



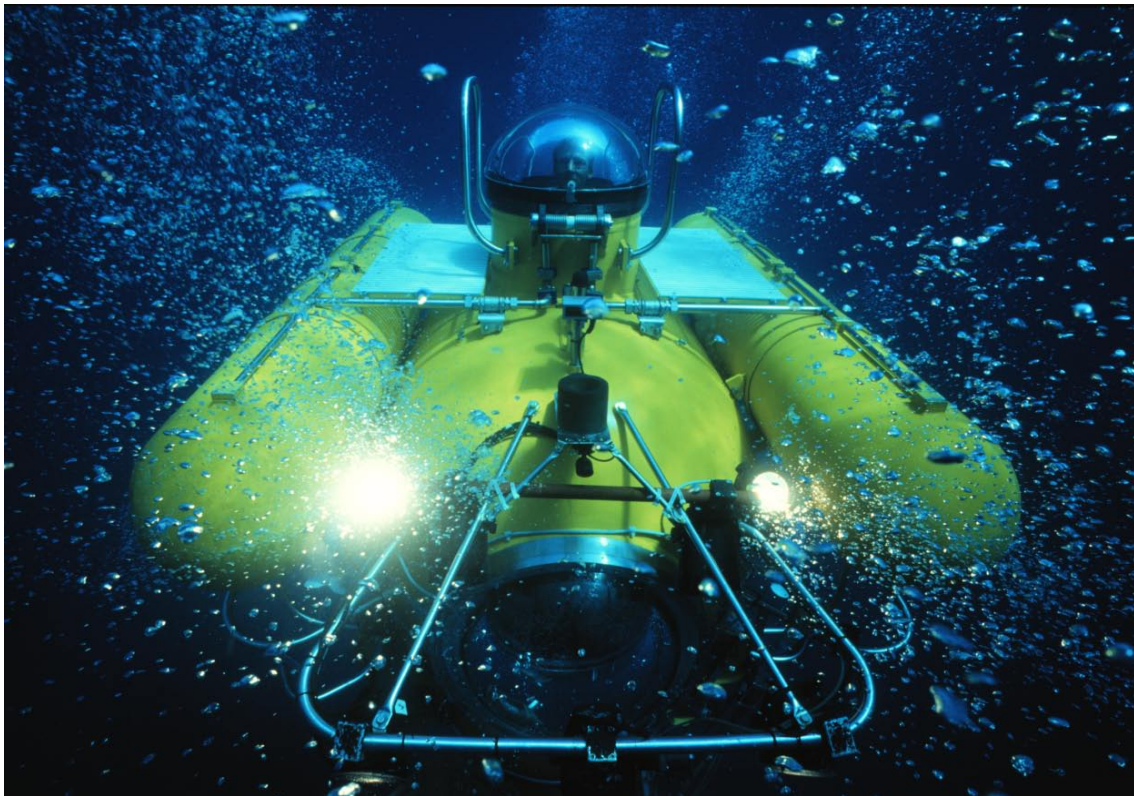
IFM-GEOMAR

Leibniz-Institut für Meereswissenschaften
an der Universität Kiel

IFM-GEOMAR Report 2006

From the Seafloor to the Atmosphere

- Marine Sciences at IFM-GEOMAR Kiel -



IFM-GEOMAR Report 2006

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Cover photo: Submersible JAGO diving in the Indian Ocean (Jürgen Schauer, IFM-GEOMAR).
Inner cover: s.a.

Preface

Three years after the merger of IFM and GEOMAR, the decision to merge the two institutes has proven to be a strategic and scientific success. The reputation and profile of IFM-GEOMAR has increased tremendously and has established Kiel as a major centre of marine sciences in Germany and Europe. One indicator of the success of the new institute is the so-called "DFG-ranking", published by the German Research Foundation (DFG). For the period 2002-2004, IFM-GEOMAR was by far the most successful non-university research institute in terms of DFG-project funding. An important milestone for the strategic development of the institute is represented by the positive funding decision for the excellence cluster "The Future Ocean". In this project, IFM-GEOMAR cooperates with six different faculties of the University of Kiel, the Kiel Institute for the World Economy and the Muthesius College of Fine Arts. The cluster, which has a budget of 36 Mio. Euros for a 5-year period, will cover a wide range of topics including chances and risks of the future ocean such as ocean acidification, marine resources and the consequences of climate change. Four of the 14 new junior research groups will be located at IFM-GEOMAR. The generous funding of "Future Ocean" will enable the creation of about 100 new high-profile jobs in Kiel.

Progress has also been made in the area of research infrastructure. The new Technology and Logistics Centre (TLC) of IFM-GEOMAR opened as the new central basis for the development and maintenance of instrumentation, as well as for the technical preparation of seagoing expeditions. The first large device that found its new home in the TLC is the submersible "Jago" the only manned research submersible in Germany. "Jago" was acquired by IFM-GEOMAR in January and provides an attractive platform for multi-disciplinary marine research. In addition, the construction of a Remotely Operated Vehicle (ROV) with a diving capability of 6000m started recently. The ROV will be available for the marine research community in late 2007. Other large-scale facilities such as offshore mesocosms and an Autonomous



Underwater Vehicle (AUV) are also being developed.

On the scientific side, plans for a new collaborative research centre (SFB) on "Climate-Biogeochemistry Interactions in the Tropical Oceans" are well developed. The review of the pre-proposal was very encouraging and the on-site review and the funding decision are expected for 2007.

Overall, the developments in marine sciences in Kiel and particularly at IFM-GEOMAR have been extremely positive during the past year. Due to successful proposals and generous additional support by the State of Schleswig-Holstein, the institute now enjoys a solid foundation with which it can strive for continued excellence in marine research. We are confident that we can further strengthen our leadership position over the next few years in order to establish IFM-GEOMAR as a "National Centre for Marine Sciences" with high international visibility.

This report provides a short overview of the major developments and scientific highlights during the past year. Detailed statistical information can be found in the appendices. I hope that you will enjoy reading the "IFM-GEOMAR Highlights 2006".

Kiel, October 2007

A handwritten signature in black ink, appearing to read 'P. Herzig'.

Prof. Peter M. Herzig
Director

Invasion ecology

The composition of any given biological community is a sub-sample of the regional species pool, which in its turn is the result of evolutionary and geological processes. Recently, a new player has entered the stage: global change and, in its wake, invasions have become stronger.

One facet of global change, climate change, provokes a shift in environmental parameters. As a consequence, species locally may exhibit reduced fitness. Under the new climatic scenario, these may be less competitive or less well defended. In other areas of the species' range, shifting environmental variables may also improve conditions. In general, we may expect a regional shift in the distribution-range with receding and advancing edges and, consequently, locally unbalanced and, thus, less competitive communities.

In addition, steadily growing global trade leads to an ever more intense and faster exchange of species between biogeographic regions. Notorious vectors for marine species introduction are ballast water and fouled ship hulls, but also overgrown drifting litter becomes increasingly important.

Global (●) and regional (●) modular invasion experiments



Fig. 2: Location of global (green dots) and regional (purple) modular invasion experiments.

Thus, structural changes in local communities are driven by changing dominance of local components, range shifts at the regional scale and large scale invasions. The latter is favoured by intensifying invasion rates and by growing stress on local communities.

Coastal regions are differently impacted depending on ship traffic, similarity between donor and receptor region, and the condition of the receptor communities. More than 300 invasive benthic species have been described from the North American coasts, over 80 from the North Sea, and more than 100 from the Baltic Sea (Schories and Selig 2006). An extrapolation of the invasion rates during the last decades illustrates the dimensions of the prob-

Successful Invasions in the World Oceans and in the Baltic Sea

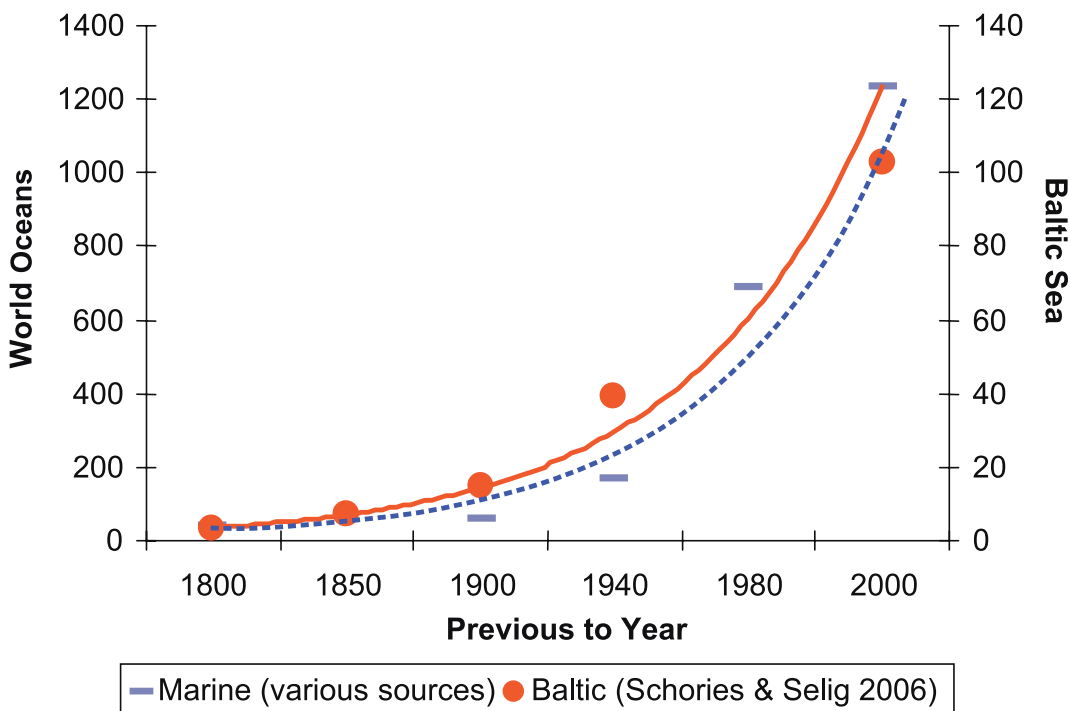


Fig. 1, left column: Successful invasions in the world oceans and in the Baltic Sea throughout the 19th and 20th century.

Mnemiopsis leidyi, a new
invasive speci in the Baltic.
Foto by J. Javidpour, IFM-
GEOMAR



lem we might be facing.

We are investigating the phenomenon of invasions at different temporal (before, during & after invasion) and spatial scales (local, regional ad global).

1. Early warning system: In collaboration with state and laender authorities we are in the process of establishing a chain of survey stations (50 km grid) along all German and Danish costs. Yearly recruitment studies will reveal both the shift of distributional ranges and the arrival of invasive species. At a later stage, this survey chain may be extended along all European coasts.

2. Simulation of community invasions under different climate scenarios: The fate of intentionally imported communities from different biogeographic regions within local receptor communities is investigated in mesocosm systems (outflow sterilized).

3. Invasibility of communities: In a global approach (5 continents), we try to identify the properties (openness, diversity, age) that determine the stability of the community in an invasion scenario.

4. Impact of invasions: When invasive species (e.g. the red alga *Gracilaria vermiculophylla* or the ctenophore *Mnemiopsis*) arrive, we study their population dynamics and establishment, as well as their ecological impact on our local communities.

These investigation will enable us to quantify the risk, the process and the consequences of invasions.

References

Schories, D., and Selig, U., 2006: Die Bedeutung eingeschleppter Arten (alien species) für die Europäische Wasserrahmenrichtlinie am Beispiel der Ostsee. Rostock. *Meeresbiolog. Beitr.*, **15**, 147-158.

Martin Wahl