TYPE AND EVOLUTION OF LANDSCAPES
OF NANSHA ISLANDS

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ABSTRACT: Landscapes of the Nansha Islands may be divided into five types: tropical marine organism-breeding landscape of reef knoll like Zengmu Shoal, Wan’an Bank and so on; tropical marine organism-breeding landscape of atoll including all emerged reefs and most submerged reefs; tropical evergreen arbor-bush forest and phosphorous lime soil landscape of limesand Islets like Taiping Islet, Nanwei islet and so on; tropical shallow sea marine organism-breeding landscape of southern continental shelf; tropical oceanic and deep-sea marine organism landscape in middle and north parts of the Nansha Islands area. These five landscape types may be also summed up as two categories, one is tropical sea landscape including those in shallow and deep sea, the other is tropical coral reef landscape including those of reef knoll, atoll and limesand islet. This paper outlines the evolutional model of landscapes of the Nansha Islands. The distribution and evolution of landscape types are related with palaeogeography and modern environmental conditions. The former shallow sea of the Nansha Islands was coastal zone in the Late Pleistocene epoch. Deep sea is evolved from shallow sea due to long and slow subsidence of crust. Modern coral reefs develop on old reef top of the Late pleistocene epoch or on baserock of continental shelf in the Holocene due to the rise of sea level in postglacial. Limesand islet is in the peak of developmental stage.

KEY WORDS: Nansha Islands, coral reef, natural complex, landscape.

All kinds of natural objects and phenomena are closely related and form a complete system called natural complex. As the synonym of complex of natural land or waters, landscape is the appearance of natural complex. Mai Yunyu led a scientific team to the Nansha Islands for investigation in 1946. Some people also made some documentary summaries (Chen, 1982). They outlined the features of physical geographic elements of the Nansha Islands, but their work lacked comprehensive study. Since 1984, the Chinese Academy of Sciences has carried out multidisciplinary scientific investigation to the Nansha Islands and its adjacent waters. During the

① Zhao Zhenxiong, South territory of motherland——Nansha Islands, 1955 (manuscript)
period, we paid attention to the study of natural complex (Zhao et al., 1994, 1995).

I. GENERAL FEATURES OF NATURAL COMPLEX OF TROPICAL CORAL REEF IN NANSHA ISLANDS

The Nansha Islands is situated in the southern part of the South China Sea, ranging 11°57'44"–3°37'N, 109°30'–117°47'E. Sea waters of the Nansha Islands are tropical sea which expanded and deepened increasingly in Cenozoic era. Sea floor landform comprises three units: deep sea basin, continental slope (including Nansha platform and trough) and continental shelf. The area is tropical monsoon climate with high temperature and humidity all the year. The annual mean air temperature is higher than 27°C and annual changing range is lower than 2.9°C. Taking Yongshu Reef as an example, the surface water temperature is the lowest in January (26.6°C), the highest in May (30.2°C), with an annual changing range of 3.6°C. The Nansha Islands area is in rainy season all the year with annual mean rainfall of 2 813.5 mm except the northern part where monthly rainfall from February to April is less than 50 mm. The temperature is slightly lower in ice period than now, but the climate is still tropical climate with high temperature and surface sea water is still tropical warm water. Tropical marine reef-building organisms and reef-liking organisms are breeding. According to the preliminary investigation, shallow water reef-building corals in this area are 124 species, and the common reef-frame corals are more than 10 genera. Reef-frame corals and other reef-building corals provide amount of fragments and make an action of filling and accumulation to the formation of reefs. The annual mean growth speed of main reef-building corals is 5 – 20 mm. Crustose Corallinaceae taking an action of cohesion is also an important kind of reef-building organism. The kinds of various reef-liking organisms providing organic fragments are hundreds of Mollusca and Halimeda genus. Fish, shrimp, crab and other marine organisms liking to dwell in reefs are abundant.

The Nanhai movement from the late Eocene epoch to the middle Oligocene epoch caused the formation of ocean basin of the South China Sea. Since then, reefs of the Nansha Islands began to develop. The reef of Liyue Bank is 2 160 m thick accumulating from the middle period of the late Oligocene epoch (27 000 000 a. B. P.) to now (Du, 1981). Core Nanyong-1 in Yongshu Reef is 152.07 m (not reaching bottom) with the oldest age of 970 000 a. (MOET, 1992). Core Nanyong-2 (413.69 m deep, not reaching bottom) is reef limestone formed after the late period of the Miocene epoch. The main type of coral reefs in Nansha area is atoll; the secondary type is reef knoll; some table reefs and tower reefs also exist. Loose fragments on reef top are accumulated with the rise of sea level after middle period of the Holocene. All the 14C ages of boulder on reef flat are less than 5 000 a B. P., most of them are less than 1 000 a B. P. (Zhao et al., 1992). Limesand islets which occurred through beach of intertidal zone, nude cay of supratidal zone, cay of grass and bush, islet of evergreen arbor-bush are formed under the action of big winds and waves in the late period of the Holocene. Plants and sea birds...