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Original paper

SHELLFISH AND FISH BIODIVERSITY OF MANGROVE ECOSYSTEMS IN LEIZHOU PENINSULA, CHINA

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ABSTRACT

Leizhou Peninsula is located in the south most continental tip of China with longitude 109:30110d, latitude 2012 2 35, and with a north tropical oceanic monsoon climate. Among its total inter tide area 99 100 hm^2, its mangrove wetlands occupy an area of 20 279 hm^2, including 7 305.8 hm^2 mangrove and 9 609.7hm^2 mudflats suitable for mangrove growing, and was designated as one of wetlands of international importance by the centre government of The People's Republic of China in January 2002. The survey we carried out into the eight major mangrove areas of Leizhou Peninsula by using various nets and tools between July 14 and September 4, 2002 showed that there were 3 order 38 family 110 species of shellfish and 127 species of fish, belonging to 15 order 58 family 100 genera, living in the mangrove areas. Among them, more than 28 species of shellfish and 34 species of fish were regarded as economical species with some importance of economy respectively. The structures of shellfish and fish resource were discussed, and the authors proposed that the conservation efforts should be secured for future sustainable development of the mangrove biodiversity resources in Leizhou Peninsula.

Key words: Biodiversity, fish, Leizhou Peninsula, mangrove area, survey.

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INTRODUCTION

Mangrove ecosystems function as important biodiversity nurseries for its near shore fishery and provide great ecological services to local economic sustainable development (Berry, 1963; Farnsworth & Ellison,1997; Field, 1999; Hamilton & Snedaker, 1984; Lin, 1997; Macnae 1968; Robertsen & Alongi 1992; Zhou & Yin,1998). eizhou Peninsula is located in the south most continental tip of China with longitude 109: –15 and latitude 20:12 21:35, and with a north tropical oceanic monsoon climate. Among its total inter tide area 99 100 hm^2, there are 20 279 hm^2 mangrove wetlands, including 7 305.8 hm^2 mangrove and 9 609.7hm^2 mudflats suitable for mangrove growing, which were designated as one of wetlands of international importance by the center government of The People's Republic of China in January 2002 and is now under the management of The Preparative Office of Zhanjiang National Mangrove Nature Reserve with the joint efforts of The Netherlands.

In order to obtain fish species list and their abundance data in or neighboring to major mangrove areas in Leizhou Peninsula and to provide background information for the integrated mangrove management and coastal protection in the region (Jiang, 2000), we carried out a shellfish and fish biodiversity survey between July 14 to September 4, 2002. This article presents the technical report of the survey results in the eight major mangrove areas of Leizhou Peninsula.

MATERIALS AND METHODS

Survey mangrove areas

Based on the mangrove distribution data in Leizhou Peninsula, the following eight major mangrove araes were selected and their mangrove forests were covered for fish biodiversity survey: (1) Gaoqiao mangrove area, Lianjiang County, with a total mangrove forest area of 700.1hm^2. (2) Beitan mangrove area, Shuixi County, with a total mangrove forest area of 210.6hm^2. (3) Techen Isle mangrove area, Xiashan; with a total mangrove forest area of 50.7hm^2. (4) Taiping mangrove area,including Huguan mangrove area, Mazhang, with a total mangrove forest area of 1 980.8 hm^2. (5) Fuchen mangrove area, Leizhou City, with a total mangrove forest area of 258.2hm^2. (6) Haijiao mangrove area, Leizhou City, with a total mangrove forest area of 567.7 hm^2. (7) He'an mangrove area, Xuwen City, with a total mangrove forest area of 369.7 hm^2. (8) Wuli mangrove area, Xuwen City, with a total mangrove forest area of 21.6hm^2.

Survey method

Trans sections and stations in and along the mangroves were set up for captures with a series nets and tools to secure all the swimming fish to be sampled. Randomly collecting with all kinds of nets and tools were also applied. Sampling time schedules were arranged both day time and night time for 4 full continuous days in each selected major mangrove area. In the field, the captured fish were put into labeled bottles or boxes for indoor identification and observation. Measurement items included net or tool measurements after used, number of each species, fish biological data such as its length, fresh weight, time and GPS location, etc.

Tools and equipments used

The following tools were used: 2 electronic balances, 2 GPS meters,2 digital cameras, metal poles, salt detector, pH detector, rental boats and veichles, 4 emergence nightlights etc. For shellfish survey, two self-designed tools were used: one 50cm wide x50cm long x30cm deep ion board frame and one 26cm long and 10cm in diameter PVC tube. Several nets with 1mm eye were used for biota collection from the soil sampled by the two self-designed tools. Local people were asked to collect shellfish in the mangrove areas with various tools. In order to catch all fish species in the field, six classes of fishing gear were employed: Gill Nets, Traps, Pots, Lift Nets, Falling Gear, Trawl Nets; all together 12 types of fishing gear (Feng, 1987): Trammel Net, Double Net, Gill Net, Boat-installed Lift Net, Shrimp Pot Trap, Stationary Uncovered Pound Net, Hundred Bag Gill Net, Fish Pot Trap, Crab Pot Trap, Cast Net, Stationary Surrounding Net, Beam Trawl Net. Their Fishing Principle is as the following expressed:

(1) Cages and Pots

Cages and pots are set passively according to fish special behaviors, feeding habits, procreation habits and so on, then the mangrove fish and other marine creatures

are tempted into the cages or pots by baits set in it. Two types of pots, the Fish pot and Crab pot, which are similar in structure, with inverse tassel funnel entrance at the bottom and with the pot tip covered with a cork, were employed during the investigation. The Crab pot's body is a bit longer. Both fishing with scatter traps, as pots distributed in mangrove area randomly.

On ebb tiding, the fish pot with bait set in it is set right in pothole which is digged by heel in the mangrove areas. After 2~4 hours the pot can be collected, and usually in different places you set, you can catch different species.

The Crab pot is set upside down in a hole and the body is covered with mud, only the bottom of which was left uncovered by the mud. The pot is set before flood tide and collected after ebb tide. Bait is not necessary with Crab pot fishing.

(2) Traps

Traps are fixed setting in water. The fish are hold up and guided into collecting units. Two types of Traps, the staked nets and the cages, were employed during the survey. The staked nets, including the fixed surrounding nets and the pound nets, were staked on the beach near the mangrove to form a long rectangle curtain of netting which is in arc form. During flood tiding, the fish, shrimps and crabs were guided into the enclosed area by the nets and after ebb tide the catch can be collected. The fixed surrounding nets have no netted hoops and the netting is raised up just before ebb tiding, while the netting of pound nets is always raised up to hold up fish, shrimp, and crab on both flood tide and ebb tide. At intervals of length (usually 20 meters) netted Hoops are assembled along the curtain of netting.

The shrimp cage belongs to cage traps. The shrimp cages we used are 8.5 m long, 0.3 m high, mesh size 1.5 cm and altogether 19 sections. On flood tiding, a number of shrimp cages are connected to form a long cage dragon, with stake at each end, along the beach near the mangrove. The shrimps, crabs and part of fish near the seabed were hold up and forced into the cage through the bugle shaped opening on either sides of the cages. The cages were collected after ebb tide.

(3) Falling Gear

The Falling Gear employed in this survey consists of cast nets. During fishing, the nets are cast by manpower to cover and catch the shoal fish, when the nets are lifted the water strained and the fish are collected. The net be deposed along the river entrance, in the bay area or the loblolly among the mangrove areas. The depth of water, in which the net could be cast vary from 1~10 meters. The net can be used all year round.

(4) Gill Nets

Gill nets, in which the aquatic animals be gilled, entangled or enmeshed. The fishing goal is to set a 'fleet' of the nets, which is composed of a number of rectangular panels joined together in water and keep it stand like a wall. Being hold up, the aquatic swimming animals are gilled, entangled or enmeshed in the netting. The single, double and triple fleet gill nets were employed in this survey. Removing the fish by hand that remain in the net after collecting the nets. We also used another gill net---One Hundred Bags Gill Net, which is quite often used in mangrove fishing, with hundreds of small opening bags on the net. A number of the nets are staked in the beach soil at outside edges of mangroves during flood tiding or ebb tiding, with the opening of the bags meeting the current, and the owner's observation tells the right time for its collection as the catch either enmeshed or entangled in the bags.

(5) Lift Nets

Lift Nets are laid in water where fish and shrimp often abound. The fishing objects are guided to the fishing area by means of

waiting, temptation and roundup, then the lift nets are raised or hauled upward from a submerged horizontal position to catch the fish lying above the net by straining the water. The Lift Nets employed by the survey were Boated Lift Nets, which is
made up of brackets, rectangular netting and jackstays. On flood tiding, the fishing usually begins at 5 minutes one haul, the haul frequency is judged by the fishing instance.

(6) Trawl Nets

Trawl Nets, which are operated by dragging or towing the nets through the water by fishing craft in order to force fish and shrimps to enter the net. The catch either passes the mesh or enmeshed. One beam trawl net was employed by a powered boat for the survey.

Indoor work, including species identification and measurement as well as sample storage, were carried out in the Laboratory of Institute of Marine Biology of Zhanjiang Ocean University.

RESULTS AND DISCUSSION

Results

Species components

There were 3 order 38 family 110 species of shellfish recorded by the survey in the 8 major mangrove areas in Leizhou Peninsula (see Annex 1) . Among the families, Veneridae was the larggest family with 20 species found Potamididae as the second largest family with 8 species collected; and Arcoidae has 7 species; Nertidae 6 species, Mytiloidae 5 species. Ostridae, Muricidae, Nassariidae all have 4 species repectively, and all other families are of less three species. There are 3 species collected during this survey new to the coastal China as new record of the fauna of coastal areas of mainland China, which include *Glauconome virens* Linnaeus, *Meretrix lyrata* (Sowerby) *Cassidula nucleus* (Gmelin).

The survey catched 127 species of fish in the 8 major mangrove areas which belong to 15 order 58 family 100 genus and among them there were 27 family 49 genus 65 species of Perciformes as the dominant order which occupies 51.2% of the total species captured.

Shellfish and fish fauna characteristics of the mangrove areas

According the shellfish species collected from the major mangrove areas of Leizhou Peninsula, the shellfish fauna consists of 35 warm water species which are widely distributed along the coastal China, 31.8% of the mangrove shellfish fauna; 62 warm water species which are distributed along the coastal East China and South China, 56.4% of the mangrove shellfish fauna; 12 warm water species which are only distributed in South China Sea, 10.9% of the mangrove shellfish fauna. The mangrove shellfish fauna do not have temperate/cold water species, neither have typical tropical species closely related to coral fauna. The mangrove shellfish fauna of Leizhou Peninsula shows its nature of subtropical component and geographically belongs to the Sub-distributional Area China-Japan of Indo-Pacific Area Wang, 1997; Zang, 2001).

Among 127 fish species collected in eight major mangrove areas in Leizhou Peninsula, there were 37 species (29.1% in total) which widely distribute along the coastlines of China, 69 species (54.3%) in the East Sea and the South Sea of China, 20 species (15.7%) only in the South Sea of China, and *Oreochromis niloticus* Linnaeus) is the only exotic species (0.8%) collected during this survey. There were 22 species of the Warm-Temperate distribution (17.3%) and all other species

as of the Warm Water distribution (82.7%). There were no Cold-Temperate Water Distributional species and the closely related species to typical tropical coral reefs. The mangrove fish fauna of Leizhou Peninsula belongs to the distributional China-Japan Subarea of the Indo-Pacific Area (Editorial Group, 1985; Meng, 1987).

Comparison of shellfish and fish faunas between the eight major mangrove areas surveyed

Since the habitats of shellfish are more vulnerable affected by the hazard factors like a period of water pollution, the fauna data of shellfish are much more variable than that of fish (Jiang, 2000). The differences of shellfish and fish faunas of the major mangrove areas surveyed in Leizhou Peninsula could be compared with the indexes of similarity. Except for the low similarities of Wuli with other mangrove areas which indicated the less than 20% fish fauna of Wuli mangrove area shared by the fish faunas of other mangrove areas, all other similarity values indicated 25.0%-60.0% of each fauna were shared by other mangrove shellfish and fish faunas. Similarities of shellfish and fish faunas between the mangrove areas surveyed proved that they were very closely related but also had some difference in fauna components. All eight mangrove areas could be listed as a related separate shellfish and fish faunas. The reasons of causing such differences are of difference of ones from the mangrove associations to the environmental factors, such as the mangrove area, geographical location, coastal environment, pollution and human being interferences, which need further analyses.

Dominant shellfish and fish populations captured in the mangrove areas

Because of diverse habitats of mangrove sites for shellfish to live there, especially the benthic material and salt content of mangrove areas vary a lot, and the tide types are different in east and western coasts of the peninsula, the diversity of mangrove shellfish we surveyed showed highly abundant in regarding to species diversity. Based on macrobenthic living material, *Placuna placent*(Linnaeus) and *Cassidula nucleus* (Gmelin) live in sticky mud; *Modiolus metcalfei* Hanley and *Cerithidea rhizophorarum* A.Adams prefer to sandy-mud soil environments; *Chione isabellina* (Philippi) and *Laternula truncata* (Lamarck) were found at sandy soil; *Fragun carinatum* (Lynge) and *Gafrarium pectinatum* (Linnaeus) live in sands. *Xenostrobus atrata* (Lischke) and *Anomia aenigmatica* Holten showed an adhesion live style; *Saccostrea glomerata* (Gould) adheres to mangrove tree and materials; *Nerita violacea* (Gmelin) and *Lunella coronata granulata* (Gmelin) are examples of making living with a manner of crawling. The mangrove shellfish show various adaptation to salinity of water, for example, *Tegillarca granosa* (Linnaeus), *Pharella acutidens* (Broderip et Sowerby), *Soletellina virescens* (Deshayes), *Moerella philippinarum*, *Clithon oualaniensis* (Linnaeus), *Cerithidea rhizophorarum* A.Adams, *Terebralia sulcata* (Born), *Ellobium chinensis* (Pfeiffer), etc. like living in sea water areas with fresh water input to low the salt content of the water, especially *Corbicula fluminea* (Müller) and *Ampullarium insularum* d'Orbigny usually live in fresh waters and can also be found the mangrove areas with low salt content water (Cai, 1988, 1989, 2001, 2002; Lai, 1988,1998).

The shellfish populations could be divided into two categories, one dwells on mangles and another dwells in soil. The tree dwell shellfish are mainly *Littoraria melanostoma* Gray, *L. articulata* (Philippi), *L. undulata* (Gray), *Anomia*

aenigmatica Holten, *Crassostrea rivularis* (Gould), *Oncidium verruculatum* Cuvier, *Cassidula nucleus* (Gmelin), *Ellobium chinensis* (Pfeiffer), *Xenostrobus atrata* (Lischke). The soil dwell shellfish vary greatly due to diverse soil nature (Wang, 1997; Zang, 2001), the biomass were recorded 2 298 Individuals/m^2 (=Ind./m^2), 782.9 g/m^2 on average; and the highest soil dwell shellfish biomass were recorded 4 552 Ind./m^2, 1 358 g/m^2 in Techen mangrove edge of *Aviccenia marina* forest with a sandy soil. The average shellfish biomass in mudflat soil outside mangrove edge was 422 Ind./m^2, 226 g/m^2, mostly dominated by *Cerithidea cingulata* (Gmelin).

All together 12 types of fishing gear belonging to six classes were employed: Gill Nets, Traps, Pots, Lift Nets, Falling Gear, Trawl Nets. Each type of fish gear has its own choice of fishing species targets so that the fishing results of each type differs greatly, that were indicated by the percentage of each fish species fresh weight in the total fish weight collected. The total capture of each major mangrove area during the survey could express the dominance and resource structure of fish species of the area. The following are dominant species in each major mangrove area surveyed as listed from the most dominant to the less dominant among the populations captured.

(1) Gaoqiao mangrove area: *Liza carinatus* (Cuvier et Valenciennes) occupies 45.0% of the total fish fresh weight captured in the area; the unit is same for the following data in brackets:>*Liza dussumieri* (Cuvier et Valenciennes)>*Siganus oramin* (Bloch et Schneider)>*Lateolabrax japonicus* (Cuvier et Valenciennes) >*Hypophthal-michthys molitrix* (Cuvier et Valenciennes)> *Synechogobius ommaturus* (Richardson)> *Ambassis gymnocephalus* Lacépède>other species.

(2) Beitan mangrove area: *Liza carinatus* (Cuvier et Valenciennes)(77.1%)>*Liza dussumieri* (Cuvier et Valenciennes)> *Acentrogobius caninus* (Cuvier et Valenciennes)> *Taenioides cirratus* (Blyth)>*Clupanodon punctatus* (Temminck et Schlegel)> *Arius sinensis* (Lacépède)> other species.

(3) Techen mangrove area: *Osteomugil strongylocephalus* (Richardson) 63.6%>*Liza carinatus* (Cuvier et Valenciennes)> *Leiognathus rivulatus* (Temminck et Schlegel)>*Liza dussumieri* (Cuvier et Valenciennes)>*Scatophagus argus* (Linnaeus)> *Trachinotus ovatus* (linnaeus)>*Siganus oramin* (Bloch et Schneider)> other species.

(4) Taiping mangrove area: *Oreochromis niloticus*(Linnaeus) 31.0%> *Sillago sihama* (Forskɔl)> *Pisoodonophis cancrivorus* (Richardson)> *Gerreomorpha japonica* (Bleeker)> *Glossogobius biocellatus* (Cuvier et Valenciennes)> other species.

(5) Fuchen mangrove area: *Sardinella fimbriata* (Cuvier et Valenciennes) 51.67%> *Caranx* (*Atule*) *Kalla* Cuvier et Valenciennes >*Liza carinatus* (Cuvier et Valenciennes)>*Clupanodon punctatus* (Temminck et Schlegel)> *Osteomugil ophuyseni* (Bleeker)> *Escualosa thoracata* (Valenciennes)> *Sillago sihama* (Forskɔl)>Scatophagus argus (Linnaeus) >Osteomugil strongylocephalus (Richardson)> other species.

(6) Haijiao mangrove area: *Fugu niphobles* (Jordan *et* Snyder) (49.0%)>*Liza dussumieri* (Cuvier et Valenciennes)> *Leiognathus rivulatus* (Temminck et Schlegel)> *Sparus latus* Houttuya >*Gerres abbrebiatus* Bleeker>Liza carinatus (Cuvier et Valenciennes)> *Sillago sihama* (Forskɔl)> other species.

(7) He'an mangrove area: Siganus oramin (Bloch et Schneider)(24.1%)>*Liza dussumieri* (Cuvier et Valenciennes)> *Acentrogobius viridipunctatus* (Cuvier et Valenciennes)>*Liza carinatus* (Cuvier et Valenciennes)> *Stephanolepis sp.*> other species.

There were only 13 species captured during the survey with body average size of individuals over 20cm long, that indicated mostly the young fish individuals living in and neigbouring to mangrove areas, and 33 species less 5cm long.

Among the 127 species captured in the eight major mangrove area, the major dominant fish populations are: *Pisoodonophis boro* (Hamilton), *Bostrichthys sinensis* (laécpède), *Acentrogobius viridipunctatus* (Cuvier et Valenciennes), the family of Periophthalmidae and etc. living perminately in mangrove areas: and the preodical mangrove living fish species (come and go) are dominated by *Liza carinatus* (Cuvier et Valenciennes), *Liza dussumieri* (Cuvier et Valenciennes), *Tylosurus strongylurus* (van Hasselt), *Lateolabrax japonicus* (Cuvier et Valenciennes), *Sillago sihama* (Forskɔl), and etc.. There were also 42 species (33.1%) recorded living in river mouth with half salty waters mainly dominated by *Clupanodon punctatus* (Temminck et Schlegel), *Arius sinensis* (Lacépède), *Tylosurus strongylurus* (van Hasselt), *Liza carinatus* (Cuvier et Valenciennes), *Therapon jarbua* (Forskɔl), *Sparus latus* Houttuya, *Siganus oramin* (Bloch *et* Schneider), *Bostrichthys sinensis* (laécpède), etc. and nine fresh water fish species 7.1% were recorded mainly dominated by *Hypophthalmichthys molitrix* (Cuvier et Valenciennes), *Cirrhinus molitorella* (Curier et Valenciennes), *Clarias batrachus* (Linnaeus), *Anabas testudineus* (Bloch), etc..

Discussion

Feasibility of economical shellfish and fish culture in mangrove areas

According to our survey observation on the ecological and biological characteristics of some of the fish species with economical importance (Su,1980), it is applicable to culture shellfish and fish in or around mangrove areas of Leizhou Peninsula. The culture trials are recommended so as to understand the nature of practice of aquaculture for each species, especially to master the techniques of reproduction and aquaculture management for some precious mangrove shellfish and fish species.

The shellfish and fish species for economical exploitation

The economical shellfish and fish species are abundant in the mangrove areas of Leizhou Peninsula. There are 28 shellfish species of economical importance, 25.5% of the total species collected during this survey, which be listed for near-future exploitation in staple production culture, mainly *Tegillarca granosa* (Linnaeus), *Musculus senhousia* (Benson), *Perna viridis* (Linnaeus), *Anomia aenigmatica* Holten, *Placuna placenta* (Linnaeus), *Crassostrea rivularis* (Gould), *Sinonovacula constricta* (Lamarck), *Solen gouldii* Conrad, *Cultellus scalprum* (Gould), *Polymesoda erosa* (Solander), *Ruditapes philippinarum* (Adams et Reeve), *Dosinia caerulea* (Reeve), *Gomphina aequilatera* (Sowerby), *Meretrix meretrix* (Linnaeus), *Cyclina sinensis* (Gmelin), *Glauconome chinensis* (Gray), *Lunella coronata granulata* (Gmelin), *Monodonta labio* (Linnaeus), *Nerita albicilla* Linnaeus, *Nerita yoldi* Recluz, *Nerita violacea* (Gmelin), *Littoraria melanostoma* Gray, *Cerithidea cingulata* (Gmelin), *Natica tigrina*

(Roeding), *Thais gradata* Jonas, *Nassarius festivus* (Powys), *Oncidium verruculatum* Cuvier, etc..

Among the above species, *Tegillarca granosa* (Linnaeus), *Musculus senhousia* (Benson), *Sinonovacula constricta* (Lamarck), *Meretrix meretrix* (Linnaeus), *Cyclina sinensis* (Gmelin), *Ruditapes philippinarum* (Adams et Reeve), *Dosinia caerulea* (Reeve), *Gomphina aequilatera* (Sowerby), *Glauconome chinensis* (Gray), *Ampullarium insularum* d'Orbigny, *Oncidium verruculatum* Cuvier have been already tried in aquaculture in China.

There are 34 species of economical importance, 26.8% of the total species collected during this survey, which be listed for near-future exploitation in staple production culture, mainly *Liza carinatus* (Cuvier *et* Valenciennes), *Liza dussumieri* (Cuvier *et* Valenciennes), *Osteomugil strongylocephalus* (Richardson), *Siganus oramin* (Bloch *et* Schneider), *Sillago sihama* (Forsk◌l), *Pisoodonophis boro* (Hamilton), *Callionymus olidus* Günther, *Tylosurus strongylurus* (van Hasselt), *Lateolabrax japonicus* (Cuvier *et* Valenciennes), *Sparus latus* Houttuya, *Therapon jarbua* (Forsk◌l), *Bostrichthys sinensis* (laécpède), *Boleophthalmus pectinirostris* (Linnaeus), etc.

Reproduction, fishing interval control and eco-tourism

The biomass of shellfish and fish species were recorded pretty low during this survey and indicates the over intensive human collecting and fishing happened. Reproduction aid to increase the economical species populations is highly recommended and urgent for the sustainable utilization of the biodiversity with both in site conservation and biological research efforts. Coastal collecting/fishing should also be controlled to protect shellfish and fish nature nursery from heavy interference of human activities. Mangrove ecotourism could be an alternative choice for the economical exploitation of mangrove resources in Leizhou Peninsula.

Conservation preference to secure and maximize mangrove ecological nursery role

The fish species we saw and collected during the survey were mostly very small, less than 15cm in length of the individuals, and the young biota individual's biomass occupied approximately 95% of the total fishing biomass. They were highly related to the near shore fishery as mangrove areas provide the most economical near shore fish species as the habitats at their nursery stage. Mangrove areas are of conservation preference based on principles of the sustainable economical development and environmental protection and integrated coastal zone management. Therefore, the "Management Regulations for Mangrove Resource Conservation of Leizhou Prefecture" issued by The Zhanjiang People's Government in March 2001 should be strictly executed, and the regular coastal fishing cease intervals in Leizhou Peninsula should be actualized.

CONCLUSION

The survey we carried out between July 14 and September 4, 2002 showed that there were 3 order 38 family 110 species of shellfish and 127 species fish, belonging to 15 order 58 family 100 genera, living in the mangrove areas. Among them, there are 3 species of shellfish new to the coastal China and more than 28 species of shellfish and 34 species fish were regarded as economical species with some importance of economy respectively. The structures of shellfish and fish resource

showed that most of the species were not common and fauna differences were obvious between each major mangrove areas. Therefore, the conservation efforts should be secured for future sustainable development of the mangrove biodiversity resources in Leizhou Peninsula.

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