Journal of Sea Research xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Journal of Sea Research

journal homepage: www.elsevier.com/locate/seares

Editorial

Ecology and evolution of marine parasites and diseases: International NIOZ–AWI symposium, 10–14 March 2014, Texel, The Netherlands

Parasites and diseases play a decisive role in the recent global increase of animal mass mortalities, especially for marine invertebrates (Fey et al., 2015). This trend is based to a large extent on commercially important species that are used in aquaculture, while surprisingly little is known about wild populations (Travers et al., 2015; Sweet and Bateman, 2015). This bias reflects the long tradition of marine parasitology to mainly focus on diseases of commercially important organisms. At the same time, the decisive role of parasites and diseases in marine mass mortality events is an indication of their importance as ecological drivers and evolutionary selective forces for marine organisms in general. Such a more general and fundamental perspective has also a long tradition in marine parasitology but generally lacks the more concerted efforts and general frameworks prevalent in the studies of commercially important organisms. The international symposium on 'Ecology and evolution of marine parasites and diseases', jointly organized by the Royal Netherlands Institute for Sea Research (NIOZ) and the Alfred Wegener Institute (AWI) on the island of Texel, Netherlands, from 10 to 14 March 2014, was therefore a welcome opportunity to summarize the state of the art in the field. Coming from a diverse background of disciplines and study systems, 75 scientists from 20 countries discussed how the field can progress through strengthening the connections to other fields, like general ecology (Poulin et al., in press). These discussions covered seven main themes during the four days of the symposium:

- Local adaptation and co-evolutionary dynamics
- Biogeography and macroecology
- Linking parasite detection, disease monitoring and ecology and evolution
- Direct and indirect effects of diseases on marine populations and communities
- Drivers of epidemics and emerging diseases: from climate change to species invasions
- Parasites in marine food webs and effects on ecosystem functioning
- Environmental Parasitology

A sub-set of the contributions and issues discussed during the symposium is presented in this special issue and together they illustrate several general patterns. One existing strength of the field is its diversity, which bridges gaps on several scales. These scales do not only include the transition from microparasites (e.g. viruses, bacteria (Schade et al., in press; Sweet and Bateman, 2015) or protozoans (Sweet and Séré, in press)) to macroparasites (e.g. helminths (de Montaudouin et al., in press; Kleinertz et al., in press; Prokofiev et al., in press)) but also a wide phylogenetic range of host taxa including invertebrates (de Montaudouin et al., in press; Noever et al., in press; Prokofiev et al., 2015) as well as vertebrates (Kleinertz et al., 2015; Lehnert et al., in press; Skirnisson, 2015). The studies in this special issue also cover a large diversity of geographical regions from Arctic (Gonchar and Galaktionov, in press; Prokofiev et al., 2015) to (sub)tropical environments (de Montaudouin et al., in press; Kleinertz et al., 2015, Sweet and Séré, in press).

While this diversity nicely sets the stage for a better integration of marine parasitology into a broad context, it became obvious throughout the meeting that the field needs to advance methodologically but more importantly also conceptually. The array of new methods that can be applied to marine parasitology include molecular barcoding that can aid identification of species and provide better estimators of diversity (Lehnert et al., 2015; Schade et al., 2015). Applying mass spectrometry in environmental parasitology makes parasites tractable indicators for accumulation of pollutants (Kleinertz et al., 2015; Nachev and Sures, in press), and the understanding of host-parasite interactions in general can benefit greatly from modern visualization techniques (Noever et al., 2015).

Since most of the theoretical foundations of our understanding of host-parasite interactions are based on terrestrial systems, conceptual advance has to include new epidemiological models that are adapted to complete life cycles in the marine environment (Poulin et al., 2015; de Montaudouin et al., in press). Such development would help to generate conceptual frameworks that are solidly embedded in theory and would provide the much needed stronger link to general (marine) ecology (Poulin et al., 2015). One conceptual ecological framework that is already quite successfully integrated into marine parasitology is the study of biological invasions (Goedknegt et al., in press). Biological invasions offer an opportunity to investigate host-parasite interactions on the ecosystem scale, but can also be used to study evolutionary dynamics in natural systems (Goedknegt et al., 2015; Wendling and Wegner, 2015).

In general, evolutionary studies are still underrepresented in marine parasitology which is also reflected in the lack of contributions to this special issue. However, evolutionary studies deserve far more attention in the face of swiftly changing selective regimes in the oceans, that are associated to global warming and ocean acidification (Poulin et al., 2015; de Montaudouin et al., in press). The future of marine parasitology therefore crucially depends on identifying the important questions and using suitable marine parasite-host model systems from which general ecological and evolutionary frameworks and theories can be derived. Ideally, this development will lead to a comprehensive conceptual framework for marine parasitology which in turn will also contribute to general theory and concepts in ecology and evolution. We are glad to be part of this development and look forward to see the follow-up events to this exciting meeting take shape.

http://dx.doi.org/10.1016/j.seares.2015.12.010
1385-1101/

Please cite this article as: Thieltges, D.W., Wegner, K.M., Ecology and evolution of marine parasites and diseases: International NIOZ–AWI symposium, 10–14 March 2014, Texel, The Netherl, J. Sea Res. (2015), http://dx.doi.org/10.1016/j.seares.2015.12.010

Acknowledgments

We thank NIOZ and AWI for logistical and financial support of the symposium and all participants for their contributions and the many fruitful discussions. In addition, we acknowledge support from NWO and BMBF (NWO-ZKO project 839.11.002). Franziska Schade is thanked for the picture of an acanthocephalan used for the logo of the symposium.

References

de Montaudouin, X., Blanchet, H., Desclaux-Marchand, C., Bazairi, H., Alfeddy, N., Bachelet, G., 2015a. Cockle infection by *Himasthla quissetensis* — II. The theoretical effects of climate change. J. Sea Res. (in press).

de Montaudouin, X., Blanchet, H., Desclaux-Marchand, C., Lavesque, N., Bachelet, G., 2015b. Cockle infection by *Himasthla quissetensis* — I. From cercariae emergence to metacercariae infection. J. Sea Res. (in press).

Fey, S.B., Siepielski, A.M., Nussle, S., Cervantes-Yoshida, K., Hwan, J.L., Huber, E.R., Fey, M.J., Catenazzi, A., Carlson, S.M., 2015. Recent shifts in the occurrence, cause, and magnitude of animal mass mortality events. Proc. Natl. Acad. Sci. U. S. A. 112, 1083–1088.

Goedknegt, M.A., Feis, M.E., Wegner, K.M., Luttikhuizen, P.C., Buschbaum, C., Camphuysen, C.J., van der Meer, J., Thieltges, D.W., 2015. Parasites and marine invasions: ecological and evolutionary perspectives. J. Sea Res. (in press).

Gonchar, A., Galaktionov, K.V., 2015. Substratum preferences in two notocotylid (Digenea, Notocotylidae) cercariae from *Hydrobia ventrosa* at the White Sea. J. Sea Res. (in press).

Kleinertz, S., Eckhardt, K.U., Theisen, S., Palm, H.W., Leinweber, P., 2015. Acanthocephalan fish parasites (rhadinorhynchidae lühe, 1912) as potential biomarkers: molecular–chemical screening by pyrolysis-field ionization mass spectrometry. J. Sea Res. (in press).

Lehnert, K., Schwanke, E., Hahn, K., Wohlsein, P., Siebert, U., 2015. Heartworm (*Acanthocheilonema spirocauda*) and seal louse (*Echinophthirius horridus*) infections in harbour seals (*Phoca vitulina*) from the North and Baltic Seas. J. Sea Res. (in press).

Nachev, M., Sures, B., 2015. Environmental parasitology: parasites as accumulation bioindicators in the marine environment. J. Sea Res. (in press).

Noever, C., Keiler, J., Glenner, H., 2015. First 3D reconstruction of the rhizocephalan root system using MicroCT. J. Sea Res. (in press).

Poulin, R., Blasco-Costa, I., Randhawa, H.S., 2015. Integrating parasitology and marine ecology: seven challenges towards greater synergy. J. Sea Res. (in press).

Prokofiev, V.V., Galaktionov, K.V., Levakin, I.A., 2015. Patterns of parasite transmission in polar seas: daily rhythms of cercarial emergence from intertidal snails. J. Sea Res. (in press).

Schade, F.M., Raupach, M.J., Mathias Wegner, K., 2015. Seasonal variation in parasite infection patterns of marine fish species from the northern Wadden Sea in relation to interannual temperature fluctuations. J. Sea Res. (in press).

Skirnisson, K., 2015. Association of helminth infections and food consumption in common eiders *Somateria mollissima* in Iceland. J. Sea Res. 104, 41–50.

Sweet, M.J., Bateman, K.S., 2015. Diseases in marine invertebrates associated with mariculture and commercial fisheries. J. Sea Res. 104, 16–32.

Sweet, M.J., Séré, M.G., 2015. Ciliate communities consistently associated with coral diseases. J. Sea Res. (in press).

Travers, M.A., Boettcher Miller, K., Roque, A., Friedman, C.S., 2015. Bacterial diseases in marine bivalves. J. Invertebr. Pathol. 131, 11–31.

Wendling, C.C., Wegner, K.M., 2015. Adaptation to enemy shifts: rapid resistance evolution to local *Vibrio* spp. in invasive Pacific oysters. Proc. R. Soc. B 282, 20142244. http://dx.doi.org/10.1098/rspb.2014.2244.

David W. Thieltges*
Department of Marine Ecology, NIOZ Royal Netherlands Institute for Sea Research, P.O. Box 59, 1790 AB Den Burg, Texel, The Netherlands
Department of Marine Benthic Ecology and Evolution, GELIFES, University of Groningen, Nijenborgh 7, 9747 AG Groningen, The Netherlands
Corresponding author.
E-mail address: David.Thieltges@nioz.nl

K. Mathias Wegner
Wadden Sea Station Sylt, Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Hafenstraße 43, 25992 List/Sylt, Germany

16 December 2015
Available online xxxx

Please cite this article as: Thieltges, D.W., Wegner, K.M., Ecology and evolution of marine parasites and diseases: International NIOZ–AWI symposium, 10–14 March 2014, Texel, The Netherl, J. Sea Res. (2015), http://dx.doi.org/10.1016/j.seares.2015.12.010