

## West Pacific Seamount Province

The ocean floor in the West Pacific is littered with seamounts, guyots, and atolls. Most of these already formed in the early Cretaceous, yet many still have surviving coral reefs, even tens of million of years after drowning. Paleomagnetic measurements show that these seamounts formed in the tropics between 10° S and 30° S, but despite their motion to the north over time due to Pacific Plate motions, these seamounts have remained within reach of the equatorial Pacific, explaining their sustained coral growth, which was able to keep track of the gradual subsidence of these aging volcanoes. The Western Pacific seamounts also are important fishing grounds for bottomfish and seamount groundfish. However, many seamounts experience overfishing, which is especially harmful because many lutjanid, serranid, and lethrinid species (and their larvae) only appear in isolated groups that differ per seamount without many interconnections. Overfishing thus easily disrupts the ecosystems on the seamounts, making reestablishment of some fish stands slow to impossible. Protection of these seamount fish stocks from environmentally destructive fishing therefore is paramount in keeping the seamount fish populations healthy.

### FURTHER READING

- Menard, H. W. 1986. *The ocean of truth: a personal history of global tectonics*. Princeton, NJ: Princeton University Press.
- Menard, H. W., and H. S. Ladd. 1963. Oceanic islands, seamounts, guyots and atolls, in *The sea*, Vol. 3. M. N. Hill, ed. New York: Wiley & Sons, 365–387.
- Nunn, P.D. 1994. *Oceanic islands*. Oxford: Blackwell Publishers.
- Wegener, A. 1915. *Die Entstehung der Kontinente und Ozeane*. Braunschweig: Sammlung Vieweg Heft.

## PALAU

### ALAN R. OLSEN

*Belau National Museum, Koror, Palau*

Located in the western equatorial Pacific Ocean, Palau is the westernmost group of islands in Micronesia. The archipelago rests on the eastern edge of the continental shelf of the Philippine Plate, approximately 800 km east of Mindanao. Palau is a mixture of old volcanic islands, raised limestone islands, coralline platform islands, and atolls representing an exposed crest of the now-dormant southern section of the Palau–Kyushu Ridge. It is estimated that the

volcanic islands emerged approximately 30 million years ago during the late Oligocene.

### GEOGRAPHY

Palau, approximately 7°30' N latitude and 134°35' E longitude, extends northeast to southwest for 700 km, with over 500 islands and an estimated total land area of 450 km<sup>2</sup>. One island, Babeldaob, accounts for 75% of the land area. The climate is wet tropical, with annual rainfall of 350–450 cm, temperatures of 22–32 °C, and relative humidity averaging 82%.

A coral barrier reef system surrounds five central islands—from north to south, Babeldaob, Koror, Arakabesan, Malakal, and Peleliu—in a lagoon that covers over 1,000 km<sup>2</sup>. Hundreds of small raised coralline limestone islands are distributed throughout the southern lagoon. These are the famous (and photogenic) Rock Islands of Palau, which are a popular tourist attraction (Fig. 1).



**FIGURE 1** One of Palau's famous rock islands. These raised limestone formations are found throughout the southern lagoon. Photograph by Milang Eberdong.

To the south, the platform island of Angaur is separated from the lagoon by a deep channel. Five small remote platform islands occur 300–600 km southwest of the lagoon: Fanna, Sonsorol, Merir, Pulo Anna, and Tobi. There are three atolls: Ngeruangel and Kayangel lie north of the lagoon and Helen Reef is south of Tobi Island. Helen Reef is a protected sanctuary for coral reefs, marine turtle nests, and seabird rookeries.

### HISTORY AND CULTURE

According to archeological evidence, Palau was settled 1000–3000 years ago. The exact origins of modern Palauans are subject to debate. Palau's matrilineal culture retains its language and many ancient traditions, which

are distinct from others in Micronesia. The people of the remote southwest islands are distinct from other Palauans, having cultural and linguistic affinities with the peoples of central Micronesia.

The Spaniard Ruiz Lopez de Villalobos made first European contact in 1543. The Englishman Henry Wilson was shipwrecked in Palau in 1783, leading the British Empire to claim Palau. In 1885, Pope Leo XIII restored the islands to Spain, which sold Palau to Germany in 1899. At the end of World War I, Palau was ceded to Japan and then to the United States of America following World War II. Palau became independent on October 1, 1994. Currently, there are 20,000 Palauans, the majority living on the central volcanic islands.

## BIODIVERSITY

Palau has many types of marine habitats that support a diversity of life. In addition to 235 km of coral barrier reef, there are coral fringing reefs and mangrove forests associated with many islands. Over 50 marine lakes are located in the interiors of various rock islands. These unusual lakes are connected to the lagoon by fissures and tunnels in the limestone rock. Some of the lakes contain unusual fauna such as Palau's golden medusa (*Mastigias* sp.) jellyfish, which have algae incorporated into their tissues. The algae provide a portion of the medusas' nutritional needs through photosynthesis.

Palau's marine biodiversity is reflected in the 385 species of reef-building corals found there. Marine fauna includes an endemic nautilus (*Nautilus belauensis*), sea skaters (*Halobates*), 1450 species of fish, and breeding populations of green turtles (*Chelonia mydas*), hawksbill turtles (*Eretmochelys imbricata*), saltwater crocodiles (*Crocodylus porosus*), and endangered dugongs (*Dugong dugon*).

Terrestrial habitats include a freshwater lake, rivers, tropical rain forests, swamp forests, and savannas. Palau's terrestrial habitats are largely undisturbed, with little deforestation. For the most part, the terrestrial flora and fauna have affinities with the biota of the large land masses in the Philippines and Indonesia with minor influences from Australia, Papua New Guinea, and Polynesia.

Terrestrial biodiversity encompasses an estimated 1200 species of plants, an estimated 10,000 invertebrates, 38 reptiles, and the only endemic frog (*Platymantis pelewensis*) in Micronesia. The avifauna numbers 148 recognized species, with 11 endemic landbirds. Palau harbors populations of the Micronesian megapode (*Megapodius laperouse*), an endangered mound-building forest bird extinct throughout much of its original range in Micronesia. There are two bats: the Pacific sheath-tailed bat (*Emballonura semi-*

*caudata*) and the Micronesian flying fox (*Pteropus mariannus*). An endemic bat, *Pteropus pilosus*, is believed extinct.

Palau has an active conservation program that includes marine protected areas, a protected area network, ecosystem-based management initiatives, important bird areas and ecosystem management plans for the southern lagoon, and other important areas. There are active programs to monitor coral reefs, crocodiles, dugongs, forest birds, and sea turtles. The Micronesia Challenge, which was recently issued through the Convention on Biological Diversity in 2006, is a regional conservation initiative that originated in Palau.

## FOLKLORE: AN UNUSUAL ICON

Interestingly, a spider is identified with a benevolent demigod who is central to the folklore of Palau's matrilineal society. Palauan folklore features a cycle of myths centered on an unusual demigod, Mengidabrudkoel, who transformed from spider into human form to introduce traditional rituals to Palau such as those involving child-birth. Among the many man-spider legends is a popular tale of a mythical island where Mengidabrudkoel planted a magical breadfruit tree that yielded a fish when a branch was broken off. Greedy villagers chopped down the tree expecting to reap a bounty of fish. Instead, a flood of ocean water poured from the tree stump to sink the entire island under the sea. Another legend in the cycle resembles the biblical account of Jonah and the whale.

Spider imagery is firmly embedded in modern Palauan society, with ubiquitous icons of spiders appearing in architecture, art, handicrafts, postal stamps, textiles, and logos of government agencies and athletic organizations. Palau's giant golden orb-weaver (*Nephila pilipes*) (Fig. 2),



FIGURE 2 Palau's giant golden orb-weaver, *Nephila pilipes*, is found throughout Palau except the southwest islands. Photograph by Alan R. Olsen.

a 15-cm spider, is the living symbol of the demigod and bears the vernacular name *mengidarudkoel*. The English name alludes to the golden hue of its 3-m web.

#### SEE ALSO THE FOLLOWING ARTICLES

Archaeology / Marine Lakes / Reef Ecology and Conservation

#### FURTHER READING

- Colin, P.L., and A. C. Arneson. 1995. *Tropical Pacific invertebrates*. Beverly Hills, CA: Coral Reef Press.
- Colin, P.L. 2007. *Marine environments of Palau*. Koror, Palau: Indo-Pacific Press.
- Crombie, R. I., and G. K. Pregill. 1999. A checklist of the herpetofauna of the Palau Islands (Republic of Palau), Oceania. *Herpetological Monographs* 13: 29–80.
- Force, R. W., and M. Force. 1972. *Just one house: a description and analysis of kinship in the Palau Islands*. Bernice P. Bishop Museum Bulletin 235.
- Kayanne, H., ed. 2007. *Coral reefs of Palau*. Koror, Palau: Palau International Coral Reef Center.
- McManus, Fr. E. G. 1977. *Palauan-English dictionary*. J.S. Josephs, ed. PALI Language Texts: Micronesia. Honolulu, HI: University Press of Hawaii.
- Wiles, G. J. 2005. A checklist of the birds and mammals of Micronesia. *Micronesica* 38: 141–189.

#### PANTELLERIA

SEE MEDITERRANEAN REGION

## PANTEPUI

#### VALENTÍ RULL

*Botanic Institute of Barcelona, Spain*

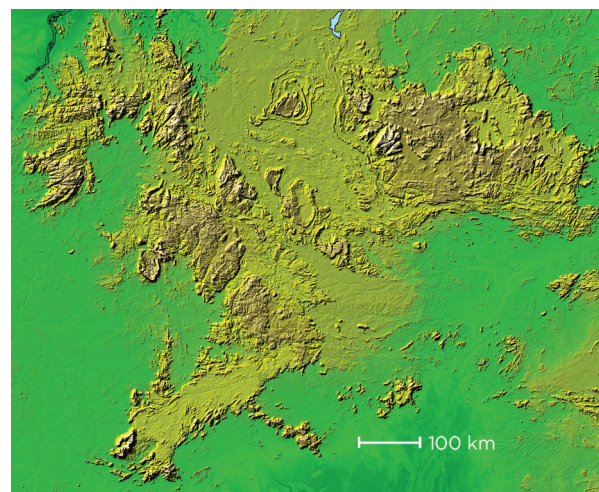
Pantepui (*pan*, Greek for “all,” and *tepuí*, South American indigenous name for “table mountains”) is a discontinuous biogeographical entity shaped by the assemblage of the flat-topped summits of the Guayana (northern South America) table mountains, or Guayana Highlands (Figs. 1 and 2), above 1500 m in altitude. These summits are isolated from each other and from the surrounding lowlands by spectacular vertical cliffs, and they hold a singular biota with unique adaptations and amazing levels of biodiversity and endemism. The origin of such biotic patterns is a still-unresolved evolutionary enigma.

#### THE TEPUIS

The indigenous (Pemón) word *tepuí*, meaning “stone bud,” has been adopted as a physiographical term to name the table mountains of the Guayana Highlands (e.g., Auyán-tepuí). A typical tepui is a tabular moun-



**FIGURE 1** Radar view of northern South America showing the placement of the Guayana highlands (GH) region, with respect to the Orinoco and Amazon basins, and the Andean range. (Image courtesy of NASA/JPL Caltech.)



**FIGURE 2** Close-up view of the Guayana highlands, showing this area's characteristic tabular topography, composed of several erosion surfaces and culminated by the tepuis. Lowlands (100–500 m altitude) are in green and yellow, whereas uplands and highlands (500–1500 and 1500–3000 m, respectively) are in light brown. (Image courtesy of NASA/JPL Caltech.)

tain made of sandstones and quartzites (with occasional intrusive rocks, mostly diabases), with a more-or-less flat summit limited by a rim, and isolated from the surrounding lowlands by vertical escarpments in the upper part and steep talus slopes in the foothills (Fig. 3). To understand the origin of the tepuis, it is necessary to go back to the Cretaceous (145 to 65 million years ago), when Africa and South America were joined in the Gondwana supercontinent. The separation began around 80–100 million years ago and determined the initial opening of the Atlantic Ocean, which led to the formation of the huge Amazon and Orinoco basins, among others. By that time, the Guayana region was covered by extensive erosional plains modeled on the Precambrian sandstones and quartzites of the Roraima