Press Release

GEOMAR
Helmholtz Centre for Ocean Research Kiel

BIOACID
Biological Impacts of Ocean ACIDification

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A journey into the future ocean
Five-months long experiment on the effects of ocean acidification successfully completed

22.07.2013/Kiel, Kristineberg. How do marine ecosystems respond to ocean acidification? Can marine communities adapt to a changing environment? In an unprecedented long-term experiment, 69 scientists from 12 European research institutes and universities studied the development of the plankton community and fish larvae in acidified waters. After the successful completion of the study, the German research vessel ALKOR returns the ten KOSMOS mesocosms and a large number of samples to Kiel. The work was carried out in the framework of the German project on ocean acidification BIOACID (Biological Impacts of Ocean ACIDification), and lead by GEOMAR Helmholtz Centre for Ocean Research Kiel.

When ALKOR docks in Kiel on July 23, a unique research marathon comes to an end. Exactly six months after the German research vessel entered the Gullmar Fjord in West Sweden with over 30 tonnes of equipment for the long-term experiment, and exactly one month after the last sampling day, the ten KOSMOS mesocosms and extensive material for further laboratory analyses arrive at GEOMAR – eagerly anticipated by the 69 participants of the study. “We have not just observed the development inside the mesocosms over a longer period than ever before, but also created an unparalleled data set," concludes Prof. Ulf Riebesell. The professor of Biological Oceanography at GEOMAR Helmholtz Centre for Ocean Research Kiel coordinates the BIOACID project and the KOSMOS mesocosm experiments. "The effort has really paid off, and I'm extremely excited to find out what the data tells us."

In mid-January, the GEOMAR team started off for Sweden with ALKOR and moored the mesocosms in the Gullmar Fjord at temperatures of minus 10 degrees Celsius. The water in five of the ten giant test tubes was enriched with carbon dioxide until it reached a level of acidity projected for the year 2100. Rain or shine, the scientists collected samples every other day. They measured physical, chemical and biological parameters and employed a special camera. During the first weeks, they also had to keep the floating constructions free from ice floes and freezing spray. In the end, they collected the most comprehensive long-term data set on the effects of ocean acidification on pelagic ecosystems.

"The early start was a real challenge. But we wanted to observe the natural development of the plankton ecosystem from the first productivity in late winter until summer, closely monitor the succession of the plankton communities and follow how effects of ocean acidification are transmitted from one generation to the next," Riebesell explains. Surprisingly, the communities in the ten mesocosms followed a similar pattern. "Even weeks after we isolated the water from the fjord, we see very similar changes in community composition in all mesocosms. This demonstrates that an experiment like this works even over such a long period of time and that we have produced reliable data – truly a big success.”

Another novelty of the experiment: fishery biologists added herring eggs into the mesocosms to test the effects of acidification on hatching success and larval development. At the end of the study, they could recover nearly 500 living larvae for further investigation.

Already the first analyses at Sven Lovén Centre for Marine Sciences in Kristineberg, base of the international research team, showed: While some plankton groups benefit from ocean acidification,

such as the tiny picophytoplankton, others lose out. In particular calcifying organisms, including the sea urchin larvae, developed more slowly and showed higher mortality. The flourishing of some species at the expense of others causes major species shifts at the base of the food chain, with likely consequences higher up the trophic web up to the fishes. "Our preliminary results demonstrate, that the complex interactions in ecosystems can not deduced from single-species laboratory experiments", Riebesell concludes. For a more reliable assessment of the long-term impacts of ocean change on marine ecosystems, food webs, and biogeochemical cycles the approach successfully applied here for the first time promises to provide critical new insights.

Links:
www.bioacid.de BIOACID-Homepage

Images and video footage:
Images can be downloaded at www.geomar.de/n1399 Video footage is available on request.

Partner institutes:

- GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany
- Alfred Wegener Institute Helmholtz Centre for Polar- und Marine Research (AWI), Germany
- Carl von Ossietzky University Oldenburg, Germany
- Gothenburg University, Sweden
- Heinrich Heine University Düsseldorf, Germany
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- National Oceanographic Centre, Southampton, UK
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