Influence of biogeochemical sediment parameters on infaunal colonization of spionids in tidal flats (Wadden Sea, Germany)

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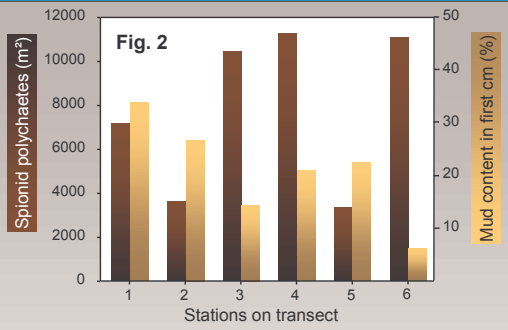
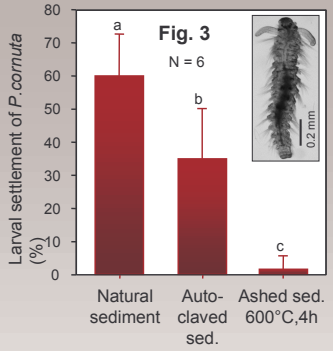
Introduction:

Spionid polychaetes play an important role as sediment stabilizers and influence biogeochemical sediment parameters through bioturbation. They distribute via settlement and metamorphosis of pelagic planktotrophic larvae into sessile juveniles. At the investigation site "Swinplate", Wadden Sea (Germany) (Fig. 1), the spionid *Polydora cornuta* shows a patchy abundance pattern with peak densities of 11.000 individuals m^{-2} (Fig. 2). The distribution does not depend on the mud content but on the viability of microorganisms associated with the sediment (Fig. 3). The objective of this study was to analyze and distinguish between the two dominant groups of sediment-associated microorganisms, i.e. bacteria and diatoms, as potential key triggers for larval settlement of *P. cornuta.*

Study site: Swinplate
(53° 38' 31'' N, 8° 04' 55'' E)





Different sediment types were sampled along a transect on Swinplate:
- Station 1 - 2: Mudflats
- Station 3 - 5: Muddy sands
- Station 6: Sand flats

- Peak densities of *Pygospio elegans and P. cornuta* occurred at Stations 3, 4 and 6 (*)
- Mud content did not influence the abundance of spionids at different stations

Larval settlement was influenced by the
- viability of microorganisms (**)
- TOC content of sediment

Methods:

Surface sediment (first 3 mm) was collected during low tide. Benthic diatoms in natural sediment were killed by exposure to the algicide cycloheximide at 3.5 mg ml^{-1} and shaking for 36h. A control without algicide was prepared accordingly. In natural sediment samples the surface density of benthic diatoms was controlled by exposure to white light or darkness (Fig. 4). The number and the viability (motility, coloration) of diatoms was determined under the stereo microscope (Table 1). The different sediment treatments were subject to larval settlement bioassays with *P. cornuta* (Fig. 5). Sterile sediment was spiked with bacterial isolates (Vibrio sp., Marinobacter sp., Psychroflexus sp.) from the top sediment surface at 10^6 cells g^{-1} and assayed for larval settlement (Fig. 6).

Results:

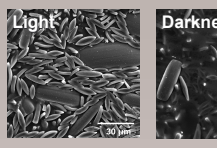
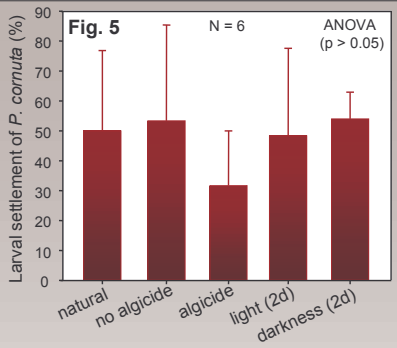
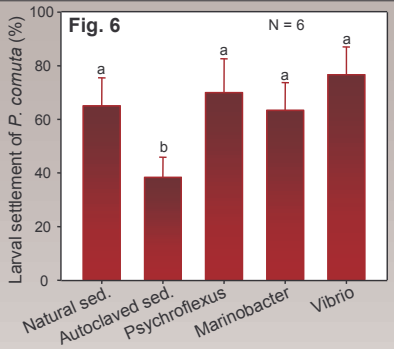


Fig. 4
Electron micrographs of sediment surfaces in white light and darkness (Sauer et al. (2002) Diatom Res.)

Table 1

Sediment treatment	Total number	% non-viable	% viable
No algicide	$4,6*10^{-5}$	31,2	68,8
Algicide	$6,3*10^{-5}$	100	0
White light	$6,8*10^{-5}$	11,2	88,8
Darkness	$3,6*10^{-5}$	58,6	41,4





Larval settlement of *P. cornuta* was not mediated by
- **the abundance of benthic diatoms**
- **the viability of benthic diatoms on the sediment surface.**
- **Larval settlement was artificially induced by monospecific bacteria on otherwise sterile sediment.**

Discussion:

Settlement patterns of spionids observed in the field are likely due to qualitative differences in bacterial communities associated with spatially separated sediment patches. The analysis of further bacterial isolates and bacteria-derived settlement cues is subject to our future investigation.

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(*) Stamm M., Dissertation

(**) Sebesvari et al. (submitted), Mar. Ecol. Prog. Ser.