UNIVERSITY OF GOTHENBURG

EARLY LIFE HISTORY OF THE COLD-WATER CORAL

Lophelia pertusa

– WITH IMPLICATIONS FOR DISPERSAL

Susanna M Strömberg

2016

FACULTY OF SCIENCE
DEPARTMENT OF MARINE SCIENCES

Akademisk avhandling för filosofie doktorsexamen i Naturvetenskap med inriktning biologi, som med tillstånd från Naturvetenskapliga fakulteten kommer att försvaras offentligt fredagen den 8:e april 2016 kl. 10:00 i stora föreläsningssalen, Institutionen för marina vetenskaper, Lovéncentret – Tjärnö, Strömstad

ISBN: 978-91-628-9770-3 (Print)
ISBN: 978-91-628-9771-0 (PDF)
Link: http://hdl.handle.net/2077/42046

ABSTRACT

For sessile marine invertebrates the pelagic larval stage is the only means for dispersal, and thus govern population connectivity and maintenance of genetic diversity. It is also a kind of life insurance, i.e. it reduces the risk of extinctions. If environmental conditions deteriorate in one location, the dispersal of sexually derived propagules ensures the survival of the species. While the dispersal potential in marine invertebrate larvae is increasingly well understood for shallow-water species, very little is known about the biological constraints and drivers for dispersal in deep-sea organisms.

Cold-water corals can form complex three-dimensional habitats, stretching continuously over hundreds of square kilometers and harbor a rich diversity of associated fauna. They have also been shown to be essential habitats for some commercially important fish. There has been considerable progress in the understanding of the prerequisites for adult populations, e.g. biogeochemical and oceanographic constraints, but until now, the early life history stages of cold-water corals—the embryo development and larval biology—has been virtually unknown. The technical advances made during the last decades, allowing for direct observation of deep-sea benthos, has revealed adverse effects on cold-water coral ecosystems from several anthropogenically induced impacts such as bottom-trawling, offshore oil and gas exploitation, and ocean acidification due to the increasing carbon dioxide concentrations in the atmosphere. This makes it even more crucial to understand the prerequisites for successful reproduction and dispersal to be able to fathom the potential resilience of these ecosystems, or, what needs to be done through management actions or interventions to secure their resilience.

In the studies conducted during this doctoral project we have been able to establish a timeline for embryo and larval development—as well as ontogenic shifts in the properties and behavior during the dispersal stage—of one of the major habitat-building cold-water corals, *Lophelia pertusa*. The larvae of *L. pertusa* are potentially very long-lived—a few survived a full year in lab. *Lophelia pertusa* planulae are found to be planktotrophic, thus further increasing potential longevity. The development rate is temperature dependent and a rise in temperature from 7–8°C to 11–12°C cuts development time to half and thus give shorter pelagic larval duration, with shorter dispersal potential as a result—an important factor to include in dispersal modeling. These new biological data can greatly enhance the accuracy of predictions from biophysical models of larval dispersal in this species.