

# Norway's quest to discover all of its native species

December 19 2013

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Looks like a comma: A crawfish that lives on the seabed along the Norwegian coast, *Campylaspis costata* is one of the 76 known species of crawfish found in Norwegian waters that we now know more about as a result of inventories conducted for the Norwegian Taxonomy Initiative. Credit: Henrik Glenner, University of Bergen

More than a thousand new species –nearly one-quarter of which are new

to science – have been discovered in Norway since a unique effort to find and name all of the country's species began in 2009.

The Norwegian Taxonomy Initiative is one of just two government efforts worldwide where scientists are being funded to find and catalogue the country's true species diversity.

The Norwegian initiative is focused on describing poorly known species groups across the country's varied habitats, from its alpine plateaus to the northernmost reaches of the island archipelago of Spitsbergen.

The finds range from [new species](#) of insects and lichens to new species of molluscs and cold-water sponges. The information gives scientists and policymakers a better platform for understanding of the complexity and function of Norway's ecosystems.

"These are very good results that provide new knowledge of both individualspecies and ecosystems," says Ivar Myklebust, director of the Norwegian Biodiversity Information Centre, which is coordinating the taxonomy initiative on commission from the Norwegian Ministry of the Environment.

Scientists believe that there are roughly 55 000 species in Norway, but until now only 41 000 have been discovered. The 1165 new species discovered by the taxonomy initiative over the last four years are thus an important addition to this number. However, it will take time before the species that are thought to be new to science can be added to this list. These newly discovered species must first be given a scientific name and a description of the species must be published in a scientific publication.

"Norway's land, seas and coastal areas have a unique variety of landscapes and ecosystems with great variation over short distances, which is rare in a global context," said Tine Sundtoft, Norway's Minister

of Climate and the Environment. "This gives us a rich and varied flora and fauna. The Government will take our management responsibilities seriously."

## **Many new insect species**

The biggest discoveries have been made in the major species-rich groups where previous knowledge has been poor – including in the groups that include wasps, flies and mosquitoes.

Scientists believe that there are thousands of species in Norway yet to be discovered in these groups. The figures from the taxonomy initiative shows that nearly 60 per cent of the new species are insects or other small terrestrial invertebrates (729 species), including 667 new species of insects, 17 new spider species and 18 new springtail species.

## **A boost in knowledge about fungi**

Fungi represent another large and species-rich group in Norway. Since 2009, scientists have found 227 new fungi species as part of the taxonomy initiative.

Some of these fungal species have been discovered using DNA analysis to clarify the relationship between species. This has led scientists to split some species into two, or to increase the species numbers from 14 to 31, as was the case for coral fungi.

## **New marine species**

Norway's rich marine environment supplied 157 new species, including sponges, snails, slime worms, bristle worms, fish parasites, molluscs and starfish. Another 16 new species were discovered in brackish and fresh

water, primarily fish parasites and small crustaceans.



Andrews' rhizomnium moss, *Rhizomnium andrewsianum*, has not been seen in Norway since 1888 and has now been located in the country for the second time. Credit: Kristian Hassel, NTNU University Museum.

Marine species are not as accessible as terrestrial species for researchers. As a result, 48 per cent of the species found as part of the taxonomy initiative are completely new to the scientific world and have never before been described scientifically.

In comparison, 18 per cent of the new terrestrial species are what scientists call undescribed species. In some of the very poorly known marine species groups such as the worm-like (aplacophoran) molluscs

that live on the ocean floor, Aplacophora/shell less molluscs, the proportion of undescribed species may be as high as 90 per cent.

## **New knowledge about better-known species groups**

Norway's landscape varies greatly in its topography, climate and habitats, which are home to a rich lichen and moss flora, with more than 2000 species of lichens and about 11 000 species of mosses.

"Even though we believe that the flora of both lichens and mosses are relatively well known, we have learned a great deal about the incidence and prevalence of both groups as a result of the initiative" says Ingrid Salvesen, senior adviser at the Norwegian Biodiversity Information Centre and coordinator of the Norwegian Taxonomy Initiative.

This is partly because much of the current knowledge and species descriptions are based on very old data. DNA analyses, combined with surveys in little explored areas, have proven to be very useful.

Salvesen also says that the initiative has given scientists a better understanding of where better-known species are found and the relationships of these species to different habitats. This is an important cornerstone for knowledge-based management.

"Geo-referenced information records of species give us new knowledge of the habitat that these species live in, and the organisms that they live with," Salvesen says. "That gives us the ability to better understand the complex interactions of nature."

## **DNA reveals new species**

DNA barcoding is a method for identifying species using differences in

genetic material. The method involves comparing a short DNA sequence of an unknown organism to known sequences in a reference library.

The DNA barcodes can identify species from just tiny tissue samples, such as from an insect leg or a drop of blood.



One of the new spider species, *Enoplognatha serratosignata*, which is new to the Nordic region. This species has the core of its distribution area in the vast steppes of Hungary, and further east in Asia. Credit: Arne Fjellberg

A selection of the material collected by the Taxonomy Initiative has been made available for DNA barcoding in collaboration with the Norwegian Barcode of Life network (NorBOL).

To date, NorBOL has registered barcodes from approximately 3800



species in Norway, over half of which have come via the Taxonomy Initiative. NorBOL is part of a global effort to build up the reference library of DNA barcodes for more and more of the Earth's species.

The Research Council of Norway has provided funding for the country's national infrastructure for DNA barcoding up to and including 2018, which will allow for a great number of Norwegian species to be registered in the library.

## **Facilitator and catalyst**

The major activity that has been generated by the Norwegian Taxonomy Initiative has revitalized the country's biosystematics research. A large number of academics, experts, technicians and students from most natural science research institutions in Norway are involved in the survey work.

The project has also led to the establishment of solid, professional networks across national boundaries. Norwegian researchers have established working relationships with their colleagues in Sweden, Denmark, Finland, Estonia, the UK, Ireland, the Netherlands, Belgium, Poland, Germany, Austria, Hungary, Georgia Spain, Canada and Japan.

## **42 projects in five years**

The Norwegian Taxonomy Initiative has started 42 inventory projects for mapping and identifying [species](#) in Norway since its inception in 2009. About half of these projects are completed or will be completed during 2013. Another eight new projects will be initiated in 2014.

Provided by Norwegian University of Science and Technology

Citation: Norway's quest to discover all of its native species (2013, December 19) retrieved 27 April 2024 from <https://phys.org/news/2013-12-norway-quest-native-species.html>

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