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Seventh Indo-Pacific Fish Conference

Held once every four years, the five-day Indo-Pacific Fish Conference (IPFC) was held for the first time in Taiwan starting on May 16, 2005. This was the seventh IPFC and the largest

yet in the 28 years that the event has been held, according to Dr. Shao Kwang-tsao, acting director of the Research Center for Biodiversity, Academia Sinica (RCBAS). The almost 600 participants from more than 40 nations included world-renowned ichthyologists, ecologists, evolutionists, and leading authorities on related subjects.

The conference was jointly hosted by RCBAS and the Ichthyological Society of Taiwan. Researchers and scientists gave a summary report on the status of Taiwan's fish, and announced many world-class scientific findings. These included reports on highly endangered and confirmed extinct fish species, discoveries of new species, the world's smallest fish and Taiwan's world-leading deep sea fish culture technology, and introduced Taiwan's first-ever project to survey deep-sea (over 100 meters) coral reef fish. Representatives at the meeting included the directors or chairmen of ichthyology associations in Europe, the Americas, and Japan, the directors of ichthyology departments at major museums,

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and world authorities in all areas of ichthyology.

RCBAS Acting Director Shao pointed out that, while the island of Taiwan is not even 2.5 ten-thousandths of the world's total land area, recent fish surveys in Taiwan have recorded 2,775 species (an increase of 700 species compared to 10 years ago)—or one-tenth of the world's total number of fish species. Taiwan's fish biodiversity is 400 times greater than the average value for other countries! The rate at which new species are being recorded in Taiwan is extremely high. Every year, 50 to 80 new species are being added as newly recorded species in Taiwan and each year three to five of

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these are completely new species that have been found nowhere else in the world. Following extensive confirmation, Taiwan has already accumulated a total of 179 new species.

Dr. Shao said that thanks to Taiwan's optimal geographical location, it possesses the following four ichthyological advantages: it is adjacent to the East Indian Archipelago, which is the world's richest marine eco-region; it has a complex underwater topography; it possesses extremely diverse coastal substratum types and habitats; and it is close to the confluence of the Kuroshio Current, the China Coastal Current, and the South China Sea Current, which causes different north-south water temperature gradients at different seasons. These geographic attributes give Taiwan its enviable fish diversity.

In addition to these geographical advantages, Taiwan also has an extremely high international reputation in the field of fish taxonomy research. Over the past two years, a survey of deep-sea fish species undertaken by the Academia Sinica has been one of the main reasons for the rapid increase in the number of new fish species recorded in Taiwan. Amateur fishing enthusiasts, fishermen and divers also helped to make this year's summary report on the status of Taiwan's fish so exciting by providing rare and valuable samples.

Although Taiwan possesses an impressive fish biodiversity, Dr. Shao noted that Taiwan

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has a 'seafood culture', rather than a 'sea culture'. The threats of over-fishing, habitat destruction, pollution, invasive species, and inappropriate ecotourism have caused the numbers of many species to plummet. Of Taiwan's 78 endemic fish species, six have disappeared during the past 30 years. Furthermore, the regional extermination of certain species, like the Bluefin tuna (toro), through their capture for the sashimi trade has led to an 80% reduction in bluefin production compared to 20 to 30 years ago. In addition, a third to half of all inter-tidal fish species are now almost extinct in the wild.

After the conclusion of the conference on May 21, Dr. Shao accompanied Richard Pyle of Bishop Museum, Hawaii, Brian G. Greene, and John Earle to Green Island to conduct the first-ever survey of deep-sea coral reef fish in Taiwan. Although the team observed five new species, of which two species were *Chromis* spp. and the other three were *Cirrhilabrus* sp., *Ptereleotris* sp., and *Xyrictys* sp., the team did not see the many groups of the small reef fish usually seen in coral reef areas at Green Island. Nor did they see the larger reef fish that feed on these smaller fish. From the tangled mass of fishing nets and fishing lines left snagged around the corals, the researchers believe that Green Island's reef fish have been seriously over-fished, causing their numbers to deplete.

After seeing the sorry state of the waters

around Green Island, Dr. Shao urged Taiwan to speed up the establishment of marine protected areas and appealed against the practice of capturing coral reef fish for food. He said that if Taiwan could create coral reef protected areas where SCUBA ecotourism could allow the public to enjoy their beauty, then "coral reefs could be protected, while local people could also enjoy some economic benefit from them."



World's Smallest Fish

The largest fish in the world is, undisputedly, the Whale shark (*Rhincodon typus*), measuring up to 17 meters in length; but the record for the world's smallest fish species continues to be broken. The earliest record was made in 1927, when the Dwarf-pygmy goby (*Pandaka pygmaea*), found in the Philippines, was listed as the world's smallest known vertebrate. It measures just 1.1 - 1.5 cm in length. This remained the smallest known fish species right up until 1981, when the Dwarf goby (*Trimmatom nanus*) was discovered among the coral reefs of the Indo-west Pacific. Males of the species measure only 8.0 mm. This was the first time in the world that a fish measuring less than one centimeter had been recorded.

However, in July 2004, the Dwarf Goby was usurped by the transparent goby: Stout Infantfish (*Schindleria brevipinguis* Watson &

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Walker, 2004). The largest female captured to date was a gravid female, measuring just 8.4 mm. Males are even tinier at just 6.6 mm. But the Stout Infantfish's name as the world's tiniest fish did not last for long. Swiss ichthyologist Dr. Maurice Kottelat announced his discovery of an even smaller fish in a paper at the 7th Indo-Pacific Fish Conference (IPFC) held in Taipei, Taiwan in May 2005. According to Kottelat, the latest world's smallest vertebrate is a cyprinid fish from the peat swamp forests of Southeast Asia that matures at 6.9 mm. The females of the species are just 7.9 mm in length.

Also at the IPFC, Dr. Chen, I-shiung of the Institute of Marine Biology, National Taiwan Ocean University announced the discovery of a new *Pandaka* species that is only up to 1.1 cm in standard length. The discovery of the new species came about through cooperative research with Dr. Shao, Kwang-tso, acting director of RCBAS, and Wu, Han-lin, professor at the Ichthyology Laboratory, Shanghai Fisheries University in China. This new species is a member of the family Gobiidae caught in the mangrove area of Hainan Island in south China. After a long period of verification, the tiny fish has recently been confirmed as the smallest vertebrate in the Greater China Area.

Three years ago, Dr. Chen found a new species of *Trimmatom* that were especially large, while diving 20-25 m depth off Orchid

Island (Lanyu). The lengths of this new species were up to 2.5 cm, making them the largest recorded and undescribed *Trimmatom* in the world.



Latest Progress in Taiwan's Deep Sea Fish Culture Technology

After just two years of hard work, a team of researchers from the National Museum of Marine Science and Technology and Academia Sinica's Research Center for Biodiversity (RCBAS) have successfully reared 16 species of deep sea fish, 12 of which were world firsts. Previously, only a handful of aquariums in advanced nations had been able to raise and display live deep sea species. In addition, the researchers proved that deep sea fish are relatively unaffected by red light interference. This is useful for future deep sea exploration and sample collection.

Dr. Hsin-ming Yeh, a RCBAS researcher, made the announcement on May 19, 2005, during presentations on the status of and the latest progress in Taiwan's deep sea fish culture technologies at the Seventh Indo-Pacific Fish Conference (IPFC 7).

At present, the international definition of the 'successful culture' of deep sea species is determined as keeping a species alive for just three days, said Dr. Yeh. This is because the unique physiology of deep sea fish means that

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fewer than 5% of deep sea fish survive being caught and brought into captivity. However, of the 16 species of deep sea fish taken from the marine area around Kueishan Island at depths of between 200 meters and 600 meters and successfully reared by Taiwan's team of researchers, seven had been kept alive for more than three months. These were the hagfish (*Eptatretus* sp.) (477 days), the hagfish (*Paramyxine sheni*) (485 days), the Japanese armorhead (*Pentaceros japonicus*) (666 days and still alive at the time of the presentation), the Raspback skate (*Bathyraja isotrachys*) (345 days), the Stonefish (*Setarches longimanus*) (121 days), the Sebastes Hilgendorfi (*Helicolenus hilgendorfi*) (207 days and still alive at the time of the presentation), and the Blacktip sawtail catshark (*Galeus sauteri*) (104 days). Furthermore, 12 of the 16 species were cultivated for the first time ever in the world.

Deep sea exploration has recently become the focus of man's quest to find new life-forms; therefore, stable deep sea culture techniques will be an important factor in this research. Another important step in understanding the physiology and behavior of deep sea species is RCBAS's discovery using animal behavior experiments for the first time that deep sea fish are relatively unaffected by red light, which suggests that red light can be used as the directional light source in future sample collection.

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Rare Megamouth Sharks Caught off Hualien

East Taiwan fishermen accidentally netted two extremely rare megamouth sharks (*Megachasma pelagios*) in waters off Fengpin Township and Chihsing Lake, Hualien, in early May this year. The first megamouth was caught on May 4 and measured 4.8 meters in length. It weighed 689 kilograms. The second was caught a day later, on May 5. It measured 4.8 meters in length and weighed an amazing 807 kilos. The two sharks were only the 31st and 32nd megamouth catches ever recorded in the world. Both catches are extremely significant from a research point of view, because little scientific knowledge has been established for the megamouth, even though the species constitutes one of the three largest sharks known in the 20th century.

Megamouth sharks are a migratory fish species and sightings have been recorded in the world's three major oceans. In particular, the number of megamouth caught in waters between Japan and the Philippines is especially high. Japan has recorded nine catches and the Philippines have recorded four. In addition, megamouth have been caught along the east and west coasts of Africa and off the state of Florida in the United States. During the day, they swim at depths of around 150 meters under the sea. They only rise to the surface to eat tiny organisms during the night.

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The Megamouth shark is one of the three giant filter-feeding sharks in the sea. The other two are the basking shark (*Cetorhinus maximus*) and the whale shark (*Rhincodon typus*). Megamouth eat huge quantities of minute sea organisms like krill and plankton, which they filter out of the water using their huge jaws (the exact feeding mechanism remains unknown due to the lack of observations on live, feeding specimens).

Previously, researchers suggested a single origin for filter feeding in megamouth and whale sharks, however, no connection has been established between the two species from analysis of morphology of bone, muscles and genetic studies. In fact, the megamouth is a close relative of the flesh-eating great white shark (*Carcharodon carcharias*), but why the two species' diets should differ so radically remains a puzzle to scientists!

For more information about megamouth sharks, please consult the following websites:
<http://www.flmnh.ufl.edu/fish/Gallery/Descript/Megamouth/megamouth.htm>

<http://www.flmnh.ufl.edu/fish/Sharks/Megamouth/mega.htm>

Note: Some of the material for this article was provided by National Taiwan University, Institute of Ecology and Evolutionary Biology Ph.D. candidate, Lee Po-Feng.



Fishing Ban during Lanyu Flying Fish Festival

The Fisheries Administration (FA) recently ratified the Taitung County Government's declaration that fishing vessels of over 10 tons in weight will be banned from fishing within six nautical miles of the Lanyu (Orchid Island) coast during the Flying Fish Festival held from March to June each year. The ban also prohibits the use of driving-in net and gillnets.

The Flying Fish Festival is an annual celebration of the migration of flying fish to Lanyu by the indigenous Yami (Tao) people. In recent years, stocks of flying fish have been dwindling due to over-fishing by large commercial vessels from other parts of Taiwan and this is jeopardizing local livelihoods and culture.

The Fisheries Section of the Bureau of Agriculture, Taitung County Government announced measures to protect the ocean around Lanyu in May of this year. Anyone found guilty of flouting the ban will be punished under Articles 10 and 65 of the Fisheries Act. Fines are clearly stipulated, as follows:

For the first offense, a fine of NT\$30,000 is payable by the vessel's owner or captain. This is to be doubled to NT\$60,000 for second-time offenders. If a third offense is committed, the vessel's fishing license and the professional

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licenses of the captain and key crew members will be suspended for one month. Documents will be suspended for three months, six months, and one year for each repeat offense, respectively, leading to the annulment of all licenses for any party that has repeatedly flouted the ban seven times.



Cross-Strait Enterprises Cooperate on Environment

Environmental issues, recently, became the focus of cross-Strait exchange and cooperation, when 15 members of China's first environmental NGO visited Taiwan. The group of industrialists from Alxa SEE Ecological Association came to exchange opinions with members of the Taiwan chapter of Alxa SEE and to learn from Taiwan's experience at balancing economic development and environmental protection.

During the six-day trip, which began on June 17, 2005, the group visited the offices of the China Times, one of Taiwan's leading national daily newspapers, to hear a talk about the history of Taiwan's environmental movement. China Times President Huang Chao-sung explained that Taiwan's 'Economic Miracle' and subsequent industrialization had come about at a heavy environmental cost.

As it rushes headlong to develop its economy, China will inevitably face similar

environmental problems to Taiwan, including the overdevelopment of hills and slopelands and heavy pollution of streams and rivers, unless efforts are taken to protect the environment. Now that environmental issues are being pushed to the top of international agendas by the implementation of the Kyoto Protocol, the time is ripe for a concerted effort by industrialists on both sides of the Taiwan Strait to protect the environment. Such action would foster even greater mutual understanding between the two sides, said Huang.

Alxa SEE Ecological Association is made up of business entrepreneurs. Project work is focused on the desert area of Alxa, located in Inner Mongolia, which is the major source of China's notorious sandstorms. SEE's two main goals are to protect the Alxa region through restoration of local vegetation and to encourage Chinese entrepreneurs to undertake more environmental and social responsibilities. SEE is an abbreviation of the words 'society', 'entrepreneur' and 'environment'. Since its establishment on World Environment Day on June 5, last year, SEE now has 87 prominent Chinese entrepreneurs who are CEOs of leading Chinese enterprises as its members.

SEE's roots began two years ago as a tourist development project in Inner Mongolia. As more and more entrepreneurs got involved in the project and saw for themselves the desertification of the Alxa region, they decided

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to form a non-profit environmental group to help protect the area and put an end to the sandstorms that were causing a serious deterioration of air quality in Beijing and even as far afield as Korea and Japan. A meeting of over 100 entrepreneurs was organized and SEE was established with the realization that enterprises could work together for a common good like environmental protection, said SEE Secretary General Yang Ping. The 80 charter members pledged to make annual investments of RMB100,000 for the next 10 years to a welfare fund organized by the association, and also to undertake projects to slow down desertification and gradually eliminate the sandstorms that plagued China.

Alxa SEE is China's first-ever entrepreneur-based environmental protection NGO, said Yang. Although it came into being spontaneously, its birth was inevitable, he said, because China's entrepreneurs are gradually realizing the unsustainability of destroying the environment in the quest for rapid economic development and accumulation of wealth. China's entrepreneurs are beginning to demand a balance of economic, environmental and social benefit, he said.

Since its establishment, last year, at Moon Lake in the vast Tengger Desert, Alxa SEE has not only successfully united entrepreneurs from China, Taiwan and Hong Kong, it also became the focus of the international community when

it received 10 million Euros in project funding from the Italian Ministry of the Environment. At present, SEE's core projects include improving the living standard of local nomadic people in the Alxa region by helping them move away from the desert and settle as farmers, improving the sustainability of Alxa's immigrants, protecting areas of natural forest, and developing alternative energies to protect tree and grassland resources. Furthermore, the organization is also engaging in long-term surveys of the ecological, social and economic conditions of the Badainjara, Ulanbuh, and Tengger deserts within the Alxa region.



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