

CÁC KẾT QUẢ CHÍNH CỦA CHUYẾN KHẢO SÁT SINH HỌC VÀ HÓA SINH TRÊN BIỂN ĐÔNG BẰNG TÀU NGHIÊN CỨU “AKADEMIK OPARIN”

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Tóm tắt Các hợp chất tự nhiên từ biển thu hút sự quan tâm bởi cấu trúc, hoạt tính sinh lý, các chức năng sinh thái-sinh học quan trọng và nguồn gốc sinh vật của chúng. Hiện tại, chúng ta đã biết được hơn 15.000 hợp chất tự nhiên từ biển. Động vật không xương sống, tảo và vi sinh vật sống ở vùng nhiệt đới của các đại dương là những nguồn chính cung cấp các hợp chất này. Các chuyến khảo sát toàn diện về sự đa dạng sinh học và hóa sinh của các quần xã rạn san hô ở vùng thềm lục địa Việt Nam được nhiều viện nghiên cứu thuộc Phân viện Viễn Đông - Viện Hàn Lâm Khoa Học Nga kết hợp với Viện Hải dương học thực hiện trên Biển Đông bằng tàu nghiên cứu “Akademik Oparin” (1987-2007). Số liệu về tác động của con người đối với các hệ sinh thái biển và đặc biệt là đối với các rạn san hô đã được thu thập. Chúng tôi cũng đã phát hiện một số cơ chế ổn định đa dạng sinh học, các nguồn hợp chất có hoạt tính sinh lý – sinh học và mô tả những loài sinh vật lớn – vi sinh vật mới tìm ra. Chúng tôi cũng đã thu mẫu động vật, thực vật và vi sinh vật biển để tiếp tục nghiên cứu, cũng như là để làm mới bộ sưu tập của bảo tàng Việt Nam và Nga.

MAIN OUTPUTS OF BIOLOGICAL AND BIOCHEMICAL SURVEYS ABOARD THE RESEARCH VESSEL “AKADEMIK OPARIN” IN BIEN DONG

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Abstract Marine natural compounds are interesting due to their structures, physiological activities, important bio-ecological functions, and biogenesis. At the present time more than 15,000 marine natural compounds are known. Marine invertebrates, algae, and microorganisms inhabiting the torrid zone of the world ocean are main sources of these compounds. Comprehensive investigations of biological and biochemical variety of coral reef communities of Vietnamese shelf were performed by several research institutes of the Far-Eastern Branch of the Russian Academy of Sciences (FEBRAS)

together with Institute of Oceanography of the Vietnamese Academy of Science and Technology (VAST) during marine scientific expeditions aboard the research vessel "Akademik Oparin" in the South China Sea (1987-2007). The data on anthropogenous influence on the marine ecosystems and especially on coral reefs were obtained. Some mechanisms of stability of biodiversity were revealed. New sources of physiologically active compounds were found and new species of macro- and microorganisms were described. Samples of sea animals, plants and microorganisms were collected for the further biochemical studies, as well as for renewing the Russian and Vietnamese museum collections.

I. INTRODUCTION

In recent years marine natural compounds have attracted more and more attention of the researchers working in the field of bioorganic chemistry, comparative biochemistry, organic synthesis, and medicine. These compounds are interesting by their structures and biogenesis; many of them show high physiological activities and have important bio-ecological functions (Blunt *et al.*, 2003). At the present time more than 15,000 marine natural compounds are known.

Ocean is the largest reservoir of biota. Marine invertebrates, algae, and microorganisms inhabiting the torrid zone of the World Ocean are main sources of marine natural compounds. For example, if examine a gain of new marine natural metabolites by geographical zones for the period of 2001 – 2005, a zone including the seas bathing the Vietnamese coasts gives the greatest gain (57 %). Most of these substances were isolated from marine invertebrates. Nevertheless, marine tropical organisms of Vietnam are still insufficiently studied as sources of biologically active compounds.

That is why comprehensive investigations of biological and biochemical variety of coral reef communities of Vietnam shelf are of a great interest and importance. These investigations include comparative studies of constitution and structure of coral reefs communities, estimation of productional processes, collection and identification of macro- and microorganisms to search for new sources of biologically active metabolites.

The beginning of research of hermatypic corals and reefs of Vietnam can be dated from the first half the 20th century (Dawydoff , 1952; Loi, 1967; Serene, 1937). In the 80s of the previous century, according to the Agreement about scientific collaboration between the Institute of Marine Biology (FEBRAS, Vladivostok) and the Institute of Oceanography of (VAST,), the cooperative investigations between Viet Nam and Russia were begun,

providing a number of publications mainly related to scleractinian species composition and distribution; analyzed mass accompanying macrobenthos species and general characteristics of reefs.

II. MAIN OUTPUTS OF THE EXPEDITIONS ABOARD THE RESEARCH VESSEL "AKADEMIK OPARIN"

The first biological and biochemical marine expedition in Bien Dong (the South China Sea) aboard the research vessel "Akademik Oparin" was organized by the Pacific Institute of Bioorganic Chemistry (PIBOC) 20 years ago in 1987. This unique vessel (2600 t displacement, 15.2 knots speed, and a crew of 73 persons) was built for PIBOC in Finland (1985) and specially equipped with facilities and devices for hydrobiological, chemical, biochemical, and microbiological studies of marine biological objects.

The next two expeditions (1989, 2004-2005) were organized by PIBOC, Zhirmunsky Institute of Marine Biology (IMB), of FEBRAS (Vladivostok) together with Institute of Oceanography of VAST. In 2005 in Nha Trang these Institutes signed the Agreement about scientific collaboration for 5 years. In 2007 Institute of Automation and Control Processes (FEBRAS) joined the 4th expedition in the South China Sea. Two groups of Vietnamese scientists participated in the explorations. During these expeditions 235 hydrological stations in Van Phong Bay, Binh Kang Bay, Tonkin Bay, and Siam Bay, as well as around many islands, islets, and separate rocks were executed. Marine invertebrate and algae samples for taxonomic studies and chemical analysis were collected by divers at a depth down to 12 meters and dredging to the isobaths of 400-500 meters. Preliminary studies (species determination, activity, chemical classification etc) were performed at the vessel laboratories. For the further studies the samples were fixed with 70% ethanol or frozen at -40°C.

Certain of the common results obtained in the expeditions should be listed as follows:

- The data on anthropogenous influence on the marine ecosystems and especially on coral reefs were obtained;
- Some mechanisms of stability of biodiversity were revealed;
- New sources of physiologically active compounds were found and new species of macro- and microorganisms were described;

- Hydrological and hydrochemical parameters of sea water around coral reefs were determined;
- About 2000 underwater photos of animals and reef landscapes were made;
- Sea animals, plants and microorganisms were collected for the further biochemical studies, as well as for renewing the Russian and Vietnamese museum collections.

It seems reasonable to emphasize particularly the most interesting results. For example, during the expedition of 1988-1989 peptides Bacillomycines and theirs methylesters with fungicide activity were isolated from the bacteria *Bacillus subtilis* KMM 457 associated with the soft coral *Sarcophyton* sp. found in Van Phong Bay. In 2005 new microorganisms were first collected and described: *Echinicola vietnamensis* and *Fulvivirga kasyanovii* (at mussel farm in Nha Phu lagoon) and *Algoriphagus vanfogensis* (Van Phong Bay) (Nedashkovskaya *et al.*, 2007a, b, and c).

In the same expedition several steroid glycosides were isolated from the blue starfish *Linckia laevigata* collected in Van Phong Bay. Recently, some steroid glycosides from the Okinawan blue starfish have been reported to show remarkable NGF-like neuritogenic activity towards to rat pheochromocytoma and neuroblastoma. Such compounds are inducers of neuritogenic factors responsible for the growth, development, survival and maintenance of neurons in the central and peripheral nervous system that is extremely important for the prevention and treatment of brain ischemia and various neurodegenerative diseases (Kicha *et al.*, 2007a, b, and c).

III. RECOMMENDATIONS

Due to extended comprehensive explorations, recommendations for prevention and regeneration of Vietnam coral reefs were developed. In particular, to preserve biological variety on reefs of Vietnam, areas of special attention and protection should be declared as follows:

- The Bach Long Vi Island in the Gulf of Tonkin;
- The Cham and Re Islands in the central Vietnam;
- Some reefs of Khanh Hoa Province in the southern Vietnam;
- The Nam Du and Tho Chu Islands in the Gulf of Thailand

- The reports about the expeditions were presented to the Vietnamese Academy of Science and Technology. The results obtained during the expeditions showed this area of the World Ocean to be important and promising for the further collaborative exploration.

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