

Natural Geography In Shore Areas (NaGISA)

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<http://www.nagisa.coml.org>

LONG-TERM GOALS

To discover, describe and record the biodiversity of the world's coastal zones.

OBJECTIVES

NaGISA emphasizes wide-scale, standardized sampling in seasons of maximum diversity in areas of minimum human impact to establish an initial census and provide a biodiversity baseline for future comparisons and long term monitoring.

APPROACH AND WORK PLAN

NaGISA aims to complete an equatorial latitudinal transect from the east coast of Africa to the Palmyra Atoll and a pole-to-pole longitudinal transect from the northern coast of Alaska to Antarctica's McMurdo Sound. This is possible because simple, cost-efficient intentionally low-tech sampling protocols allow NaGISA to draw on the participation of international researchers and community groups. The ultimate goal is a global series of well-distributed standard transects from the high intertidal zone to depths of 20m, which can be repeated over a 50-year or longer time frame. Building on site selection criteria and sampling protocols developed during the International Biodiversity Observation Year (IBOY), NaGISA aims to achieve wide coverage with standardized techniques that will provide a baseline for future biodiversity comparisons. Target habitats include hard substrate algal communities and soft substrate sea grass communities, chosen for their complexity and global distribution. For each study site, replicate samples are collected in the high, mid and low intertidal zones and at 1m, 5m and 10m sub-tidal depths (where possible, at 15 and 20 m). NaGISA protocols constitute the minimum standardized sampling requirements for biodiversity determination, although scientists are welcome to incorporate additional sampling parameters at local sites. The standardized protocol includes:(1) Passive sampling; photography and observational techniques, estimates of percent cover of colonial invertebrates and rhizoidal and encrusting macroalgae, and counts of algal stripes and solitary fauna within quadrates (2) Active sampling; core samples of seagrass beds, and careful removal of organisms from 0.25x0.25m quadrates; and; (3) Assessment; measurements of surface and bottom seawater temperature, salinity, light and visual classification of the substrata.

The data collected during the project is held in the NaGISA database www.nagisa.coml.org, which will be open to the public in the spring of 2005 and incorporated in CoML's Ocean Biogeographical Information System www.iobis.org. The overarching global action plan, standardized techniques and database are organized on an international level by NaGISA headquarters in Kyoto University Japan. The work of local researchers and community groups who are in charge of managing the sites is coordinated by regional centers. These regional centers are charged with gathering and over-seeing the groups, which are a combination of universities, institutions, schools and community groups. Within each region, taxonomic expertise and educational programs are distributed with the aim of furthering the local biodiversity knowledge base and maintaining regional scientific integrity. At its core NaGISA is an exercise in international cooperation and capacity building, which is organizationally complex, but clearly achievable.

NaGISA currently has Regional Centers in the Pacific, Caribbean and in the Atlantic. The Western Pacific Center is run by Professor Yoshihisa Shirayama of Kyoto University and currently involves close to 10 Western Pacific countries. The Eastern Pacific Center run by Drs. Brenda Konar and Katrin Iken of the University of Alaska, Fairbanks is in charge of the entire eastern span from Chile to Alaska as well as the polar research. The Caribbean Sea Center, run by Dr. Paula Spirello of the central University of Venezuela is in its first year as is the North Atlantic Center run by Lisandro Benedetti-Cecchi of the University of Pisa. The Indian Ocean Center is still in the development phase.

The taxonomic analysis is presently focused on visible organisms associated with large algal and seagrass communities, but a full spectrum of samples is being collected and preserved for analysis that will be conducted as resources become available. A team of experts is being built to travel to regionally designated sites and examine samples and conduct taxonomic seminars while local participants are being encouraged to expand their interests through student and postdoctoral programs. Resulting in one of NaGISA most valuable assets, that of a capacity building.

The initial discovery phase, in to which we are moving now, is likely reveal thousands of new species, and is thus often seen as NaGISA greatest impact to science. However NaGISA sets it goals on the longer term. Where its standardized methods can lead to the first global near shore monitoring network and where detailed analysis of samples from the hundreds of transects ultimately conducted will result in the creation of a number of new approaches. For although the core NaGISA project is intentionally 'low-tech', it also includes efforts to maximize the value of the samples collected through the development of automated sorting and species recognition systems. Associations with groups interested in molecular diversity approaches are part of the development process. The groundwork and new technologies will be essential for the success of future long-term biodiversity monitoring programs.

Notes on the Upcoming Year

Although we still view expansion as our immediate purpose sampling will begin to replace meetings in our agenda. We will continue to sample in all active sites (see list of work completed) and add to this list a number of sites that have been recently selected.

The standardized protocols will soon be joined by guidelines for Fish and Rhodolith Transects that are currently being created by specialists for NaGISA. These will be assessed, incorporated and promoted where applicable.

Integrating work with CeDaMar on sediment sorting, CMarZ on Plankton and the bar Code of Life will hopefully be on track with in the next year.

The now bi-annually scheduled taxonomic workshops that will take place in 2005 will be 1) A workshop on Nematode Taxonomy held in Japan and 2) A workshop on Decapod Taxonomy held in Indonesia.

WORK COMPLETED

NaGISA has successfully standardized methods for gathering data in hard bottom Macro algal and soft bottom sea grass beds as well as developed guidelines for near shore plankton tows

To date, 30 active NaGISA field sites are collecting data with these standardized methods. They can be found in:

Western Pacific

Japan

- Hokkaido, Akkeshi 2002 (Macroalgae)
- Honshu, Seto 2002 2004 (Macroalgae)
- Honshu, Takeno 2002 (Macroalgae)
- Shikoku, Kochi, Usa 2003 April (Macroalgae)

Thailand

- Libong Island, 2002 (Macroalgae, Seagrass)
- Phuket, Banken, 2003 (Seagrass)

Vietnam

- Halong Bay 2003 (Macroalgae)
- Tam Lagoon 2004(Macroalgae)

Indonesia

- Bitung 2003, 2004 (Seagrass)
- East Kalimantan 2002, 2004 (Seagrass)

Malaysia

- Sg Pulai 2003(Seagrass)

Philippine

- Puerto Galera Bay 2003, 2004 (Macroalgae, Seagrass)
- Puerto Princesa Bay 2004 (Seagrass)

Eastern Pacific

USA

- Beaufort Sea- Boulder Patch 2003, 2004 (Macroalgae)
- Kodiak Island 2003, 2004 (Macroalgae, Seagrass)
- Prince William Sound 2003 2004 (Macroalgae, Seagrass)
- Kachemak Bay 2003 2004 (Macroalgae, Seagrass)

Western Atlantic

USA

- Florida 2003, 2004

NaGISA has successfully completed annual taxonomic workshops since its conception in 2002 including a Meiobenthos Workshop in Phuket Thailand in 2002, a Marine Polychaete Taxonomy Workshop in Phuket Thailand in 2003 and a Marine Amphipod Taxonomy Workshop in Nha Trang Vietnam in 2004.

NaGISA has also established a research center in Thailand, initially based at the Phuket Marine Biological Center, now located at Keaserate University in Bangkok, which will soon be duplicated in Indonesia.

Research groups have been established in over 20 countries including; Japan, Thailand, Malaysia, Indonesia, Taiwan, Vietnam, Philippines, USA, Mexico and Venezuela.

The NaGISA international website, started in April 2003 is used for information dissemination, communication and protocol promotion.

RESULTS

Please describe meaningful scientific and/or technical results achieved in the report year. Make the significance clear. Emphasize what was learned, not what was done. This should be a summary of significant results and conclusions.

Most of what NaGISA has learned has been in the arena of project management. Our international agreements, educational programs and scientific research are not yet balanced on the global scale. However we are not devoid of technical accomplishments, our latest, which is that we have learned the value of sub-core samples and have revised our sea grass bed sampling methods accordingly. We now accept that 15cm cores for meiobenthos requires excessive hand sorting and is inefficient so we now sample 2cm sub-cores in the standardized methods, although the seagrass root biomass continues to be estimated from the 15cm core samples.

During the 2004 field season we made an exiting scientific discovery of a single bed of rhodoliths, near Knight Island in Prince William Sound. Rhodolith beds have been found throughout the world's oceans, including in the Arctic near Greenland and in waters off British Columbia, Canada. But they have never been documented in Alaska waters. Globally, rhodoliths fill an important niche in the marine ecosystem, serving as a transition habitat between rocky areas and barren, sandy areas. Rhodoliths provide habitat for a wide variety of species, from commercial species such as clams and scallops to true corals. The discovery of rhodoliths in Alaska is likely to fuel the debate over the protection of seafloor habitats.

IMPACT AND APPLICATIONS

Ocean Observing Systems

It is NaGISA's hope that it will become uniquely tied to the OOS program as the near shore component. As the NaGISA network grows, the standardized techniques will hopefully be drawn into a long-term global monitoring system that will be compatible with the OOS program.

Marine Ecosystem-based Resource Management

NaGISA can be easily integrated into any marine ecosystem based resource management program as the method of monitoring long-term effects. Special notice should be given to current NaGISA sites and any management programs in the near shore should seriously consider NaGISA methods. NaGISA partnership is open to any and all for consideration.

Science Education and Communication

Local capacity building is a corner stone of the NaGISA approach. Working with the Global Taxonomic Initiative and the Japan Promotion of Science Multinational Research Project on Coastal Marine Science, NaGISA has started to make headway in the taxonomic ability of Western Pacific Counties through training workshops, graduate and postdoctoral programs. NaGISA has expanded its initial university level courses to include high school seminars and workshops and has successfully involved both Japanese and American high schools in the management of NaGISA sites. Public communication has been relegated to newspapers and local television stations however it is proving to be an ever-snowballing effort.

RELATED PROJECTS

“Spin-Off” Projects

The whole construct of NaGISA is to propagate the protocols and so below is the list of all the regional centers however under these there are again whole lists of projects carrying out the NaGISA protocols.

Project Name	Principal Investigator	Geographic Locale
NaGISA Western Pacific	Shirayama, Yoshihisa	Shirahama, Japan
NaGISA Eastern Pacific	Konar, Brenda	Fairbanks, USA
NaGISA Caribbean Sea	Spirello, Paula	Caracas, Venezuela
NaGISA Atlantic	Benedetti-Cecchi, Lisandro	Pisa, Italy
NaGISA Indian Ocean	Wafar, Mohideen	Dona- Paula, India

Links Within CoML

Project Name	Nature of Relationship
CoML Arctic	We set up the initial Arctic workshop and published its outcome. We hope to continue our close ties making NaGISA protocols a standard near shore protocol for the Arctic
Zooplankton	Ideally we will be able to hand over the coastal zooplankton that we collect to them, thus enlarging their sphere of collection.
Coral Reefs	With coastal zones in common it has been suggested that we share the same data base and try to promote each others protocols This may come to fruition as we both develop this relationship
Bar Code of Life	In our search for a method of automated recognition of near shore taxa it is very likely that we can work with this group as they will be most likely to be assisted by the image analyzers for there long term goals.

External Projects

Project Name	Nature of Relationship
Global Taxonomic Initiative	We are currently co-coordinating our databases
JSPS multinational benthos initiative	Jointly organizing Taxonomic workshops in the Western Pacific region to enhance scientific capacity
GEM monitoring US Minerals Management Service Monitoring in the Beaufort Sea	NaGISA is currently identified as a player in the Alaskan Gulf Monitoring Program NaGISA protocols are being adopted for monitoring MMS sites in the Beaufort Sea

PUBLICATIONS

Books

Shirayama, Y. (2004). Census of Marine Life. In *The relationship between the woodlands, fields and oceans* edited by Kyoto University Field Science Education and Research Center. Pp. 37-39 Kyoto University Press (in Japanese)

Brenda Konar and Katrin Iken (2003). Natural Geography in Near Shore Areas (NaGISA) The Near Shore Component of the Census of Marine Life. In the *Proceedings of the Arctic Biodiversity Workshop A New Census of Marine Life Initiative* edited by Katrin Iken and Brenda Konar. Pp. 35-48 Alaska Sea Grant Program

Yoshihisa Shirayama, Ashley Rowden, Dennis Gordon and Hiroshi Kawai (2002). Latitudinal Biodiversity in Coastal Macrophyte Communities Chapter 4 of *Biodiversity Research Methods IBOY in Western Pacific and Asia* edited by Thru Nakashizuka and Nigel Stork. Pp. 162-182, Kyoto University Press and Trans Pacific Press

Articles

Rigby, P. R., T. Kato and Y. Shirayama (in print). **Discovering the Near Shore**, Marine Biodiversity and Ecosystem Functioning an EU Network of Excellence Report.

Rigby, P. R. (2004). An introduction to Natural Geography In Shore Areas (NaGISA). In the proceedings of the First Caribbean Workshop Isla de Margarita – Venezuela, June 2004 – to be reprinted as a book.

Shirayama, Y. (2004). Census of Marine Life and its application to Biological Science. *BioScience and Industry* vol. 62, Pp. 56-59 (in Japanese).

Iken, K and B. Konar. (2003). Natural Geography in Nearshore Areas (NaGISA): The near shore component of the census of Marine Life. *Gayana* vol. 67, Pp. 53-160.

EDUCATION & OUTREACH

The NaGISA Educational program involves students from the high school to postgraduate level. Programs have included the International High School Workshop on Biodiversity in July 2004, where high school students from Niceville High and Tanabe High were brought together at the Seto Marine Biological Laboratory. The program was a great success thanks to the hard work of the teachers involved and backing from the Fulbright Memorial Fund. The result is that the NaGISA concept has expanded and will include 4 other schools in the state of Florida and 3 others in Wakayama Prefecture.

Many university classes are incorporating NaGISA sampling in their coursework. As example at the University of Alaska Fairbanks, the Kelp Forest Ecology class and the Marine Biology and Ecology field course have adopted the sampling of the Kachemak Bay sites. These courses involve both undergraduate and graduate students.

Participants including graduate students and researchers from throughout the western pacific attended three taxonomic workshops including a Meiobenthos Workshop in Phuket Thailand in 2002, a marine Polychaete Taxonomy Workshop in Phuket Thailand in 2003 and a Marine Amphipod Taxonomy Workshop in Nha Trang Vietnam in 2004. All three were a great success and NaGISA we are now attempting to schedule biannual taxonomic workshops due to the overwhelming response from the students and demands from the institutes involved.

NaGISA also has been responsible for the training of 9 parataxonomists in Thailand through an on-going process where professional taxonomists are in charge of relaying information. The success of this program has resulted in it being taken over by Keaserate University as well as duplicated in Indonesia.

NaGISA has funded numerous educational exchanges, directly or with a combination of funding for research or research assistance (travel grants, access to material, professors etc) to students of all levels. These exchanges have resulting in 4 honors, 3 masters and 2 doctorates level graduations as well as 5 postgraduate advancements.

NaGISA has been successful in acquiring community involvement for choosing and sampling sites. As example, in Alaska, many native communities have shown support of NaGISA by assisting in site selection and sampling around their villages.

NaGISA's dedication to involving students and local community groups has resulted in having NaGISA's researchers constantly assisted in the field by a combination of university students attempting to get credits, volunteers hoping to learn, and community members wanting to become more familiar with their own environment. We are certain that this success will continue.

PROJECT PARTICIPANTS

Additional personnel not previously reported:

Surname	First Name	Organization	Address	Email	Role in project
Spirello	Paula	Central University of Venezuela	Facudad de Ciencias Instituto de Zoologia Tropical	pspinel@strix.ciens.ucv.ve	LAC NaGISA PI
Benedetti-Cecchi	Lisandro	University of Pisa	Dipartimento di Scienze dell'Uomo e dell'Ambiente, Via A. Volta 6, I-56126 Pisa, Italy	bencecc@discat.unipi.it	EU NaGISA Manager