

The focus of NCB Naturalis is biodiversity. NCB Naturalis curates a collection of 37 million specimens; this is one of the world's largest natural history collections. We present the history of our planet and the diversity of life on Earth with permanent and temporary exhibitions, educational programmes and websites. Our research and education are maintained at a high academic level.

NCB Naturalis is appealing to a wide audience, attracting over 250,000 visitors and 5 million hits to its website annually. Co-operation with international institutions, including three renowned Dutch universities, and the outstanding collections, are all factors that attract hundreds of visiting scientists every year.

Expectations and ambitions for the next few years are high. We will develop new exhibitions and plan to integrate several collections. NCB Naturalis will invest significantly in infrastructure for collections and research, including new buildings. In short, we are a developing, world-class institution, and present this exciting opportunity for you to help us achieve our ambitions and meet our challenges.

Starting May 1st 2011, the NCB Naturalis has positions available for:

Three PhD students

For 36 hours a week

We seek to attract three PhD students who will be working on one of three projects described below. You are an energetic and enthusiastic scientist with interest in systematics in general and one of the projects specifically. You are eager to join our new institute and to study the NCB Naturalis natural history collections.

PhD project 1: Diversification of mycoheterotrophic angiosperms

In deeply shaded understory of forests plants are light-limited. To cope with this limitation numerous plant lineages have evolved to take advantage of mycorrhizal networks, or free-living saprotrophic fungi, by gaining organic carbon and other essential elements from the fungi. These achlorophyllous plants are referred to as 'mycoheterotrophs'. A mycoheterotrophic mode of life has evolved many times independently in flowering plants, both in monocots and eudicots. While some species of mycoheterotrophs are remarkably widespread, many other species are rare and have very limited distributions.

Unlike mycorrhizal autotrophic plants some species of mycoheterotrophic plants are associated with very narrow lineages of mycorrhizal fungi. Because the availability of a suitable mycorrhizal fungus is crucial for the germination and development of specialized mycoheterotrophic plants, it has been suggested that mycorrhizal specialization and the distribution of their host fungi drives the diversification and distribution of the mycoheterotrophs. Evidence for this hypothesis is lacking, and due to the rarity and minute habit of many mycoheterotrophic species, little is known about their evolutionary history, phylogenetic relationships, and interaction with mycorrhizal fungi.

The aim of the proposed PhD study is to elucidate the evolutionary history of selected groups of mycoheterotrophic plants that associate with arbuscular mycorrhizal fungi, and the potential role of mycorrhizal specialization in their diversification and distribution. This includes:

- inferring the phylogenetic relationships and biogeographical history of the study groups;
- investigating their fungal associations and host specificity;
- studying the role of mycorrhizal specialization in plant diversification and distribution.

The study will be focused on mycoheterotrophic genera in Burmanniaceae, Triuridaceae, Corsiaceae, and Gentianaceae. You will construct molecular phylogenetic hypotheses and infer biogeographical histories of the study groups. You will use molecular tools to identify the associated mycorrhizal fungi. This project combines molecular laboratory techniques and advanced data analysis. The project also includes fieldwork in the tropics.

Skills: The successful applicant will have proven knowledge of molecular phylogenetics and plant systematics.

PhD project 2: Ecomorphology and evolution of sharks

The study of feeding mechanics in chondrichthyans (sharks and relatives) is becoming well developed. However, understanding the role of an organism in a marine ecosystem can be hampered by the inability to observe it in its natural habitat—a factor that influences both living and fossil organisms—though to different degrees. In this project, the candidate will use a combination of discrete character analysis and morphometric landmark analysis to explore the relationship between locomotor and feeding strategies in modern chondrichthyans (sharks and relatives). Landmark analysis will be used to quantify shape differences in major locomotor features such as fin shape and position, and body profile, as well as jaw gape, branchial chamber size, etc. The student will be expected to use the ichthyological collections at NCB Naturalis, as well as collections at institutions abroad, and develop research collaborations with other working groups on ichthyology. This project will require creating photographic records of body shape and fin shape for digitization and landmark analysis, as well as recording aspects of gape, dentition, and jaw function. The candidate will integrate methods in systematics, collections-based research, possible fieldwork, and comparative quantitative morphometrics. The goal will be to try to discover predictors of trophic level and feeding ecology in chondrichthyans. These results will hopefully be transferrable to conservation research, as well as macroevolutionary studies.

Skills: The successful applicant will have proven ability in maths and some background in zoology or a related discipline; and demonstrate a keen interest in learning morphology and systematics of sharks and their relatives. Some experience with statistics and/or computer programming are desirable.

PhD project 3: Biodiversity responses to environmental change in the Netherlands.

Most studies assessing impacts of past land use and climate change on flora or fauna target single species or species groups (e.g. flowering plants, birds or butterflies). As a result, we have a fragmented understanding of how communities respond to change, have to assume that the observed response in the focal species is representative for other species' responses, and do not know how individual changes percolate through the food web. This project aims to improve our understanding of the main environmental drivers that are affecting Dutch biodiversity by (1) assessing the spatial congruence in colonization and extinction patterns for multiple taxa (e.g. pollinators, grasshoppers, plants, spiders, beetles); (2) analyzing whether responses can be predicted from functional traits; (3) determine the role of historic land use and environmental change in species occupancy patterns, by means of species distribution modelling; (4) assess the role of ecological dependencies (e.g. plant-pollinator, host-parasite, insect-plant) in species responses; (5) assess whether species-habitat relationships have changed over time. Besides making scientific progress, this project will provide a range of tools and knowledge that can be applied in nature conservation and species management in NW Europe.

You will use the collections and databases of NCB Naturalis, EIS, FLORON and others which are among the best in the world. There will be intensive collaboration with UVA-IBED, Alterra and several dataholders and you will be part of a dynamic and growing group with an extensive network of collaborators.

Skills: The successful applicant will have considerable expertise in spatial ecology and data analysis (e.g. GIS, Access, R) and interest in biodiversity and global change.

General requirements

You have a master degree in systematics, evolutionary biology, palaeontology or other relevant discipline. You have a scientific and critical attitude, excellent time management and organizational skills, the ability to work independently, good verbal and written communication skills. Fluency in English required.

We offer

A fulltime contract (36 hours per week) for a period of four years. A salary that is comparable with salary for PhD's at Dutch Universities. All our employees are incorporated into a pension fund. The successful candidates will be employed by NCB Naturalis in Leiden. The candidate will also be affiliated to either the University of Leiden, the University of Amsterdam or Wageningen University. The appointment must

lead to the completion of a PhD thesis. During your appointment you will be supervised by either Dr. Vincent Merckx (project 1), Dr. Martin Brazeau (project 2) or Dr. Koos Biesmeijer (project 3).

Procedure

You are invited to submit your application including your curriculum vitae, a list of publications, up to five keywords describing your research interests, and the names and e-mail addresses of at least two persons that can be contacted for reference (and who have agreed to be contacted) **before March 14th 2011** by e-mail to; sollicitaties@ncbnaturalis.nl, or by mail; NCB Naturalis, HR department, PO box 9517, 2300 RA Leiden, the Netherlands.

For more information on the current research and facilities, see the websites of the founding partners of the NCB Naturalis, on www.ncbnaturalis.nl - www.nhn.leidenuniv.nl - www.science.uva.nl/zma - www.bis.wur.nl/UK/Organisation/Herbarium

Any additional information can be requested from:

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