Marine environment
Research 2003 – 2006

Beginning in 2003, the Swedish Government has allocated an annual sum of SEK 10 million to Formas for research on the marine environment. This research studies how the seas around Sweden are being affected by human activity and how this activity can be modified in the direction of sustainability.

Human activity can have very substantial negative impacts on the structure, diversity and function of marine ecosystems. Ecosystems are affected not only by fishing and aquaculture but also by land use and emissions to water in the catchment area, fall-out of airborne pollution, navigation and construction. They may also be impacted by a future warmer climate.

Marine environmental research concentrates mainly on the ways in which fishing, eutrophication and environmental toxins, singly or in combination, change the ecosystem, and on what can be done to minimise negative impacts. This knowledge forms the foundation for the sustainable use of marine natural resources.

Important fields of research include:
- marine ecosystem structure, diversity and function
- impacts of fishing, eutrophication and environmental toxins
- changes in human activity towards sustainable development

This brochure describes 41 projects, which are grouped under six headings: biodiversity, ecosystem structure, fish and impacts of fishing, eutrophication, environmental toxins, and climate.

Biodiversity

Exciting genetic discoveries about Baltic bladderwrack

Bladderwrack is a characteristic species around the Swedish coast and is the dominant marine alga in the Baltic. The project is studying the genetics of bladderwrack, and preliminary results reveal a number of new findings. In and north of the Åland Sea there is a dwarf form which constitutes a new species. The dwarf species reproduces by cloning, like some of the Baltic bladderwracks. Bladderwrack normally reproduces sexually through the fertilisation of eggs by sperm, but this is not very successful in the low salt content of the Baltic. A careful survey of areal genetic differences will be necessary for the long-term management of bladderwrack.

Project budget: SEK 2,042,000

Project manager: Kerstin Johannesson, Department of Marine Ecology, Tjärnö Marine Biological Laboratory, Göteborg University, kerstin.johannesson@tmbl.gu.se

How important is bladderwrack for other species?

Bladderwrack has been in retreat in much of the Baltic, probably because of eutrophication. Bladderwrack is the most common large wrack species in the Baltic, forming banks which provide a home for many aquatic organisms and algae. The project seeks to answer the question how important bladderwrack actually is to other organisms by examining how it impacts on productivity on the sea bottom and on the diversity of other species as the availability of nutrients increases.

Fucus vesiculosus, bladderwrack – how important is it for other species?
Foto: Jan Töve/Naturfotograferna.

Project budget: SEK 410,000
Project manager: Britas Klemens Eriksson, Institute for Botany, University of Cologne, keriksso@uni-koeln.de

How can we regulate aquatic bacteria in littoral waters?

The aquatic bacterial genus Vibrio includes many types of pathogenic bacteria which are harmful to both humans and animals. Our knowledge of the environmental factors which control the presence and growth of these bacteria in our waters is incomplete. As a result, we are unable to predict the impact of climatic change and local human activity on their distribution. The project investigates these questions in order to contribute to our knowledge of the ecology of aquatic bacteria and to develop a tool for identifying Vibrio-related environmental risks.
Project budget: SEK 1,698,000
Project manager: Stefan Bertilsson, Department of Limnology, Evolutionary Biology Centre, Uppsala University, stebe@ebc.uu.se

Understanding the biology of the shipworm – new measures against an oldenemy

The shipworm is a threat to marine wooden structures of all kinds. Protection has been based on toxic agents that have a wide range of negative impacts on other species. The development of new, non-toxic agents will require an understanding of the shipworm's ecology and the behaviour of its larvae. The project aims to build this understanding and will study the chemical and physical signals used by the larvae to locate wood in the water. New molecular methods will be developed to identify species in the larval stage, assess their distribution and quantify the threat posed by the shipworm in the field.
Project budget: SEK 1,579,500
Project manager: Jonathan Havenhand, Department of Marine Ecology, Tjärnö Marine Biological Laboratory, Göteborg University, jon.havenhand@tmbl.gu.se

Survey of chemical diversity in marine sponges

What chemical defence agents are formed by the marine sponge Geodia barretti when it is attacked by its predators? It is possible that these substances may be active against viruses and bacteria and prevent barnacles from fouling ships' hulls. In the longer term, a knowledge of these substances may lead to the discovery of new molecules that can be used for drugs and for environmentally friendly ship paints. The project is connected with the development of green chemistry based on degradable natural products.
Project budget: SEK 1,988,000
Project manager: Lars Bohlin, Department of Medicinal Chemistry, Uppsala University, lars.bohlin@fkog.uu.se

Can substances from marine sponges be used to prevent barnacles from fouling ships' hulls? Foto: Bo Brännhage/Naturfotograferna.

Grazing-induced chemical defence in green algae

Algae contain defence chemicals which make them unpalatable to grazers. Because chemical defence can be costly, it is an advantage if it is only produced when grazers are present (induced chemical defence). The purpose of the project is to study and compare the induction of defence chemicals in the green alga Ulva lactuca under different nutrient loads. This knowledge is important in order to learn whether the algae's chemical defence is significant for the biodiversity of algal communities.

Project budget: SEK 325,000

Project manager: Gunilla Toth, Department of Marine Ecology, Tjärnö Marine Biological Laboratory, Göteborg university, gunilla.toth@tmbl.gu.se

Larval behaviour and propagation mechanisms in a non-tidal environment

The purpose of the project is to study how planktonic larvae propagate between different areas in the Kattegat and the Skagerrak. The interaction between larval behaviour and water currents is poorly known, particularly in areas with feeble tidal flows such as the Skagerrak–Kattegat. This results in major problems in the management of commercial species and the conservation of marine biodiversity. Large-scale sea currents and swimming behaviour are modelled in a 3D mathematical model. Data on crab larvae are analysed to determine what oceanographic processes transport the larvae towards the coast, thus promoting recruitment.

Project budget: SEK 364,000

Project manager: Per-Olav Moksnes, Department of Marine Ecology, Kristineberg Marine Research Station, Göteborg University, p.moksnes@kmf.gu.se

What are the interacting impacts of physical disturbance and eutrophication on biodiversity?

Reduction in biodiversity due to human activity is one of our most urgent environmental problems today. A better knowledge of the processes that create and maintain the diversity of different types of ecosystems is critical to effective action against the problem. In this project we test the interacting effects of physical disturbance and increased production on the biodiversity of hard-bottom communities off the west coast of Sweden. The results may make an important contribution to the evaluation of impacts on marine diversity by increased availability of nutrients and activities leading to increased physical disturbance, such as boat traffic and near-shore facilities.

Project budget: SEK 917,500

Project manager: Henrik Pavia, Department of Marine Ecology, Tjärnö Marine Biological Laboratory, Göteborg University, henrik.pavia@tmbl.gu.se

Bottom vegetation as an indicator of biodiversity in shallow littoral environments in the Baltic

Shallow littoral environments are important to the life of many fish species. At the same time they are subject to major impacts from human activities. The study shows that the prevalence of long-lived species, such as bladderwrack and aquatic plants, is important for the environment's productivity and can be used as an indicator of biodiversity.

Project budget: SEK 585,000

Project manager: Lena Kautsky, Department of Botany, Stockholm University, lena.kautsky@botan.su.se

How do the biodiversity and function of thread algae affect the food web?

The increasing supply of nutrients to coastal waters has changed the species composition of thread algae and increased their production. The study aims to find out how these long-term changes in the structure and function of the thread algae community affect and propagate through the food web.

Project budget: SEK 1,498,500

Project manager: Lena Kautsky, Department of Botany, Stockholm University, lena.kautsky@botan.su.se

Marine biodiversity and ecosystem functions

Many ecosystems today are suffering accelerated loss of biodiversity. The purpose of the project is to test experimentally how ecosystem functions are affected by loss of marine biodiversity. In particular, ecosystem functions such as the production and breakdown of growth biomass will be studied for different scenarios of biodiversity loss in several links of the food chain.

Project budget: SEK 1,026,000

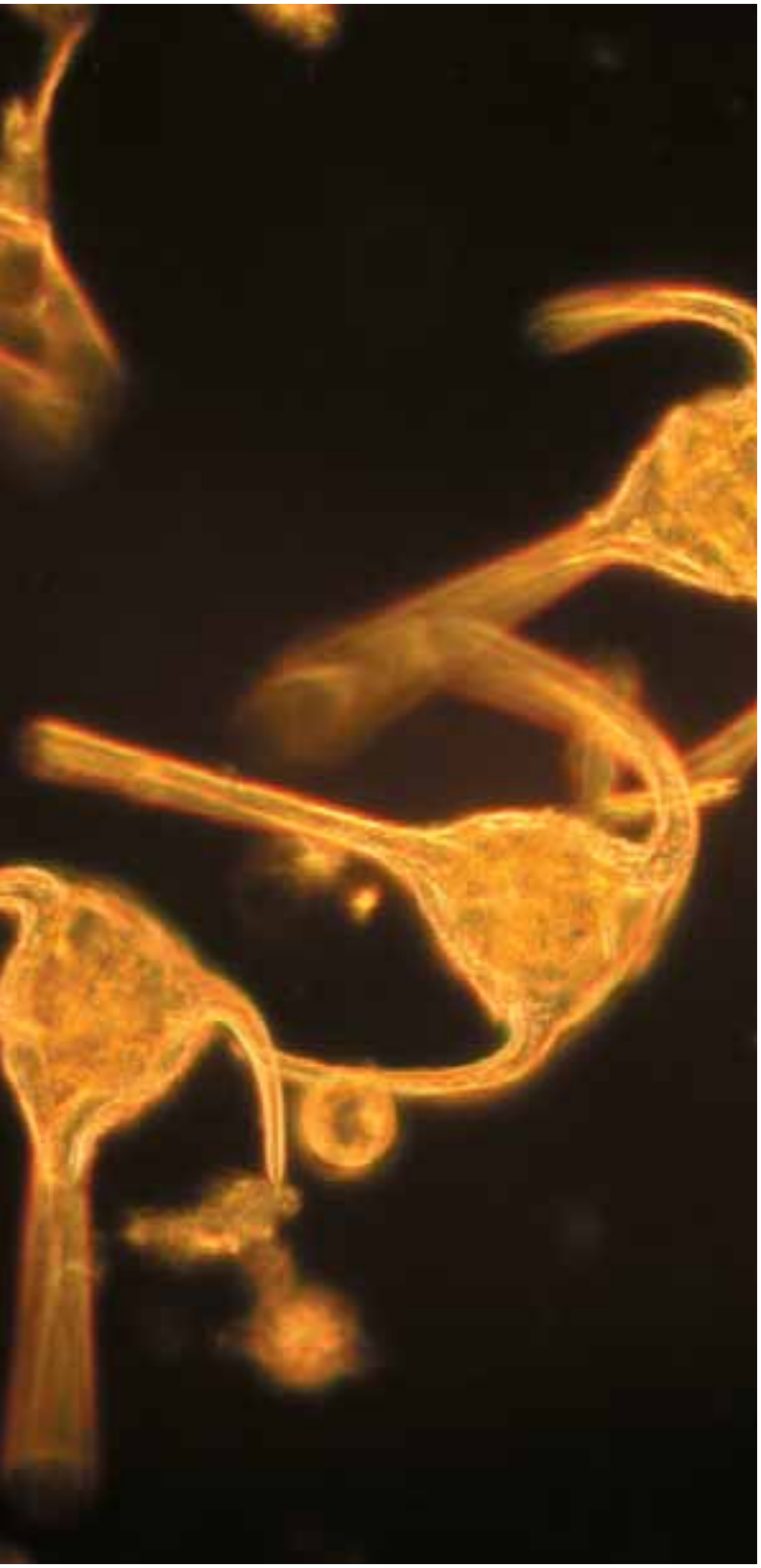
Project manager: Per Jonsson, Department of Marine Ecology, Tjärnö Marine Biological Laboratory, Göteborg University, per.jonsson@tmbl.gu.se

Evolutionary history of bristle worms

Bristle worms are a dominant group of worms on the sea floor and are important as a food of many commercially exploited fishes and crustaceans. The project is studying the evolutionary history (phylogeny) of bristle worms based on combinations of macroscopic observation and molecular DNA data on species existing today. From these data, evolutionary trees are drawn up to serve as a basis for the group's systematics and for a compilation of the descriptive literature as an aid to the identification of the worms by other marine biologists.

Project budget: SEK 1,971,000

Project manager: Fredrik Pleijel, Department of Marine Ecology, Tjärnö Marine Biological Laboratory, Göteborg University, pleijel@mnhn.fr



Ceratium tripos, a dinoflagellate from the Swedish west coast.
Foto: Mona Johansson.

Genetic methods for the analysis of marine invertebrate communities

Marine soft bottoms are home to millions of invertebrates per square metre. The communities are very species-rich, particularly the dominant threadworm group. These animals are of great ecological importance and are ideal for use in research. However, they are difficult to identify by traditional taxonomic methods. The purpose of the project is to use new genetic methods to identify invertebrate communities in the Baltic.

Project budget: SEK 500,000

Project manager: Emil Ólafsson, Department of Zoology, Stockholm University, emil.olafsson@zoologi.su.se

Ecosystem structure

Nutrients and fishing as regulating factors on eelgrass

Eelgrass (Zostera marina) meadows are an important living environment in shallow marine systems because they have high biodiversity and are also an important reproduction and growing area for fish. In recent years a decline has been observed in the prevalence of eelgrass meadows along the coasts of Sweden and other countries. What is the significance of eutrophication and fishing pressure for different functional groups in eelgrass? Are there synergies between nutrients and fishing pressure? Experiments are being conducted in eelgrass in the Skagerrak and the Baltic, i.e. in marine and brackish water environments.

Project budget: SEK 117,000

Project manager: Susanne Pihl Baden, Department of Marine Ecology, Kristineberg Marine Research Station, Göteborg University, s.baden@kmf.gu.se

Parasites in dinoflagellates along the Swedish coasts

Dinoflagellates are an important plankton group that is found in most seas. Some species are toxic or harmful to humans and fish, and they can appear en masse in unpredictable blooms. Scientists recently discovered that blooms may be affected by parasites. Molecular methods are now being developed to detect the parasites along the Swedish coasts and to study how the parasites affect dinoflagellate blooms.

Project budget: SEK 350,000

Project manager: Mona Johansson, Evolutionary Biology Centre, Uppsala University, mona.johansson@ebc.uu.se

Long-term changes in zooplankton in the Baltic

Eutrophication increases the production of phytoplankton, zooplankton and fish. Fish, by eating zooplankton, also indirectly affect the phytoplankton. This means that fishing can affect large parts of the ecosystem. Knowledge about zooplankton is central to our understanding of the effects of eutrophication, fish, and fishing. There are already data from 1977–1988 on zooplankton in a coastal

area south of Stockholm. The data series is now being extended forwards from 1989. The project will result in 25 years of zooplankton data, which will be interpreted in the light of changes in food supply (phytoplankton) and predation pressure (fish).
Project budget: SEK 429,000
Project manager: Sture Hansson, Department of Systems Ecology, Stockholm University, sture.hansson@ecology.su.se

Biochemical method for measuring zooplankton growth in the Baltic

It is important to be able to clarify the state of our knowledge of ecological impacts on the ecosystems of the Baltic, particularly natural marine production. Zooplankton play an important role in marine environments, and zooplankton numbers and growth are directly linked to reproductive success in fish. Until recently there has been no way of measuring the growth rate of single individuals in mixed populations. However, this has now been made possible through a new biochemical technique for quantifying the growth rate of individual copepods by analysing their nucleic acid content. This is the focus of the project.
Project budget: SEK 208,000
Project manager: Elena Gorokhova, Department of Systems Ecology, Stockholm University, elenag@ecology.su.se

What is the impact of increased inflow of organic material on marine food webs?

Future climate changes are likely to cause increased precipitation in northern Europe, and increased river catchment may cause deterioration of the light climate in the sea. Phytoplankton production may decrease while bacterial production increases. As a result, food webs will have more levels and their transfer efficiency will probably diminish. The project is studying the way changes in the base resource affect production of zooplankton and bottom fauna, which are an important food resource for fish. Observed production changes in the Gulf of Bothnia will be analysed.
Project budget: SEK 935,000
Project manager: Agneta Andersson, Department of Ecology and Environmental Science, Umeå University, agneta.andersson@eg.umu.se

How does the prey selectivity of zooplankton affect phytoplankton communities?

We have a very incomplete understanding of the significance of zooplankton prey selectivity for the massive algal blooms in Scandinavia's littoral waters. The project will examine how prey choices by zooplankton regulate the structure, function and species diversity of the phytoplankton community. This will be studied by quantitative analysis of species-specific DNA sequences of prey found in zooplankton organisms.
Project budget: SEK 1,350,000
Project manager: Peter Thor Andersen, Department of Marine Ecology, Kristineberg Marine Research Station, Göteborg University, peter.thor@kmf.gu.se

Upgrade of image analysis system for environmental analyses

The project is to upgrade an image analysis system used for counting and determining the shape and size of bacteria, single-celled zooplankton and phytoplankton. A neural network will be trained to recognise particles of certain shapes. The image analysis system provides objective and consistent estimates of the number and volume of microscopic plankton and helps in monitoring the status of the marine environment.
Project budget: SEK 277,000
Project manager: Ulf Båmstedt, Umeå Marine Sciences Centre, Umeå University, ulf.bamstedt@eg.umu.se

Fish and impacts of fishing

Stock structure of cod in Swedish waters

To understand the decrease in cod stocks it is necessary to identify the spatial and temporal distributions of the individual populations. The purpose of the project is to identify relevant cod stocks in Swedish waters by means of relatedness analysis using DNA markers. The primary question for investigation is whether juvenile cod in the coastal areas of the Skagerrak are produced locally or are carried there by currents from the North Sea and the Kattegat. Are the current fish stock management divisions appropriate, or should they be more finely granular?
Project budget: SEK 310,000
Project manager: Carl André, Department of Marine Ecology, Tjärnö Marine Biological Laboratory, Göteborg University, carl.andre@tmbl.gu.se

Management models for sustainable angling in the coastal belt

The project is studying management regimes to cope with a greater number of anglers or a reduced supply of fish. Management must set up a framework which enables angling pressure to be regulated on the basis of supply without causing total depletion of stocks. The researchers are using computer simulations to investigate the dissemination of information among anglers and a game theoretic approach to study the feasibility of coordination without legislation.
Project budget: SEK 285,000
Project manager: Jon Norberg, Department of Systems Ecology, Stockholm University, jon.norberg@ecology.su.se

Are there defined cod spawning grounds, or does recruitment take place by diffusion of larvae and codlings from surrounding areas?
Foto: Anders Axelsson.

The nutrient quality of Baltic plankton and its relation to oxidative stress

The planktonic algae produce vitamins and antioxidants which defend DNA and cell membranes against damage from oxidative stress. These substances are vital in the food chain from zooplankton through the Baltic herring and the European sprat up to the cod and salmon. The purpose of the project is to study whether low levels of antioxidants in Baltic plankton due to environmental changes may be responsible for problems in fish, such as the severe reproductive problems in Baltic salmon (M74 syndrome). The researchers analyse plankton for nutrient content, vitamins, fatty acids, enzymes and other antioxidants and trace their transfer to fish.
Project budget: SEK 1,525,000
Project manager: Pauline Snoeijs, Evolutionary Biology Centre, Uppsala University, pauli.snoeijs@ebc.uu.se

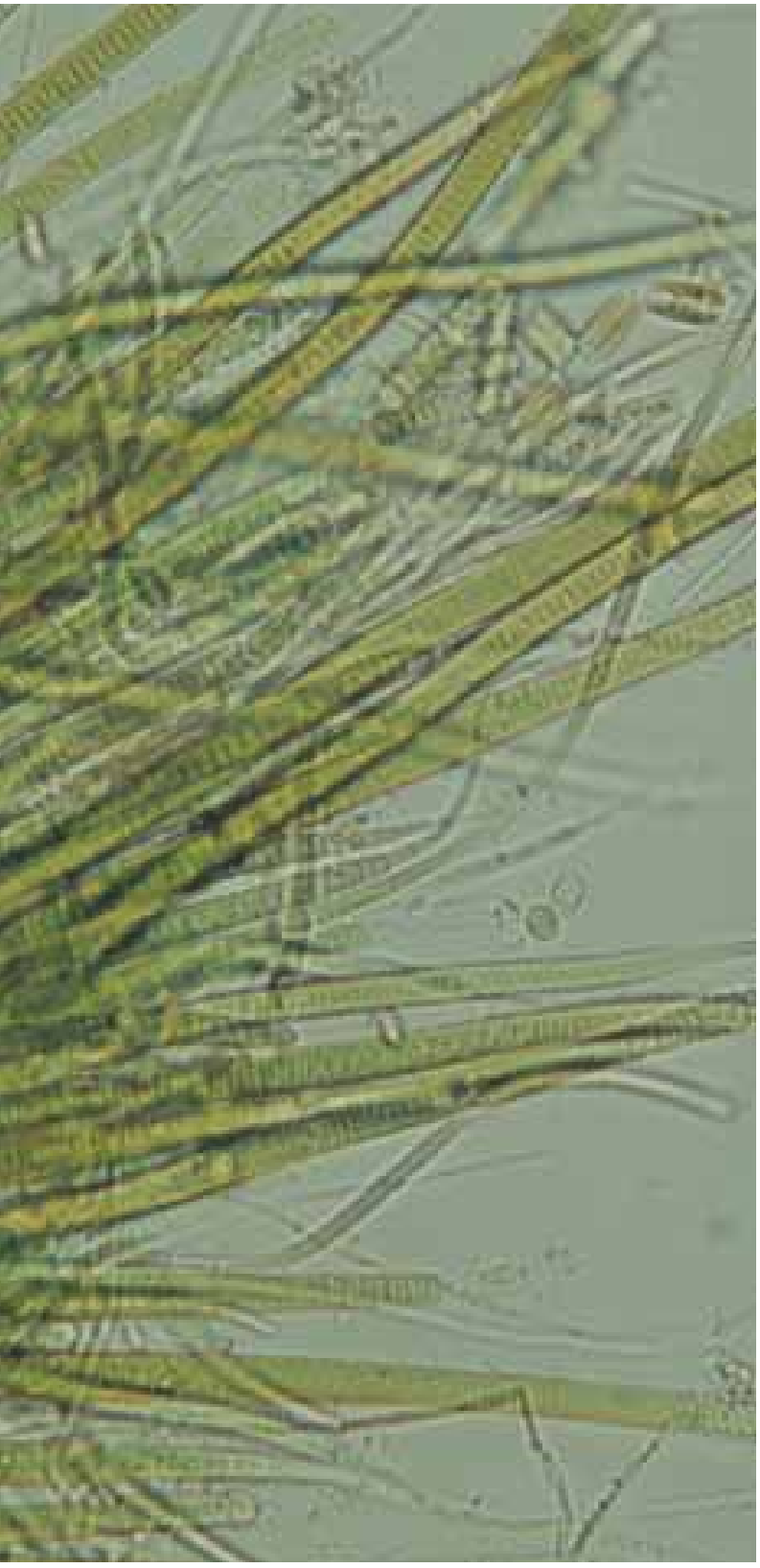
Cod spawning grounds in the Kattegat and the diffusion of eggs and larvae

Although cod has been fished commercially in the Kattegat for a long time, we know relatively little about the location of its spawning grounds or the diffusion patterns of its eggs and larvae. An important part of the project is the collection of eggs during the spawning season in order to locate spawning areas. The study is expected to answer the question whether there are defined and possibly protectable spawning grounds that are important to the size of stocks, or if recruitment takes place by the diffusion of larvae and codlings from surrounding areas.
Project budget: SEK 860,000
Project manager: Göran Björk, Department of Physical Oceanography, Göteborg University, gobj@oce.gu.se

Methods for estimating survival in long-lived mammals

To estimate the status and growth of animal populations one needs a knowledge of the survival of different age classes. There are few survival estimates for whales, since determining the age of whales in nature is difficult. The project develops a method whereby survival is estimated by adjusting survival models to age data from collected dead whales. The results can be used e.g. for evaluating the effect of bycatches on marine mammal populations.
Project budget: SEK 500,000
Project manager: Per Berggren, Department of Zoology, Stockholm University, berggren@zoologi.su.se

Calothrix scopulorum is a marine cyanobacterium.
Foto Ingmar Holmåsen/Naturfotograferna.



Eutrophication

Nodularia in the Baltic – a functional genetic approach

Toxic blooms of blue-green algae (cyanobacteria) are a growing environmental problem in the Baltic, where it is estimated that growth of cyanobacteria constitutes around one fifth of the total annual primary production. The researchers are using modern molecular methods to study the genetics of nitrogen assimilation in Nodularia, the dominant toxigenic cyanobacterium in the Baltic. The understanding that the project is expected to yield will be of decisive importance for effective management measures for the Baltic as a whole.
Project budget: SEK 1,777,500
Project manager: Rehab El-Shehawy, Department of Botany, Stockholm University, rehab.shehawy@botan.su.se

New method for estimating the spatial distribution of cyanobacteria in the Baltic

The project will evaluate a method that uses optical reflection to describe how filiform cyanobacteria are distributed in the water during summer blooms in the Baltic. Due to their buoyancy, cyanobacteria accumulate in patches on the water surface in calm weather. Estimates from satellite images are therefore highly weather-dependent, and we do not know at present whether blooms are increasing in intensity. A better description of the blooms at depth will improve our ability to monitor and detect changes.
Project budget: SEK 104,000
Project manager: Carl Rolff, Department of Systems Ecology, Stockholm University, crolff@ecology.su.se

The significance of sediments for water quality in the Gulf of Finland

Notwithstanding a reduction in nutrient emissions from the land into the Gulf of Finland, water quality has not improved. This may be due to the occasional release of nutrients stored in bottom sediments, e.g. during storms or when the oxygen content decreases. These questions are being studied in a three-year project involving scientists from ten research institutes. The project uses unique equipment with the object of gaining a better understanding of eutrophication issues.
Project budget: SEK 432,000
Project manager: Anders Tengberg, Department of Chemistry, Göteborg University, anderste@chem.gu.se

Blooms of fine filiform red algae in the central Baltic

Eastern Öland is plagued by regular blooms of fine filiform red algae. From high summer onwards, thick banks of algae build up along the shallow beaches. The algae contain large amounts of nitrogen and their main growth takes place in high summer when the water is poor in nutrients. The most likely nitrogen source is excre-

tion from the large quantities of mussels in the area. The researchers are investigating nitrogen transport in the beach zone. Is it the spring diatom bloom or the summer bloom of blue-green algae (cyanobacteria) that fertilises the red algae via the mussels?
Project budget: SEK 416,000
Project manager: Torleif Malm, Department of Botany, Stockholm University. torleif@botan.su.se

Alternative reaction paths in the nitrogen cycle

Observations show that there are other processes besides denitrification that form nitrogen in anaerobic environments. One such process is anammox, which proceeds apparently without the formation of carbon dioxide, nitrous or nitric oxide. These are important greenhouse gases, and nitric oxide also decomposes ozone in the stratosphere. The researchers are investigating whether it is possible, by manipulating temperature and the availability of oxygen and organic material, to control the balance between anammox and denitrification and hence influence the net production of greenhouse gases. An important focus of the project is whether and how the diversity of important bacteria is changed by the manipulations.
Project budget: 3 045 000 kr
Project manager: Stefan Hulth, Department of Chemistry, Göteborg University, stefan.hulth@chem.gu.se

Environmental toxins

Test system for evaluation of new anti-fouling agents

Fouling is an economically costly problem for navigation. Traditionally it has been effectively controlled by paints containing broad-spectrum biocides, mainly tin and copper, but their use is banned under new international regulations. New, environmentally friendly marine paints may be developed from bioactive substances which prevent fouling without deadly effects, but this requires new and sensitive test methods. The project is using computerised behaviour analysis to develop rapid, reliable tools that can be utilised in evaluating the next generation of anti-fouling agents.
Project budget: SEK 416,000
Project manager: Jonathan Havenhand, Department of Marine Ecology, Tjärnö Marine Biological Laboratory, Göteborg University, jon.havenhand@tmbl.gu.se

Bioturbation and the transport of radionucleides in Baltic Sea sediments

The project will study and quantify bioturbation processes, i.e. the mixing of sediments by sediment-living organisms, and the importance of these processes for the release and transport of radioactive substances. In particular, the layers between sediment and water and between oxygen-rich and oxygen-poor sediments will be studied. The results will be used to refine models for the transport of radionucleides in the Baltic. The results may be of practical importance for risk assessments.
Project budget: SEK 182,000
Project manager: Clare Bradshaw, Department of Systems Ecology, Stockholm University, clare@ecology.su.se

Is the increasing incidence of intestinal ulcers in Baltic grey seal due to changed environmental conditions?

Concentrations of most environmental toxins in the Baltic have decreased, resulting in a general recovery in the health and numbers of grey seal. However, the incidence of intestinal ulcers is increasing. The reasons for the increase are unknown, but the primary lesion may be caused by a parasite, the hookworm. The project is investigating the cellular composition of the ulcers and the presence of endogenous substances that may be formed from dioxins and cause inflammation. What is the role played by dioxins? What is the significance of the major change in the diet of the grey seal in the last twenty years?
Project budget: SEK 520,000
Project manager: Britt-Marie Bäcklin, Contaminant Research Group, Swedish Museum of Natural History, britt-marie.backlin@nrm.se

Environmental pollutants in the food chains of the Baltic – from water to humans

The project is to develop a computer-based model to describe the transport of chemicals from the water and sediments of the Baltic, via various organisms in the food chain, to the edible fish species. The model will thus be a useful tool for government agencies, and the ultimate goal is to generate the information and knowledge we need in order to assess when our fish is totally safe to eat.
Project budget: SEK 455,000
Project manager: Ian Cousins, Institute of Applied Environmental Research (ITM), Stockholm University, ian.cousins@itm.su.se

Sperm quality – a new biomarker for reproductive disturbances in marine species

The project will consider whether it is appropriate to use sperm quality as a biomarker for reproductive disturbances in marine fish species. The three-spined stickleback is being used as a model species. The fishes are exposed to metals, endocrine disruptors, and wastewaters from sewage treatment works and pulp and paper plants. The survival, motility and morphology of the sperm cells are then studied quantitatively by means of the new Computer Assisted Sperm Analysis (CASA) system. The results are related to the fertilisability of the sperm and the hatchability of the offspring.
Project budget: SEK 520,000
Project manager: Ian Mayer, Department of Zoology, Stockholm University, ian.mayer@zoologi.su.se

Purchase of an Accelerated Solvent Extractor (ASE)

The Institute of Applied Environmental Research at Stockholm University is engaged in numerous research projects resulting in a basic understanding of processes in marine environments. About one thousand samples a year are analysed for environmental toxins. The ASE will streamline the Institute's work by reducing time and solvent consumption by over 90 percent for each extraction. Its principle of operation is that samples are exposed to conventional solvents at elevated pressure and temperature.

Project budget: SEK 600,000

Project manager: Örjan Gustafsson, Institute of Applied Environmental Research (ITM), Stockholm University, orjan.gustafsson@itm.su.se

What is the significance of particulate organic material for the bioavailability and leaching of sediment-bound toxins?

The researchers are investigating biological processes that control the accumulation of environmental toxins (metals and organics) in sediment communities from the Baltic and the Skagerrak–Kattegat. What is the significance of the quality of particulate organic material for the bioavailability of particle-bound toxins in sediment-eating invertebrates? How useful is the extraction of digestive fluid as a simple method of assessing the bioavailability of sediment-bound compounds? To what extent can compounds bound to sediment be released and enter the food web of the coastal zone as a result of bioturbation?

Project budget: SEK 400,000

Project manager: Jonas Gunnarsson, Department of Systems Ecology, Stockholm University, jonas@ecology.su.se

What is the role of natural factors in sex ratio variations in fish?

The ratio of males to females (the sex ratio) in fish is used as a measure of hormonal disruption by pollutants. Rather unexpectedly, the sex ratio of young three-spined stickleback caught in "clean" areas varies along the Swedish coast from Öland to Medelpad: males dominate in the south and females in the north. Does this apply to all of the Swedish coast? And how frequent are intersex (male and female sexual characteristics in the same individual) and sex change?

Project budget: SEK 1,201,500

Project manager: Bengt-Erik Bengtsson, Institute of Applied Environmental Research (ITM), Stockholm University, bengt-erik.bengtsson@itm.su.se

Elemental sulphur and the trapping of environmental toxins in sediment

Elemental sulphur has properties which cause fat-soluble environmental toxins such as DDT, PCBs and dioxins to be trapped in the sulphur. In oxygen-poor environments elemental sulphur is formed

The incidence of intestinal ulcers in grey seal is increasing. Is it due to changes in the environment? Foto: Torbjörn Lilja/Naturfotograferna.

by sulphur-fixing bacteria which appear annually, often abundantly, in deep sediments of the Baltic. The project is studying the role of sulphur in the trapping of environmental toxins in sediment. The results are of importance e.g. for risk assessment when seeking to determine to what extent fat-soluble environmental toxins are bound to or released from sediments depending on the availability of oxygen and elemental sulphur.
Project budget: SEK 977,000
Project manager: Mats Olsson, Institute of Applied Environmental Research (ITM), Stockholm University, mats.olsson@itm.su.se

Transport of environmental toxins from water via plankton to humans

In the sea, non-biodegradable environmental toxins such as PCBs and PBDE flame retardants can move from the water into phytoplankton and from there into zooplankton, fish, and humans. The project is to study the efficiency of this transport, so that by measuring the concentration of toxins in the water one can estimate what their concentration will be e.g. in food fish. Toxic effects on phytoplankton and zooplankton will also be investigated.
Project budget: SEK 1,417,500
Project manager: Kerstin Magnusson, Department of Marine Ecology, Kristineberg Marine Research Station, Göteborg University, kerstin.magnusson@kmf.gu.se

Climate

Carbon dioxide exchange between air and sea in the Baltic

The exchange of carbon dioxide between air and sea is a determinant of how much of the anthropogenic carbon dioxide remains in the atmosphere and thus affects climate. The aim of the project is to study the exchange of carbon dioxide between air and sea all over the Baltic. It is part of a collaboration with the Finnish Institute of Marine Research in Helsinki and the Baltic Sea Research Institute in Warnemünde. The project uses historical and new data. All the data is grouped by region, year and season. The exchange is calculated from observed differences in carbon dioxide partial pressure above sea level, wind speed, and carbon dioxide solubility, as well as from box model calculations for the different sub-basins.
Project budget: SEK 320,000
Project manager: Leif Andersson, Department of Chemistry, Göteborg University, leifand@chem.gu.se

G2:2004. This brochure is also available as pdf-file on Internet (www.formas.se)
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