

**Migration Pattern of three Species (*Cirrhinus microlepis*, *Pangasius hypophthalmus* and *Botia modesta*) in the Mekong mainstream and major tributaries of Cambodia.**

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**1. Abstract**

Fish migration in the Mekong River basin have been extensively documented in recent years, among others as a result of several large-scale surveys undertaken jointly by the MRC Fisheries Programme and fisheries line agencies in the four riparian countries.

This paper is based on data sets originating from some of these surveys, which was implemented over the past 4 years by the Assessment of Mekong Fisheries Component (AMFC). These data sets include survey of Local Ecological Knowledge (LEK) and a migration monitoring survey, where local fisheries were directly involved in collecting data on occurrence and migration of certain important species.

Based on data from these surveys, the paper describes migration patterns and spawning time for the three species *Cirrhinus microlepis*, *Pangasius hypophthalmus*, and *Botia modesta* in Mekong mainstream, Tonle Sap, Bassac, Sekong, Sesan, Srepok Rivers.

**2. Introduction**

The Mekong River, like most major tropical rivers, is a very dynamic ecosystem, and living conditions for aquatic organisms changes with season. Consequently almost all Mekong fish species are adapted to exploit different habitat in different seasons. Often, these habitats are far away from each other, forcing many fish to migrate long distances on a seasonal basis in order to reach spawning sites or fertile feeding ground.

The fisheries of Cambodia play a very important role in both the national economy and in food security for the people of the country, particularly poor people in rural areas. A large proportion of the fisheries are based on the capture of migratory fishes. For future management and planning purposes, the documentation of Mekong fish migrations is urgently required. Although migrations occur basin-wide, the Cambodian part of the Mekong, including some of the major tributaries, appear to be particularly important for the fisheries productivity of the entire lower Basin.

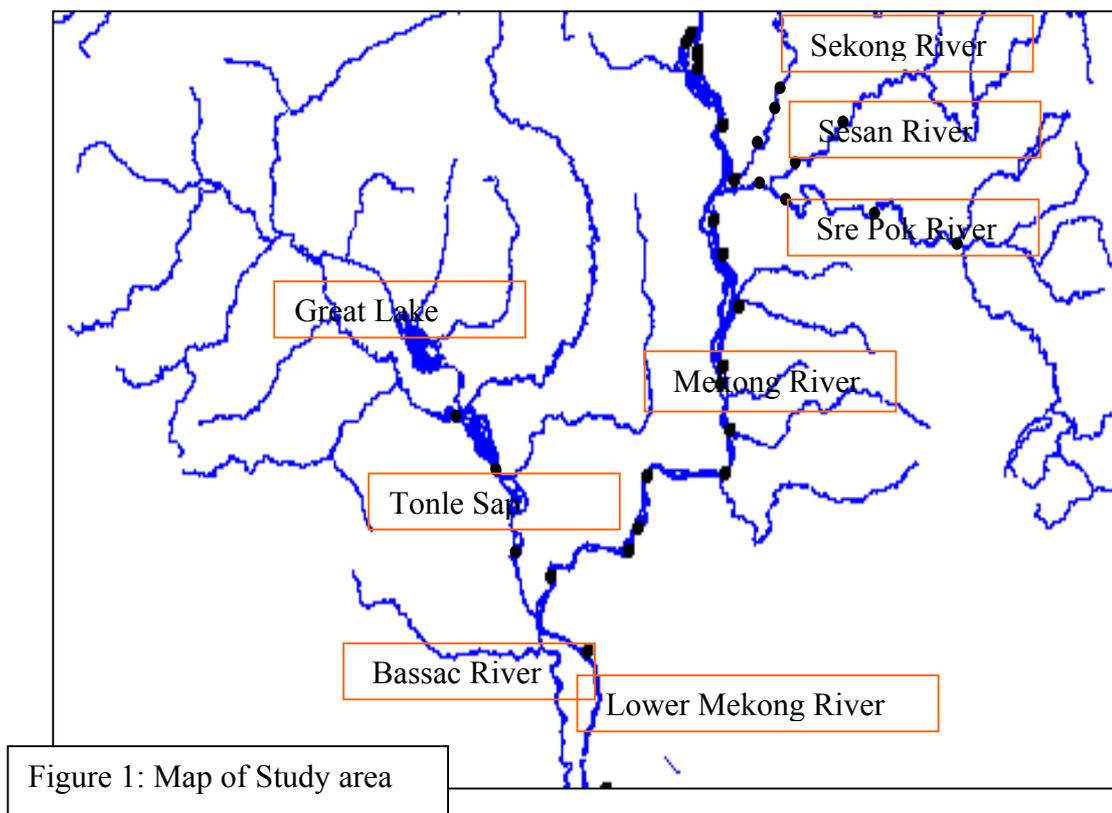
*Cirrhinus microlepis*, *Pangasius hypophthalmus*, and *Botia modesta* are three species, which are very important in the fisheries of Cambodia and which undertake seasonal migrations within the Cambodian section of the Mekong. The migration patterns of the three species are outlined below.

The AMFC developed a methodology for the use of local knowledge in the study of fish migration and spawning habits in the Mekong Basin. Also, together with certain expert fishers along the Mekong, a methodology was developed to collect ecological data through a logbook system.

### 3. Study area

The study area includes the entire Cambodian part of the Mekong mainstream (approximately 500 km long), the Bassac River from Phnom Penh to the border with Viet Nam, the Tonle Sap River and the Sesan sub-catchment. The Sesan River is one of the biggest tributaries of the Mekong River and joins the Mekong at Stung Treng. The Sesan has two large tributaries, the Sekong (which joins the Sesan 5 km upstream of Stung Treng) and the Srepok (joining the Sesan 35 km upstream of Stung Treng).

A map of the study area is shown in Figure 1.



## 4. Results

### 4.1. Migration Pathway for *Cirrhinus microlepis*

The migration pathway for *Cirrhinus microlepis* is illustrated in figure 2. At the end of the flood season, *Cirrhinus microlepis* migrate from floodplain habitats in southern Cambodia, including the Tonle Sap system, to river refuge habitats in northern Cambodia. These migrations mainly occur during the period from November to February and consist mainly of sub-adult fishes of sizes of 10 to 50 cm.

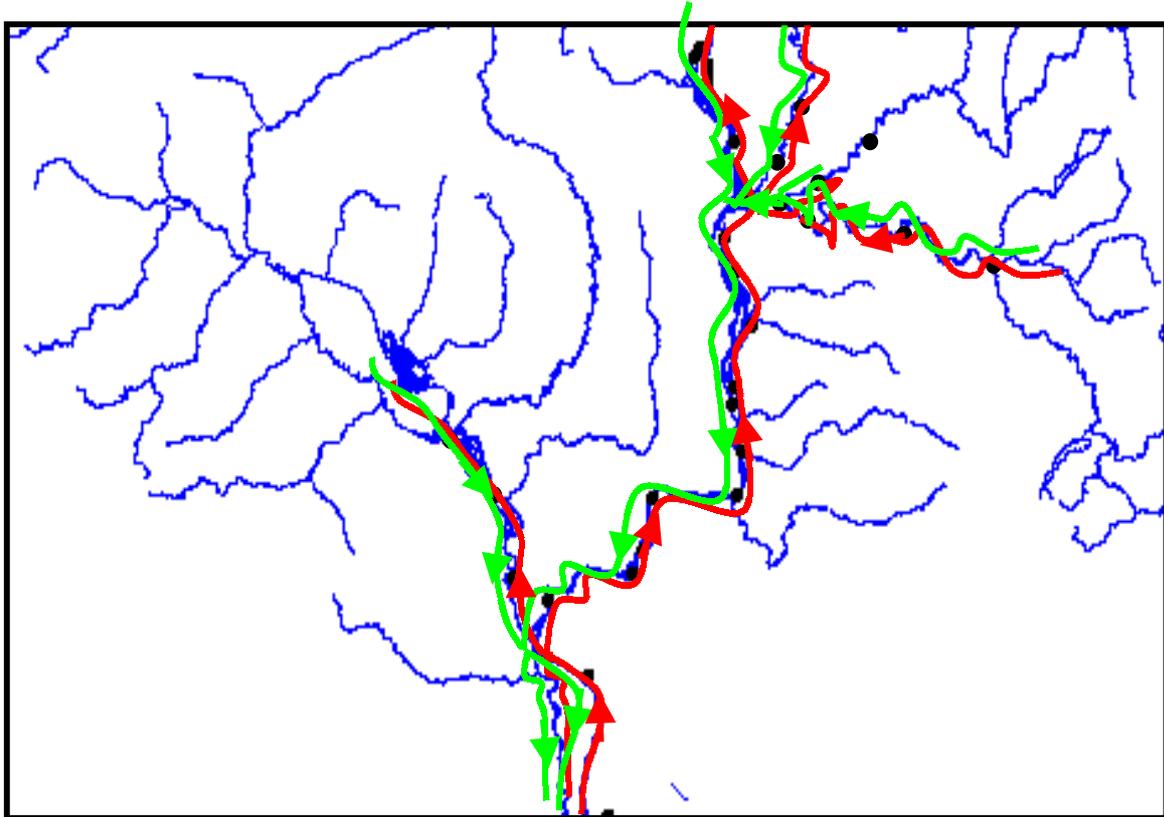


Figure 2: Migration pathway for *Cirrhinus microlepis*

At the end of the dry season and early flood season, (April to July), fishes migrate the opposite direction, i.e. from the Khone Falls and downstream. This migration also mainly constitutes sub-adults of up to about 50 cm in length. It seems to be less conspicuous than the upstream migration as some stations within this stretch did not report any downstream.

In the Sesan catchment (including Sekong and Srepok rivers), *Cirrhinus microlepis* migrate upstream during the early flood season (July and August), possibly in order to reach floodplain habitats and/or spawning sites. When water begins to recede at the beginning of the dry season, the fish migrate downstream, in search of refuge habitats in the lower Sesan catchment, or in the Mekong mainstream.

The spawning time for *Cirrhinus microlepis* was reported to be in May-July.

#### 4.2. Migration pathway for *Pangasius hypophthalmus*.

The migration of *Pangasius hypophthalmus* is illustrated in Figure 3. This species migrate from the Great Lake / Tonle Sap River to the Mekong River and upstream to northern Cambodia (Kratie - Stung Treng) during the early dry season from October to January. At the onset of the flood season, it migrates downstream toward floodplain habitats in southern Cambodia (including the Tonle Sap system).

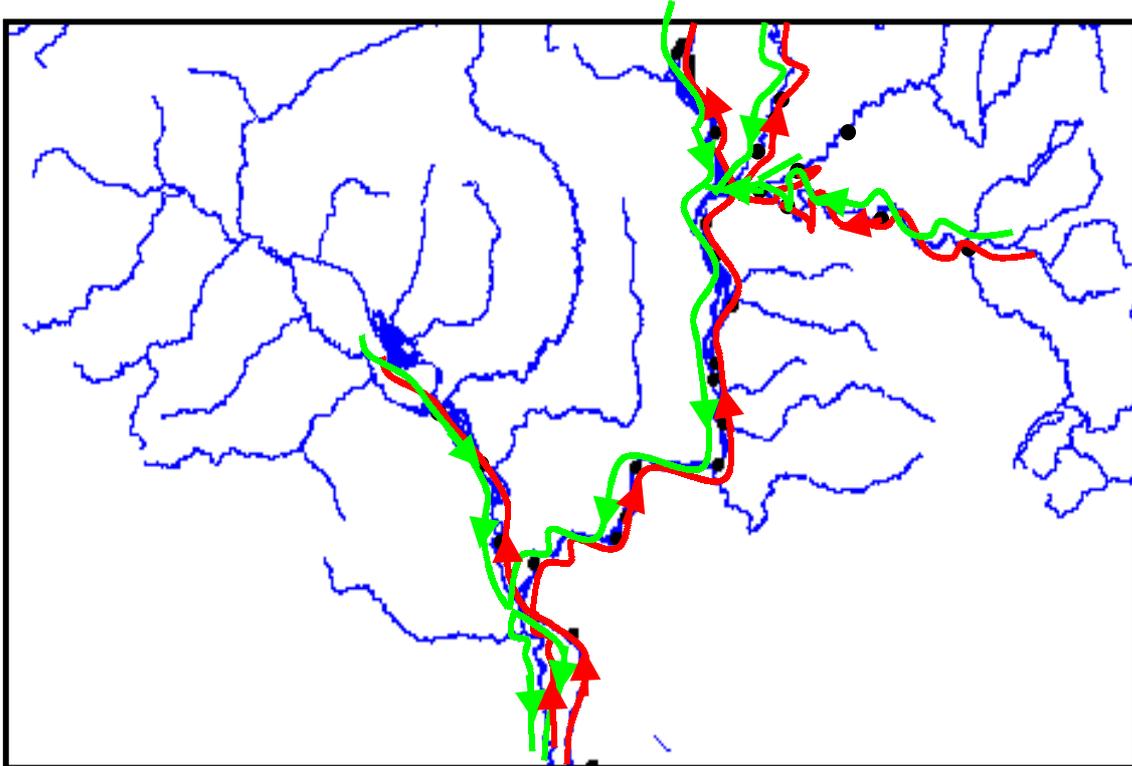


Figure 3: Migration pathway for *Pangasianodon hypophthalmus*

In the Sesan catchment (including the Sekong and Srepok rivers), on the other hand, it migrates upstream at the onset of the flood season, from June to July and downstream at the beginning of the dry season, from October to November.

The fishermen also reported that *Pangasius hypophthalmus* have eggs in the abdomen in May to June and they indicated a spawning ground at Khos Hep, which is upstream of the town of Stung Treng.

### 4.3. Migration pathway for *Botia modesta*

Figure 4 illustrates the migration pattern of *Botia modesta*.

This species migrates from the Tonle Sap River and upstream to northern Cambodia (to just below the Khone Fall) during the early dry season from November to March. This migration is reportedly triggered by receding water levels and also influenced by the lunar cycle (reported to occur during full moon).

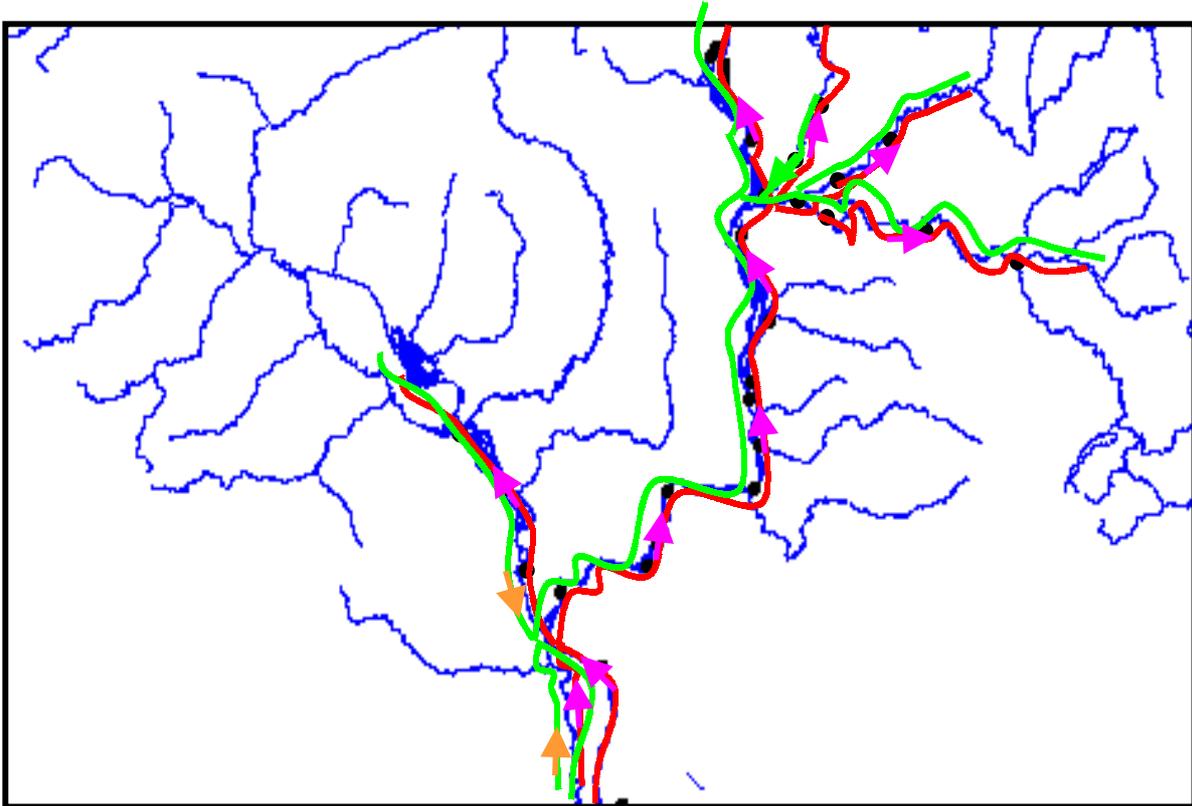


Figure 4: Migration pathway of *Botia modesta*

When the flood levels start to rise at the beginning of the monsoon (May to July), this species migrate from the north and downstream towards the floodplains of southern Cambodia and the Tonle Sap system.

In the Sesan catchment (including Sekong and Srepok), *Botia modesta* migrate upstream from late dry season to early flood season (February to June). During the early dry season, the species migrate downstream towards lower reaches of the catchment, possibly all the way into the Mekong mainstream.

Again, migrations are influenced by lunar cycles and the peak of migration occurs just before the full moon.

*Botia modesta* also spawns at onset of the flood season, and eggs and larvae drift with the current from upstream spawning sites to downstream flooded areas.

## **5. Discussion**

As can be seen from figures 2 to 4, the migration patterns of the three species appear very similar in spite of the fact that the species represent three different families. This shows that a large proportion of the migratory behavior is triggered by environmental (including hydrological) factors rather than genetic factors. All the migrations are triggered by hydrological changes in the river system and follow the seasonal changes in water discharge determined by the monsoon climate. During the flood season, fish migrate from the Mekong River to canals and flooded areas, whereas at the end of the flood season they migrate back to the larger rivers.

Species-specific differences are mainly associated with microhabitat requirements (for example in relation to spawning habitats) and timing of migrations. When looking at the migrations from a large scale (represented by figures 2 to 4), these differences are “overridden” by the effects of environmental and hydrological factors.