ETHNOBIOLOGY AND CONSERVATION

RESEARCH ARTICLE

Ethnobiology and Conservation, 11:23 (10 August 2022)
doi:10.15451/ec2022-08-11.23-1-14
ISSN 2238-4782 ethnobioconservation.com

Traditional Aucan knowledge on fish and plants eaten by fish along the Tapanahoni River, Suriname

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ABSTRACT

Suriname's freshwater systems are home to a large diversity of (endemic) fish species, and communities of Suriname's interior strongly depend on this diversity for their nutrient intake. However, studies on traditional knowledge of the country's freshwater fish and fish-plant interactions are scarce. Here, we present our findings of a pilot study in the Aucan Maroon community of Diitabiki (Tapanahoni river). We report the species of freshwater fish caught for food, their corresponding Aucan names and plants eaten by fish and/or used for fishing by the local population. We held semi-structured interviews and performed participant observation with fishers and forest guides in August and September 2021. We recorded 14 fish species, of which 12 were identified to species level, and recorded 16 Aucan fish names, of which nine were previously undocumented. Furthermore, we reported 11 plant species that were used for fishing and one fish poison (*Tephrosia sinapou* (Buc'hoz) A.Chev.). Suriname's riverine ecosystems are threatened by gold mining activities that endanger the health of local communities, as well as the fish populations and riverine forests on which both people and fish depend. Local knowledge on fish, their feeding behavior and the flooded forests is essential for the conservation of this important Amazonian ecosystem, for the development of sustainable management plans and health education programs on mercury levels in consumption fish.

Keywords: Ethnobotany, Ethnoichthyology, Flooded Forest, Maroons, Mercury.

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SIGNIFICANCE STATEMENT

Amazonian riverine ecosystems are threatened by gold mining and mercury pollution. In the forested interior of Suriname, many communities are dependent on fish for food and income. Freshwater fish in these regions may contain high levels of mercury, which specifically threatens pregnant women and young children. Our pilot study reports on the fish species that are currently consumed by Aucan Maroons in Suriname, their local names and the plant species consumed by these fish or used to catch them. Local names are essential to enhance communication on health, biodiversity and conservation issues between the scientific and non-scientific public. Furthermore, we report on local ecological knowledge connected to freshwater fish, including plant species eaten by fish and plants used to catch fish residing in flooded forests. This study contributes to the field of ethnoichthyology in Suriname, which is still in its infancy.

INTRODUCTION

Flooded forests cover about 3% of the Amazon, and harbor many species that are not common to the upland forests or *terra firme*. Trees of these flooded forests produce fruit mostly during periods of high water, as their seeds can be dispersed by currents and fish (Goulding 1980). At least 200 species of fruit- and seed-eating fish are known from the Amazon basin, which move far into temporarily flooded habitats during the rainy season and feed on flowers, fruits and seeds (Anderson et al. 2009). This ecosystem also supports many human communities: fish is the main source of protein for forest-dwelling people throughout the Amazon basin (Begossi 2000; Murrieta and Dufour 2004). Overexploitation has reduced the abundance of seed-dispersing fish species, which in turn jeopardizes the survival of the associated rainforest trees, as it disrupts their interaction with their dispersal agents (Anderson et al. 2009).

The perceptions of local fishers about the ecology and behavior of fishes may provide relevant information to guide the conservation and sustainable management of these flooded forests, including the potential effects of deforestation, mining and climate change (Camacho Guerreiro et al. 2016; Silvano et al. 2008). Ethnotaxonomy, which focuses on local and indigenous systems of nature classification, and the related field ethnoichthyology which specifically focuses on the knowledge, classification and use of fish as a resource and includes aspects of conservation and cultural behavior (Catelani et al. 2021), provide strong methodologies to study these local perceptions. Local names for fish are important sources for ethnobiologists, anthropologists, linguists and government officials. Vernacular fish names should be documented and published to enhance communication within the scientific and non-scientific public, including discussions on biodiversity and conservation issues (Kuljanishvili et al. 2020). Much debate has taken place among ethnobiologists on whether to focus on the similarities or the differences between local classifications of animals and the Linnaean order used by taxonomists. Renck et al. (2022) recently argued that the overlap between fishers' and academic knowledge provides common ground for transdisciplinary collaboration, a theoretical framework that we chose to follow here.

Most research on Ethnoichthyology has been done in Brazil (see Catelani et al. 2021 for an overview), but such studies are still lacking for Suriname, although the country's freshwaters are home to 394 species of fish (Mol et al. 2012) and many species are endemic to a single river system (Mol 2012). At the same time, several groups of indigenous peoples and Maroons (descendants of enslaved Africans who escaped from coastal plantations in the 17th and 18th century) depend heavily on Suriname's forest resources for their subsistence and cash income (Love et al. 2007; van Andel et al. 2007; van den Boog et al. 2018). Very little is documented on the traditional knowledge on freshwater fish and their relationships with flooded forests of Suriname, although Grenand et al. (2015) published an inventory of vernacular names for fish in French Guiana that includes some indigenous and Maroon languages spoken in Suriname as well. The Biodiversity Database Suriname, compiled by the Amazon Conservation Team (`http://www.ethnobiobase.act-suriname.org`), provides an overview of the main species of freshwater fish in the country with informative images, scientific and vernacular names, but these are limited to Sranantongo (the *lingua franca* in Suriname) and two indigenous languages (Trio and Wayana). Names in any of the six Maroon languages are lacking altogether from this database, and no traditional knowledge on fish behavior or fishing methods is mentioned. Moreover, the database covers only the Marowijne and Corantijne rivershed.

The Tapanahoni is a major river in the south eastern part of Suriname, which originates near the border with Brazil and joins the Marowijne River at Stoelmanseiland. With a total population of 19,000 people, the Aucans or Ndjuka are the second largest Maroon group (Price 2018), and most of them live along the Marowijne, Cottica and Tapanahoni rivers. Aucans are the only Maroon ethnicity that live along this river, a few indigenous Wayana and Trio villages exist along the upper parts of the Tapanahoni (Boven 2006). The main language spoken along the Tapanahoni is Aucan, while the Dutch and Sranantongo language is spoken by few, and an even smaller number of people speak the indigenous Wayana or Trio languages. Although Aucans acquire some store-bought food obtained with cash earned by gold mining and river transport, most of their food is sourced from slash-and-burn agriculture, hunting and fishing (Thoden van Velzen and van Wetering, 2013). Freshwater fish has always been a significant protein source in the Maroon diet (van der Kuyp 1961). Geijskes (1954) described in detail the traditional fishing methods of the Aucans along the Marowijne, but listed vernacular names only in Sranantongo. Furthermore, in their revision of vernacular names for freshwater fish in French Guyana, Grenand et al. (2015) mentioned that Aucan names are underrepresented and emphasize that a more comprehensive study is necessary. Here, we present the findings of a short pilot study in the Aucan Maroon community of Diitabiki along the Tapanahoni river. We report on the species of freshwater fish caught, their corresponding Aucan names, the plant species mentioned by local fishers as being

eaten by fish, and plants used to catch fish.

MATERIAL AND METHODS

This pilot study was carried out in Diitabiki, a village of a few hundred inhabitants, situated along the Tapanahoni river, Sipaliwini District, Suriname (4°6'49" N, 54°40'30" W). Diitabiki is located in an area where the Tapanahoni splits into many side rivers and rapids (Figure 1). We were invited by the Aucan traditional authorities and the foundation Wooko Makandie to contribute to the documentation of traditional plant knowledge, part of the intangible Aucan cultural heritage that will be shown in the future museum of Diitabiki (https://fositengudu.org).

Botanical fieldwork took place between 24 August and 14 September 2021, at the start of the dry season, when water levels started to drop and only parts of the surrounding tropical rainforest were still flooded. During our ethnobotanical survey on useful plants along the river and in the forest surrounding the village, our informants mentioned several plant species that were either eaten by fish and/or used to catch fish. As the villagers could only mention those fish by their local Aucan names, and many of these names were not listed or linked to scientific names in the literature or relevant online databases, we decided to carry out a more systematic inventory of caught fish. Our pilot inventory of fish took place over the course of c. three days.

Our interviews on fish took place on one of the main river landings of Diitabiki, where most villagers moored their boats, washed clothes and dishes, and groups of fishers were active on a daily basis. We conducted participant observation and semi-structured interviews during three sessions spread out over three days with children and, additionally, conducted semi-structured interviews with adults. Questions were related to fish names and associated ecological knowledge, such as the feeding behavior of the fish. Our interviews were held in Dutch, Sranantongo and Aucan. As soon as a 'new' species was caught, we photographed the fish, documented its vernacular name, pronounced this name several times to check the correct spelling and discussed our pictures and spelling afterwards with the fishers and Aucan anthropologist Thomas Polimé. The spelling of Aucan and Sranantongo names for fish were also checked with the database Languages of Suriname (Summer Institute of Linguistics, 2003). Sranantongo fish names were obtained from literature (Geijskes 1954; Grenand et al. 2015; Mol 2012) and the Biodiversity Database of Suriname (http://www.ethnobiobase.act-suriname.org). For the identification of the fish species, we consulted Jan Mol, an expert on Surinamese freshwater fish, and consulted literature (Mol 2012; Mol et al. 2012) and online databases (www.fishbase.org). For scientific information on feeding habits of the fish species we encountered, we consulted www.fishbase.org and scientific literature (Durrieu et al, 2004).

The botanical inventory on useful plants was done along the riverbanks in a boat and along two paths leading into the surrounding primary and secondary

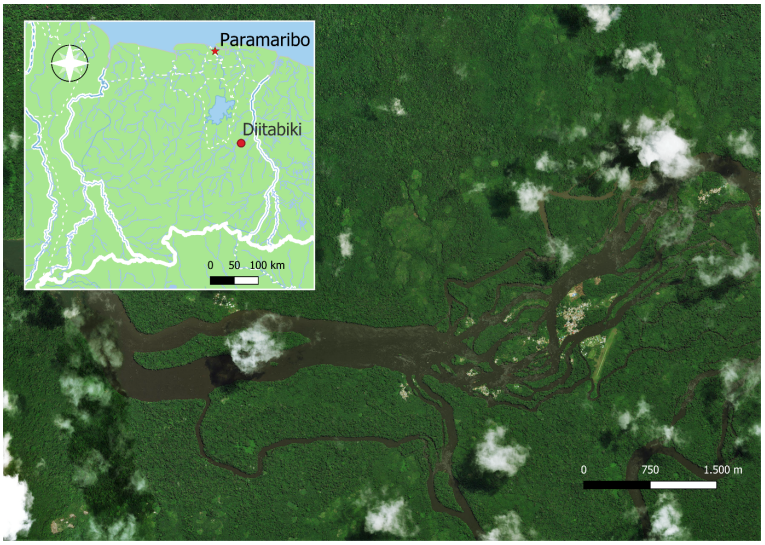

Figure 1. Location of Diitabiki along the Tapanahoni river in Suriname (inset). Satellite image of the village with its airstrip, surrounded by forests subjected to flooding. Source: Natural Earth Data in QGIS (inset) and Bing Satellite.

forest. Plants that could not be identified on the spot were collected using standard botanical methods (Martin, 2010). Duplicate vouchers were deposited at the National Herbarium of Suriname (BBS) in Paramaribo and at the herbarium of Naturalis Biodiversity Center (L) in Leiden, the Netherlands. A collection and export permit for plant specimens was obtained through the Suriname Forest Service, Nature Conservation Division. Plants were identified using the Flora of Suriname (Pulle 1932-1986), Flora of the Guianas (Görts-van Rijn 1985-1996; Görts-van Rijn and Jansen-Jacobs 1997-2007), and the Flora of Central French Guiana (Mori et al. 2002). Current scientific names were checked with the website Plants of the World Online (https://powo.science.kew.org). Our results will be made available (in Dutch) and donated to the future museum of Aucan culture in Diitabiki.

RESULTS

We conducted participant observation and semi-structured interviews with eight children fishers (three girls and five boys) between the age of six and 18. Additional information on fish names and associated ecological knowledge were asked to seven adults, themselves experienced fishers and knowledgeable about flooded forests (two females and five males). Children were seen fishing almost every day along the riverbanks, where they caught fish for their family's lunch or evening meal. They were seen using fishing lines, an empty can or their bare hands, but most of the fish we documented were caught with a fishing rod (*ukutiki* in Aucan). These were often made from a young *Duguetia* tree (Annonaceae), chosen for its strength and flexibility, synthetic fishing line and a store-bought hook (*haka* or *uku* in Aucan).

We documented 14 species of freshwater fish that were regularly caught in Suriname, of which 12 could be identified to species level, and 16 Aucan fish names (Table 1). Most of these fish were either omnivorous or fed on plants, detritus or microbes. The species we measured were between 2 and 25 cm (Figure 2), but larger fish were observed that were caught by adult men and women using fishing nets from their boats, especially near rapids (Figure 3). The skilled girls and boys, who only fished in shallow water, needed 30 minutes to an hour to fill their container with fish (Figure 4a). Some of these young fishermen and women sent several 5-litre plastic buckets off by plane every week to their family members in the capital Paramaribo, who were said to 'only eat fish from the Tapanahoni river'.

While the adults used fish meat as bait, most children used cooked rice on their fishing hook (Figure 4b). On a daily basis, dirty dishes were washed in the river and rice and bones from previous meals were thrown into the river by women and children, probably attracting the large schools of young fish seen along the river banks. Children were often seen fishing shortly after dishwashing.

We reported 11 plant species that were said to be eaten by fish (Table 2) and one shrub (*Tephrosia sinapou*, Figure 5) that was frequently planted in the village, of which the roots are used as fish poison. The practice of stunning fish with plant material (*ponsu* in Aucan) is mainly done in the dry season, when the Tapanahoni in several areas is reduced to a small stream between large rocks. The small pools in between these boulders are dammed and the pounded roots of *T. sinapou* are soaked in the water to stun fish. We did not observe this practice, as the river was still full during our stay.

Fish traps (baskita, Au) are still employed in Diitabiki, made from the midribs of the leaves of spiny *Bactris* palms. Plant material is put in these baskets as fish bait, for example the roasted seeds of *Pachira insignis* (Sw.) Savigny (Table 2).

Interestingly, not all fish were mentioned as seed-eaters (and thus possible dispersal agents for trees in flooded forests). Several fish were said to eat flowers, such as those of the liana *Dioclea guianensis* Benth. and the tree *Vochysia guianensis* Aubl., some of which were then said to be hooked as fish bait. Fish were also attracted to the fleshy arils attached to seeds, in the case of *Gustavia augusta* L. (Figure 6), and therefore possibly also involved in seed dispersal. Along the river, many trees had their branches loaded with fruits hanging just above the water surface. The Aucans used their knowledge to locate good areas for fishing: waiting quietly in a dugout canoe under a flowering or fruiting tree would yield a good catch.

Some of the plants were even named after the fish that feed on them, like 'peas of the maloko' for Dioclea guianensis and *Macropsychanthus scaber* (Rich.) L.P.Queiroz & Snak, or 'kumalu's food' for the pink flowers of *Mourera fluviatilis* Aubl., commonly growing on the rocks of rapids. The Aucan fish name *apaulobi* literally means 'it loves trees', a quite adequate name for a fish in this specific habitat. In the Flora of Suriname and the Flora of the Guianas, however, little information is provided on the relationships between fish and the flora of the flooded forest.

Table 1. Freshwater fish recorded in a 3-day inventory in Diitabiki, Suriname.

Vernacular names	Scientific name	Feeding behaviour	Fishing method
abalabe*, adekibe* (Au); weti fisi, sribi (Sr)	*Moenkhausia grandisquamis* (Müller & Troschel 1845)	omnivorous?	Fishing rod
agankoi* (Au)	*Geophagus harreri* (Gosse 1976)	omnivorous?	Fishing rod
akeng jai* (Au)	*Hemiodus huraulti* (Géry 1964) or *H. quadrimaculatus* (Pellegrin 1908)	omnivorous?	Fishing rod
apaulobi* (Au); djogoe (Sr)	*Hemiodus unimaculatus* (Bloch 1794)	detritus, microbes	Fishing rod
koro*, kolo*, kuru* (Au), kululu (Sr)	*Cyphocharax spilurus* (Günther 1864)	detritus	Fishing rod
kuana (Au), kwana (Sr)	*Leporinus fasciatus* (Bloch 1794)	omnivorous	Fishing rod
kumalu (Au), kumaru (Sr)	*Myleus rhomboidalis* (Cuvier 1818)	plants, fish	Net
mabè (Au)	*Serrasalmidae* sp.	plants	Fishing rod
maloko (Au), moroko, mbooko (Sr)	*Brycon falcatus* (Müller & Troschel 1844)	plants, omnivores	Fishing rod
paku (Au)	*Myloplus ternetzi* (Norman 1929)	plants	Fishing rod
pataka (Au)	*Hoplias* sp.	fish	Scooped up in cans
pilen (Au), pireng (Sr)	*Serrasalmus rhombeus* (Linnaeus 1766)	fish	Fishing net
waku* (Au), waraku (Sr)	*Leporinus friderici* (Bloch 1794)	omnivorous	Fishing rod

Au = Aucan; Sr = Sranantongo. * Aucan name not previously documented.

Figure 2. Fish caught by children in Diitabiki. a) Maloko (*Brycon falcatus*); b) Akeng jai, (*Hemiodus hurault*i or *H. quadrimaculatis*); c) Abalabe/Adekibe (*Moenkhausia grandisquamis*); d) Kuana (*Leporinus fasciatus*); e) Apaulobi (*Hemiodus unimaculatus*); f) Waku (*Leporinus friderici*); g) Agankoi (*Geophagus harreri*); h) Mabè (*Serrasalmidae* sp.); i) Koro, *Cyphocharax spilurus*. Pictures: I. Pombo Geertsma and D. van der Hoeven.

Figure 3. Young man showing a *pilen* (piranha), *Serrasalmus rhombeus*, caught with a net. Picture: T. van Andel.

Figure 4. a) Several fish caught for dinner, including *apaulobi* and *kuana*. b) Cooked rice is attached to the fishing hook. Pictures: I. Pombo Geertsma and D. van der Hoeven.

Figure 5. Fruiting individual of Bumbi (Au), *Tephrosia sinapou*, a shrub that is planted for its roots, to be used as a fish poison. Picture: I. Pombo Geertsma.

Figure 6. Opened fruit of *Gustavia augusta*, showing the black seeds and fleshy yellow aril, which is eaten by fish. Picture: T. van Andel.

Table 2. Plants mentioned as eaten by fish or used to catch fish in Diitabiki, 2021.

Aucan plant name	Plant species	Family	Collection nr.	Fish species associated	Fishing method
liba awaa	*Astrocaryum jauari* Mart.	Arecaceae		Not specified	Fishing under this tree when fruits are ripe?
pansjimuti, opo oli	*Copaifera guianensis* Desf.	Leguminosae	TvA6938	*Myloplus ternetzi*	Paku eats seeds and arils, entire fruit attached to hooks
maloko pesi	*Dioclea guianensis* Benth.	Leguminosae	TvA6915	*Brycon falcatus*	Flowers attached to hooks
uma tapu-upa	*Genipa americana* L.	Rubiaceae	TvA6932	Not specified	Fish eat the fruits, used as fish bait
man tapu upa	*Gustavia augusta* L.	Lecythidaceae		"big fish"	Fishing under this tree when fruits are ripe
kushi weko	*Inga disticha* Benth.	Leguminosae	TvA6923	Not specified	Fish eat seeds and arils
maloko pesi	*Macropsychanthus scaber* (Rich.) L.P.Queiroz & Snak	Leguminosae	TvA6929	*Brycon falcatus*	Flowers attached to hooks
kumalu nyanyan	*Mourera fluviatilis* Aubl.	Podostemaceae		*Myleus rhomboidalis*	Fish eats the flowers and leaves
moomoo	*Pachira insignis* (Sw.) Savigny	Malvaceae	TvA6908	Not specified	Roasted seeds put as bait in fish traps ('baskita')
kaasi tiki	*Solanum schomburgkii* Sendtn.	Solanaceae	TvA6928	Not specified	Fish eat fruits
bumbi	*Tephrosia sinapou* (Buc'hoz) A.Chev.	Leguminosae		Not specified	Roots used as fish poison
kwari	*Vochysia guianensis* Aubl.	Vochysiaceae	TvA6931	*Serrasalmidae* sp.	Mabè fish feeds on the flowers that fall in the river

DISCUSSION

Aucan fish names

We are aware that had we extended our inventory and systematically asked for all flowering and fruiting riverine plants which fish species were feeding on them, we would have yielded much more specific information on local fish names, species consumed and plants used to catch fish. However, our main objective was a botanical inventory of useful plants and our time was limited. More extensive research, among adults and children, is needed to fully grasp the Maroon knowledge of fish diversity and fish feeding habits in the flooded forests of Suriname. This research should be carried out along different watersheds and throughout the year, as the distribution of fishes in this region varies along the seasons and between types of flooded forests (Boujard 1992).

Still, we were able to add valuable data to the body of traditional knowledge on consumed fish in the region. Of the c. 42 Sranantongo fish names reported among Aucans along the Marowijne by Geijskes (1954), we only found seven in Diitabiki, because fishers along the Tapanahoni mostly use Aucan fish names. As his taxonomic identification methods are not described, we could not compare the species of fish he documented with our results, although we assume that many of the species that he listed were observed by us as well.

During our short pilot study, we found several vernacular names for fish that were not published before, such as *abalabe*, *adekibe*, *apaulobi* and *akeng jai*. Of the 17 Aucan names listed for French Guiana by Grenand et al. (2015), only *maloko* was also found in Diitabiki. Some of the Aucan fish names we documented (*agankoy*, *kulu*, *kumalu*, *pataka*, *pilen* and *waku*) overlapped with Aluku Maroon names listed for French Guiana (Grenand et al. 2015), although not always for the same species. Several Aucan names in Diitabiki appeared to be loanwords from indigenous languages, such as *kuru*, probably derived from *kulu* in Wayana, spoken on the upper Tapanahoni. The limited overlap between local names in Diitabiki and those listed for Maroons by Geijskes (1954) and Grenand et al. (2015) shows that only a fraction of the traditional knowledge on fish names has been documented. To fill this gap, linguists, anthropologists and ichthyologists should collaborate, but this hardly happens in the Guianas. Even though Grenand et al. (2015) linked more than 150 Aluku terms for fish to scientific names, the online dictionary of the Aluku Maroon language, published shortly afterwards (Migge, 2019) lists just 80 Aluku names for fish, of which only 23 are accompanied by a scientific name.

Gender and age of fishers

Although some ethnographic literature (Van der Kuyp 1962) considered fishing as a male activity among Maroons, we observed more fishing girls than boys, and we frequently saw adult women catching fish as well. Geijskes (1954:64) described this disdainfully: 'Also along the riverbanks near the villages, the women often fish a meager fare of smaller fish', disregarding their contribution to the household diet. Modern anthropologists have shown repeatedly that in rainforest communities, women are actively engaged in both hunting and fishing, especially in households where men leave the village in search of income-generating activities (Gallois and Henry 2021; Reyes-García et al. 2020). The traditional knowledge of children in forest-dwelling communities and their contribution to the household diet is also often overlooked or downplayed (Gallois 2017; Van den Boog et al. 2017; Van 't Klooster et al. 2019) and deserves more scientific attention. Fishing children are generalists, they do not fish for one specific species, and the local biocultural diversity becomes visible in the many different species they catch and are able to name in just a few days.

Fishing techniques involving plant material

Several of the traditional fishing techniques described in the ethnographic literature (Geyskes 1954; Van der Kuyp 1962) were not observed by us, such as fishing by means of bow and arrow, the damming of creeks and the production of fishing lines from the fibers of *singaasi*. These fibers were made from the leaves of the wild *Bromelia alta* L.B. Smith. or a non-edible cultivar of *Ananas comosus* (L.) Merr., and although the latter species was still cultivated in Diitabiki, we only saw plastic fishing lines in use, probably because these were cheaper and easily available in local shops, and less complicated to use than the *singaasi* fibre that needs to be processed, dried and twined by hand.

Probably, more plant species than we found are used as fish poisons, as the use of *Clibadium surinamense* L. and *Lonchocarpus chrysophyllus* Kleinh. were reported among Maroons elsewhere in Suriname (van Andel and Ruysschaert, 2011). The remark by Geijskes (1954) that fish poisoning is a technique that the Maroons must have copied from Suriname's indigenous people is incorrect. *Tephrosia vogelii* Hook.f. is widely cultivated in Central Africa for its roots, to be used in fish poisoning. The Kikongo name for this species, very similar in appearance to the South American *T. sinapou*, is *bumi dia baka*, from which the Aucan and Saramaccan term *bumbi*

is probably derived (van Andel et al. 2014). Research on the current use of fish poisons should take place in the dry season, as in this period this method is practiced in shallow pools formed between rocky riverbanks.

Some of the relations that we observed between fish and trees in the Tapanahoni are well-known, such as the preference of *Myleus rhomboidalis* for *Mourera fluviatilis* leaves that cover the rapids (Boujard 1992). The spiny, riverine palm *Astrocaryum jauari* Mart. is probably the most abundant palm of Amazonian floodplain forests, and its seed and pulp are eaten by at least 16 species of fish in Brazil (Piedade et al. 2006). Other food preferences of Tapanahoni fish, such as the fruits of *Solanum schomburgkii* Sendtn. and the flowers of *Vochysia guianensis* are to our knowledge not reported elsewhere.

The future of Tapanahoni fish: mercury, troubled water and plastic

The fish caught in the Tapanahoni river in Diitabiki is not only very important for local sustenance, but also has a significant cultural value. Many Maroons now live in the city of Paramaribo, but weekly flights from small airstrips all over the Surinamese hinterland connect them to their family members that still reside in the interior villages. The many buckets of freshly-caught fish sent by plane from Diitabiki to Paramaribo indicate a cultural preference by urban Maroons for freshwater fish over the widely available brackish and saltwater species sold in Paramaribo. What happens in Diitabiki is likely to occur elsewhere: a steady stream of fish from the forest rivers to the capital. The question, however, is whether the consumption of freshwater fish from Suriname's rivers is without risk.

There is ample evidence that since the 1990s, the increasing number of illegal gold mines in the Amazon threatens the safe consumption of food originating from the river, due to the pollution of small rainforest streams and large rivers with mercury (Mol et al. 2001; Durrieu et al. 2004; Maury-Brachet et al. 2018). Mercury levels in the blood of women and children in interior villages in Suriname were recently shown to be significantly higher than in control groups, and local fish is regarded as the source of their exposure to this heavy metal (Ouboter et al. 2018; Wickliffe et al. 2021). In a study in French Guyana along the Lawa river, which together with the Tapanahoni river forms the upper Marowijne watershed, 57% of the indigenous Wayana population had mercury levels in their hair that were higher than the safety levels established by the World Health Organization (Fréry et al. 2001). Of the fish consumed by the Wayana, 14,5% had mercury levels higher than the safety levels, and four carnivorous fish species even accounted for 72% of the heavy metal uptake of the indigenous community.

Apart from *Leporinus friderici*, which had a lower mercury content at Surinamese gold-prospecting sites than the 0.5 μg/g threshold for safe consumption (Mol et al. 2001), most of the fish species documented by us have not yet been studied with regards to toxic mercury content. No specific data exist for the Tapanahoni river on mercury levels in fish or in people's body. However, some species commonly consumed in Diitabiki, such as *Serrasalmus rhombeus* (*pireng*) were found to have high mercury levels in French Guiana, because of their carnivorous behavior (Fréry et al., 2001). On the other hand, *Myleus rhomboidalis* (kumalu) was found to have low mercury levels, due to its vegetarian diet (Fréry et al., 2001), as was the case with the omnivorous *Leporinus* spp. (Durrieu et al. 2004). As the children interviewed by us mostly caught small fish and juveniles of larger species that were either omnivorous, or fed on plants or detritus, we expect mercury levels of their catch to be less high than in the large carnivorous fish caught by adults in the village.

The traditional Aucan authorities have expelled Brazilian goldminers in the Tapanahoni area and prohibited floating river dredges on this river, as these dredges disturb the riverbed (Thoden van Velzen and Hoogbergen 2011). However, mining in terra firme forest along the river also causes an increased sediment input. A new gold pit and broad entrance road for heavy machinery that was opened in 2021 near Diitabiki (GPS: 4°09'38" N, 54°66'71" W), and the river near this location was entirely yellow (instead of dark blue-green) from the clay runoff. This sediment from gold mines changes the instream habitat and has a negative impact on the structure of fish communities in Suriname (Mol and Ouboter 2004), and may affect consumed fish as well. Future health education programs that target mercury pollution should take into account local Aucan knowledge on fish names and feeding behavior or fish caught for consumption.

Another concern is the plastic waste that is thrown into the rivers by the inhabitants. Previous research has shown that riverine fish are contaminated with microplastics (Sanchez et al. 2014). The presence of microplastics in freshwater fish in Suriname has received little or no attention, but are found to be harmful for fish (Jovanović 2017). The effects of microplastics on fish consumers deserves further investigation (Gamarro et al. 2020). We believe that awareness campaigns, proper environmental education on waste disposal and encouraging people to use less unnecessary plastic may significantly mitigate this problem.

CONCLUSION

Our pilot study revealed that there is an ample body of traditional knowledge on fishes and the plant species they consume and/or are used to catch them among Aucan Maroons in Diitabiki. Although our inventory was far from complete, we provide several previously undocumented vernacular names and relations between flooded forest plants and fishes that have not been reported before. The Tapanahoni river is a very important element in peoples' lives: it is the place where they bathe, wash, do the dishes and laundry, clean food, swim, play and fish. The contribution of fishing women and children to the family's daily protein intake should not be underestimated, and part of their catch is sent to the capital on a weekly basis.

At the same time, the Tapanahoni river ecosystem is threatened by mercury pollution, increased sedimentation as a result of gold mining and plastic waste. This poses a threat to human health, fish populations and ultimately the riverine forests, who depend on fish for their survival. Research on Maroon knowledge on fish and flooded forests is essential for future conservation and sustainable management plans, but should be done in a collaboration between ichthyologists, ethnobiologists, linguists and local communities. The preservation of biological, cultural and linguistic diversities in an integrated manner is important for the conservation of riparian ecosystems. Local knowledge on fish and their ecology should be incorporated in future health education programs on mercury pollution.

ACKNOWLEDGMENT

We are grateful to the traditional authorities of Diitabiki (Granman Bono Velanti and captain Johan Djani) for hosting us in their village and to Thomas Polimé (foundation Wooko Makandie) for facilitating our fieldwork. Fieldwork was partly funded by the Alberta Mennega Stichting. We could not have done this research without the knowledge shared by the young fishers of Diitabiki, in particular Joaisa Palang, Nogil Misidyan, Shosho Atoti, Utiputi Palang, Chantel Aviankoi, Oettje Bow, Shelven and Davila Palang. Baa Boi Leo, Kolen Matodja, Natali Andaa and Anesta Aviankoi also shared their knowledge of plants fish with us. Lastly, we are grateful to Jan Mol for helping us identify our fish photographs.

DATA AVAILABILITY

The data used to support the findings of this study are available from the corresponding author upon request. Duplicates of collected plants can be consulted at the National Herbarium of Suriname in Paramaribo and Naturalis Biodiversity Center in Leiden.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

CONTRIBUTION STATEMENT

Conceived the idea: IPG, DH.
Carried out the data analysis: IPG, DH, TA.
Wrote the first draft of the manuscript: IPG.
Review and final writing of the manuscript: IPG, TA.

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Received: 20 January 2022
Accepted: 25 July 2022
Published: 10 August 2022

Editor: Ana H. Ladio