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Our monthly newsletter features a variety of information, highlighting current domestic and international issues concerning bioresources.

Introduction to Resource Center No.20

National BioResource Project "Algae"

Fumie KASAI Environmental Biology Division,
National Institute for Environmental Studies

Ongoing Column No.26

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- Applications of Google Map -

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"BMB 2007" (The 30th Annual Meeting of the Molecular Biology Society of Japan & The 80th Annual Meeting of the Japanese Biochemical Society)
December 11-14, 2007 : Panel exhibitions of NBRP are scheduled.

The series "Let's Use! BioResource" is being published in Cell Technology. Bioresources in Japan are introduced in a series of 14 volumes from November 2006 to December 2007.

Introduction to Resource Center No.20

National BioResource Project "Algae"

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<http://www.shigen.nig.ac.jp/algae/>

The Microbial Culture Collection at the National Institute for Environmental Studies (MCC-NIES; Fig. 1), a core institute of algae resources, was established in 1983 as a facility to preserve microalgae related to environmental issues. The preserved strains known as NIES strains (for example, NIES-102) have been used in numerous studies. In the last 25 years, the number of preserved strains has increased approximately 10-fold and, presently, the institute has an extremely diverse number of classification groups. In particular during the 1st stage of the National BioResource Project (NBRP) initiation in 2002, microalgae strains in the Institute of Molecular and Cellular Bioscience at the University of Tokyo, the National Museum of Nature and Science, and the University of Tsukuba were deposited at MCC-NIES. Thus, MCC-NIES became the core institute of algae resources. In the 2nd stage of the NBRP initiated in 2007, the Kobe University Research Center for Inland Seas (KURCIS; involved in the collection, preservation, and distribution of macroalgae) and the Graduate School of Life and Environmental Sciences at the University of Tsukuba (involved in the collection and taxonomic studies of important species) will continue with their roles from the 1st stage of NBRP. We aim to consolidate resources to achieve more diverse and extensive information on microalgae.



Fig. 1: Microbial Culture Collection, National Institute for Environmental Studies (MCC-NIES; left); subculture strains in a culturing room under controlled temperature and light conditions (top right); and a preservation system with liquid nitrogen (bottom right).

MCC-NIES website
http://www.nies.go.jp/biology/mcc/strainlist_j.htm

1 Algae are an extremely diverse biological group and comprise numerous strains. Some algal species such as Chlorella and Chlamydomonas have long been used as model organisms to study photosynthesis and heredity, while others have been used for various studies such as phylogenetic evolution and ecology; thus, the extensive diversity of this group has been exploited for research purposes.

Recently, among approximately 2,300 strains of algae preserved in MCC-NIES, approximately 2,000 strains have been released. According to the proportion of taxonomic groups (Fig. 2), it was found that extremely diverse taxonomic groups are preserved although cyanobacteria and chlorophyta constituted a major portion of the conserved groups.

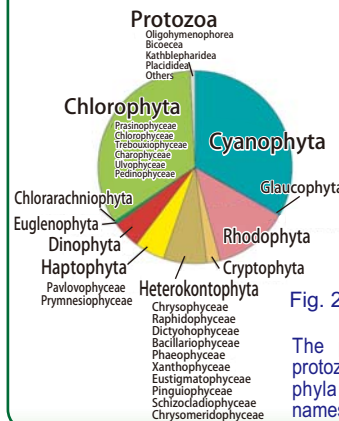


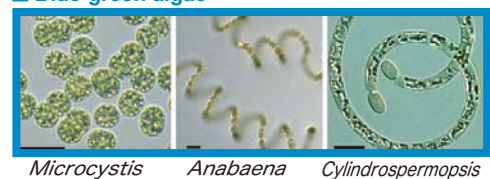
Fig. 2: The proportion of taxonomic groups of preserved strains

The proportions of 10 phyla of algae and protozoa are indicated in the pie chart. For the phyla containing multiple classes, the class names are indicated under the phylum names.

2 One of the features of MCC-NIES is the preservation of environmental index species, and many of these strains have been distributed. In addition, using the NIES strains, organelle genomes in *Mesostigma* and *Nephroselmis* have been sequenced from the viewpoint of gaining an understanding into the evolution of higher plants as these are located in important phylogenetic positions (Fig. 3). Moreover, another feature is that the MCC-NIES is involved in the ex situ conservation of endangered algal species. Please refer to the MCC-NIES website for more information as this is beyond the scope of the NBRP's objectives.

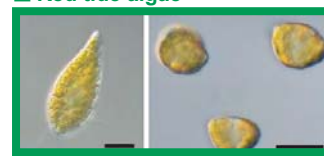
Fig. 3: Microalgae preserved in MCC-NIES

Blue-green algae (Scale bar : 10µm)



Microcystis *Anabaena* *Cylindrospermopsis*

Red tide algae



Chattonella *Heterosigma*

Most primitive strains of Streptophyta including higher plants



Mesostigma

Numerous species from the algal resources have been used for various purposes. We introduce the preservation operations of algal species at MCC-NIES—a preserving and distributing base of NBRP algae.

The following are the primary operations conducted at the MCC-NIES: strain data management which includes administrating the subcultured dates of strains; subculturing; cryopreservation; ensuring growth and sterility; sterilization and the reassessment of preserved strains. These operations are essential to maintain high-quality culture strains (Fig. 4). Currently, approximately two-thirds of all strains are being preserved by subculturing since the cryopreservation of most strains is difficult. The culture strains are maintained by subculturing into fresh media every 2 weeks to 6 months, depending on the algal species. The subcultured dates of a large number of strains are managed by using a computer system developed independently. Different media are used depending on the species, and approximately 40 types of media are constantly prepared. In particular, the marine red tide algae (which MCC-NIES has the most comprehensive collection of in the world), some species of blue-green algae, and coccolithophore (which has never been successfully cryopreserved) require frequent subculturing, and thus, preserving these strains requires significant manpower. In contrast, cryopreservation is a stable preservation method that does not require any manpower; however, a uniform preservation method cannot be applied to a variety of algal species. The development of preservation methods based on the investigation of species-specific preservation conditions is essential. The MCC-NIES is equipped with sixteen 245-L liquid nitrogen tanks and a cryopreservation system that can automatically supply liquid nitrogen and monitor the temperature inside the tank (Fig. 1). Currently, approximately 20,000 tubes primarily comprising 640 strains of cyanobacteria and green algae are preserved in the gas phase of liquid nitrogen.

The growth of subcultured algal strains is examined both macro- and microscopically, and various precautions are constantly taken to maintain the strains under optimal conditions. The sterility of axenic strains is confirmed annually, and the results are documented as part of strain information. In addition, the phylogenetic analysis of primarily green algae, which exhibit relatively fewer morphological features among others that were previously deposited, is conducted based on their 18S rDNA sequences for the re-identification and elucidation of their phylogenetic positions.

Fig. 4: Preservation of microalgae conducted at MCC-NIES



The culture strains of microbes and microalgae have long been used as research resources. Several issues with regard to maintaining the quality of these strains, appending accurate strain information, and providing researchers with easy access to these strains have been debated. Encouraged by the Organisation for Economic Co-operation and Development (OECD), many facilities worldwide attempted to acquire authorization as resource centers via third-party institutions. However, to objectively indicate the high quality of resources, registration with an international authority on quality management systems such as ISO 9001:2000 may be essential. MCC-NIES endeavors to acquire the ISO certification in the 2nd stage of the NBRP.

The next issue will be
"Introduction to the Japan Collection of
Microorganisms (JCM) at RIKEN BRC."
 Hope you are looking forward to it!

Editor's Note: Algae are defined as "organisms excluding terrestrial plants that perform photosynthesis." Of the 3 domains Archaea, Eubacteria, and Eukarya, the algae comprise diverse species of eubacteria and eukaryotes, namely. Although microbial solutions look the same to an amateur, their microscopic images are attractive and clearly exhibit the diversity between diverse microbes. In addition to their use as basic research resources for phylogenetic analysis, algae attract attention as environmental index species and as resources to search and produce useful compounds. (Y.Y.)



Zoom into your image ! - Applications of Google Map -

Have you ever searched for your residence by using Google Maps? This time, I will introduce a unique function of Google Maps along with a convenient tool to implement this function.

Google Maps are provided through a service called Google Maps API and you can display the maps on your own websites if you apply for it. A key function of these maps is that they can be scrolled up and down and zoomed in and out; this function can be used for your own images in addition to those provided by Google Maps.

However, a drawback of this function is that it is necessary to prepare images for each zoom level. A single image is necessary for zoom level 1; 4 images, for level 2. In this manner, 4 to the nth number of images will be necessary as the level increases; accordingly, 256 images will be necessary for the 5-fold magnification of images, which could be quite troublesome.

"The Google Maps Image Cutter" resolves this problem. Once you load the image to be displayed and specify the zoom level, this tool will automatically generate the necessary images. This tool can be used as follows.

[The Google Image Cutter]



- ① "The Google Maps Image Cutter" can be downloaded from the following website at the University of London.
<http://www.casa.ucl.ac.uk/software/googlemapimagecutter.asp>
- ② Unzip the downloaded file and click on "GMapImageCutter.jar" to start "The Google Maps Image Cutter". Please install the Java Runtime Environment (JRE) from Sun (<http://www.java.com/>) if this does not work.
- ③ Select "Open File" from "File" options (red box), and select an image to be used. The image will be displayed at the center of the screen. Next, select the Max Zoom Level located on the right side of the screen (blue box). For example, if you want to zoom into your image until level 5, select 5. Lastly, click the "Create" button in the lower right corner to create the required images (Fig. 1).
- ④ The HTML and created image files will be stored in the same folder as the original image.
- ⑤ Please open the HTML file with your browser to check that the images are displayed properly with Google Maps API. In order to release the images on your website, you need to obtain the Google Maps API key and add it to the HTML file.

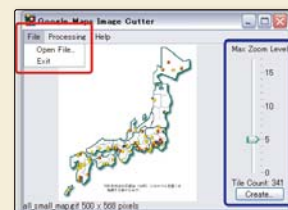


Fig.1. Google Maps Image Cutter

Fig. 2 is a distribution map of chimpanzees, gorillas, and orangutans in the Japanese islands. This map was customized using Google Maps and is provided by the Great Ape Information Network (GAIN) of the NBRP project. Markers to indicate each species were created to display pop-ups. These functions can be easily appended by simply adding markers and the JavaScript codes for pop-ups to the HTML file.

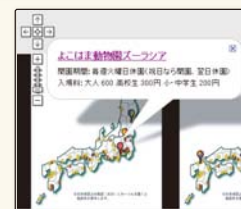


Fig. 2. Distribution of great apes in the Japanese islands

Aside from creating display maps, this tool can be used for many other purposes and thus has great potential.
Let's try it!

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