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***Editor of***

***Journal of Coastal Development***

Dr. Youji Wang completed his B.S and M.S. from College of Fisheries, Huazhong Agricultural University, P.R.China. He successfully confirmed his PhD from the Department of Biology and Chemistry, City University of Hong Kong, Hong Kong, China. Presently, Dr. Youji Wang is a Lecturer at Shanghai Ocean University, Shanghai, China and also a Visiting scholar at The Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research , Bremerhaven, Germany. He has a number of funded projects, publications, patents and conference presentations in his name and is an eminent reviewer to journals.

## Biography

- Animal ecophysiology, Shellfish aquaculture, Effects of ocean acidification and warming on marine invertebrates.

**Research Interests**

1. Wang, Y.J., Hu, M.H., Li, Q.Z., Li, J.L., Lin, D.H., Lu, W.Q. (2014): Immune toxicity of TiO<sub>2</sub> under hypoxia in the green-lipped mussel *Perna viridis* based on flow cytometric analysis of hemocyte parameters. **Science of the Total Environment** 470–471, 791–799.
2. Wang, Y.J., Hu, M.H., Cheung, S.G., Shin, P.K.S., Lu, W.Q., Li, J.L. (2013): Anti-predatory responses of the green-lipped mussel *Perna viridis* (linnaeus) under acute hypoxia and low salinity. **Journal of Molluscan Studies** 79, 42–50.
3. Wang, Y.J., Hu, M.H., Shin, P.K.S., Cheung, S.G., Lu, W.Q., Li, J.L. (2012): Immune parameter changes of hemocytes in green-lipped mussel *Perna viridis* exposure to hypoxia and hyposalinity. **Aquaculture** 356–357, 22–29.
4. Wang, Y.J., Hu, M.H., Cheung, S.G., Shin, P.K.S., Lu, W.Q., Li, J.L. (2012): Chronic hypoxia and low salinity impair anti-predatory responses of the green-lipped mussel *Perna viridis*. **Marine Environmental Research** 77, 84–89.
5. Wang, Y.J., Hu, M.H., Chiang, M.W.L., Shin, P.K.S., Cheung, S.G. (2012): Characterization of the subpopulation and immune-related parameters of hemocytes in the green-lipped mussel *Perna viridis*. **Fish and Shellfish Immunology** 32, 381–390.
6. Wang, Y.J., Hu, M.H., Cheung, S.G., Shin, P.K.S. (2011): Combined effects of dissolved oxygen and salinity on growth and body composition of juvenile green-lipped mussel *Perna viridis*. **Journal of Shellfish Research** 30, 851–857.
7. Wang, Y.J., Hu, M.H., Cheung, S.G., Shin, P.K.S. (2011): Immune responses to combined effect of hypoxia and high temperature in the green-lipped mussel *Perna viridis*. **Marine Pollution Bulletin** 63, 201–208.
8. Wang, Y.J., Hu, M.H., Wong, W.H., Cheung, S.G., Shin, P.K.S. (2011): The combined effects of oxygen availability and salinity on physiological responses and scope for growth in the green-lipped mussel *Perna viridis*. **Marine Pollution Bulletin** 63, 255–261.

## Recent Publications

- The term Invertebrates generates a great deal of confusion among non-biologists; it does not refer to any particular taxon in the same way that for instance Arthropoda, Vertebrata or Manidae do. Each of those examples describes a (presumably monophyletically) valid taxon, say a phylum, subphylum or family. In referring to taxonomy of the Animalia, "invertebrata" is a term of convenience, not a taxon; it has very little circumscriptive significance except arguably within the Chordata.

## Introduction

- Invertebrates can be classified into several main categories, some of which are taxonomically obsolescent or debatable, but still used as terms of convenience. Each however appears in its own article at the following links.
  
- Protozoa (like the worms, an arbitrary grouping of convenience; link to their article for details)
- Sponges (Porifera).
- Stinging jellyfish.
- Comb jellies.
- Flatworms (Platyhelminthes).
- Round- or threadworms segmented worms.
- Insects, spiders, crabs and their kin.
- Cuttlefish, snails, mussels and their kin.
- Starfish, sea-cucumbers and their kin.
- Bivalves, mussels, oysters, clams etc.

## **Classification of Invertebrates**



- The green mussel, *Perna viridis*, has been used extensively for marine research.
- Some of the most commonly studied bivalves are invertebrates: such as the blue mussel *Mytilus edulis* and the green mussel *Perna viridis*. They have long been the most intensively studied marine organisms as bioindicators for marine environmental research.

## Professional Prospects

# Significance of Invertebrates

- Invertebrates are animals without a vertebral column. This has led to the conclusion that invertebrates are a group that deviates from the norm, vertebrates. This has been said to be due to the fact that researchers in the past, such as Lamarck, viewed vertebrates as a "standard": in Lamarck's theory of evolution, he believed that characteristics acquired through the evolutionary process involved not only survival, but also progression toward a "higher form", to which humans and vertebrates were closer than invertebrates were.



- The trait that is common to all invertebrates is the absence of a vertebral column: this creates a distinction between invertebrates and vertebrates. The distinction is one of convenience only; it is not based on any clear biologically homologous trait, any more than the common trait of having wings functionally unites insects, bats, and birds, or than not having wings unites tortoises, snails and sponges. Being animals, invertebrates are heterotrophs, and require sustenance in the form of the consumption of other organisms. With a few exceptions, such as the Porifera, invertebrates generally have bodies composed of differentiated tissues. There is also typically a digestive chamber with one or two openings to the exterior.

## Characteristics

# Definition

Invertebrates are animal species that neither possess nor develop a vertebral column, derived from the notochord. By definition, this includes all animals apart from the subphylum Vertebrata. Familiar examples of invertebrates include insects, crabs, lobsters and their kin, snails, clams, octopuses and their kin, starfish, sea-urchins and their kin, and worms.

- Insects inhabit a diverse range of habitats, both terrestrial and aquatic and this is often reflected by the great diversity in their appearance. Most undergo some degree of change or metamorphosis during their life cycle and young may not have all of the adult insect features such as wings.

**Life cycle**

- Over 95% of all animals on the earth are invertebrates of one form or another. Invertebrates are found just about everywhere in both terrestrial and aquatic habitats, and include animals ranging from sponges, corals and seastars to insects, crabs and worms, just to name a few. For information on collecting aquatic invertebrates in freshwater environments see the Waterwatch site. Over 80% of all invertebrates are grouped into the single phylum Arthropoda that includes spiders, crustaceans, centipedes, millipedes and insects.

## **Invertebrates**

**Approved By**

**E-signature: Youji Wang**