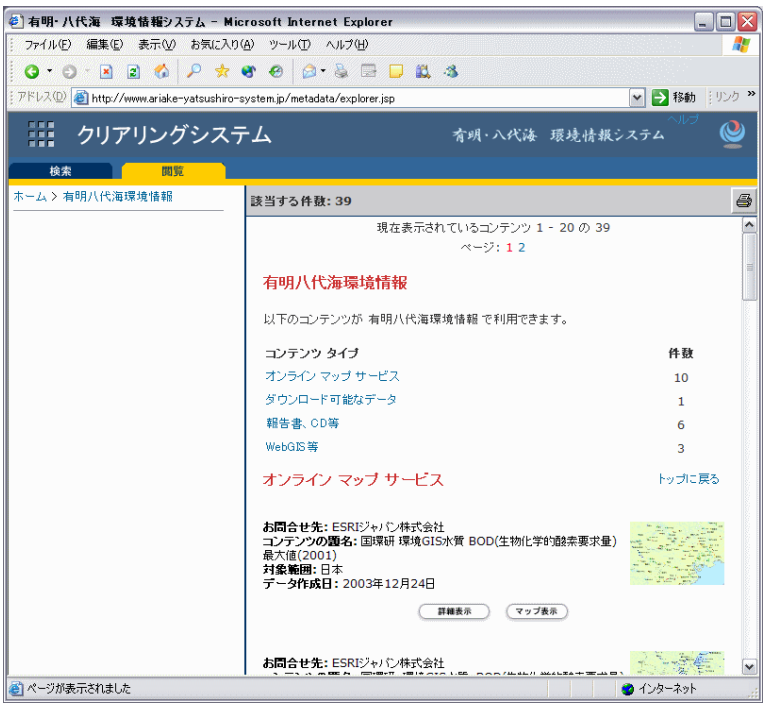


Figure 4　the result of metadata searching

Conclusions and next steps

The web site was opened in April, 2005 at Kyushu maintenance bureau of MLIT, in which WebGIS and the clearinghouse system are focused on to improve the Ariake & Yatsushiro marine environment protection and information exchange. It has been looked as a successful case that provide a new approach for information sharing among coastal area in Japan.
In order to clarify the system location and expend the system usage, the following should be enhanced in the next phase.

System maintenance
The improvements of maintenance, efficiency and security are needed for the full scale run this year because a regular data update is required. So, it is also necessary to take account of extending the system of Kaiki investigation data for system management as a comparatively high-difficulty system.

Server maintenance
It is indispensable for a computer system to be maintained with a regular check. It is necessary to make a "periodic stop" to maintain a continuous and stabilized operation, during which the technique, such as how to maintenance the system etc, can be dealt with, and Kaiki marine investigation data and system functions can be updated, the system bugs can be fixed.

Enhancement of clearinghouse
It cannot be safely said that the amount of the maintained metadata is enough to the users. It is necessary to take account of the enhancement of the clearing system by the way of explaining the system to the more related organizations and collecting the more information sources. The following approaches will be thought as an effective way in the next step.

a. Cooperation and cooperation request with coastal prefectures, cities, towns and villages
b. Cooperation and cooperation request with academic research organizations (educational institution such as universities)
c. Cooperation and cooperation request with investigation research organizations of another ministry
d. Cooperation with environment study for primary, junior and senior high schools

Moreover, from the beginning of MLIT, many of clearing systems are being constructed in each ministry. If the cooperation among the metadata can be attempted in the future, an effective network of marine environmental information can be constructed.

Author Information
name (e-mail address), title, organization, address, telephone and fax numbers

name : Hideki YOSHIDA (yoshida-h86s3@pa.gsr.mlit.go.jp)
Organization : The Ministry of Land, Infrastructure and Transport, Japan
address : 2-29-1, Higashiyamato-machi Shimonoseki, 750-0066, JAPAN
Tel. : +81-832-68-1250
Fax. : +81-832-61-1317

name : Toshihide SAISHOJI (toshihide_saishoji@pasco.co.jp)
name : Susumu TAKAGISHI (susumu_takagishi@pasco.co.jp)
name : Hiroshi KADOTA (hiroshi_kadota@pasco.co.jp)
name : Koutaro KABA (koutaro_kaba@pasco.co.jp)
Organization : PASCO Corporation, Japan
address : 3-5-2, Higashihie Hakata-ku, Fukuoka City, Fukuoka Pref., 812-0007, JAPAN
Tel. : +81-92-451-3525
Fax. : +81-92-414-9858