49 EUROPEAN EMBS MARINE BIOLOGY SYMPOSIUM

A variety of interactions in the marine environment

ABSTRACTS VOLUME FROM 49TH EUROPEAN MARINE BIOLOGY SYMPOSIUM

September 8–12, 2014
St. Petersburg, Russia

Zoological Institute Russian Academy of Sciences

HYBRIDIZING MUSSELS *MYTILUS EDULIS* AND *M. TROSSULUS* IN THE WHITE SEA: GENETICS, DISTRIBUTION, ECOLOGY AND MORPHOLOGY

M. V. Katolikova[1], V. M. Khaitov[2], R. Vainola[3], M. M. Gantsevitch[4], Y. T. Marchenko[1], P. P. Strelkov[1]

[1]Saint Petersburg State University, Department of Ichthyology and Hydrobiology, Saint Petersburg, Russia
[2]Saint Petersburg State University, Department of Invertebrate Zoology, Saint Petersburg, Russia
[3]Finnish Museum of Natural History, Helsinki, Finland
[4]Lomonosov Moscow State University, Department of Invertebrate Zoology, Moskow, Russia

The originally Pacific temperate blue mussel *Mytilus trossulus* and its Atlantic congener *M. edulis* are closely related, widespread benthic species. They can be routinely distinguished by molecular markers while reliable diagnostic morphological markers are lacking. Whenever areas of the two species overlap they fall into introgressive hybridization Historically in Northern Europe populations of *M. trossulus* were known to be confined to the Baltic Sea. Recently *M. trossulus* was found in some other regions of the Northern Europe, in particular in the White Sea it coexists with *M. edulis*. Here we use a set of four semi-diagnostic allozyme loci to perform a detailed survey of *Mytilus* populations in the Kandalaksha Bay of the White Sea. We use genetic data to map the distribution of *M. trossulus* and *M. edulis* in the region (i); to evaluate the extent of hybridization between the two species (ii); to determine the micro-biotopic (substrate) preferences of genotypes; vi) study size distributions of genotypes. We also perform a morphological analysis to assess the applicability of the species discrimination by the shell character suggested earlier – the extension of the nacreous layer under the ligament on the inner shell surface. *M.edulis* predominated in most populations of Kandalaksha Bay, but in the very top of the Bay, in Kandalaksha harbor and surrounding waters *M. trossulus* prevailed. In other regions *M. trossulus* genotypes appeared sporadically, mainly in the area of Umba harbor. Analysis of hybridization confirmed earlier observations on bimodality of mixed populations – domination of parental species genotypes over hybrids. Mosaic distribution at the regional level is supplemented with micro-biotopical mosaicism: *M. trossulus* genotypes were found to be more frequent on algae substrates, while *M. edulis* were more common on bottom substrates. Genetic study of different size classes showed a shortage of *M. trossulus* among bigger mussels in mixed populations. We also found a good congruence between genetics and morphology: *M. trossulus* on average had a reduced nacreous layer and, hence, a persistent prismatic stripe under a ligament, while *M. edulis* didn't have this stripe due to developed nacreous layer. This morphological marker thus could be used for preliminary identification of *M. trossulus* in the White Sea populations and for mapping two species distributions. As a conclusion, our data indicate that in the White Sea *M. edulis* and *M. trossulus* stand out as rather isolated gene pools and as morphological and ecological distinct entities.

The work was supported by research grants of St. Petersburg State University (1.38.253.2014) and RFBR (13-04-00394).

MOTILITY OF *SIEDLECKIA NEMATOIDES* (APICOMPLEXA): STRUCTURAL CHANGES OF CYTOSKELETAL ELEMENTS AFTER DRUGS APPLICATION

M. Kovacikova[1], T. G. Simdyanov[2], G. G. Paskerova[3], A. Diakin[1], A. Valigurova[1]

[1]Department of Botany and Zoology, Faculty of Science, Masaryk University, Brno, Czech Republic
[2]Department of Invertebrate Zoology, Faculty of Biology, M. V. Lomonosov Moscow State University, Russia
[3]Department of Invertebrate Zoology, St. Petersburg State University, St. Petersburg, Russia

Apicomplexans belong to the most monitored group of Protista, comprising exclusively parasites of vertebrates and invertebrates. Members of the phylum Apicomplexa are characterised by typical apical complex of organelles and a complicated cell cortex consisting of cortical alveoli, i.e. dual membrane layer (= inner membrane complex, IMC) underlying the plasma membrane. The IMC is connected with numerous cytoskeletal elements such as actomyosin complex, microtubules and a network of intermediate filamentous proteins. Numerous studies report that the motile apicomplexan invasive stages, the so-called zoites, use a unique mechanism of substrate dependent gliding motility facilitated by a conserved form of actomyosin motor (the so called "glideosome" concept). This concept was described in *Toxoplasma gondii* and *Plasmodium falciparum*, important human pathogens responsible for dangerous diseases (malaria and toxoplasmosis). Actin filaments (F-actin) in these parasites are, in contrast to their microtubules, very unstable and overwhelming majority of actin is present in its globular form. Their actin filaments can be observed only after treatment with jasplakinolide (JAS, a drug that drives actin polymerization). The gliding motility relies on dynamic turnover of actin, unpolymerized form of which seems to have an increased potential to form filaments relative to vertebrate actin. Similarly their myosins are considered unconventional and form a new class (XIV) of small myosin motors lacking typical regulatory domains. This actomyosin motor is localized in between the parasite plasma membrane and IMC, and the gliding motility is based on the locomotion of myosin along actin filaments together with the transport of adhesins to the parasite's posterior end. It is well documented that this machinery is based and limited by a formation of transient actin filaments and their fixation to the IMC, and requires a stabile subpellicular network of microtubules. Nevertheless, there exist early emerging groups of Apicomplexa, comprising lower coccidian and gregarines, in which the exact mechanism of motility still remains unknown. These organisms seem to use several mechanisms of motility that correlate with various modifications of their cell cortex (in gregarines named epicyte), and their locomotion usually differs from the substrate-dependent gliding observed in apicomplexan zoites. These different modes of motility, such as bending, rolling, coiling or waving, gliding, metaboly or peristalsis, could represent specific adaptations to parasitism in different environment. Deeper understanding of cell motility in basal lineages of Apicomplexa will improve our knowledge on the apicomplexan evolutionary history and in this way it could help to explore new practical possibilities, such as treatment for diseases caused by them. Here we present our preliminary data on *Siedleckia nematoides* Caullery et Mesnil, 1898, belonging to blastogregarine family Siedleckiidae. This intestinal parasite of polychaete *Scoloplos* (*Scoloplos*) *armiger* Müller, 1776, was collected at the Nikolai Pertsov White Sea Biological Station of Moscow State University (Velikaya Salma straight, Kandalaksha Gulf of the White Sea). It develops attached to the host cell via mucron with a well-developed apical complex and feeding mode is apparently myzocytosis. The elongated, flattened individuals of *S. nematoides* perform wavy movement and are covered by a pellicle, consisting of the plasma membrane and IMC. Their surface appears smooth lacking any grooves or folds. Interestingly, subpellicular microtubules are organized in several layers; one of them is continual and located just beneath the IMC, while the other discontinuous layers are to be found deeper in the cytoplasm. Drugs proved to influence polymerization of cytoskeletal proteins, actin and tubulin, were used to evaluate the presumptive involvement of specific subcellular components in gregarine motility. For monitoring the subpellicular microtubules, incubation of living parasites in oryzalin (a drug causing the disruption of the microtubules) was performed. To verify the essential role of continuous assembly and disassembly of actin microfilaments in motility of *S. nematoides*, drugs with contradictory effect, i.e. JAS and cytochalasin D (inhibits polymerization of actin) were applied on living parasites. Behavioural and morphological changes of parasites induced by drugs' application were monitored, and individuals used in experiments were subsequently fixed for further analyses. Incubation in all mentioned drugs resulted in partial or complete blocking of parasites' motility, but their motility recovered after returning them to the natural habitat (seawater). The distribution of actin, myosin and α-tubulin was investigated using the direct and indirect fluorescent labelling for confocal laser scanning microscopy (CLSM). The application of oryzalin for prolonged period completely blocked the parasites' motility, and the putatively unpolymerized α-tubulin (visualized using specific antibody and CLSM) seemed to be more dispersed throughout the cytoplasm in contrast to control parasites incubated in the sea water. Increasing of oryzalin doses resulted in further decrease of fluorescence signal and formation of rosette-like tubulin structures. Similarly, changes in presence and distribution of F-actin were observed using the TRIC-phalloidin staining for CLSM; i.e. prolonged incubation of parasites in high doses of JAS caused significant increase of fluorescent signal, while their incubation in cytochalasin D resulted in its obvious decrease. Results of this study proved that the actin and tubulin polymerized forms play essential role in the movement of *S. nematoides* and the motility mechanism is comparable to the "glideosome" concept described in apicomplexan zoites.

We acknowledge the financial support from ECIP – Centre of excellence, GAČR No. GBP505/12/G112.

DEVELOPMENTAL TRENDS IN BACTERIAL SYMBIOSES AND THEIR NUTRITIONAL CONSEQUENCES IN TWO DEEP-SEA MUSSELS

S. R. Laming[1], S. M. Gaudron[1], M. R. Cunha[2], A. Hilario[2], C. F. Rodrigues[2], K. Szafranski[1], N. Le Bris[3], S. Duperron[1]

[1]Sorbonne Universites, UPMC Universite Paris 06, UMR7208 Laboratoire biologie des organismes et ecosystemes aquatiques (UPMC CNRS MNHM IRD CAEN), Paris, France

[2]Universidade de Aveiro, Departamento de Biologia and CESAM, Aveiro, Portugal

[3]Sorbonne Universites, UPMC Paris 6, UMR8222 Laboratoire d`Ecogeochimie des Environnements Benthiques (UPMC CNRS), Banyuls, France

Repeated discoveries of communities thriving upon hydrothermal vents, hydrocarbon seeps and organic falls initiated a new era in deep-sea biology, and altered conventional understanding of deep-sea ecosystems. In these habitats, chemosynthetic bacteria occur both as free-living primary producers and as symbionts, supporting the often-endemic communities by deriving metabolic energy from the electron donors and electron acceptors available at anaerobic-aerobic interfaces. As hosts, the Bathymodiolinae