

**JOINT VIETNAMESE - RUSSIAN RESEARCHES
IN MARINE BIOLOGY DURING 1980 - 2007**

NGUYEN TAC AN⁽¹⁾, T.N. DAUTOVA⁽²⁾

Summary: The main programs of cooperation between IMB FESC AS USSR and Institute of Marine Researches belonging to the National Centre of Natural Science and Technology in Vietnam for the period of 1980-2000 were established as follows:

- Tropical littoral ecosystems (coral reefs and the intertidal area: biodiversity and productivity).

- Biological basis for mariculture of algae and invertebrates.

- Biochemistry and chemistry of marine organisms.

- Microelemental consistency of mass species of algae and invertebrates.

Co-researches in the 21st century are being held due to agreements of co-activities between IMB RAS and Scientific Institutes of VAST. Together with Institute of Oceanography, Institute of Materials and Institute of Marine Environment and Resources, Institute of Natural Combinations' Chemistry, of VAST, there are some main cooperative projects:

- Due to increasing influence of anthropogenic stress it was concluded that important task is to use macrophytes and reef-building corals as indicators of anthropogenic pollution. Another idea – to estimate productive resources of marine algae, grasses and reef-building corals, their realization in nature and cultivation.

- Research in spheres of biodiversity of Vietnamese open waters.

- Study of bioactive substances of marine animals and algae.

- Study of species diversity and distribution of marine plants in southern and northern regions of Vietnam.

The first agreement of cooperation between AS USSR (IMB FESC AS USSR) and NCSI of Vietnam (IMR NCSI of Vietnam) was signed for the period of 1980 – 1985. For the same period the main programs of cooperation between IMB FESC AS USSR and Institute of Marine Researches of National Centre of Scientific Investigations of Vietnam were established as follows:

1. Tropical littoral ecosystems (coral reefs and the intertidal area: biodiversity and productivity)

Original extensive data on the rules of distribution and resources of Vietnamese littoral animals and plants were achieved. More than 18,000 samples of benthos and phytoplankton which were taken at 78 districts of littoral and coral populations were examined.

It was shown that the coral reefs of Vietnam occupy great species diversity. These high-productive ecosystems act as an important source of organic substance, which has a great influence on productivity of coastal waters of the South China Sea.

The littoral of Vietnamese coastal waters has a great productivity – the biomass of marine organisms occupies more than 3.3 kg/m² (Thu island, 1984). Lists of the most important marine species out of some regions of Vietnam were prepared including reef-building corals, bivalvians, algae. An original description was given to bionomic groups of plants and animals found on an extensive territory of Vietnamese littoral, from Khanh Hoa province to the Gulf of Siam. More than 8,000 species of invertebrates were recorded.

2. Biological basis for mariculture of algae and invertebrates

The biology of Sargasso algae was studied. Three species of them were found to be prospective for mariculture; further recommendations were given for their cultivation. The biology of *Gracilaria* rich with agar was also studied. The experience of its cultivation was achieved. For the mollusks mussel and pinna, biology was studied and the recommendations for their cultivation were given. The unique calculative data were achieved for the distribution of larval plankton of the Nha Trang bay and the near-by territories. The Nhaphu lagoon of the Binh Cang bay was found to have the greatest density of larval stations belonging to the following mollusks which are of great importance for the national economy - Mussel, *Tridacna*, *Spondilus*, Oyster, *Macra*. The periods of multiplication were settled for the aquatory.

3. Biochemistry and chemistry of marine organisms

An analysis of marine animals and plants' lipids out of Vietnamese coastal waters was originally conducted. Beside *Lobophytum carnatum*, biologically active substances which are of great importance for pharmacology and national economy, were extracted.

4. Microelemental consistency of mass species of algae and invertebrates

It was shown that marine coastal ecosystems of Vietnam are comparatively not polluted by the heavy metals. A greater amount of substances related to economical activities was only found in the mouth of rivers. Three species (algae and a bivalvians mollusk *Tridacna crocea*) were chosen to indicate the geochemical and environmental factors.

Several cooperative coastal expeditions of IBM FEB RAS and IMR of the NCSI of Vietnam, and also a scientific-research trip on vessel «Akademik Nesmeyanov» were carried out in 1984.

Two Soviet-Vietnamese scientific symposia on marine biology were held to discuss the research results (the 1st – April 1981, in Ho Chi Minh, the 2nd – March 1984, in Nha Trang).

During the period of 1985-1990, the modern researches were held in the project «The Southern Chinese Sea» of the program «The Worldwide Ocean» (supervisor A. V. Zhirmunsky, E. A. Titlyanov, Le Trong Phan and Nguyen Kim Hung).

The main ideas were: searching a biogeographic border which divides the southern and the northern faunas of Vietnam; keeping researches in spheres of biotechnology (mariculture and biologically active substances); biological monitoring of coastal waters and rivers' mouths.

The research of species diversity of reef building corals and mass marine invertebrates was continued. The change of their communities related to depth changes and substrate types was followed. Types of benthic deposits and main zones of reef sedimentations were distinguished.

A study of species consistency and quantitative distribution was done, supplies of benthic plants on littoral and sublittoral of Nha Trang bay, Condao, Anthoi, Thochu islands were valuated.

Concentrations of nitrates and nitrites were measured for subterranean waters, population of denitrification and saprotrophic bacteria, velocity of denitrification, nitrification and nitrogen fixation were also found out.

Investigations on biotechnology were conducted in concerning with lipids, physiology of marine organisms and the search of bioactive combinations' sources. The consistency of fatty acids (FA) was studied for symbiotic zooxanthellae algae, analysis of FA was performed for 13 species of Scleractinians, Alcyonarians, Millepores and Tridacna. It was shown that a source of arachidonic acid (a predecessor of prostaglandines) found in alcyonarians is zooxanthellae algae. Out of alcyonarians, preparations that have anti-ulcer and anti-burn activity were made. Methods for high-cleaned FA receiving and their chemical modification were worked out.

Another stage of biotechnological investigations was mariculture and biomonitoring of Vietnamese coastal waters. As a result the genetic alternation of 27 species of marine invertebrates was studied. Concentration of Ag, Cd in surface waters of coastal and open

aquatories was established. Fe, Mn, Zn, Cu, Cd, Pb maintenance in mass water species was found out.

The 3rd joint symposium of marine biology was held in Nha Trang in March 1986. There were 70 Vietnamese and 40 Russian scientists, 20 reports were made. Vice-chairman of NCSI Dang Ngoc Thanh, director of IMR Le Trong Phan and director of IMB FESC AS USSR A. V. Jirmunskiy also presented.

For the next period of joint investigations – during 1990 – 2000 - the main ideas were: study on the consistency and structure of productive coral reef ecosystems and conditions of their existence for purposes of rational use and protection; continue the work in sphere of biotechnology (mariculture, biologically active substances); biomonitoring of the South China Sea coastal waters.

Consistency and structure of productive coral reef ecosystems and conditions of their existence for purposes of rational use and protection.

Data of the most important factors of physical environment which have great influence on Vietnamese reefs were originally achieved. Intensification of sedimentation and character of water movement at coral reefs were found out for Tonkin Gulf and coast of Quang Ninh province.

Species composition and distribution of reef-building scleractinian corals were studied with 5-volume monography published with keys: Latypov Yu.Ya., Dautova T. N. “*Scleractinian corals of Vietnam*”. It was found that the coral fauna of Vietnam (360 species of scleractinians) is equal to the coral fauna in the centre of species diversity (in Indonesia and Philippines).

Data of zooplankton biodiversity found in coral reef waters of Tonkin Gulf were originally obtained.

Biomonitoring of the South China Sea coastal waters.

Information on the distribution of coral ecosystems diversity and the current state of Vietnamese coral reefs in context of intensive economical activities were originally achieved. Preliminary recommendations were given on monitoring coral ecosystems and choosing coral reefs for setting nature protection terms.

After the first period of cooperation 122 scientific papers were published before 2000 as a result of co-working. Among them, 6 are subject collections and monographs, including keys of reef-building scleractinians in Vietnam.

Co-researches in the 21st century.

Works are being held due to agreements of co-activities between IMB RAS and Scientific Institutes of VAST. Together with Institute of Oceanography, VAST, Nha Trang (2002 – 2007) there are 3 main cooperative projects as follows:

1. Due to increasing influence of anthropogenic stress it was concluded that important task is to use macrophytes and reef-building corals as indicators of anthropogenic pollution. Another idea – to estimate productive resources of marine algae, grasses and reef-building corals, their realization in nature and cultivation.

A method of young corals growing for Vietnamese damaged reefs' re-establishment was studied.

It was shown that mass death of coral reefs of the Southern Vietnam in 1988, 1994 and 1998 led to the increased number of algae biomass in these regions. Corals of shallow bays were found not to indicate the water polluted with organic wastes. Macrophytic algae act as indicators of organic pollution only in littoral and sublittoral zones of bays and lagoons of the Southern Vietnam. The following algae are found to be mass species in the polluted areas.

2. Research on the biodiversity of Vietnamese open waters. Study on biologically active substances found in marine organisms. Replenishment of scientific collections. Study on the anthropogenic influence on marine ecosystems.

After period of 1981-1983, a second study was performed at Van Phong and Nha Trang bays. Species of scleractinian corals which provide quick regeneration and growth of their colony fragments and also having great degree of surviving (not less than 90%) were experimentally found. Experiments were also performed to grow corals in natural environment of Vietnamese waters.

In situ complex studies were made to establish the influence of hydrological ($T^{\circ}C$, pH, $S^{\circ}/_{00}$, FARp) and hydrochemical (P- PO_4 , N- NH_4 , SI, O_2) indexes of waters on productive characteristics of plankton association existing in coral reefs waters of Vietnam in the winter of 2005. The research of productive indexes of phytoplankton (breath, full and clear photosynthesis, chlorophyll «a») showed that they are greatly dependant on ΦAP intensity, which falls with the depth increase.

3. Study on the bioactive substances of marine animals and algae. Replenishment of scientific collections. Research on the regenerative abilities of different scleractinian corals under purposes of recultivation of reef biodiversity. Microbiological studies of biotechnological objects. Research on the consistency of marine algae species in southern and central parts of Vietnam. Writing a book "Vietnamese marine algae".

Cooperative projects between the Institute of Materials VAST (Nha Trang) and the Institute of Marine Environment and Resources (Haiphong) are concerning with the study of species diversity and distribution of marine plants in southern and northern regions of Vietnam. Additional important task is - working out new methods of receiving planting materials of algae, introduction and cultivation of high-productive agarum-possessing Gracillaria algae. Writing books and articles about marine grasses and algae of Vietnam.

200 species of algae were collected and identified in non-polluted aquatories of Nha Trang. 100 algae species were collected in regions of maximum anthropogenic pollution with organic wastes.

A comparative study of nematodes fauna of marine and salt-watered regions of Vietnam and the Far East of Russia is conducting together with the Institute of Marine Environment and Resources (Haiphong). The main purposes are to estimate the influence of rivers on marine ecosystems and the valuation of invertebrates' reproductive potential under anthropogenic pressure.

The research of lipid and oxylipine substances out of coral reef organisms is carrying out together with the Institute of Natural Combinations' Chemistry, Hanoi. The main themes are - finding out the information about biochemical diversity of natural resources of coral reefs; elaboration of products for health made of marine organisms; exchange of students and specialists.

A study of fatty acids (FA), which are predecessors of prostaglandynes, out of 27 species of soft corals of Nha Trang bay (the South China Sea) was performed. Peculiarities of FA compositions which present in alcyonarians, gorgonarians and antipatarians, were found out.

Qualitative and quantitative consistence of common lipids, phospholipids, FA and superlong-chained FA out of 8 soft corals species was originally found out. The first case of finding some rare furan and benzofuran FA took place.

HỢP TÁC NGHIÊN CỨU SINH VẬT BIỂN GIỮA VIỆT NAM VÀ NGA TRONG THỜI KỲ 1980-2007

NGUYỄN TÁC AN ⁽¹⁾, T. N. DOUTOVA ⁽²⁾

Tóm tắt: Giới thiệu những kết quả hợp tác Việt - Xô trước đây và Việt - Nga hiện nay về nghiên cứu sinh vật biển giữa Viện Nghiên cứu Biển, Viện Khoa học Việt Nam, (nay là Viện Hải dương học, Viện Khoa học và Công nghệ Việt Nam) và Viện Sinh vật Biển thuộc Phân viện Viễn Đông Viện Hàn Lâm Khoa học Liên Xô, nay là Viện Hàn Lâm Khoa học Liên bang Nga.

Trong giai đoạn từ 1980 đến 2000, các công trình nghiên cứu chủ yếu tập trung đề cập đến 4 lĩnh vực sau: Các hệ sinh thái vùng triều, cơ sở sinh học phục vụ nuôi trồng rong biển và thân mềm, sinh và hóa học sinh vật biển, hàm lượng các nguyên tố vi lượng trong các loài thân mềm và thực vật phổ biến.

Theo thỏa thuận được ký kết trong năm 2007 vừa qua giữa Viện Khoa học và Công nghệ Việt Nam và Phân viện Viễn đông, Viện Hàn lâm Khoa học Liên bang Nga, hai bên sẽ xúc tiến, đẩy mạnh hơn nữa hợp tác nghiên cứu biển trong thế kỷ 21.

Ngày nhận bài: 08 - 9 - 2007

Người nhận xét: Ths. Nguyễn Thanh Vân

Địa chỉ: (1) Viện Hải dương học Nha Trang

(2) Viện Sinh vật biển, Phân viện
Viễn Đông Viện Hàn Lâm khoa
học Nga