

67/2015

Increased toxicity due to migration? An invasive seaweed amplifies its defensive capacity

22 December 2015/Kiel. A seaweed from Asia - used for human nutrition - contains toxic compounds providing protection against animal consumers. However, newly introduced populations of the alga in North America and Europe contain considerably more of the deterrents. This was recently published by an international team of scientists led by GEOMAR Helmholtz Centre for Ocean Research Kiel. A migration of resistant strains back into Asia in the future is well possible and poses a risk for food safety, as cases of human intoxication may increase in frequency.

Newly introduced marine organisms need to survive in habitats to which they are not adapted. Sometimes they are lucky and the new environment contains only few enemies. Under such conditions introduced species may become invasive, spreading rapidly and causing damage. Some examples are the Chinese mitten crab, the naval ship worm or the Japanese oyster that all invaded North Sea and Baltic Sea areas successfully after they were introduced by humans. However, in some newly reached environments more enemies may be looming. Under such conditions the invader needs to increase its defensive capacity rapidly in order to survive. This has happened in the seaweed *Gracilaria vermiculophylla* that originates from East Asia and has recently spread into Europe and North America.

In Asia the alga is used for alimentation and preferentially eaten raw, although it occasionally causes severe or even lethal cases of intoxication, due to its content of Prostaglandin, a hormone-like compound. Prostaglandin provides protection against animal consumers, as periwinkles and crustaceans are also very sensitive to it. Newly introduced populations of *Gracilaria vermiculophylla* in Europe and North America seemingly need to protect themselves more against consumers, for they contain much more Prostaglandin than native populations in Asia. This was demonstrated by a study led by GEOMAR Helmholtz Centre for Ocean Research Kiel, recently published in the international science journal *Harmful Algae*.

"We have compared 12 selected populations of the alga in East Asia, Mexico and Europe" explains Dr. Florian Weinberger, project leader and co-author of this international study. „That was a difficult task because we used living specimens that had to be collected from all populations and to be transported alive to the cultivation facility of GEOMAR. Only in this way we could compare the capacity of all the specimens to produce deterrents under identical environmental conditions“, Weinberger says.

The results of this effort were remarkable. „Non-native populations clearly contained more Prostaglandin than populations from Asia – the concentration was elevated by up to 390 %“, explains Marieke Hammann, the main author of this study, which was a part of her PhD project. „After translocation to the new environments *Gracilaria vermiculophylla* obviously needed to be better protected against consumers, so that individuals containing more Prostaglandin were selected“, Hammann continues.

These findings lead to quite new questions: What will happen in case that invasive specimens of *Gracilaria vermiculophylla* migrate back to Asia one day? „Intoxication of humans by the seaweed

could certainly become more frequent" reckons Florian Weinberger. "Permanent screenings of all populations that are used for alimentation may be inevitable from now on, in order to allow for timely warnings in cases of increasing toxicity".

Original publication:

Hammann, M., M. Rempt, G. Pohnert, G. Wang, S. M. Boo, F. Weinberger, 2016: Increased potential for wound activated production of Prostaglandin E₂ and related toxic compounds in non-native populations of *Gracilaria vermiculophylla*. *Harmful Algae*, **51**, 81-88, <http://dx.doi.org/10.1016/j.hal.2015.11.009>

Links:

www.geomar.de GEOMAR Helmholtz Centre for Ocean Research Kiel

Pictures:

Pictures showing may be downloaded from www.geomar.de/n4179

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