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Oil Spill Pollutes Kenting

Taiwan authorities and residents are working to rescue a protected area after probably the worst maritime oil spill in Taiwan since 1977. The oil spill from grounded Greek bulk cargo ship, the M.V. *Amorgos*, has caused substantial damage to the marine area around Hengchun in south Taiwan. Already, more than three kilometers of coastline have been polluted, of which two kilometers of coral are heavily contaminated.

The *Amorgos* ran aground on submerged reefs on Jan. 14, 2001 approximately one kilometer east of Oluanpi, causing some 1,150 tons of fuel oil to leak out and contaminate the pristine coastline that constitutes part of Kenting National Park. The tanker, which was carrying around 1,000 tons of heavy oil and 500 tons of diesel oil, as well as its cargo of 60,000 tons of iron ore, was headed for Nantong in China from Singapore when it developed a mechanical problem and drifted on the high seas.

The areas most seriously contaminated by the spill include Oluanpi, Lungkeng and Hsiangchiao Bay. The Kenting National Park Headquarters mobilized local people to manually scoop up oil floating on the surface of the sea along the Lungkeng coastline. The clean-up operation has been made more difficult by the fact that the areas affected are mostly coral and Taiwan lacks specialist equipment and personnel for dealing with oil contamination.

The spill has forced the Kenting National Park Headquarters to close Lungkeng Ecological Protection Area. Experts say that the local fishing industry has been devastated by the disaster. Seaweeds can no longer be picked due to the pollution. The reef shelf along the Kenting coast is a traditional shellfish and seaweed harvesting area and it is estimated that the oil contamination has destroyed marine life and corals not only along the coast, but also on the seabed. Kenting National Park Headquarters officials estimate that it will take at least one year to clear all traces of oil from the coral habitat at Lungkeng and it will take several decades for the environment to fully

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recover and resume productivity. At present, as much oil as possible has been cleared from the area, but much of the black, sticky oil has hardened onto the coral after exposure to sunlight and will require other means to remove.

The Kenting National Park Headquarters intends to commission ecological surveys of contaminated marine and land areas by National Pingtung University of Science and Technology, the National Museum of Marine Biology & Aquarium and other agencies, to speed up the recovery. Scholars and experts recommended establishing a marine biology database to serve as an important basis for future environmental repopulation and damage claims. At present, there is no species database

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relating to Lungkeng Ecological Protection Area; it is almost impossible to estimate the number of plants and animals affected by the *Amorgos* oil spill. The National Museum of Marine Biology & Aquarium will undertake long-term research of the marine area because the region contaminated is relatively large and various species on the seabed have been affected.

Rescue work to recover leftover oil and iron ore from the wreck of the *Amorgos* has been delayed continually by rough seas around the Pingtung and Kenting area. Although experts estimate that the best sea conditions for towing the wrecked ship off the rocks and scuttling it on high seas would be from April to July, Taiwan enters its annual Typhoon season around May, so unpredictable sea conditions would continue to be the biggest problem facing the rescue efforts. Meanwhile, the owner of the *Amorgos* has commissioned the removal of remaining heavy oil from the tanks of the wreck. By the end of March, a further 32 tons had been cleared. More than 100 tons of heavy oil still left onboard has hardened and will be cleared from the area along with the wreckage.

On March 23, the Executive Yuan called the first meeting of a national taskforce for dealing with major marine contamination incidents, at which the conditions and measures for relevant follow-up work and government intervention were discussed. The *Amorgos* disaster has highlighted the need for the Taiwan government to draw up a set of guidelines for

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dealing with marine and coastal pollution and to establish a system for gathering information and monitoring sea conditions. Most importantly, a comprehensive national chain of command must be established to clarify the role of local and central authorities in dealing with crisis management.



Tanta, Kuanshan and Shuangkueihu Major Wildlife Habitat

As part of efforts to create a Central Mountain Range Conservation Axis (CMRCA), the Council of Agriculture (COA) has decided to upgrade the status of Major Wildlife Habitats (MWH) at Tanta, Kuanshan, Shuangkueihu and other areas to become Wildlife Refuges.

The CMRCA project aims to create a continuous green corridor along the length of Taiwan's Central Mountain Range by linking existing Forest Reserves, Nature Reserves, Wildlife Refuges and National Parks, and creating new protected areas. With this goal in mind, the Taiwan Forestry Bureau (TFB) of the COA established the Yuli Wildlife Refuge and declared several MWH at Chilán, Tanta and Kuanshan, last year, with a total area of 246,436 hectares. These new protected areas link existing Nature Reserves at Chatienshan, Chuyunshan and Tawushan, as well as Shei-Pa National Park, Taroko National Park, Yushan National Park, and Shuangkueihu Forest

Reserve, making the Central Mountain Range a protected green corridor stretching 300 kilometers from north to south.

In addition to commissioning ecological surveys of existing protected areas by the TFB, the Taiwan Endemic Species Research Institute (TESRI), and other agencies, the COA has also decided to upgrade MWH at Tanta, Kuanshan and Shuangkueihu to become Wildlife Refuges. These areas will be managed separately, and in the future, the COA plans to establish zones for sustainable utilization.

Furthermore, the COA intends to establish administrative sites, each with its own dedicated staff, at each of the five protected areas at Chatienshan, Tanta, Yuli, Chuyunshan, Shuangkueihu, and Tawushan. Depending on the characteristics of the protected area, these sites will provide a location for education and research.

Ecology display centers will be established at protected areas, so that the public can enjoy educational trips to these areas.

Lastly, the COA also hopes to develop a formal system of eco-tourism, alongside the national network of hiking trails presently being demarcated within the Central Mountain Range. The COA hopes to employ local aboriginal mountain guides, on the one hand, to create job opportunities for indigenous communities, and on the other, to increase public awareness of Taiwan's Central Mountain Range and its ecology. The COA

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pointed out that, at present, Taiwan has no formal system of eco-tourism; therefore, it hopes to commence eco-tours at certain specified locations before the end of this year, with the aim of establishing an eco-tourism system.



Pan-Asian Black-faced Spoonbill Survey

In January, Taiwan took part in the “2001 Asian Survey of Black-faced Spoonbills” with the aim of better understanding changes in black-faced spoonbill (*Platalea minor*) populations around the world. Other participants included researchers from Kagoshima, Fukuoka and Ryukyu in Japan, Cheju Island in South Korea, the southeast coastal areas of China, Hong Kong, Hainan Island, Macao, Vietnam, and other major spoonbill winter nesting sites.

It is known that, every year, over half of all black-faced spoonbills winter in marshes at the mouth of the Tsengwen Stream in Taiwan. In recent years, Taiwan has cooperated extensively with other nations to protect the black-faced spoonbill through international conservation projects. As a result, the global population of black-faced spoonbills has shown remarkable growth, rising from just 293 individuals in 1989 to 772 individuals in 2000.

International cooperation on conservation projects like the annual survey of spoonbill

winter populations, breeding and habitat research, the study of spoonbill migration and public awareness campaigns arose from a global consensus on the need to conserve the black-faced spoonbill. Taiwan has played a major role in these projects. For instance, in 1996, students and researchers from the Graduate School of Biology at National Taiwan Normal University were the first to successfully attach a short-range radio transmitter to a black-faced spoonbill. Then in 1998, Taiwan worked with Japan on a satellite telemetry study to track spoonbills and uncover the mystery of where black-faced spoonbills breed.

In 1999, Taiwan and Japan continued their cooperation and discovered that, after leaving Taiwan, the black-faced spoonbill they were tracking was spotted off the coast of Yuanwan in Zhejiang Province, China. Then the bird flew on to Yancheng Nature Reserve in Jiangsu Province and on to a small island off the coast of Han River in South Korea. Through satellite tracking researchers now have some understanding of the black-faced spoonbill's migratory path and breeding sites.

The Asian Survey of Black-faced Spoonbills, which is organized by BirdLife International, coordinates various Asian nations in recording the winter population of black-faced spoonbills. This year, the survey took place over two days, Jan. 13 and 14, at locations where black-faced spoonbills have been seen in recent years. In the Taiwan Area, these regions included Wenti at Lanyang Creek

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and Wushi-er-chia in Yilan County, Hualien Creek in Hualien County, the Penghu archipelago, the Kinmen islands, Shetsu and Kuantu in Taipei, coastal areas in Hsinchu, the Tatu Creek in Taichung County, Aoku in Chiayi County, Tsutsao and Chiku in Tainan County, and Linpien and Lungluntan in Pingtung County.



Penghu Releases Fish Fry to Repopulate its Oceans

On Feb. 20, 2001, the Penghu County Government released 50,000 gold-lined sea bream fry (*Sparus sarba* Forsskal) into the sea at Chingwan, southern Penghu, in the start of a major marine farm project to repopulate the ocean resources of Neiwan. The head of the County Government's Agriculture and Fishery Department, Mr. W. T. Hsu, said the authorities aim to build and develop Taiwan's first offshore marine farm at Nei-an this year. He said that, in the future, all cultivated fish fry would be released at Nei-an, where fishing bans and other methods would be used to ensure the fingerlings grow into adults, thus sustaining Penghu's marine resources.

Last year, Penghu County Government released over one million larvae from various different species. This year, the first batch of artificially propagated fish fry, also known as fish seed, produced by local hatcheries was

released into the sea at Chingwan on Feb. 20. Hatchery owner, Mr. Chen Chin-lung, said gold-lined sea bream were particularly mobile and good at hiding, making them an excellent choice for replenishing Penghu's marine resources. At present, the fingerlings are five to six centimeters in length on average. Chen said he was confident they would be able to grow into adult fish within a short period of time, thus quickly restoring the marine areas around Chingwan and Neiwan to their former vitality. Penghu County Government also intends to release the fry of other fish species, as well as *Tectus pyramis* and *Haliotis diversicolor*.

Previously, the Penghu authorities distributed most fish seed over a wide sea area; however, starting this year, they will gradually concentrate resources in the area around Nei-an in Hsiyu Township, which is the proposed site of Taiwan's first marine farm. At the same time, the authorities are also creating artificial reefs to shelter the newly released fingerlings, while also promoting the establishment of management committees at Nei-an village and Chihma village. In addition, the Penghu County Government has stipulated fishing bans within the marine farm area and has outlined the farm's operating procedures in the hope that, through effective management, the marine farm will become the first stage in the large-scale repopulation of Penghu's ocean resources. If the initial project is successful, similar projects are intended for Chingwan, Houliiao, Chuwan, Hsianglu Island, and other areas, thus providing

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Penghu with an inexhaustible supply of marine resources.

Marine experts, however, cautioned that, although mariculture may be beneficial for restoring fish stocks at certain areas, it may also have conservation impacts on the habitat and the wild stocks, and the practice should be evaluated carefully.



Artificial Breeding Sites for Formosan Landlocked Salmon

According to recent studies, the number of Formosan landlocked salmon (*Oncorhynchus msaou formasanum*) remaining in Chichiawan Creek, Taichung County, is little more than 800. In an attempt to repopulate the species more quickly, the Shei-pa National Park Headquarters has accelerated the construction of artificial breeding sites for the Formosan landlocked salmon, which is considered a national treasure. It is expected that these sites will be ready for use in time for the salmon's breeding season in October this year.

Shei-pa National Park Headquarters secretary, H. C. Wu, said the Formosan landlocked salmon population of Chichiawan Creek in the Wuling area of Shei-pa National Park was declining rapidly. He said that, in addition to habitat degradation caused by typhoons, torrential rainstorms and other natural disasters, another reason for the

salmon's decline was attributable to global climate change caused by the El Nino and El Nina, which was raising the temperature of the rivers and streams inhabited by the salmon.

The Formosan landlocked salmon is particularly sensitive to temperature change during its spawning season from October to November each year. If the water temperature rises above 12 °C, the salmon eggs are often unable to hatch. As a result, artificial means are needed to help the salmon breed successfully.

Initially, the breeding sites aim to raise around 5,000 salmon fry a year. As well as conserving and repopulating this species, the breeding sites will also serve an educational function in the future and incorporate underwater viewing and display centers. The underwater viewing areas will allow the general public to become better acquainted with one of Taiwan's endemic species and its ecology and encourage the public to help ensuring its survival.



Hahpen Nature Reserve

Introduction to Taiwan's Nature Reserves

Located at the edge of Wulai Township in Taipei County and Yuanshan Township in Yilan County, Hahpen Nature Reserve was established in 1986. With a total area of 332.7 hectares, the reserve is located at an elevation of between 450 to 1,030 meters above sea level. The mean annual temperature is 18.4 °C and mean annual precipitation is 2,900mm. The

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reserve falls into the warm and very humid-type subtropical climate.

The reserve is representative of typical natural broadleaf forest found in northern Taiwan. The plant species here include members of the Fagaceae, Lauraceae, Theaceae, Ebenaceae, Juglandaceae and others. The dominant tree species is the *Castanopsis carlesii* var. *sessilis*, while the dominant shrub is *Tutcheria shinkoensis*. On the forest floor, the dominant herb is *Diplazium dilatata* Blume. Hahpen has abundant sources of water, giving the reserve a high level of wild plant and animal species diversity. The insect most commonly found within the reserve are moths and butterflies, while the fish species most often seen in the streams within the reserve are the *Varicorhinus barbatulus* and *Zacco barbata*. Amphibians include a number of rare frog species such as Moltreche's tree frog (*Rhacophorus moltrechti*), Brown tree frog (*Buergeria robustus*), the Taipei tree frog (*Rhacophorus taipeianus*) and the Emerald tree frog (*Rhacophorus prasonatus*). Reptiles include many rare species of snake and lizard. The bird species found within the reserve are mainly residents, but some migrants inhabit the area. The mammalian species recorded in the reserve include the Formosan muntjac (*Muntiacus reevesi micrurus*), Formosan macaques (*Macaca cyclopis*), Chinese pangolins (*Manis pentadactyla pentadactyla*), Formosan gem-faced civets (*Paguma larvata*

taivana), and the Crab-eating mongoose (*Herpestes urva*), as well as other species.

In 1992, the National Science Council supported the establishment of Taiwan's first long-term ecological research (LTER) site—the Fushan LTER site, which incorporates Hahpen Nature Reserve. Long-term ecological research has become an extremely important aspect of international ecological research projects. Due to the fact that many changes in ecosystems occur very gradually over a long period of time, such changes cannot be understood thoroughly through one- or two-year research projects. Therefore, LTER projects aim to use long-term monitoring to fully examine the process of change and the function of ecosystem in order to provide basic information for the management of ecosystems. In particular, as global climate change gradually becomes the main focus of attention today, long-term research projects are becoming increasingly valuable. Since its establishment, the Fushan LTER site has undertaken a large number of research projects within the Hahpen Nature Reserve, for instance studies of vegetation types, phenology, the study of mammalian species, surveys of freshwater fish species, and surveys of aquatic insects and crustaceans, etc. These research projects not only help us to understand the ecosystem of Hahpen, but they are also helpful for the management of future nature reserves.



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