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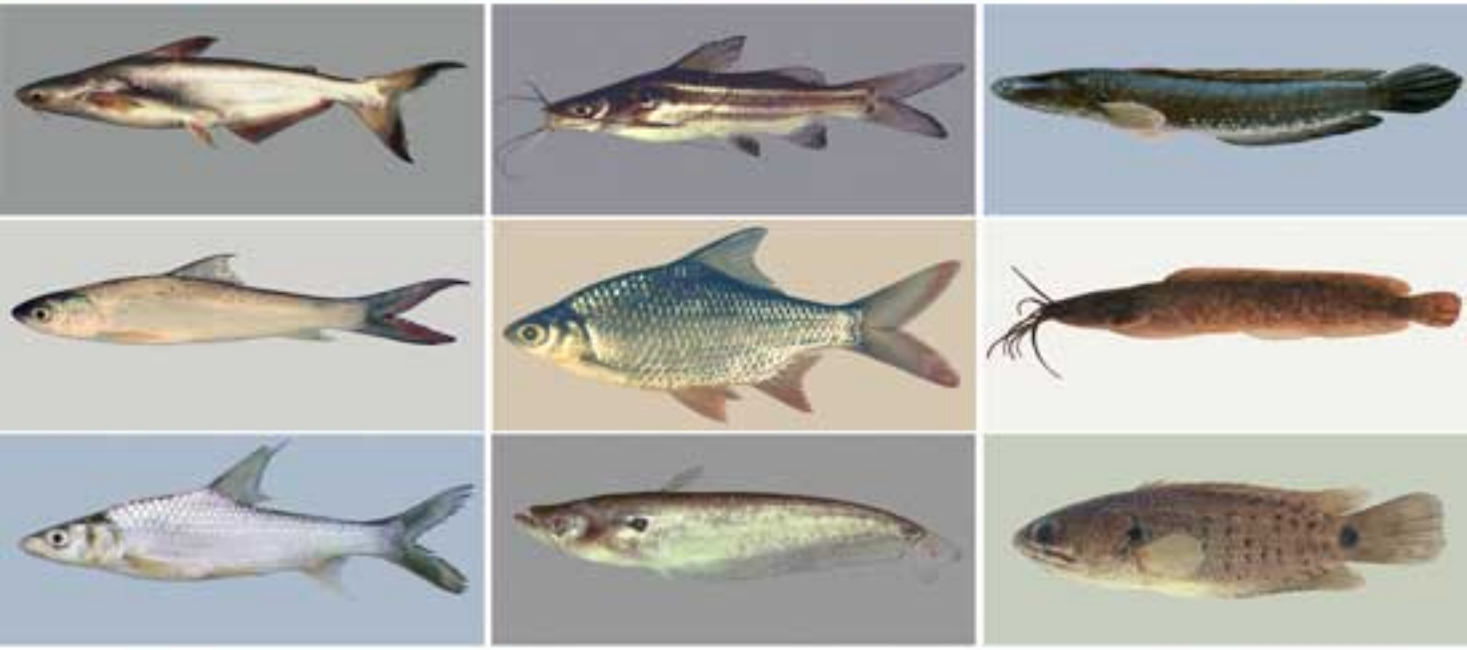

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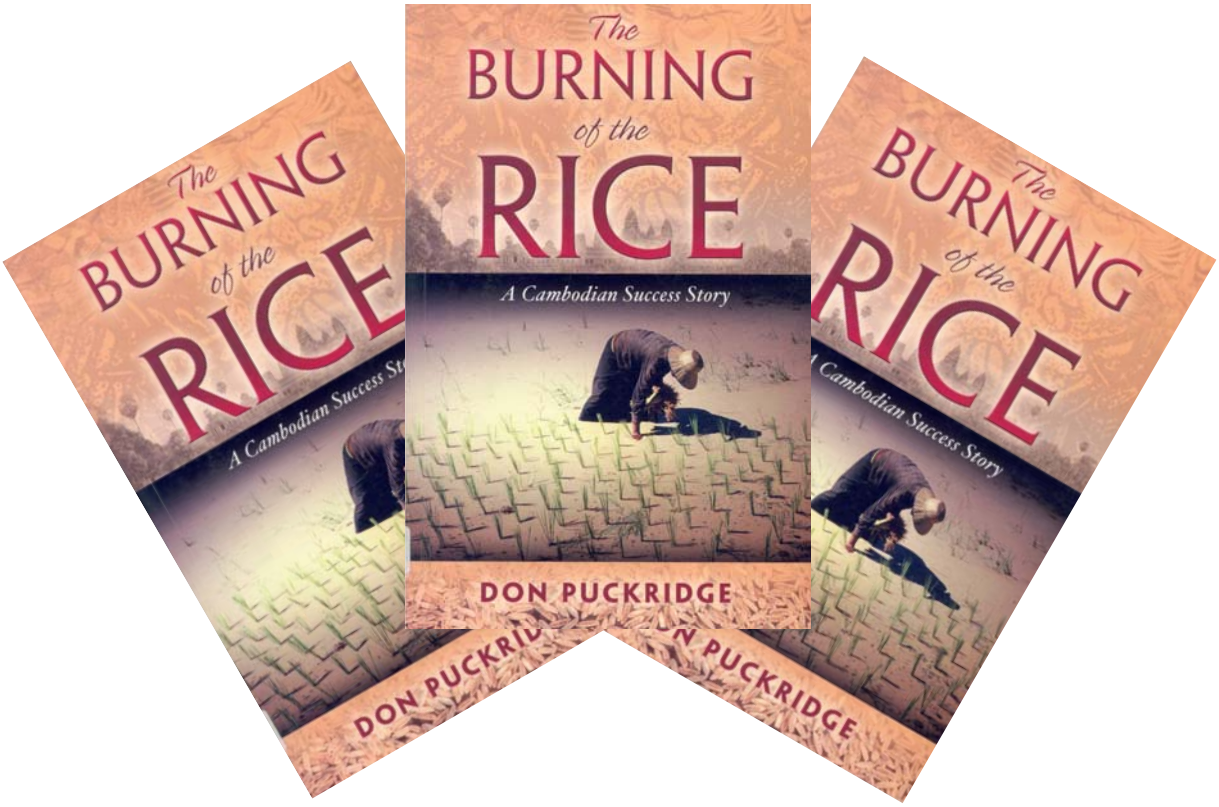

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FISH ECOLOGY AND COMMUNITY STRUCTURE IN TONLE SAP LAKE, CAMBODIA

Srun Lim Song

អត្ថបទសង្ខេប

អេកូឡូស៊ី នៃប្រភេទត្រីក្នុងតំបន់ទំនាបបឹងទន្លេសាប រួមមាន: ការរស់នៅ ការបន្តពូជ ការចិញ្ចឹមជីវិត ការធំធាត់ និងបាត់បង់បរិមាណត្រី ត្រូវបានគេយកមកប្រើប្រាស់ ដើម្បីធ្វើការសិក្សាស្រាវជ្រាវទៅលើតុល្យភាពនៃប្រភេទមច្ឆាជាតិផ្សេងៗ ដែលគេប្រទះឃើញនៅតាមទីកន្លែងស្រាវជ្រាវនានានៃបឹងទន្លេសាប។ ពពួកមច្ឆាជាតិចម្រុះ នៅតាមតំបន់ទំនាបលិចទឹកមានច្រើនប្រភេទ អាស្រ័យទៅនឹងទីជម្រកសមស្របនៅទីកន្លែងផ្សេងៗគ្នា ហើយមានប្រភេទមច្ឆាជាតិជាង ៣០ប្រភេទ ផ្សេងទៀតជាធម្មតារស់នៅតាមកន្លែងដែលបានសិក្សាស្រាវជ្រាវ។ ពាក់ព័ន្ធទៅនឹងភាពសម្បូរណ៍បែបនៃប្រភេទត្រីទាំងនេះ គឺមានការប្រែប្រួលទៅតាមធម្មជាតិ ប៉ុន្តែភាគច្រើនបណ្តាលមកពីឥទ្ធិពលរបស់មនុស្ស ជាពិសេសនៅពេលដែលប្រើប្រាស់បច្ចេកទេសនេសាទថ្មីៗ ត្រូវបានយកមកអនុវត្តជាទូទៅនៅទូទាំងប្រទេសកម្ពុជា ដូចជាការនេសាទដោយប្រើឧបករណ៍ឆក់ និងការនេសាទដោយឧបករណ៍ស្បៃមុង ក្រឡាល្អិតជាដើម។ ទង្វើទាំងនេះបានជះឥទ្ធិពលយ៉ាងធ្ងន់ធ្ងរទៅលើពពួកវារីសត្វនៅក្នុងដែនទឹកធម្មជាតិ។

Abstract

The ecology of Tonle Sap floodplain fish, their distribution, reproduction, feeding, growth and mortality are used to examine the community structures, the balance of different types of fish species, found at the study sites of Tonle Sap Lake. Floodplain communities are invariably diverse following the wide range of habitats available and more than 30 species are common in each of the study sites. The relative abundance of these species fluctuate naturally, but are also under human influence, particularly when new fishing methods are introduced and used such as electro-fishing and small mesh size (mosquito net) fishing gears which have recently spread widely in Cambodia. This type of practice has seriously affected the living aquatic animals in the water bodies.

Introduction

There are about 500 fish species found in Cambodian territory among 1200 in Mekong River, but about 280 fish species found in Tonle Sap Lake (Thuok N., 1998). However, more than 30 different fish species are commonly represented in the fish catches of the project sites. The populations are broadly similar and all contain several representatives of the (mostly herbi/omnivorous) Cyprinids, and the (mostly carnivorous) Channid, Silurid and Anabantid families common throughout freshwaters bodies. In terms of the number of species, the Cyprinids and catfish dominate the catches. The actual weights of different types of fish caught, however, are highly variable. Each species has been roughly classified either from simple observations or literature sources in terms of its migration habits, size, and feeding. The percentage of fish in each ecological category is examined in a number of the following sections.

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Fish distribution and migrations

The distribution and migration of Tonle Sap floodplain fish species depend largely on their abilities to tolerate the extreme conditions, which develop on the floodplain as it is very shallow in dry season, these may include low oxygen and pH levels and high temperatures. Differences in the spatial distributions of floodplain fishes are most pronounced in the dry season, when two broad classes may be distinguished (Welcome 1985):

- Whitefish: 'rheophilic' flowing-water fishes, intolerant of severe dry season conditions, emigrate from the floodplain, back to the main river.
- Blackfish: 'Limnophilic' still-water fishes, adapted to survive deoxygenated conditions, remain in the standing waters of floodplain, or may burrow into the mud in very dry years.

Figure 1. Dai fishing in Tonle Sap.

The term Blackfish and Whitefish are very common used with fishermen in Cambodia.
Whitefish thus migrate onto the floodplain every year to take advantage of the good feeding available, but must return to the river due to their intolerance of the deoxygenated waters in the standing pools of the dry season .

These species usually included Cyprinids *(Cirrhinus microlepis, Hampala macrolepidota, Barbodes altus, Leptobarbus hoeveni, Osteochilus melanopleura, Morulius chrysophekadion),* Pangasiids *(Pangasius larnaudiei, P. pangasius, Pangasianodon hypophthalmus)*, Silurids *(Wallago attu, Micronema apogon)* and Notopterids *(Notopterus chitala, N. notopterus)*. Fish leave the drying floodplain in an ordered sequence of species with the least tolerant and often the larger or older fish emigrating first. In large river systems, many fish also migrate to optimal breeding habitats, usually upstream of the main floodplains so that developing fry drift downstream towards the best nursery areas, particularly, in the flooded forest around the Tonle Sap Lake and along the sides Mekong River.

Blackfish, in contrast, may spend their whole lives in the standing waters of the floodplain and are particularly common in Asian inland waters. These species include Clariid *(Clarias batrachus, C. macrocephalus),* Channids *(Channa micropeltes,* C. *striata),* Bagrid *(Mystus nemurus, M. mysticetus*), Belontids *(Trichogaster microlepis, T. pectoralis*) and Anabatid (*Anabas testudineus).* All such blackfish have some form of air breathing adaptation, and young *Channa punctatus* for example may surface to breathe up to 1900 times per day. The blackfish most commonly have anatomical developments of their gills or branchial chamber. The blackfish species have all developed some form of diverticula of the branchial cavity. This is least developed in Channids, which have only a simple vascularised cavity; Anabantids have developed 'labyrinth' organs from their first gill arch; Clariids have two 'arborescent' organs extending from the 2nd and 4th gill arches; and Heteropneustids have extended the branchial cavity along the body to create a functional air sac. Such fish can survive in totally anoxic water, but many , including the Clariids and Heteropneustids, are still vulnerable to desiccation. Channid fish, however, can even survive short periods of total drought by cocooning themselves in the drying mud in a layer of hard slime with only a thin air passage to the surface to maintain oxygen exchange (see reviews in Lowe-McConnell, 1975 and Welcomme, 1985).

At the project sites, the majority of fish species are non-air-breathing whitefish. The greatest contributions to the total weight of the catch, however, are made of blackfish species such as Channids, Clariids and gouramis (Table 13). This may suggest either that blackfish species are particularly well suited to these floodplain habitats, or that whitefish species have been overexploited, possibly due to their greater vulnerability to the many filtering gears which intercept their movements.

Figure 2. Fish production in Tonle Sap.

Fish reproduction

Maturation

Maturation in tropical floodplain fish is generally very rapid as an adaptation to the uncertain survival rates in such an environment. Most small species are ready to breed at the onset of the first rainy season following their birth, though larger species may delay maturation until their second, third or even fourth years. *Anabas testudineus, Clarias batrachus, Colisa fasciatus, Helostoma temmincki, Heteropneustes tassilis,* and *Trichogaster pectoralis* have thus all been reported to mature by the end of their first year, ready for spawning at the beginning of the new flood (various references in FAP 17, 1993 and Lowe-McConnell, 1975). *Channa striatus* snakeheads have been observed with maturing ovaries in Cambodian wetland areas in April and May at sizes less than 25 cm, thought to correspond to ages less then one year old. Elsewhere *Channa micropeltes* has been reported to mature at between one and two years of age.

Reproductive strategies

Reproductive methodologies can be broadly divided as follows (from a classification by Balon, 1981):

Non-guarders :	-Open substratum spawners	Catla, Puntius, Cirrhinus
(Total spawners)	-Brood hiders	
Guarders :	-Open substratum spawners	Channa, Anabas
(Partial spawners)	-Nest spawners	Notopterus, Clarias, Trichogaster
Bearers :	-External bearers	
	-Internal bearers	

Examples are given of fish species from Asian floodplains following the first two breeding types. Both free spawners and guarders are common, but few incubating or bearing fish such as the mouth brooding African cichlids are found. The non-guarders or total spawners include whitefish such as the Cyprinids *(Henicorhynchus lobatus, Cirrhinus jullieni)*. The larger species produce many small eggs up to several hundred thousand or millions in a synchronised season, usually at the start of the flood, to place the fry in regions of good aeration, abundant food and vegetation cover, and low predation. Hatching times for such fish are usually short, down to as little as one day in open substratum spawners such as *Cirrhinus jullieni, Hypsibarbus pierrei*, and the fry of these fish are able to utilize the extended floodplain habitat for the longest possible period. The main danger of a total spawning strategy is the chance of spawning being triggered by false stimuli such as a temporary raise in water levels, only to leave the whole cohort stranded before the full monsoon arrives. Recruitment variability may thus be expected to be higher in such fish, especially if flood regimes are modified by river regulation or habitat degradation.

The guarders, in contrast, migrate only laterally within

the local floodplain area and produce fewer eggs (a few hundreds or thousands). They may, however, breed several times per year and increase their progeny's survival by parental care. Guarders are often blackfish which spawn on the floodplain in poor water Quality, but place their eggs or nests at the water surface to take advantage of the higher oxygen levels. Some Anabatids including *Anabas testudineus* lay floating eggs indiscriminately in weedy margins while others such as *Trichogaster pectoralis* and the larger *Osphronemus goramy* build a foaming nest of air bubbles held together by a hardened secretion into which the eggs are laid. Spreading the broods throughout an extended season may be advantageous in the highly variable floodplain environment by ensuring that at least one of the broods is able to survive. Comparing the strategies suggests that floodplain fish catches should be composed of fairly constant catches of blackfish, and variable, occasionally great catches of whitefish, when their spawning is successful.

Trophic relationships

The seasonality of feeding in tropical fish is determined largely by habitat availability, linked to the rise and fall in water levels. Both food availability and population densities improve during the flood, and become restrictive at low water. High water feeding enables fish to build sufficient reservoirs of body fat to survive the dry season and to develop gonadal material in preparation for imminent breeding. During the dry season, many fish are seen to lose condition (weight) of up to 10%, but certain predatory fish may be able to continue feeding throughout the dry season if their prey species are stranded alongside them.

The food resources of river floodplain ecosystems are diverse and can be divided roughly into those originating from within the system and those from outside (as listed by Welcome, 1985) :

Autochthonous food resources

Plankton community:	phytoplankton; zooplankton; drift organisms.
Benthic community:	mud and associated microorganisms; coarse detritus, decomposing animal and vegetable remains; insects and small crustacean.
Plant community:	including filamentous algae and submersed, floating or emergent higher vegetation.
Epilithic-Epiphytic community:	epiphytic and epilithic algae; associated microorganisms, insects, crustacea etc.; this category includes the root flora and fauna of floating vegetation as well as the detrital aggregate, the coating of detritus, bacteria and algae found on submerged parts of plants and rocks.
Neuston community:	insects and larvae living at the air/ water interface.
Fish:	including eggs, larvae and juveniles.
Other vertebrates:	amphibian, reptiles, birds, small aquatic mammals.

Allochthonous food resources

Vegetable matter:	leaves, roots, flowers, fruit and seeds of plants growing near Or overhanging the water course.
Animal matter:	insects, arachnids, worms etc falling or washed into the water from the terrestrial environment.

The higher plants are the chief primary producers in floodplain rivers, and the most important food chain derives from the decay of this dried out, and then re-flooded vegetation by micro-organisms, detritus feeding inverts and fish and then to various levels of piscivorous fish. Four of the above categories thus emerge as particularly important in floodplain systems: the detritus communities of the benthos, the allochthonous materials, particularly in swamp forests, and predation. The full use of foods from the lowest trophic levels, in the first three categories gives floodplains their characteristically high production rates. The importance of predation rises as one moves from the upper head streams, to the lower potamon reaches of rivers with their floodplains, and also increases as the dry season progresses, as food resources for the other trophic levels become scarce.

Most species are specialized to take advantage of a limited range of these foods, but are also able to switch feeding preferences as the season progresses to take advantage of food sources which become abundant for limited times. Many species thus have overlapping niches largely in response to the variability in the environment, and there is little competitive exclusion among the fish communities.

Similar numbers of each trophic category are found at each of the project sites. More than 40% of both the number of species and the catch weights are comprised of carnivorous fishes including large Channid snakeheads and Siluroid catfishes and smaller Notopterids and perches. This dominance of carnivorous fish is characteristic of SE Asian river systems (Lowe-McConnell, 1987). The remaining fish have mostly been classified as either herbivores or omnivores and include several Cyprinids and Anabantid perches. As noted above, the food preferences of many such fish are flexible, and few thorough studies are available to enable rigorous separation of these and the other groups. Overall, there do not appear to be large differences in the trophic composition of the three communities and the multi-species nature of these systems may be seen to be in response to the diversity of foods available in the Tonle Sap Lake.

Fish growth

The growth of Tonle Sap floodplain fish may be characterised as fast and seasonal. Growth broadly follows the feeding pattern described above, with the fastest growth observed in the high water season. Many large species grow particularly fast in their first season, possibly as an adaptation to avoid the intense predation of the floodplain by rapidly exceeding edible size before the shelter of the floating vegetation disappears in the dry season. An alternative strategy may be adopted by smaller species, which remain vulnerable to predators all their lives, but mature and breed as early as possible.

Year to year variations in growth can also be pronounced in these environments, largely depending on the intensity and duration of flooding. In the Mekong River, fish have been shown to achieve smaller in their normal sizes in poor year, particularly in 2003 water level was much lower than previous year, resulting in reproduction failures.

Growth rates have been estimated for the key species at the study sites from the length frequency data collected between April and December, 2003. Maximum fish sizes are highly variable from less than their normal sizes. Nearly all fish, however, including the largest snakeheads, grow towards their asymptotic lengths very fast, at around 45-50% per year. The slow growing species are usually best exploited by delaying or reducing exploitation below that of

the other fish until they have grown to a reasonable size.

Mortality

The causes of mortality may be grouped in two interrelated classes:

- Density dependent (where density may relate to the species itself, or those of its competitors or predators); and
- Density independent (related to physical/chemical changes in the environment).

Density dependent factors include intraspecific and interspecific competition for food and/or space. Competition for resources exists whenever populations breed beyond the carrying capacity of their environment. Since this capacity is constantly varying in these habitats, competition must occasionally be indirectly raised, especially as water levels are falling. The more important contribution to density dependent mortality is that of predation, particularly with the high levels of carnivorous fish observed. Mortality due to disease also usually increases with density as the cramped conditions favor the transmission of parasites and other pathogens. A condition known as epizootic ulcerative syndrome (EUS) has swept through all three of the countries over the past decade, with blackfish being notably vulnerable to infection. The highest prevalence has been observed during the dry season in Tonle Sap lake and other water bodies in Cambodia.

In many floodplains, a major cause of density independent natural mortality is stranding. This may result in the loss of four times the fish actually caught (Bonetto *et al.,* 1969 in Welcomme, 1985) but has not been frequently observed at any of the project sites, suggesting that they are relatively heavily exploited. Spectacular fish kills may also be caused by sudden deoxygenation in eutrophic or polluted rivers especially in high summer temperatures, but again are not common at the project sites. Excessively high or sudden flooding can also raise mortalities as fish, eggs or fry get swept out of the river system to unsuitable habitats.

From the combination of the most important factors, predation, disease, seasonal habitat deterioration, and fishing, the greatest losses of fish generally occur during the drawdown and low water phases (Welcomme 1985). This pattern implies that an excess of fish biomass is normally produced during the flood, which will always enable the maximum possible dry season survival into the next year. Much of this biomass can clearly be removed as yield to the fishery, without harming the potential of the stock. The exact amount that can be taken remains a crucial question. The relationship between stock sizes and recruitment are obscure in even the best study fisheries, and no information is available on the likely forms for floodplain fish.

The implication of high mortality rates is that few fish survive to ages greater than one, two or perhaps three years old. The relatively young structure of floodplain river communities confirms the dynamic, opportunistic and rapidly circulating nature of these ecosystems.

Conclusion

There are more than 500 fish species has been found in Cambodian territory among 1200 in Mekong River, but over 250 fish species found in Tonle Sap Lake. However, more than 30 different fish species are commonly represented in the fish catches of the project sites during the study period. The relative abundances of these species fluctuate naturally, but are also under human influence.

The distribution and migration of Tonle Sap floodplain fish and their feeding patterns determine their vulnerability to the various types of fishing gears used in different parts of the floodplain as the season progresses. Floodplain habitats experience a characteristic annual sequence of events in which the biomass and production of most fish foods increases during inundation to give the main feeding season in the flood where fish grow well in such nature. Fish populations are often adapted to this cycle by spawning at the beginning of the flood, particularly in June/July and placing their progeny on the floodplain at a time of plenty. The uncertainty over future water levels and the large number of predators then gives strong selection pressure for rapid growth and early development.

References

Baran E, van Zalinge N, Bun NP, Baird I, Coates D 2001: Fish resources and hyrdobiological modelling approaches in the Mekong basin. Research report, Mekong River Commission Secretariat, Phnom Penh, Cambodia.

Dirk L 2001. Tonle Sap Fisheries: a Case Study on Floodplain Gillnet Fisheries. Asia-Pacific Fishery Commission, Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific, Bangkok, Thailand.

Karl F, Lagler (1976). Fisheries and Integrated Mekong River Basin-wide Fishery Studies. The University of Michigan School of Natural Resources. pp.85.

Lim Song S et al. (2004). The Unsustainable Exploitation of Inland Fisheries Resources in Cambodia.

Nao Thuok, Lim Song S (2000) Fisheries Environment Study in the Mekong Delta, Cambodia. Department of Fisheries, Phnom Penh, Cambodia. pp. 2-18.

Rainboth, W. J. (1996) Fishes of the Cambodian Mekong. Food and Agriculture Organization of the United Nations, Rome, Italy.

Van Zalinge, N., and T. S. Tana. 1996. Catch assessment and fisheries management in the Tonle Sap Great Lake and River. Presentation at the Workshop on Fishery Statistics, 18 September, 1996. Phnom Penh. Department of Fisheries.

Van Zalinge, N. and Nao Thuok. 1999. Present status of Cambodia's Freshwater Capture Fisheries and Management Implication. Mekong River Commission and Department of Fisheries, Phnom Penh, Cambodia, pp 11.

Welcomme, R. L. 1985. River Fisheries. *FAO Fisheries Technical Paper* 262.

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OU REANG OV: A NEW SOIL GROUP FOR THE CAMBODIAN AGRONOMIC SOIL CLASSIFICATION

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អត្ថបទសង្ខេប

ដីបាសាល់គ្របដណ្តប់លើតំបន់សំខាន់ៗ នៃប្រទេសកម្ពុជាភាគខាងកើត និងស្ថិតនៅក្នុងតំបន់តូចៗដទៃឯទៀត នៅភាគខាងជើង ភាគឦសាន និងភាគពាយព្យនៃប្រទេស។ ដីបាសាល់ ទំនងជាផ្តល់លក្ខណៈល្អ ក្នុងការអភិវឌ្ឍន៍ដំណាំកសិកម្មខ្ពង់រាប ក៏ប៉ុន្តែលក្ខណៈធម្មជាតិ និងលក្ខណៈសម្បត្តិនៃដីប្រភេទនេះពុំត្រូវបានគេស្គាល់ច្បាស់ឡើយ។ ក្នុងការសិក្សានៅក្នុងស្រុកអូររាំងឪ ខេត្តកំពង់ចាម ដីល្បាយឥដ្ឋលាយត្រួស ដែលមិនធ្លាប់បានធ្វើការពិពណ៌នាពីពេលមុនមកនោះ ត្រូវបានជួបប្រទះជាទូទៅ។ នៅក្នុងស្រុកអូររាំងឪ ដីនេះមានប្រហែលដល់ទៅ ១៣ ភាគរយ នៃដីបាសាល់។ តាមលក្ខណៈរូបសាស្ត្រ ដីនេះមានលក្ខណៈខុសគ្នាយ៉ាងច្បាស់ពីដីដាំស្រូវ ដែលបានពិពណ៌នាសម្រាប់ដីបាសាល់ (ក្រុមដីឡាបានស្បែក និងកំពង់ស្បែម) និងកើតមានឡើងនៅលើកូនភ្នំ និងខ្ពង់រាបបាសាល់។ ក្រុមដីអូររាំងឪ ត្រូវបានស្នើឱ្យទៅជាក្រុមដីថ្មីមួយទៀតនៃចំណាត់ថ្នាក់ដីកសិកម្មកម្ពុជា។ ក្រុមដីអូររាំងឪនេះមានលក្ខណៈច្រោះទឹកខ្លាំង និងមិនសមស្របសម្រាប់ដំណាំស្រូវឡើយ។ តាមការពិតវត្តមាននៃត្រួសនៅក្នុងដី ធ្វើឱ្យដំណាំរងាប់ទទួលរងនូវភាពរាំងស្ងួត។ ក្រៅអំពីភាពជូរនៃដីស្រទាប់ក្រោម ក្នុងប្រូហ្វីលខ្លះ លក្ខណៈសម្បត្តិគីមីផ្សេងៗទៀតនៃដី មានភាពអំណោយផលល្អ។ ការពិតនៅលើដីអូររាំងឪនេះ សារធាតុផូស្វ័រ ដែលអាចចំរាញ់ចេញបានមានកំរិតខ្ពស់ជាទូទៅ។ ដីឥដ្ឋកៅឡាំង (Kaolinite) និងថ្មក្រាស្យ (Quartz) ជាសារធាតុរ៉ែ ដែលមានច្រើនលើសលប់ជាងគេនៅក្នុងដីអូររាំងឪនេះ ទោះបីជាវាយនភាពនៃដី បង្ហាញឱ្យឃើញថាមានសារធាតុក្លាស្យយ៉ាងច្រើនស្ថិតក្នុងប្រភាគជាទំហំដីឥដ្ឋ និងល្បាប់ម៉ដ្ឋក៏ដោយ។ សារធាតុខនិជនៃដីឥដ្ឋ ស្មិចថាយ (Smectite) ត្រូវបានជួបប្រទះជាញឹកញាប់ ទោះបីជាដីនេះមិនបង្ហាញឱ្យឃើញនូវការប្រេះក្រហែងនៅលើផ្ទៃដីនៅពេលដែលវាស្ងួតក៏ដោយ។ ទោះបីជាវាកើតមាននៅលើទីចំណោតក្តី ដីអូររាំងឪនេះ មានការធន់ទៅនឹងការហូរច្រោះជាបង្អួរដែរ ហើយជាទូទៅវាមានសក្តានុពលពីមធ្យមទៅល្អ សម្រាប់ការដាំដំណាំ ប្រសិនបើដំណាំដែលមានលក្ខណៈធន់ទៅនឹងភាពរាំងស្ងួតត្រូវបានគេជ្រើសរើសសម្រាប់ដាំ។

ពាក្យគន្លឹះ: ដីបាសាល់ ត្រួស សមាសភាពទឹកក្នុងដី សមត្ថភាពនៃដី ។

Abstract

Basaltic terrain occupies significant areas of eastern Cambodia and occurs in pockets elsewhere in the north, north-east and north-west. Basaltic soils are likely to be prominent in the development of upland cropping; however, the nature and properties of these soils are poorly understood. In studies in Ou Reang Ov district of Kampong Cham province, a previously undescribed brown gravelly clay loam soil was found to be prevalent. In Ou Reang Ov district it comprises about 13 % of the basaltic terrain. It is morphologically distinct from the rice soils described for basaltic terrain (Labansiek and Kompong Siem Soil groups) and occurs on the slopes of basaltic hills and plateau. The Ou Reang Ov Soil group is a newly proposed member of the Cambodian Agronomic Soil Classification. The Ou Reang Ov Soil group is well drained and unsuited to padi rice. Indeed the gravel content of the soil makes field crops prone to drought. Apart from sub-soil acidity in some profiles, other soil chemical properties were generally favourable. Indeed the extractable P levels on Ou Reang Ov soil were generally high. Kaolin and quartz were the dominant minerals in Ou Reang Ov soil although the soil texture suggests that much of the quartz is in silt and clay size fractions. Smectite clay minerals were prevalent even though this soil does not exhibit cracking at the surface when dry. Although occurring on slopes, the Ou Reang Ov soil is relatively resistant to erosion. Overall it is considered to have fair to good capability for cropping, if drought tolerant crops are selected.

Keywords: Basalt, gravel, soil water content, land capability.

Introduction

Pleistocene basalt flows are quite extensive in eastern Cambodia (Workman 1972). Similar aged basalt flows occur in southern Laos and the central highlands of Vietnam (D'haeze *et al.* 2001), and to a minor extent in Northeast Thailand (Tawornpruek 2005). In Cambodia, the greatest area of basaltic terrain occurs as a series of lava sheets with elevations up to about 300 m above sea level in Kampong Cham province, extending into the south-east of Kampong Thom province and north to Kratie (SCW 2006). Additional large areas of basalt occur in southeast Mondulkiri, and in eastern Ratanakiri, bordering Vietnam. Smaller but significant occurrences of basalt are found in the vicinity of Kulen mountains, north-east Kampong Thom province and in Battambang province.

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