What's In a Name?

Visiting Russian Scientist Devotes Career to Copepod Taxonomy

Russian scientist Dr. Elena Markasheva lived and worked at VIMS last fall as part of Dr. Deborah Steinberg's Census of Marine Life Project (see article on facing page). The following profile describes the path that led to her esoteric career as a copepod taxonomist.

Dr. Elena Markasheva knows the importance of a name.

As a world expert in the taxonomy of copepods, Markasheva has devoted her entire career to identifying and naming these tiny marine creatures. As a Russian who in 1991 saw her native Leningrad renamed St. Petersburg, she knows that the act of naming can signify a fundamental shift in reality or its perception.

Taxonomy—the science of describing, naming, and classifying Earth's myriad organisms—is a dying art. Few young scientists enter a field whose detractors liken to bean counting or stamp collecting. Why spend innumerable painstaking hours counting copepod spines when you could be swimming with dolphins? Why struggle through the convoluted bifurcations of a taxonomic key when your real interest is an organism's role in an ecosystem?

Why indeed. "Taxonomy," argues Markasheva "is the very foundation of biology." If species are actors on the world's stage, taxonomy provides a playbill to identify them, describe their roles, and tell when they enter and exit a scene. Biology without taxonomy is like Shakespeare without Cliff's Notes.

Markasheva notes that taxonomy is particularly relevant in today's climate of biological crisis. Earth currently faces a mass extinction event like that which finished off the dinosaurs. As habitat loss, pollution, and human exploitation push more and more species toward extinction, humanity risks losing a resource that provides both tangible benefits like food and medicine, and intangible values of beauty, joy, awe, and diversity.

In fact, some now define taxonomy as the science of documenting biodiversity. Like curators rushing priceless artifacts from a burning museum, taxonomists are scouring the globe to collect, describe, and name as yet uncatalogued species before they go extinct or their natural distribution is disrupted. Markasheva hopes that the growing recognition of taxonomy's central role in biodiversity will help fuel a resurgence in her field.

Markasheva first became interested in marine biology as a young girl after seeing a TV show featuring Jacques Costeau. "I knew then that I wanted to be included in some kind of marine research," she says. A mentor advised her to become a biologist if she really wanted to be connected to the sea. "At that time in Russia to be a woman oceanographer was not so easy. Going on a research cruise was considered masculine work."

At age 14, Markasheva enrolled in a marine science course at her high school. Summertime trips with her teacher to a research station on the White Sea confirmed her career choice. "When I graduated from this school I was absolutely sure that I would study marine invertebrates," she says.

Upon graduation, Markasheva began working at the Russian Academy of Sciences' Zoological Institute, while simultaneously taking evening classes to earn a Master's degree from Leningrad (now St. Petersburg State) University.

She ascribes her interest in copepod taxonomy to chance. "I was working in the Institute when a position opened with a very well known researcher." This was Dr. Konstantin Brodsky, a "copepodologist" so well regarded by his colleagues that several have paid him the ultimate taxonomic compliment—five copepod species now bear his name. Dr. Brodsky died in 1991. "I was his last student and we had a very good connection," says Markasheva. "I decided if I am working in this department and have such a good professor, I will continue with copepods." She earned her Ph.D. degree from the Institute in 1991.

Markasheva now says that her "whole life is devoted" to copepods. To date, she has named 15 new copepod species, and re-named numerous others. Her esoteric expertise brings her offers to travel to laboratories around the world, helping researchers identify the copepods in their samples. "Since the Iron Curtain fell, I am traveling nearly every year," says Markasheva. "I have been in Norway, Amsterdam, U.S., and many other places."

Her role in the Census of Marine Life project is to identify a single group of copepods called calanoids. "There are many other kinds of copepods in the samples," she says, "but I've concentrated on the calanoids because it was too much for me to look at all the groups." Copepods, the most abundant multi-cellular animals on Earth, are extremely diverse, with about 11,000 different species.

Identifying a copepod is no easy task. "You can compare a copepod to a grain of rice with a small tail'" says Markasheva. "To identify these animals to species level it is necessary to dissect and look at them under the microscope, because distinguishing characters may be number of spines or spinoliths, spines on spines. They are different shape, different length, and all this plays a role in taxonomy."

"It's not like to catch a lobster and say 'Oh, that's a lobster.' You need to work a little bit more. It is very, very laborious work."

During her two visits to VIMS, in the fall of 2001 and 2002, Markasheva identified more than 100 copepod species. She transfers her list of species to VIMS technician Joe Cope, who enters them into a computer database. "Then it is possible to take a really interesting look at what is going on," she says. "After this it is possible to look at their abundance and diversity and how it might change with time."

Researchers active in the Census of Marine Life program include (L to R) Joe Cope, Dr. Deborah Steinberg, Stephanie Wilson, and Dr. Elena Markasheva.

VIMS Researchers See the Bay in a Grain of Sand
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who could not move from an unhealthy neighborhood even if they wanted to.

The B-IBI has proven highly effective for detecting changes in the biodiversity and abundance of benthic communities, but the relation of B-IBI to other potential measures of ecosystem health remains unknown. "The question," says Anderson, "is what B-IBI really means. One way to judge its meaning is to compare it with other measures of ecosystem function such as nutrient cycling, algal blooms, and the rate of microbial processes."

"Management of the Bay's ecosystem will be easier if we are able to show that the B-IBI predicts changes in ecosystem function as well as the health of benthic communities, which are important living resources" say Schaffner.

The pair hopes that extending the B-IBI to include investigations of smaller organisms and measures of physical and biogeochemical processes will help provide a yardstick for measuring more subtle changes in ecosystem health and function.

The B-IBI test has been the backbone of the Chesapeake Bay Benthic Monitoring Program since 1994. The program was set up to help scientists and managers track and meet the Chesapeake Bay Program Benthic Community Restoration Goals. These are part of the larger Chesapeake 2000 Agreement, which calls for reducing nutrient and sediment pollution enough by 2010 to remove the Bay and its tidal rivers from the EPA's list of "impaired" waters.

For further information about the Chesapeake Bay Benthic Monitoring Program, visit www.baybenthos.versar.com