caused rapid decline or depletion of the nutrient pool in the peat soil that would not likely to be fully compensated through recycling, particularly after harvesting of trunks. Thus, an appropriate fertilization programme should be developed to continuously replenish the pool.

Peat soil

Reference

Nitta, Y., Yoshida, G.M. and Jong, F.S. 1999. The growth of sago palm on tropical peat in relation to micro-nutrient requirements, Ibaraki University-Kochi University-Tohoku University P.T. National Timber on site Sago Research Report. 44 pp.

Toxicity of the Yellow Puffer Fish *Xenopterus naritus* from Sungai Saribas, Sarawak

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Despite common fish poisoning problem, puffer fish is still considered as a delicacy in Japan and China. Most of the poisoning cases occur after consuming marine puffer fish species. The principle toxin exists in puffer fish is known as tetradotoxin (TTX). In freshwater puffer fish species, paralytic shellfish toxins (PSTs) have also been detected besides the TTX. Studies have shown that the highest toxin content was found in the skin, followed by gonad, muscle, liver and intestine.

In Saribas River, Sarawak, the yellow puffer fish (*Xenopterus naritus*) is normally found in abundance during the month of August, which probably coincided with its spawning season. The villagers of Kampung Manggut, a village along the Saribas River, consume this fish as a local delicacy. Although mild poisoning was reported among villagers from time to time, there has never been any life-threatening situation. Due to the increasing trend of puffer fish consumption in this area, it is desirable to elucidate the toxicity as well as determine the toxin principle of this fish. Six samples (5 females and 1 male) were analysed using Mouse Bioassay method. The result showed that samples (muscle, skin, liver and gonad) had very low toxicity, in the range of 0.7- 4.5 MU/g or less than 10 MU/g. This level is considered as non-toxic based on Tani Classification of Puffer Fish Toxicity in Japan (Table 1). The presence of TTX and its derivatives was confirmed with Liquid Chromatography/Mass Spectrometry (LC/MS) analysis. The highest toxin concentration was found in the liver whereas the lowest was in the skin. Since this study only involved a very limited number of samples, the presence of highly toxic individuals in Saribas River could not be ruled out. Therefore, there is a need to examine more samples in the future order to obtain a clear picture of the toxicity level of this species.

Table 1: Tani Classification of Puffer Fish Toxicity in Japan (Tani, 1945)

Category	Toxin concentration (MU/g)	Level of toxicity
I	>1000	extremely toxic
II	100-1000	moderately toxic
III	10-100	weakly toxic
IV	< 10	non-toxic

There has never been any report related to puffer fish poisoning in Malaysia. The real reason behind this is still unclear. However, we thought that there are two possible reasons either: (i) general awareness about the presence of natural toxin in certain organisms has deterred people from consuming those organisms, or (ii) difficulty in distinguishing between puffer fish poisoning and bacterial-related poisoning. For safety reason, there is an urgent need to carry out comprehensive studies related to puffer fish poisoning, particularly in Sarawak.

Reference

Tani, I. 1945 *Toxicological Studies In Japanese Puffers*. TeikokuTosho, Tokyo. pp1-103.

Peacock Bass Fish Invasion in Malaysian Waters

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The peacock bass is of group native freshwater fish to South America including the Orinoco, Negro and Amazon River basins. This popular game fish belongs to the order Perciformes, family Cichlidae and genus *Cichla*. Although there are many color variations throughout their range, the genus *Cichla* is represented by five species: *Cichla ocellaris, Cichla monoculus, Cichla temensis Cichla orinocencis* and *Cichla intermedia*. These species are easily identified by the dark vertical bars on the flanks and the peacock 'eye' on the tail fin of adults. Their coloration is olive-green dorsally fading to yellow-white ventrally, with three dark bars on their sides, between which are a series of dark spots. The first dorsal, upper caudal, and pectoral fins are gray or black, the anal, pelvics and the lower caudal fins are red. White spots are present on the second dorsal and the upper lobe of the caudal fin. Large adults have a yellow-orange stripe