Short Communication

Fishes of the Salonga National Park, Democratic Republic of Congo: survey and conservation issues

Bila-Isia Inogwabini

Abstract Data were collected on the species richness and abundance of fishes at two sites in the Salonga National Park, Democratic Republic of Congo. Thirty species were identified out of a total of 1,180 fish caught. *Claria buthupogon* and *Synodontis nigriventris* (respectively 4.7 and 3.5 catches per net-night) were the most abundant species. Twenty-six other fish species were reported from interviews with local people. Conservation concerns are the burning of breeding sites, use of chemicals for fishing, and the newly introduced practice of dynamite fishing. The effects of these practices in the Park have yet to be documented, but it is likely that these fishing techniques are having negative effects on the fish fauna and urgent action is required to curb such activities, at least within the Park.

Keywords Abundance index, Democratic Republic of Congo, fish, fishing practices, species richness, Salonga National Park.

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Fish are the most abundant class of vertebrates but are the least known (Groombridge, 1992), and freshwater habitats are subjected to unprecedented levels of human disturbance (Saunders *et al*., 2002). Fish are a major food resource and an important economic asset in the central Congo basin region (CEFDHAC, 2001), and the region of Cuvette Centrale of the Democratic Republic of Congo (DRC), where the Salonga National Park is located, is a high priority conservation area for freshwater fishes (Toham *et al*., 2003).

The conservation community, however, possesses only a limited knowledge of the region (Van Krunkelsven *et al*., 2000; Toham *et al*., 2003). For the implementation of conservation measures to secure both the protection of the aquatic fauna and the human need for the use of fish as food, surveys of fish species and their ecology, and study of fishing practices, need to be undertaken. Fishing is a traditional practice in the Salonga region, but non-traditional fishing techniques have recently been introduced. Illegal fishing practices in the Park include modern nets, chemical poisoning of ponds and small lakes during the dry season, and burning and clearing large areas of *Pandanus* and *Alchornea cordifolia* during the dry season to facilitate collection of fish that take refuge in muddy areas beneath these plants (Corsi, 1984; Inogwabini; *et al*., 2000; pers. obs.). All these practices are used in the Park without any prior evaluation having been conducted to ensure that harvesting of fish is sustainable. This paper documents fish diversity at two sites in Salonga National Park, estimates relative abundances, and provides insights into conservation issues associated with fishing practices in the Park.

Data were collected from two study sites (Fig. 1), both located near the perimeter of Salonga National Park: Etate on the Salonga river in the northern sector and Lokofa on the Luilaka river in the southern sector. The altitude at Etate and Lokofa is 345 and 350 m, respectively. Both sites are adjacent to extensive areas of seasonally flooded and some permanently inundated zones (Evrard, 1968; Bailey, 1986; Gauthier-Hion *et al*., 1999), with an open understorey. The most important plant communities include *Raphia sese*, *Pandanus* sp., *Guibortia demeusi*, *Uapaca guineensis* and *U. heudelotii* (Evrard, 1968; Gauthier-Hion *et al*., 1999). The water of both sites originates from the humid tropical rainforest, is deep brown in colour, carries humic acids, and has a pH range of 3.5–5.2 (Bailey, 1986). The Salonga is *c*. 200 m wide at Etate, and the Luilaka *c*. 150 m wide at Lokofa. There are rainy seasons from September to December and April to June and dry seasons from July to September and January to March. During September - December *c*. 50% of the westernmost part of the Park, including the area of Etate, is inundated (Gauthier-Hion *et al*., 1999), with the flood plain extending up to 2.5 km from the river-bank. Mean

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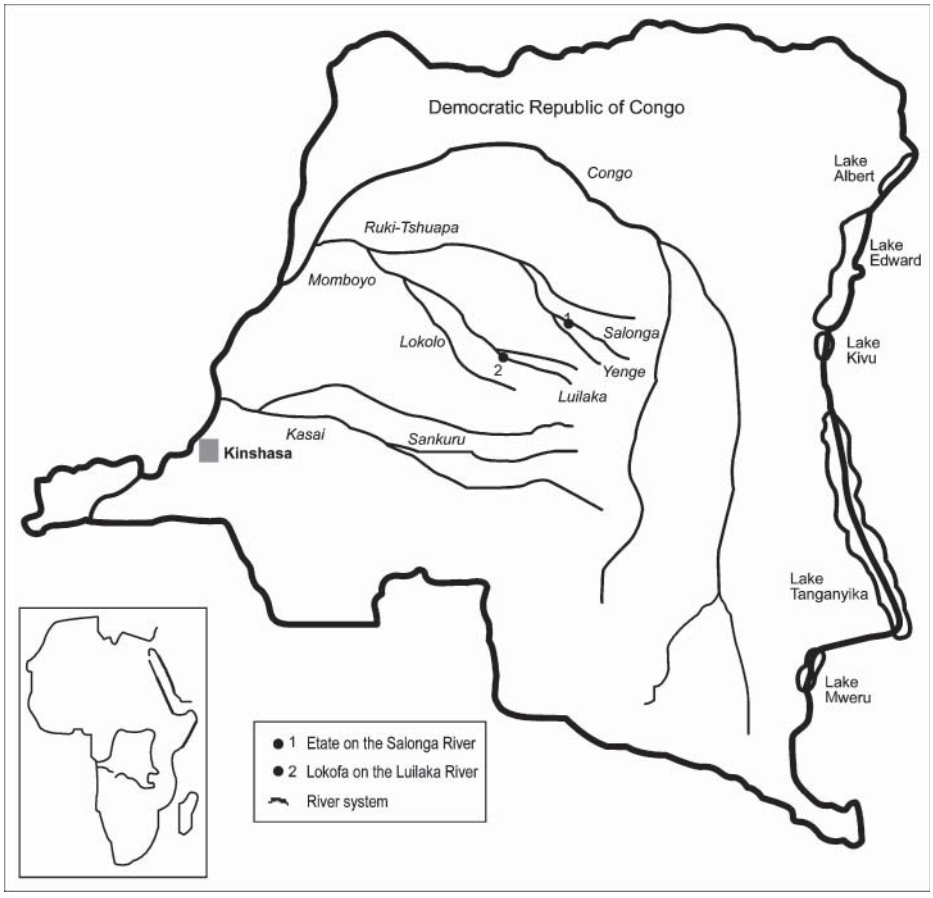

Fig. 1 The study sites at Etate and Lokofa within the central Congo basin network, and the location of rivers mentioned in the text. The inset indicates the location of the Democratic Republic of Congo in Africa.

annual rainfall is 2,007–2,106 mm and mean annual temperature 24.5ºC, recorded at Bokela and Boende (Evrard 1968; Griffiths 1972; Gauthier-Hion *et al*., 1999).

Unbaited 10 m long nets with mesh sizes of 2, 2.5 and 3 cm, and hooks of sizes 8, 10, 12 and 14 were used. A nylon rope attached the float line of each net to two sticks and the lead line was attached to small stones to stretch the nets vertically. Ten nets (*c*. 2 m wide; three with a 2 cm, four with a 2.5 cm, and three with a 3 cm mesh) were deployed in shallow waters (2–5 m) of the flood plain overnight, in areas accessible by canoe. Nets were set between 17.00–18.30 and visited the next morning at 5.00–7.00. Eighty worm-baited hooks were also deployed overnight along a gradient line crossing the flood plain from the edges of the river to shallow areas (*c*. 0.5 m deep). Nets and baited hooks were deployed at Etate for 17 days in November 2001 and at Lokofa for 25 days in May 2003.

I initially identified fishes in Lomongo, the local language of the region. Lomongo names were then translated into scientific nomenclature based on Lootens (1980) and Hulstaert (1992). These were judged to be appropriate because they utilize the three variants of Lomongo spoken in the region, and used museum collections to identify species. Nomenclature was then checked using the checklist of freshwater fishes of Africa (Daget *et al*., 1984–1986). Pictures were taken for further identification, and for comparing pictures of fishes from Salonga with those from other sites (Shumway *et al*., 2002; Stiassny, undated). A relative abundance index was defined as catches per net-night. Hence, species whose catch per net-night was $0.01 - 0.025$, $0.026 - 0.050$, $0.051 - 0.250$, and > 0.250 were respectively categorized as rare, common, very common and abundant.

To complement the species list thus obtained, local fishermen were also interviewed to name fish species they knew occurred in the area. In some instances the lists of Lootens (1980) and Hulstaert (1992) were used during interviews and fishermen were asked to respond by yes or no after each species name. Species names obtained through this process were added to the list of fishes caught. The 37 interviews were also used to gather information about fishing practices in the region.

The survey identified 56 separate fish species, of which 30 were caught in nets or on baited hooks, and the names of a further 26 were obtained from interviews. Overall, two species were categorized as abundant, 12 very common, three common and 13 rare.

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Of a total of 1,180 individual fish, nets and hooks caught, respectively, 77.8% (2.1 catches per net-night) and 22.1% (0.08 catches per hook-night). The four most abundant species were *Claria buthupogon, Synodontis nigriventris*, *Auchenoglianus punctatus* and *Schilbe marmoratus*.

The list of 56 species identified in this study (Appendix) is lower than the number of species known for Lake Tumba, and the Kasai, Ubangi and Lokoro rivers, which respectively harbour 100, 129, 263 and 107 species (Groombridge, 1992; B. Fruth, pers. comm.), but higher than the number of species known in Lake Kivu and Lake Albert in eastern DRC, which respectively have 17 and 46 species (Groombridge 1992), and similar to the 56 species reported for the Tshuapa River (Chapman, 2001). The region of Salonga National Park covers a large network of watersheds, including small sandy and white-water creeks, medium brown-water rivers, major rivers such as the Momboyo-Luilaka, Yenge and Salonga (Fig. 1), and large swampy areas. Such a diverse assemblage of biotopes would be expected to harbour more species (Bailey, 1986; Banister, 1986; Chapman, 2001) than reported here. I did not, however, attempt to systematically survey small rivers, and most of the samples came from the flood plain. To make comprehensive comparisons of species richness across the region of the Park, further surveys would be needed.

The abundance of *C. buthupogon* is not surprising, as the species occurs in a wide range of habitats (Chapman, 2001). *Channa obscurus* (Channidae) and species of other families, such as Mormyrideae, are also widespread, occurring throughout Central Africa (Chapman 2001), even though they are heavily fished. *C. obscurus*, locally known as *mongusu* or *nsinga*, is a preferred delicacy and is commonly found in markets throughout the Tshuapa-Ruki region. Despite the fact that this study shows them to be still abundant, these species may be commercially overfished given their abundance in markets. In the particular case of *C. obscurus* there is even a special fishing technique locally known as *ilolo* that targets the species. Markets in large towns such as Mbandaka and Kinshasa are supplied with smoked fish, carried over long distances from remote fishing camps, to be exchanged for commodities such as salt, soap, sugar, machetes, nets, hooks and other items. A study on the abundance of these fish species and their availability in both local and regional markets is required for a full assessment of their conservation status.

All of the fishermen interviewed acknowledged using poison and fire as fishing tools during the 5 months preceding the interview. The sustainability of these practices is questionable but there has been no population monitoring that would allow an examination of this. Nets are deployed without any control over mesh sizes, and small mesh sizes (1–2 cm) are frequently used, resulting in the catch of small, unwanted fish. Furthermore, numbers of nets are not monitored, and in some instances fishers use up to 100 nets per night during the fishing season (pers. obs.) and travel for weeks within Salonga National Park. Larger mesh sizes catch large-bodied fishes (Baijot *et al.*, 1994), and the Congolese legislation limits mesh sizes (Corsi, 1984) but without limitation on numbers of nets per fisherman. There is also poor law enforcement, and political reasons compelled the Institut Congolais pour la Conservation de la Nature (ICCN) to allow local people to fish within the Salonga National Park. Some members of parliament, originating from the region, forced ICCN to allow local people to fish in the Park during the dry season, based on the claim that people needed to be able to access this required food resource. Unfortunately, no prior investigation to gauge the sustainability of different fishing techniques and define appropriate fishing seasons was conducted, and many fishermen are not local, originating far from the vicinity of the Park.

The practice of clearing and burning large areas of *Pandanus* and *Alchornea cordifolia* is almost certainly unsustainable, for two main reasons: there is no selectivity of the fishes caught and, more importantly, fish breeding sites are physically destroyed or, at best, left exposed to conditions that may not sustain normal breeding activities. Poisoning of ponds during the dry season is widely carried out (Corsi, 1984; Inogwabini *et al.*, 2000). Prior to the civil unrest of 1996–2002 locally made mixtures (known as *botoko*) of bark, foliage and fruits were used to poison ponds (Corsi, 1984). Recently, however, local people have reported the use of imported chemicals nicknamed *moyen orient* (middle east) and *andrine* (Bofenda, pers. comm.), the origins, contents and toxicities of which are unknown. Dynamite has also been reported in the northern sector. According to the conservators of the Park, soldiers, then deployed in the front line, exchanged dynamite for fish and taught local people how to use the dynamite. Dynamite fishing has been reported from the region of Kinshasa and Kisangani (Corsi, 1984). There is no record of its use in other regions of Congo.

The effects of clearing, burning, and chemical fishing on these river and lake systems have not yet been documented. However, chemical fishing is likely to affect both the fish and its human consumers, and poisons and dynamite deplete fish stocks, killing young, small and non-commercial fishes. The use of imported chemicals is a recent practice, encouraged by their availability during the war. Immediate action is required to prevent people from accessing such chemicals and to ban their use at least within Salonga National Park. A large-scale survey of fishes in the Park is also required, with components to

document the effects of the various fishing practices and to define sections of rivers wherein fishing should be entirely proscribed. Such sections could provide breeding sites from which other rivers would be repopulated. While it is solely the responsibility of the government to undertake such work through its technical agency ICCN, there is a lack of appropriate expertise. Conservation NGOs planning to operate in Salonga will therefore need to consider the provision of training, and to help the government make appropriate decisions and implement conservation measures.

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Appendix

The appendix for this article is available online at http://journals.cambridge.org

Biographical sketch

Bila-Isia Inogwabini's previous work has included surveys of western lowland gorillas, chimpanzees and elephants in the eastern Democratic Republic of Congo, and bonobos in the Salonga National Park. He currently works in the Regional Forest Elephant Programme, Central Africa, with the Wildlife Conservation Society, where he has recently worked on the MIKE (Monitoring of Illegal Killing of Elephants) surveys. He currently oversees the Elephant Monitoring Programme in the Odzala National Park in Congo-Brazzaville.