



The Floating World of The

LIFEBLOOD OF THE ANCIENT KHMER EMPIRE, CAMBODIA'S GREAT LAKE HAS FOR CENTURIES NOURISHED RICE FIELDS, WETLANDS, AND A UNIQUE WAY OF LIFE. BUT CAN THIS FRAGILE ECOSYSTEM SURVIVE THE ENVIRONMENTAL PRESSURES OF THE MODERN AGE?

By **Christopher R. Cox**
Photographs by Martin Westlake

Tonle

Sap

GOING WITH THE FLOW Boats at sunrise off Chong Kneas, a floating village of 1,000 families that serves as Siem Reap's port.



THE SIGHTS OF CHONG KNEAS—grade school and police station, temple and morning market—are the standard inventory of any large, rural Cambodian community. But in this bustling village south of Siem Reap there is a remarkable difference: every structure, including bars and billiards halls, even animal pens and vegetable gardens, floats on a boat or a barge or a raft. A settlement of 1,000 families, Chong Kneas is hardly settled at all; it literally shifts with the seasons, borne across Southeast Asia’s largest lake, the Tonle Sap (pronounced “tohn-lay sab”), by the fluid rhythms of a great annual flood.

More than any other country in the region, Cambodia is sustained by water. For more than a millennium, the kingdom has depended on a unique natural phenomenon: a monsoon-fed inundation that irrigates the country’s heartland and nurtures one of the world’s richest fisheries.

“It’s a very special place,” says Laurent Holdener, the Khmer-Swiss owner of Terre Cambodge, a local outfitter that runs boat tours of the Tonle Sap. “All the life and ecosystems are adapted to these conditions.”

One has only to visit the 12th-century Bayon temple in nearby Angkor to sense the deep, abiding connection between the Cambodian people and the Tonle Sap, or “Great Lake.” That the Khmer empire flourished here was no coincidence; in addition to supporting 200-plus fish species, the abundant lake and its

tributaries watered thousands of hectares of rice paddy and filled enormous reservoirs that could weather any drought. The Bayon’s southeastern galleries are covered with exquisite bas-relief carvings commemorating daily life on the lake: fishermen casting a net; women selling the catch; fish and turtles swimming among the submerged trees of the seasonally flooded forest. The sandstone sculptures, which feature such rare creatures as Siamese crocodiles (now all but extinct in the wild) and saurus cranes, also celebrate the rich—and fragile—biodiversity of this waterland.

“The Bayon reliefs are an amazing testimony to the importance of the lake in terms of resources for building Angkor into an economic power,” says Frederic Goes, cofounder of Osmose, a Siem Reap–based NGO working to conserve the Tonle Sap’s natural bounty.

More than 800 years after the Bayon’s completion, the lake remains the nation’s lifeblood.

VILLAGE VIGNETTES Above, from left: Residents of Peak Kantel, one of the lake’s many floating villages; dried lake shrimp. Opposite: Overlooking Prek Toal.

FOLLOW THE LAKE Road south from Siem Reap and the shophouses of the town’s old quarter soon give way to a floodplain of rice fields. Stilted houses cling to the steep slopes of a lone,

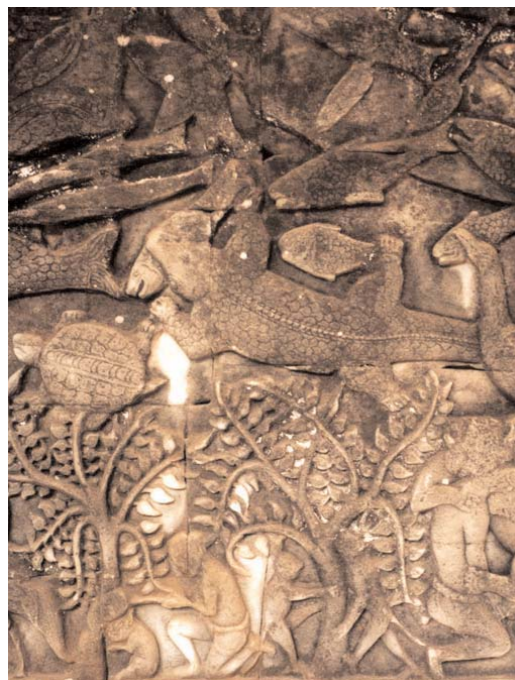
elevated causeway that runs 12 kilometers to Phnom Krom, a temple-topped mountain overlooking Chong Kneas. During the wet season, this 137-meter rise provides a scenic backdrop for the floating village, which serves as Siem Reap’s port. Come April and May, the nadir of the dry, hot season, the shoreline—and Chong Kneas with it—retreats an incredible eight kilometers farther south.

The Tonle Sap, which formed as an isolated lake about 15,000 years ago, is one of the hydrological wonders of the world. Just 5,000 years



WATER WORLD Clockwise from above: Chong Kneas' floating church. Opposite; a Khmer fisherman; Chong Kneas; breakfast on the lake. Opposite: A lone Prek Toal ranger.





ago, a warming climate and rising sea levels helped carve a 100-kilometer-long channel, the Tonle Sap River, that linked the lake to the Mekong River. During the summer monsoon, the water level of the rain-swollen Mekong rises so precipitously that part of the torrent veers west into the Tonle Sap River, actually *reversing* the tributary's current. Fed by a watershed extending across Indochina, the floodwaters roll upstream and then spill into the shallow lake, which is barely one meter deep during the drought. By September, when the deluge is at its peak, the level of the Tonle Sap rises 10 meters. Its surface area nearly quintuples its dry-season size, growing from 2,500 to 12,000 square kilometers, making it the largest freshwater floodplain lake in the world.

When the rains stop, the current of the Tonle Sap River reverses course once again and flows down to Phnom Penh, where it joins the Mekong. Scores of migratory fish species move from the shrinking lake into the big river, and the receding waters leave behind seasonal ponds and rich deposits of silt that have transformed the lake basin into Cambodia's rice bowl.

This yearly miracle is ingrained in Khmer culture.

One of the kingdom's biggest holidays is Bon Om Tuk, a November water festival complete with boat races in Phnom Penh and Siem Reap that celebrates the Tonle Sap's reversal. Yet the lake's superlatives extend far beyond its sheer size and fluctuations. An estimated 3.5 million people live on the floodplain, including 80,000 who are permanent lake residents. Besides Chong Kneas, 170 villages float upon this watery world. Among them are the sizable communities of Kompong Phluk, about 25 kilometers southeast of Siem Reap, and Prek Toal, on the south shore of the lake. They all owe their

continued existence to one of the world's most prolific freshwater fisheries. Several hundred thousand tons of fish are hauled from the lake every year, about 70 percent of Cambodia's national catch.

In Chong Kneas, hundreds of subsistence fishermen like 48-year-old Guon Let tend homemade bamboo traps and cast small nets to catch "white fish" (migratory species including the Mekong giant catfish, which can exceed three meters in length) and "black fish" (resident species like the resilient snakehead, which can survive drought conditions and even cross dry land in search of water). Smaller fishes such as *trey riel* are dried, salted, and fermented into *prahok*, a pungent paste that is a staple of rural Cambodian cooking. Over the southern horizon, the sprawling floodplain of Battambang province has been systematically divided into fishing lots. There, the fishing is on an industrial scale, with massive pens, weirs, and dip nets.

To visitors, the hundreds of watercraft of Chong Kneas may seem haphazardly scattered across the shimmering surface of the Tonle Sap. But the village is highly organized and families return to the same moorings, which are marked with pilings, every year. The floating houses range from substantial barges with fresh paint and wraparound verandas to austere sampans with woven-bamboo awnings and small braziers on their bows. Guon lives on a small barge that his wife, Sambath, has decorated with potted plants, including a tiny lime tree. In an adjacent floating pen, he raises

LAKE LIFE Above, from left: A Bayon bas-relief; market day at Chong Kneas. Opposite: Paddling through the submerged forest at Kompong Phluk.





Siamese crocodiles for meat and hides. The reptiles are fed water snakes, part of the five million serpents caught every year on the Tonle Sap—the largest such harvest in the world. Many of Guon’s neighbors have floating pigsties and vegetable gardens. As evidenced by a nearby floating Catholic church, Chong Kneas also has a substantial minority of Vietnamese, who have historically been the lake’s most accomplished fishermen, though ethnic persecution by the Khmer Rouge decimated the population.

“We don’t have any problems now,” Sambath says. “We stay in different areas. But we can work together.”

THAT WASN’T THE CASE IN KOMPONG PHLUK, A village of 500 families that lies 10 kilometers due south of Roluos. Best known for its ninth-century pre-Angkor ruins, Roluos was a haven for the Khmer Rouge well into the 1990s. So frequent and vicious were the guerrilla attacks on Kompong Phluk’s ethnic Vietnamese that the population fled permanently, leaving only Khmer—an anomaly, since most villages surrounding the Tonle Sap are a mix of Khmer and minority groups of Vietnamese and even Cham, a Muslim seafaring people who migrated from the central coast of Vietnam to the lake more than 500 years ago.

Another distinctive feature of the village is its permanent location. Unlike Chong Kneas, the homes of Kompong Phluk are all fixed to stilts and pilings. In the wet season, the lake water laps

against the floorboards; during the dry months, the structures teeter as much as seven meters above ground.

It’s November when Holdener paddles our pirogue through a forest of half-drowned trees standing between Kompong Phluk and the open lake. The water has begun its slow, inexorable drop and fish pens and low-hanging boughs hamper our progress. Somewhere through the tangle floats the chatter of macaque monkeys and the quavering call of a Brahminy kite. I can make out leaf-filled branches beneath the lake’s surface. Here, the water is so clear that trees

continue to photosynthesize and to fruit, providing fish with an abundant arboreal feast.

“In the dry season you can walk in this forest,” Holdener remarks. “This village is special, because the forest here is protected and watched by the people. They understand that if they cut these trees it will be a big problem for them: no more fish, no protection from the waves.”

HOUSE PROUD Above, from left: Royal portraits and family photos adorn a home; Kompong Phluk’s stilted houses. Opposite: A fisherwoman in Peak Kantel.

According to Goes, the only comparable ecosystem to this waterlogged place—technically, a seasonally flooded freshwater swamp forest—is the floodplain of the Amazon. Yet despite the lake’s immensity, it can seem an underwhelming place at first blush. It’s only after several visits, at different times of the year, that a full appreciation is possible. Unlike timeless Angkor, every Tonle Sap encounter varies: access, activities, smells, wildlife.

“That’s the main personality of the lake, this tremendous change,” says Goes. “That’s something that’s very different than Angkor. You go to Angkor in any season and it’s more or less the same experience. But the lake can be completely different.”

If there are tourists (Continued on page 126)

(Continued from page 93) with an appreciation for the Tonle Sap, chances are they're birdwatchers. Where there are fish there will be winged predators, and the lake has some of the largest waterbird colonies in mainland Southeast Asia. The grasslands of Kompong Thom province northeast of the lake support the critically endangered Bengal florican, a long-legged member of the bustard family. The flooded forest near Prek Toal is the only viable refuge for seven globally threatened species, including the greater adjutant, giant ibis, milky stork, and spot-billed pelican. It's no wonder Goes calls the place "the bird factory": darters and little cormorants gather in August and September, the peak of the flood, to breed. Pelicans arrive in November, followed by wading birds such as storks and adjutants. There's no peace and quiet in these huge, squawking colonies until the birds disperse in May and June.

Recognizing its ecological, economic, and cultural value, UNESCO designated the entire lake an international biosphere reserve in 1997. Three core areas of seasonally inundated forest, including Prek Toal, protect the bird rookeries as well as habitats for endangered mammals like hairy-nosed otters and silvered langurs. The Wildlife Conservation Society, a New York-based NGO, then created a bird-monitoring program and hired villagers from Prek Toal as rangers. Not coincidentally, half this team of local bird experts had previously toiled as egg collectors. Since their employment by the WCS, however, poaching has been completely eradicated from the 31,282-hectare preserve.

Thanks to its relative proximity to Angkor and the hotels of Siem Reap, Prek Toal, reachable via a 75-minute speedboat ride from Chong Kneas, has attracted a small but growing number of birders and ecotourists. One hundred local families benefit from the WCS project through employment as rangers or guides or the sale of handicrafts.

That's not the only income derived from this healthy swamp forest. Prek Toal also happens to hold the richest fishing

concession on the entire lake. Under a system formalized by the French a century ago, close to 5,000 square kilometers of the floodplain are leased to private businessmen, who build bamboo fences that stretch for kilometers to corral and channel fish into pens and traps, where they are harvested and often exported to Thailand. The Prek Toal Core Area rests completely inside the largest concession, Fishing Lot No. 2, which covers more than 500 square kilometers. The forest here has actually been protected by the concession, since many of the fish species depend on the nutrients in the leaves and fruit shed by the trees. Public access is limited, as is the cutting of timber.

"The habitat is the most pristine you can find on the lake," Goes enthuses. "There are many large trees, which are the best sites for birds. And it's the most productive fishing ground."

DESPITE SUCCESS STORIES SUCH AS Prek Toal, this singular lake now confronts a host of problems that threaten not only wildlife but the very welfare of the Tonle Sap and the millions of people who depend on its resources.

Cambodia's growing population and the region's robust economy have placed enormous pressure on the lake. Simply put, there's too much fishing with too much sophisticated equipment, and too little access to prime spots for people like Guon. The choicest locations are leased to powerful businessmen and the politically connected. There is also no quota system to ensure the fishery's sustainability.

"It's not easy," says Guon, who must travel several kilometers into the open lake to cast his nets. "Right now, it's hard to catch fish because there are more people and not so many fish."

He adds, "The people who have money, they buy a big net. But I cannot afford to buy a big net. It's not a big business for me; just for living."

On a good day Guon nets just three or four kilograms of fish—enough only to feed

a family with five children, plus a small surplus to sell for staples such as vegetables, rice, and, as the lake is too polluted near Chong Kneas to be potable, drinking water.

In 2000, Prime Minister Hun Sen attempted to reform the concession process by reducing the fishing-lot areas by more than 50 percent and releasing the land to community fisheries. The initiative helped Cambodia's inland fish catch to quickly quadruple, from 85,600 tons in 2000 to 344,800 tons in 2003. But according to the most current statistics, the haul fell sharply in 2004, to 250,000 tons. Overfishing is an obvious culprit. The lack of environmental regulations and local-level management expertise has also resulted in widespread degradation of these once-fertile forests, which were denuded for firewood and charcoal. Fish stocks can recover if their habitat remains healthy, says Goes, "but once you start to destroy that base, then you get in trouble."

Last year at a special forum on the Tonle Sap, Hun Sen told the gathering, "The lake is facing a serious threat of over-exploitation and its ecosystem has become quite fragile."

Honestly, if this problem is not addressed decisively and soon, Cambodia could face a serious environmental disaster."

Guon, however, doesn't need a symposium to know that his nets are increasingly barren.

Further threats come in the form of fertilizer and pesticide runoff from the ever-expanding paddy lands. Only about 30 percent remains of the floodplain's original one-million-hectare forest cover, and a further one percent is cleared and burned every year for farming. This conversion may soon spell the extinction of the Bengal florican. Less than 1,000 birds remain, all in a small enclave in northern India and the grasslands of Kompong Thom, its last stronghold, which are being cleared for rice fields at an alarming rate. A British NGO, BirdLife International, has begun a conservation campaign to rescue the species, which could vanish completely in just a few years.

Other potential troubles have international implications. Goes is most concerned about the hydroelectric projects being built on the Mekong in southern



TONLE SAP

China and the dams erected across several major Mekong tributaries in Laos. Fishermen in northern Thailand have reported drastic declines in their catches because of the alteration in river levels. How will these massive, multiple impoundments affect the fluctuation of the Tonle Sap?

“That’s a big question that nobody knows exactly the answer to,” says Goes. “We don’t understand much about this ecosystem, but we do know that what makes the lake so productive is the interaction between this forest habitat and the amplitude and timing of these regular floods. Most people suspect the dams will create a disaster. How and at what scale that disaster will be, it’s difficult to tell.”

Holdener, who has sailed the lake for a decade, has noticed a sea change.

“I can see the difference as I navigate with my boat,” he says. “I remember some areas where we could jump in the water and not touch the bottom. Now it’s easy. Every month of the year we can touch bottom. There is less water, for sure.”

In the late spring of 2004, when the maximum dry-season depth measured less than one meter—the lowest on record—the lake was not even navigable for most boats. The same year, relates Goes, Chinese engineers completed a second big dam on the Mekong, and the normal discharge was retained to fill its reservoir. In years to come, the dams will have a further hydrological effect. Most likely the Tonle Sap’s dry-season minimum level will increase, by perhaps 40 centimeters, as water is released upstream to spin hydroelectric turbines.

“It could be damaging to this ring of tall gallery forest around the lake,” says Goes. “But nobody knows. If the trees are always one foot under water, will they survive or not?”

A more predictable—and more serious—impact of the dams is that these structures trap sediment. With reduced silt deposits, riverbank erosion will be exacerbated. And the loss of nutrients within this detritus—the foundation of the Tonle Sap food chain—will spell a sharp decline in biological productivity.

The Tonle Sap’s dilemma may be a portent of water-rights crises to come this century, as consumption, agriculture, and energy demands make fresh water an increasingly valuable commodity. What claim does a small, developing country like Cambodia have to a critical natural resource largely controlled by another nation, in this case the emerging superpower China, with its own agenda for development? While the upper course of the Mekong flows through China, the country is not a member of the multinational Mekong River Commission; so far it’s paid only lip service to the ecological concerns of its downstream neighbors. The development of an eight-dam cascade continues.

“They don’t care,” says Goes.

If that’s the case, a way of life that has existed for 1,000 years could soon vanish, leaving only the bas-relief panels of the Bayon as testament to the lost, flooded world of the Tonle Sap. Chong Kneas may shift with the seasons, but it can’t dodge an environmental disaster.

“The lake would become dry,” says Guon, “because the Chinese will keep the water by building more dams. It’s hard to live if there’s no water. I cannot fish

anymore. I would have to move to the town. I don’t know what work I would do. Maybe become a farmer.”

The fourth-generation fisherman grows pensive, regarding a horizon where the hazy sky melds into the vast inland sea.

“If Chong Kneas still has water, I will live here,” he says. “If there’s no water, I have to change. There is no choice.” ©

Fact File

Tonle Sap

GETTING THERE

Depending on the season, the lake is anywhere from 12 to 20 kilometers south of Siem Reap, the gateway town to Cambodia’s Angkor temple complex. Daily flights connect Siem Reap with Bangkok (**Bangkok Airlines**; *bangkokair.com*), Kuala Lumpur (**Air Asia**; *airasia.com*), Singapore (**Silk Air**; *silkair.net*), and Ho Chi Minh City (**Vietnam Airlines**; *vietnamairlines.com*).

WHEN TO GO

The best time to visit is December through January, when the weather is at its driest and coolest. The Tonle Sap’s water level is still high enough during these months for large boats, while the mixed bird colonies are at their peak. During the dry season, lake access may be limited to a handful of villages, like Chong Kneas.

WHERE TO STAY

Tourist-savvy Siem Reap has a good range of accommodation, from single-room boutique lodgings at **One Hotel Angkor** (*The Passage, Old Market*; 855-12/755-311; *theonehotel*

angkor.com; US\$250 a night) to the 238-room **Sofitel Phokeethra Royal Angkor** (*Vithei Charles de Gaulle*; 855-63/963-591; *sofitel.com*; doubles from US\$468), where the amenities include a golf course and spa. For a taste of colonial-era grandeur, check into the **Raffles Grand Hotel d’Angkor** (*1 Vithei Charles de Gaulle*; 855-63/963-888; *siemreap.affles.com*; doubles from US\$360).

WHERE TO EAT

Lake fish can be found on numerous restaurant menus in Siem Reap. At Hôtel de la Paix’s sleek dining room **Meris** (*Sivutha Blvd.*; 855-63/966-000), chef Joannes Riviere gets high marks for his seasonal Khmer specialties, which include grilled *prahok* (fish paste) with crudités and catfish steamed in banana leaves.

WHAT TO DO

Laurent Holdener of **Terre Cambodge** (*terrecambodge.com*; 855-63/964-391) offers day trips by boat to Kampong Phluk and its flooded forest from July to January; multiday lake expeditions can also be arranged. Local NGO **Osmose** (*osmosetonlesap.net*; 855-12/832-812) organizes day trips and overnight stays in Prek Toal, with bird-watching at the adjacent UN Biosphere Reserve from November to March. Almost any tour company in Siem Reap can arrange a boat tour of Chong Kneas throughout the year; they can also book scheduled passenger boats from Chong Kneas to Phnom Penh and Battambang.

