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Toward Establishing a Spratly Islands International Marine Peace Park: Ecological Importance and Supportive Collaborative Activities with an Emphasis on the Role of Taiwan

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The Spratly Islands constitute one of the earth's most ecologically significant areas, hosting a high diversity of marine species, providing critical habitats for endangered species, and providing marine larvae to reestablish depleted stocks among the heavily overfished and degraded coastal ecosystems of the South China Sea. Territorial disputes have led to the establishment of environmentally destructive, socially and economically costly military outposts on many of the islands. Given the rapid proliferation of international peace parks around the world, it is time to take positive steps toward the establishment of a Spratly Islands Marine Peace Park. Its purpose would be to manage the area's natural resources and alleviate regional tensions via a freeze on claims and claim supportive actions.

Keywords Coral Triangle, Marine Peace Park, marine protected areas, Spratly Islands

Geographical Features and Legal Aspects of the Spratly Islands

The South China Sea is a marginal sea partially enclosed by the lands of the People's Republic of China, the Republic of China (referred to as Taiwan), the Philippines, Malaysia, Brunei, Indonesia, Singapore, and Vietnam. Covering an area of 800,000 square kilometers and containing more than 200 identified islands, islets, reefs, shoals, sand cays, and banks, four major archipelagos named the Pratas Islands (Dongsha 東沙), Paracel Islands (Xisha

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西沙), Macclesfield Bank (Chungsha中沙), and Spratly Islands (Nansha南沙) are distributed from north to south.

The Spratly Islands are scattered between 12∞ and 6∞ north, and 109∞ and 117∞ east in the southern part of South China Sea. The water area of the Spratly Islands is substantial, encompassing approximately 160,000–360,000 square kilometers, depending on how limits are chosen. There are approximately 150 named landforms, and innumerable unnamed spits of land. The majority of these are rocks, reefs, sandbanks, or other types of partially submerged landforms. They rest primarily on partially submerged coral reef atolls, ranging in length up to approximately 40 kilometers. The largest island in the Spratly group is called Taiping Island (太平島) or Itu Aba by others. Taiping Island and six other reefs form a lagoon-shaped Tizard Bank or Zhenghe Reefs (鄭合群礁) near the center of the South China Sea. The island itself has an elliptical shape, 1,289 meters in length and 365 meters in width, with 0.49 square kilometers of area. The altitude is less than 5 meters. The geographical distance between Taiping Island and Kaohsiung (Taiwan) is about 850 nautical miles; to Hainan (China) 550 nautical miles; Ho Chi Minh City (Vietnam) 330 nautical miles; Palawan (the Philippines) 220 nautical miles. Taiping Island has been under control of Taiwan since 1956.

The Spratly archipelago is the focus of complex sovereignty disputes. There are competing claims to island territories, exclusive economic zones (EEZs), and continental shelf by Taiwan, China, Malaysia, the Philippines, Vietnam, and Brunei. Though these countries claim the sovereignty of part or all of the Spratly Islands, each major island is controlled and governed by only one country that, in many cases, has installed military facilities. The eight largest islands and the controlling nations are listed accordingly: Taiping Island (Taiwan), Thitu Island (the Philippines), West York (the Philippines), Spratly Island (Vietnam), Northwest Cay (the Philippines), Southwest Cay (Vietnam), Grierson Cay (Vietnam), and Swallow Reef (Malaysia). Mainland China controls several reefs and emergent features scattered throughout the area, including Mischief Reef.

Ecological Significance of the Spratly Islands

The Spratly Islands are subject to a tropical climate. The average annual temperature is 27°C. During summer, from May to August, the high temperature is approximately 30°C while, in winter, the average temperature is about 25°C. The Spratlies experience a 7-month dry season and a 5-month rainy season, with an annual average rainfall of 1,800 to 2,200 millimeters. Southeast monsoon winds blow from March to April, and then shift to a southwest monsoon wind from May to November. Few of the islands have surface freshwater. However, on some, wells were successfully dug that, over the years, have provided a source of water to troops, tourists, and visiting fishermen. Thirteen islands, including Taiping Island, have terrestrial vegetation that indicates a significant degree of soil formation.[1]

Due to the remote distance and limited accessibility to the Spratly Islands, only a few surveys have been conducted during the past few decades. The earliest Taiwanese ecological inventory in Taiping Island was led by K. H. Chang with a group of experts from the Institute of Zoology, Academia Sinica (中央研究院) in 1980. They recorded 33 families and 173 species of fish within an 800-square-meter sea area south of Taiping Island. They published a fish guide book[2] and a fish checklist in a scientific journal.[3] In 1994, a group led by the National Museum of Marine Biology and Aquarium recorded 399 reef fish species from 49 families, 190 coral species from 69 genera from 25 families, 99 mollusk species,

91 invertebrate species from 72 genera, 27 crustacean species, 14 polychaete species, 4 echinoderm species, and 109 terrestrial vascular plant species. There were also 59 bird species observed, which indicates that Taiping Island is a major stop for migratory birds in East Asia.[4] According to BirdLife International (2001), the species mainly included streaked shearwater (*Calonectris leucomelas*), brown booby (*Sula leucogaster*), red-footed booby (*S. sula*), great crested tern (*Sterna bergii*), and white tern (*Gygis alba*).[5] Both the green turtle (*Chelonia mydas*) and the hawksbill turtle (*Eretmochelys imbricata*) were often reported to be nesting even on islands inhabited by military personnel in the Pratas and Spratly Islands, though their numbers have gradually declined.[6] The richness of marine biodiversity, spectacular coral reefs, and threatened species such as the crested tern and green turtle together add considerable value to Taiping Island as a future conditional ecotourism reserve.

The Spratly Islands hosts a high diversity of marine organisms. White included the islands as a priority area for marine conservation and management in 1983.[7] However, the importance of the island group to regional fisheries was identified in the early 1990s based on studies of water circulation relative to the presettlement pelagic times of coral reef fish.

Currently, there is a project evaluating whether Taiping Island should be established as a marine park, similar to the Pratas Islands (Dungsha) Group, which was successfully established as a Taiwanese National Marine Park in 2007.[8] In their expedition in June 2009, the project personnel added more records of terrestrial and marine species in Taiping Island.[9] For example, there were 40 newly recorded terrestrial invertebrate species, 3 newly recorded bird species, and 66 newly recorded fish species. However, they also noticed that many coral-eating crown-of-thorns starfish (*Acanthaster planci*) occurred in one station.

Along the coasts of the South China Sea, many of the coral reef fisheries are heavily overfished, especially along southern mainland China, Vietnam, Malaysia, and the Philippines. Harvests of adult fish are in decline. Coastal fish populations are periodically renewed via influxes of presettlement pelagic juveniles. Wyrtki determined that a cyclonic (counterclockwise) circulation predominates across the basin in the winter and an anticyclonic circulation (clockwise) caused by the annual shift in monsoon starting from the south in summer.[10] Various recent studies have confirmed that this general pattern does indeed exist, although a number of smaller subgyres and vortices also occur periodically.[11] Using the circulation charts of Wyrtki and a 24-day pelagic time determined from a compilation of published studies of various reef fish species, McManus determined that the seasonally shifting currents of the South China Sea could disperse presettlement fish from the Spratly Islands throughout the coasts of the South China Sea.[12] Some coasts could be reached within 24 days, while others could be reached in a process in which fish from the Spratly Islands settle on intermediate reefs and then pass in a second generation to the coast. This finding indicates the importance of the water area of Spratly Islands for conservation.

During the period 2000 to 2002, the WorldFish Center, along with Academia Sinica Taiwan and institutional partners from other neighboring countries, organized a collaborative project to examine interreef connectivity patterns by analyzing genetic groupings among marine organisms. The results showed that each genetic subgroup may include portions of the Spratly area.[13] This was consistent with the idea that juvenile pelagic fish could be transported from the Spratlies to rejuvenate dwindling populations around the region, including the reefs of Taiwan.

There have been many reports emanating from other investigations of the South China Sea, but few have focused on the Spratly Islands or specifically on Taiping Island. Thus, it is

also difficult to sort out the species of marine animals or plants from which collections were made. The *Raffles Bulletin of Zoology* from Singapore has devoted two issues to the South China Sea biomes and biodiversity.[14] They included comprehensive species checklists of marine fauna and flora as well as papers with newly recorded species.

Types and Severity of Threats

The South China Sea is the site of major fishing operations. According to the Global International Waters Assessment (GIWA), "Regional Assessment 54 South China Sea," the South China Sea ranks fourth among the world's 19 fishing zones with regard to total annual marine production.[15] However, unsustainable exploitation of fish has led to difficulty in finding adult fish of heavily exploited species in the region. China estimated that the total fishery production in the Spratly Islands was less than 7000 tons each year, about 0.3 tons per square kilometer.[16]

Between 1980 and 1990, the Taiwan Fisheries Research Institute collected harvests from experimental and commercial fishing vessels, and published reports on the fisheries potential and the situation in the Spratlies. For example, Wu investigated the marine environment, biological resources, and fishery resources around Taiping Island.[17] Chi and Huang both inventoried the fisheries of the Spratly Islands with the records of 20 families (72 species) and 45 families (245 species) of fishes.[18]

Since 1985, China, Vietnam, and the Philippines have upgraded their fisheries in the Spratly Islands to include large-scale explosive and cyanide fishing operations that have depleted the resources at a high speed. Additionally, the El Niño conditions in 1998–1999 and 2007–2008 caused short-term increases in water temperature, resulting in widespread coral bleaching and subsequent mortality. The combination of destructive fishing and coral bleaching has created a serious threat to the reef resources of the area.

Being bordered by some of the world's most rapidly industrializing countries, as well as being located amid some of the world's busiest shipping lanes, has proven detrimental to the island ecosystems in many ways. Concerns with political disputes, maximizing economic growth, and ensuring adequate energy supplies have taken precedence over the preservation of the bordering nations' common maritime environment. Although it is effectively the oceanic hub of Asia's industrial revolution, the Spratlies and other South China Sea islands have been and are being degraded by physical disruption of native flora and fauna, by overexploitation of natural resources such as guano and turtles, and by severe environmental pollution.

Marine Protected Area Development and Regional Cooperation

The Convention on Biological Diversity targets the establishment of 10% of marine protected area coverage throughout the world by 2012.[19] With regard to the Spratlies, transboundary protected area arrangements have often been proposed. There is a well-established precedent for these, although they are primarily in the form of parks on land. In 1988, the Commission on National Parks and Protected Areas of the International Union for the Conservation of Nature (IUCN) listed 70 protected areas in 65 countries that straddle national borders.[20] In 2007, there were 227 complexes surveyed by the United Nations Environment Programme (UNEP), including both terrestrial and marine.[21]

The conflicting territorial claims over parts of the South China Sea have not totally dampened cooperation among the claimant countries. Cooperative activities in the fields of marine scientific research, environmental protection, and defense are regularly carried out

on bilateral or multilateral bases. These have included two major expeditions in 2002 and 2004 under the auspices of the South China Sea Workshop series[22] and a joint scientific expedition between Vietnam and the Philippines in 2006. These and other studies are believed to have contributed to a certain degree of stability in the area as "confidence-building exercises," and gathered valuable information on the area's natural resources. The important question, however, is whether the present level of cooperation can be enhanced and extended to ensure natural resource stability in the South China Sea.

One option for regional cooperation that has often been proposed is the initiation of a Large Marine Ecosystem (LME) study. The LME concept was developed by the U.S. National Oceanic and Atmospheric Administration (NOAA) to agglomerate consensus, and to monitor and assess the changing of the world's coastal ecosystems. It is widely recognized that such an international cooperative study would improve international relationships and facilitate knowledge-based management of the South China Sea, although no such study has yet been initiated in the region.

Examples of Regional Joint Programs

The Philippines-Vietnam Joint Research in the South China Sea, 1996–2007

In 1994, the presidents of the Philippines and Vietnam signed a bilateral agreement to conduct a Joint Oceanographic and Marine Scientific Research Expedition in the South China Sea (JOMSRE-SCS). After 11 years of research, the findings on marine biodiversity showed that the Spratly Islands could be a source of coral propagules for destroyed reef areas in the southern and western Philippines. However, the densities of marine species associated with offshore coral reefs were found to have been drastically reduced, particularly in shallow waters where blast and poison fishing are common. The biomasses of target fish species in 2007 had been reduced to approximately one-third of their levels in the late 1990s. This project not only provided strong evidence that heavy exploitation of the fishery resources has occurred in the South China Sea, but also demonstrated a cooperative governance mechanism for larger-scale research, safety navigation, and conservation.[23]

UNEP/GEF South China Sea Project, 2002–2008

The UNEP/Global Environment Facility (GEF) funded the project Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand, which involved a partnership of seven countries bordering the South China Sea (Cambodia, China, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam). The project consisted of 59 organizations as a "networked institution," plus around 100 subcontracted institutions and more than 400 institutions involved through individual participation. An important by-product of this project is an interactive project Web site that serves as an information portal for 1,800 relevant documents and a metadatabase containing 1,428 entries.[24]

Coral Triangle Initiative

The Coral Triangle Initiative is an intergovernmental, multiply-sponsored, coordinated effort to improve the management of coral reefs and related resources.[25] It covers a triangular area previously determined to be high in coral diversity, encompassing Indonesia, the Philippines, Timor Leste, Papua New Guinea, and the Solomon Islands. The total area is approximately 18,000 square kilometers and includes, for many groups of organisms, the

richest species diversity in the world. This area hosts more than 600 species of coral, over 3,000 species of fish, and the world's largest mangrove forests.

The objective of the initiative is to protect the region's marine resources for future generations. In May 2009, six heads of state from the region met in Manado, North Sulawesi, Indonesia and signed a declaration approving the Coral Triangle Initiative.[26] Although there is no legal enforcement power, the whole process is based on strong political will among neighboring countries.

The Spratly Islands is located at the border of the Coral Triangle Initiative area as presently defined. Because of the demonstrated potential influence of the Spratly Island reefs on coral reef ecosystems within the initiative area, it would be rational to extend initiative resources to improve their protection. However, the sovereignty complexity and lack of research data might be an obstacle preventing this important archipelago from being included in the initiative's activities.

The Proposed Spratly Islands Marine Peace Park

The term *peace park* does not necessarily imply that it is sited within an area in conflict, although the term does indicate a propensity for this kind of protected area to reduce violent conflict and bring more harmony to a region.

The IUCN defined *parks for peace* as: "Transboundary protected areas that are formally dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and to the promotion of peace and cooperation."[27]

During the past century, many peace parks have been established around the world. The first was established between Canada and the United States in 1932, and named the Waterton-Glacier International Peace Park. Another milestone was the Red Sea Marine Peace Park, one of the most well-known examples of a marine peace park. The term refers to an area in the northern Gulf of Aqaba in which Israel and Jordan have developed a binational partnership to share natural resources and confront ecological pressure together. Some aspects of this park are under further development, including an extension into Egypt.[28]

In the South China Sea, the Spratly archipelago is characterized not only by territorial claimant disputes, but also by the multifaceted importance of waterways, fisheries, tourist value, and possible deposits of hydrocarbons. The process of gathering consensus among claimant countries is troublesome. Valencia et al. summarized the political situation and proposed various scenarios of international cooperation in the area.[29] They expressed the concern that making the whole area a marine park might be difficult because of, in addition to strategic military concerns, the strong interest in exploiting oil in the area. However, Townshend-Gault, summarizing the results of an international workshop on the South China Sea, pointed out that there was little evidence that substantial, economically extractable oil actually exists in the area, and reemphasized that the protection of the natural resources of the Spratly Islands was vital to maintaining fisheries and economically important ecosystems throughout the coastlines of the entire South China Sea.[30] Valencia and van Dyke replied, clarifying the view expressed in a 1997 book that the concerns about exploitation of oil were secondary to sovereignty and the strategic significance of the Spratlies in general.[31]

Strategic concerns and vague possibilities of hydrocarbon deposits have led each country in the region to station troops in the area, resulting in occasional violent confrontations and environmental stress. The feasibility of establishing a Marine Peace Park when originally proposed was enhanced by the high cost of military maintenance in the area. As

suggested by Valencia et al., confidence-building activities are important and could lead to a lessening of regional tension and to increased regional support for the marine park.[32] Scientific collaboration and the further development of economic trade would be helpful. In some cases, it might be easier to set up informal international activities by sponsoring participation in scientific and conservation activities by nongovernmental organizations (NGOs), rather than to concentrate efforts solely on sponsoring participation by representatives of governmental agencies. A concept for a full-area Spratly Island Marine Peace Park, which may have sounded unrealistic in 1994, gained substantial credibility by 2009 in a world that had come to understand the value of this approach.[33]

Following up on suggestions from previous investigators, McManus suggested that a treaty for the Spratlies might follow the leads of the 1959 Antarctic Treaty[34] and the 1978 Torres Strait Treaty[35] for raising the flag of truce and freezing ownership claims for a definite period, such as 50 years, with an option for review and indefinite renewal.[36] A possible management strategy might include five elements: (1) an international board of directors, (2) a contracted research and management institution, (3) a private ranger/air-sea rescue force, (4) tourism facilities, and (5) research facilities and programs.

The engaged countries would provide representatives and form a board of directors. A scientific research group with the extra function of planning for international collaboration on research programs in the area would be a good first step. Park management would involve monitoring activities in order to head off possible deterioration from such things as regional oil spills from tanker incidents, or diminishing supplies of larvae from other areas. An international organization might be contracted to oversee management and conduct activities such as air-sea rescue, charting, channel marking, and antipiracy enforcement. These suggestions are generally in keeping with the multiuse cooperation scenario presented in Valencia et al.,[37] with the exception of replacing their suggested "managed multi-use approach" with the more natural resource and regional fisheries protection oriented and tourism industry supportive full-area marine peace park.

Taiwan's Role in Working Toward a Spartly Island International Marine Peace Park

Taiwan's policy toward the South China Sea sovereignty was considered self-restrained and moderate from the 1970s to 1990s. In 2000, jurisdiction of the islands of the South China Sea shifted from the Ministry of National Defense to the newly established Coast Guard Administration, which is considered a law enforcement agency under the administration of the Executive Yuan. In 2007, Tungsha (the Pratas Islands) National Marine Park became the seventh national park in Taiwan. In 2008, former President Chen Shui-bian announced the Spratly Initiative at the opening ceremony for the airstrip on Taiping Island.[38] He was Taiwan's first president to set foot on Taiping Island. The Spratly Initiative is an ecofriendly invitation toward surrounding countries to cooperate in regional environmental protection and sustainable development.[39] President Ma also announced a marine policy to gradually open the South China Sea and cooperate with international conservation organizations for a Marine Peace Park in order to enhance positive interaction with neighboring countries, and to conserve ecosystem and cultural heritages.[40]

Neither a member of the United Nations nor of the Association of Southeast Asian Nations (ASEAN), Taiwan cannot join the Convention on Biological Diversity (CBD),[41] the Law of the Sea Convention,[42] and any other major political international organizations, except APEC and the International Council for Science (ICSU). This diplomatic impediment has limited Taiwan's participation in many international collaborations. However,

Beckman highlighted the importance of Taiwan's participation in regional cooperation because Taiwan occupies the largest island and is a major fishing entity in the South China Sea.[43] Recently, the relationship between Taiwan and China has greatly improved. In 2002, China and the ASEAN countries signed the breakthrough Declaration on the Conduct of Parties in the South China Sea,[44] which has helped to make the South China Sea relatively calm and peaceful. The signing in 2010 of the Economic Cooperation Framework Agreement (ECFA) between Taiwan and China[45] may give Taiwan a better chance to promote the Spratlies as an international Marine Peace Park.

Given Taiwan's significant capacity for biodiversity research, the following priorities are recommended for further activities.

1. Creating a taxonomy and compilation of fauna and flora of the South China Sea.
2. Establishing a long-term ecological research and monitoring program, including a centralized information portal that will make all data widely accessible in a Geographic Information System (GIS) format with real-time remote sensing data, links to onsite sensors and video systems, and the ability for users to explore scientific hypotheses and management action scenarios via online simulation systems.
3. Undertaking ecological community studies of both terrestrial and marine organisms as well as their metapopulation relationships such as the dependence of one reef system on the larvae washed in from a downstream reef (connectivity).
4. Conducting phylogeographical studies on selected groups of organisms (e.g., the relationships among taxonomic groups and their spatial distributions).
5. Undertaking population studies for certain important species in South China Sea.
6. Engaging in fishery resource analyses and simulations to guide sustainable use and conservation biology.
7. Ensuring other database integration, including links to the catalog of life (COL), barcode of life (BOL), encyclopedia of life (EOL), tree of life (TOL), ReefBase, FishBase, and expert's name lists.
8. Studying the effect of climate change on marine biodiversity, ecological connectivity and fisheries in the South China Sea.

The establishment of state-of-the-art marine stations at several islets would greatly facilitate the long-term research needed to unravel the complexities of South China Sea ecology. Sufficient research facilities and equipment including dry and wet labs, living accommodations, diving boats, and wireless Internet access will be essential to support this research. The research at these stations would benefit greatly by being open to international visiting scientists. As with the scientific exchange provisions of the Antarctic Treaty, a system for freely exchanging specimens, physical oceanographic observations, and ecological distribution data should be established based on agreements among collaborating countries. Gradually, opposing military installations could be supplanted with collaborating scientific research laboratories. Military and political disputes should be supplanted with scientific debates and jointly agreed, effective, natural resource management. Ultimately, it is envisioned that, under the guidance of an international natural resource management authority, any scientist or tourist would be able to enter any part of the Spratly Islands, passing in freely on vessels and aircraft from any international destination, and then move on to any other destination with no more difficulty than is found in traveling among the nations of the European Union.

Conclusion

The Spratly Islands have considerable ecological and biodiversity value, both intrinsically, and as the source of larvae for coastal ecosystems throughout the South China Sea. Sovereignty disputes have limited the implementation of effective measures to protect these resources from overexploitation and destructive fishing. Recently, strong support from some, including the government of Taiwan, has spurred renewed interest in the incorporation of the islands and surrounding waters into an international Marine Peace Park. Agreements associated with this park would include a freeze on claims and claim-supportive activities for a specified but renewable period of time, thus easing tensions and facilitating collaborative research and resource management activities. Whether it is achieved via a single agreement, or via the accumulation of nationally declared parks into a coordinated network, a Spratly Islands International Peace Park would be an achievement of considerable regional and global significance.

Notes

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37. Valencia et al., supra note 29, at 171–190.

38. See, generally, Song, supra note 22.

39. E. Hsiao, "Chen Urges Cooperation with 'Spratly Initiative,"' Taiwan Today, available at www.taiwantoday.tw/ct.asp?xItem=29848&CtNode=427 (accessed 1 March 2010).

40. See Song, supra note 22.

41. Convention on Biological Diversity, 1760 U.N.T.S. 79.

42. U.N. Convention on the Law of the Sea, 1833 U.N.T.S. 397.

43. R. Beckman, "Territorial Disputes in the South China Sea: A New Model of Cooperation," Straits Times, 4 June 2007, available at law.nus.edu.sg/news/archive/2007/ST040607.pdf (accessed 20 March 2010).

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