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Nurseryfish *Kurtus gulliveri*. Upper fish is a male based on the hook above its head on which it carries the eggs, lower fish is a female

Photo: Nathan Litjens

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Photo: Hans-Georg Evers

# Fish species sold in the Kikori market, Papua New Guinea, with special reference to the Nurseryfish, *Kurtus gulliveri* (Perciformes: Kurtidae)

Carla C. Eisemberg<sup>1,2</sup> & Tim M. Berra<sup>1,3</sup>

## Abstract

The Kikori River has about 100 species of freshwater fishes with the equal highest percentage of endemism of any drainage system in New Guinea. The Nurseryfish (*Kurtus gulliveri*) is a distinctive euryhaline species from southern New Guinea and northern Australia where it is not known to be a commercial species. To the best of our knowledge, we report for the first time, the commercial use of *Kurtus gulliveri*, from the Kikori River estuary which was the most common species sold in the market. The Ariidae was the most common family represented. Fishes from 10 families and 16 species were identified during three Market surveys (17th, 19th and 23rd of January 2012). This survey was undertaken before the spread of Tilapia (*Oreochromis mossambicus*), an introduced species that has rapidly become widespread in the Kikori delta. Long-term monitoring programs are urgently needed in this area to evaluate the population trends not only for the Nurseryfish but all native species. Market surveys are especially relevant in remote communities that rely heavily on subsistence fisheries. During these surveys, new scientific and cultural knowledge can be obtained for unusual species, such as the Nurseryfish.

## Introduction

The freshwater fish fauna of New Guinea contains about 375 species, nearly 75% of which are endemic (Allen, 1991; Allen et al. 2008). About a third of these have a marine larval stage and are widespread

throughout Australia, Eastern Indonesia and the Philippines. Since New Guinea and Australia were connected by land in what is now the Torres Strait until about 9000 years ago when sea level was 19 metres lower than today (<http://sahultime.monash.edu.au/>

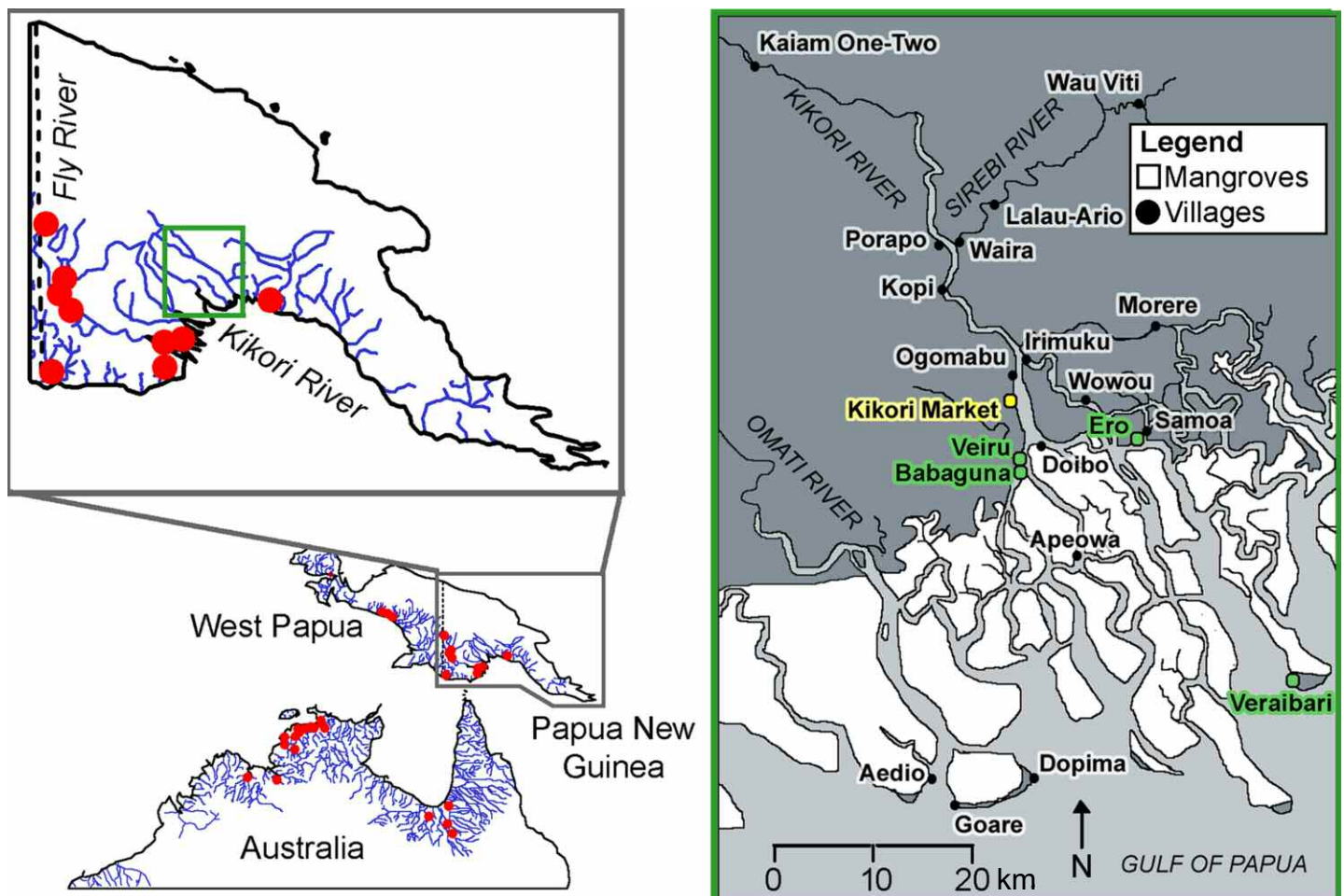


Figure 1. The Kikori delta study area in relation to the distribution (red dots) of *Kurtus gulliveri* (adapted from Berra 2003 and Eisemberg et al. 2015a). The Kikori Market (yellow) and Nurseryfish sellers' villages (green) are marked on the Kikori delta map.

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Figure 2. Mangroves surrounding Aird Hills near Ero Village, Kikori delta, Papua New Guinea.

Photo: Carla Eisemberg

explore.html), it is not surprising that the freshwater fish fauna of New Guinea shows a close relationship with Australia. The Fly River has about 108 species of freshwater fishes, and the Kikori River is a close second with about 100 species (Allen et al. 2008). These systems have the equal highest percentage of endemism of any drainage system in New Guinea at about 14%.

The Kikori drainage extends from the Southern Highlands Province alpine grasslands to the extensive mangrove wetlands of the Gulf Province of Papua New Guinea (PNG). The coast includes the delta islands in the Gulf of Papua (Fig. 1). The delta is a large alluvial plain below 40 m elevation covered in mangroves. It is dissected by a distributary system of river channels that meander extensively (Fig. 2). The dominant tree species in the delta are the mangrove *Sonneratia lanceolata* and the palm *Nypa fruticans* (Eisemberg et al. 2015a; Fig. 1): The Kikori and Purari deltas together comprise the largest contiguous area of mangroves in Papua New Guinea. Here 63 estuarine, 59 marine and 15 riverine adult fish species were found by Haines (1979).

One of these species is *Kurtus gulliveri* the Nurseryfish (Castelnaud, 1878), a distinctive euryhaline species restricted to rivers in northern Australia and southern New Guinea (Haines 1979; Berra 2003) (Figures 1 & 2). Nurseryfish may reach 590mm SL (Weber 1913, repeated by Beaufort and Chapman 1951), feed upon insects, shrimp, and fishes (Berra and Wedd 2001),

have a diploid number = 44 (Ezaz 2007), and may live to be four years old (Berra and Aday 2004). Males of this species carry the eggs on a supraoccipital hook on the forehead (Berra and Humphrey 2002, Berra et al. 2004). Nurseryfish spawn throughout the dry season (Berra et al. 2007), and have bizarre rib and swim bladder anatomy (Carpenter et al. 2004). Larvae are planktonic and leave the plankton at about 25 mm (Berra and Neira 2003). Fungal disease of *Kurtus* is discussed by Humphrey and Berra (2006). Low genetic variability is present in this species which makes paternity difficult to determine (Sommer et al. 2011). All of these studies have been conducted in northern Australia where Nurseryfish is not considered a commercial species. In fact, this species is poorly known by anglers and indigenous people of the area. It is not represented in Aboriginal art, except for a single commissioned work (Berra 2006). Only commercial Barramundi (*Lates calcarifer*) fishers know Nurseryfish, and they refer to it as “Breakfastfish” because they remove it from their nets in the morning after an overnight set.

The mangroves of the Gulf of Papua are also considered to be important nursery areas for fish and prawns including species targeted for human consumption (Robertson et al. 1991, 1998). In the coastal and delta areas of Western and Gulf Provinces of PNG, the capture of fishes utilizing gill-nets is one of the main sources of food and income for local communities (Mobiha and Murri 1993, Milton et al. 1998). The aim of this study was to collect information on the local sale

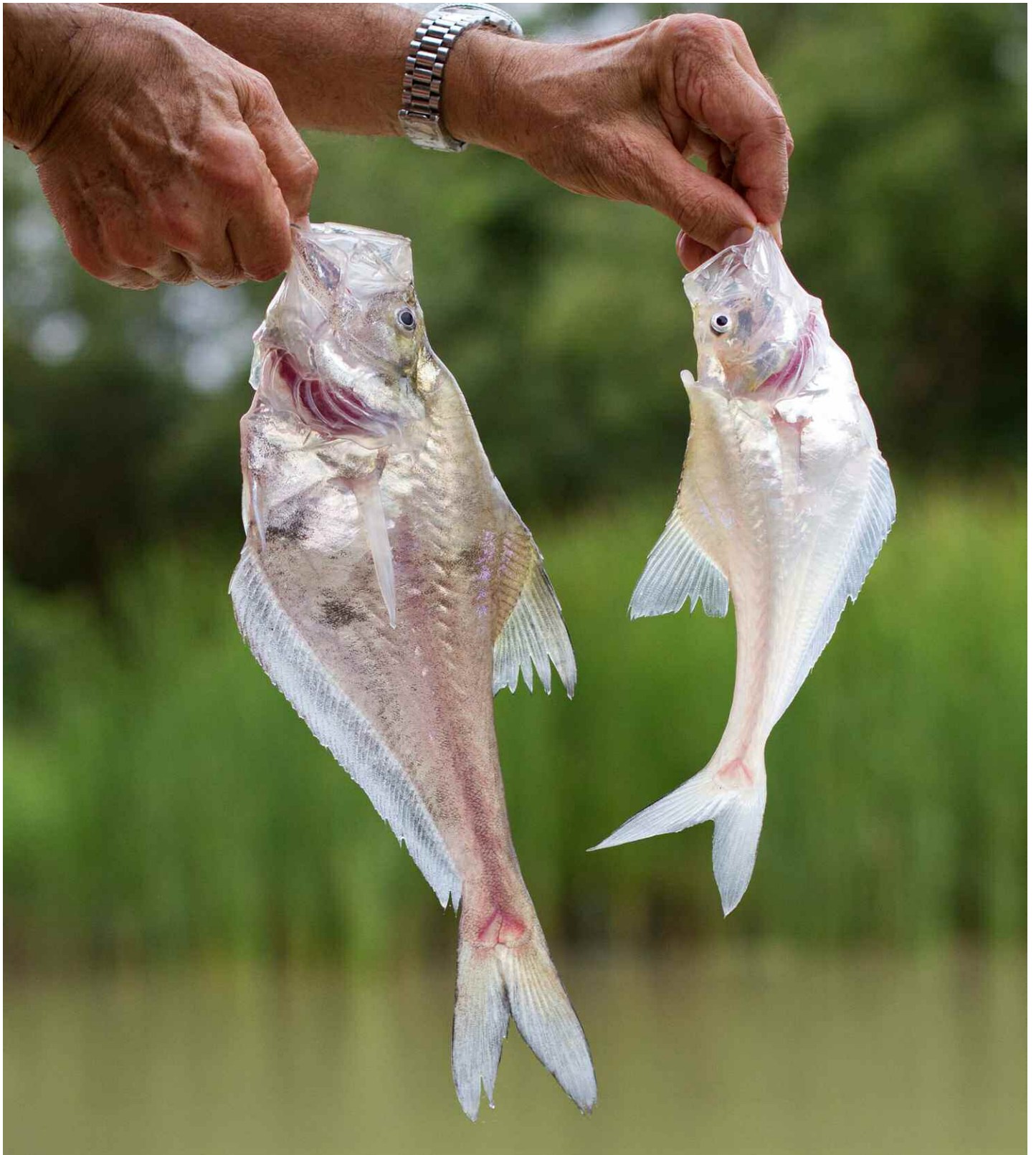


Figure 3. Female and male living Nurseryfish as removed from gill net on the Adelaide River NT, Australia. Note male's hook. These fish were released. Photo: Kate Paneros

of fishes in the Kikori Market, Gulf Province, PNG with special reference to Nurseryfish. To the best of our knowledge, we report for the first time, the commercial use of *Kurtus gulliveri*.

### Methods

Details on traded species were gained opportunistically in Kikori Market (7°24'44.45"S; 144°14'51.78"E). One of us (CCE) visited the Kikori Markets on three separate

days (17th, 19th and 23rd of January 2012). The data were recorded as part of a pilot study for monitoring fish in conjunction with long term market surveys of Pig-nosed Turtle (*Carettochelys insculpta*) (Eisemberg et al. 2011). Information was recorded on fish specimen condition (fresh or dried), price, and seller's tribe (Language groups: Kibiri, Porome, Kerewa, Urama) and village, as well as local species name. Species were identified to the lowest taxonomic level possible by the

second author (TMB) in consultation with Dr Michael Hammer of the Northern Territory Museum in Darwin from photographs taken at the Market by CCE using a Panasonic Lumix DMC-TS1 12 megapixel digital camera.

### Observations and Conclusions

Fishes from 10 families and 16 species were identified. These made up 60% of the specimens present in the Market (Table 1; Figs. 4 & 5). Unidentified specimens of the family Ariidae encompassed 6.5% of the 154 fish recorded. Thirty four percent of the individuals were not identified to the family level due to the lack of photos, absence of at least one local name which could be associated with identified species, or to the fact that some species were sold as pieces without heads or tails. The most common identified species sold in the Market was the Nurseryfish, which accounted for 15.6% of the total fish recorded (Fig. 5). Sellers from the delta area regard the Nurseryfish as a common species. However, the importance of Nurseryfish might have been overestimated since Nurseryfish can be easily identified. Other species of the family Ariidae could potentially also account for a high abundance but were not matched by specific local names during this study. Furthermore, the small amount of Barramundi accounted for in the Market were probably influenced by fisherman preferentially selling the larger specimens directly to the Kopi Camp Refectory, located upstream of Kikori Town.

The Tok-Pisin (a form of trade pidgin and one of the

three national languages of PNG) local name for the Nurseryfish is Glassfish, while the four language groups in the area called this species Ago (Kibiri), Ebei (Porome), Hago (Kerewa) and Eba (Urama) (Amepou, Kikori research student, pers. comm. Table 2). Sellers of Nurseryfish belonged to four villages, all located in the delta (Table 2, Figs 1 & 4). According to the sellers in the Market, the most common way of capturing Nurseryfish in Kikori is with gill-nets during the low tide in small, slow flowing side streams in the mangrove areas (Amepou, Kikori Research Student, pers. comm.) (Fig. 6). Gill-nets are relatively recent in Kikori, and they were probably introduced in the last 30 years (Eisemberg et al., 2015a). The habitat and preferable period of modern capture of Nurseryfish in the Kikori is similar to the Adelaide River (Northern Territory, Australia), where the best time to set gill nets for Nurseryfish was 3–4 hours before high tide in mud flats mostly covered with mangroves and water salinity ranging from 0 to 28 ppt (Berra 2003). Water salinity in the Kikori estuarine areas ranged from 2 to 17 ppt (Eisemberg et al. 2015b) These estuarine areas are usually turbid.

Prices depended on the species and condition of the fish. Fresh specimens averaged 4.4 Kina (\$1.37 USD) which was more expensive than those sold dry. The most expensive specimen was a large fresh Flat Catfish (*Cochlefelis insidiator*), which was sold for the price of 20 Kina (\$7.60 USD; Fig. 3c). Two fresh and 22 dry Nurseryfish were found in the Kikori Market (Fig 5), with prices varying from 40 Toea to 2 Kina (\$0.15 to

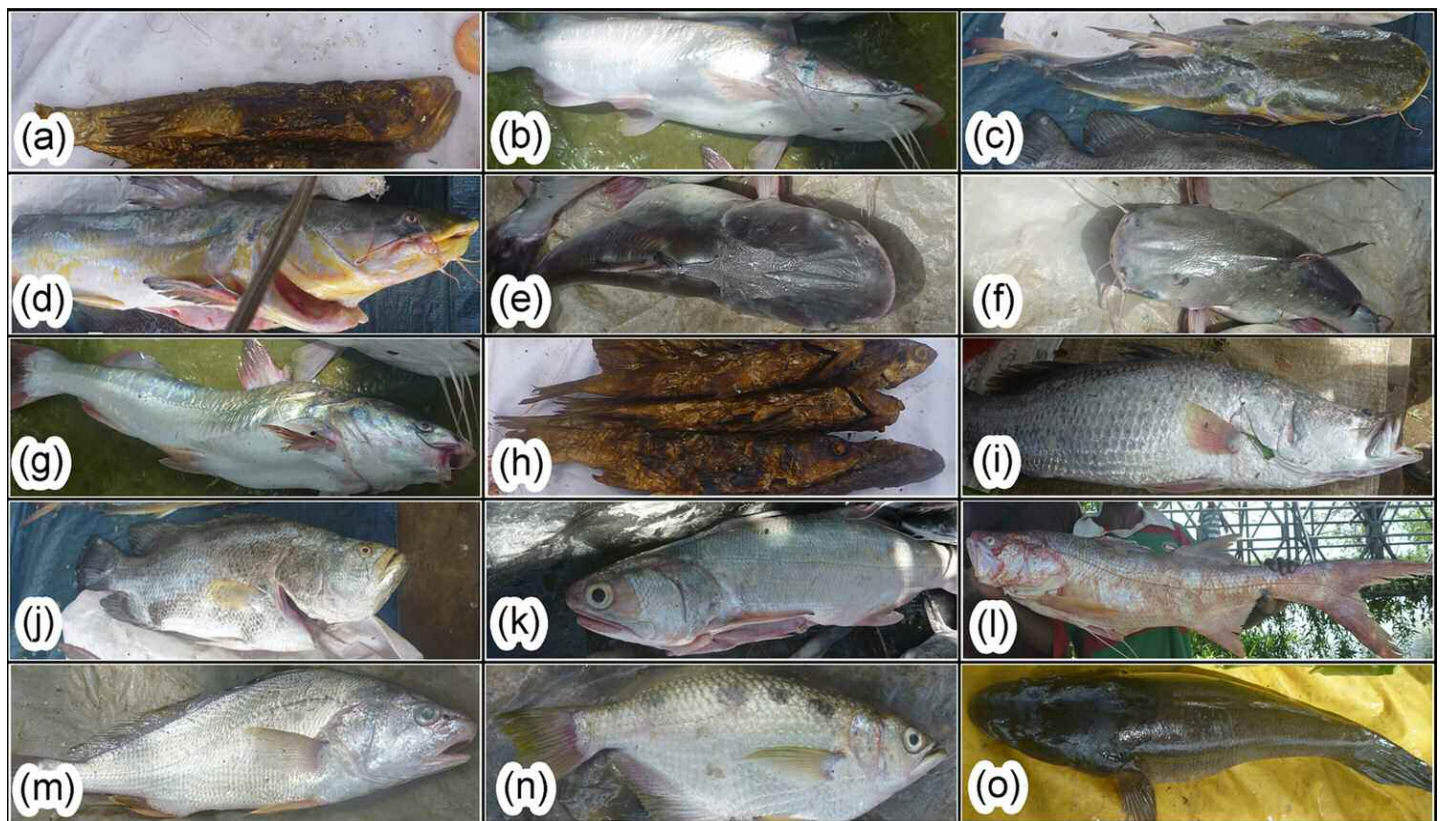


Figure 4. Species of fish identified in the Kikori Market (except for *Kurtus gulliveri*, Figure 3), Papua New Guinea. (a) *Thryssa scratchleyi*, (b) *Cochlefelis danielsi*, (c) *Cochlefelis insidiator*, (d) *Hemiarus dioctes*, (e) *Hexanematichthys mastersi*, (f) *Nearius leptaspsi*, (g) *Netuma bilineata*; (h) *Liza alata*?; (i) *Lates calcarifer*, (j) *Lobotes surinamensis*, (k) *Eleutheronema tetradactylum*, (l) *Polydactylus macrochir*, (m) *Nibeasquamosa*, (n) *Toxotes chatareus*, (o) *Eleotris* sp. Photo: Carla Eisemberg



Figure 5. Nurseryfish (*Kurtus gulliveri*) in the Kikori Market, January 2012. (a) Women from Ero selling fresh Nurseryfish; (b) Two male Nurseryfish; (c) Kerewa lady selling smoked Nurseryfish. Photo: Carla Eisemberg

\$0.76 USD). Two specimens were sold fresh for 1 Kina each (\$0.38 USD) (Table 2). The Nurseryfish specimens were one of the least expensive species sold in the market.

Regional markets are fascinating places where information about local fauna and cultural practices can be promptly obtained. Market surveys are especially relevant in remote communities that rely heavily on subsis-



Figure 6. Gill-nets from Apeowa (a) and Babai (b) Villages used to capture Nurseryfish (*Kurtus gulliveri*) in the Kikori delta, Gulf Province, Papua New Guinea. Photo: Arthur Georges

tence fisheries. During these surveys, new scientific and cultural knowledge can be obtained for unusual species, such as the Nurseryfish. However, it is important to take into account the new and future threats to the Kikori River fishes and environment. Although no anecdotal report of Nurseryfish decline was mentioned, this market survey was undertaken before the spread of Tilapia (*Oreochromis mossambicus*), an introduced species that has rapidly become widespread in the

Kikori delta. In 2012, no Tilapia was recorded in the Market, while in 2013 it was considered common (Georges 2013).

Tilapia has been in the country for decades and was the species collected at the most localities in the Laloki River in a 1971 study (Berra et al. 1975). However, no study of the effect of this introduced species has been undertaken in New Guinea. The effects of introduced

Table 1. Number and percentage of fish species identified in the Kikori Market on the 17th, 19th and 23rd of January 2012. Prices are given in Kina as average for the species when advertised for sale “fresh” or “smoked”. Scientific names are those considered valid by the Catalog of Fishes of the California Academy of Sciences (2014; www.calacademy.org/research/ichthyology/catalog/).

Family	Species	Common name	Local name (tribe)	Number of fish (%)	Price Kina (fresh)	Price Kina (smoked)
Engraulidae	<i>Thryssa scratchleyi</i>	Freshwater Anchovy	Agavai (Porome)	3 (1.9%)	K1.50	-
Ariidae	<i>Cochlefelis danielsi</i>	Daniel's Catfish	Boromo (Kerewa)	2 (1.3%)	K 4.00	-
	<i>Cochlefelis insidiator</i>	Flat Catfish	Boromo (Kerewa)	1 (0.6%)	K 20.00	-
	<i>Hemiarus dioctes</i>	Giant Catfish	Amamai (Kerewa)	5 (3.2%)	K 7.00	-
	<i>Hexanematachthys mastersi</i>	Master's Catfish	Campteri (Porome)	7 (4.5%)	K 4.50	K 1.50
	<i>Neoarius leptaspi</i>	Triangular Shield Catfish	Boi (Porome)	1 (0.6%)	K 2.00	-
	<i>Netuma bilineata</i>	Bronze Catfish	Boromo (Kerewa)	2 (1.3%)	K 4.00	-
	Unidentified			10 (6.5%)	-	-
	Mugilidae	<i>Liza alata</i>	Diamond Mullet	Agavai (Porome)	5 (3.2%)	K 1.70
Centropomidae	<i>Lates calcarifer</i>	Barramundi	Gidobu (Kerewa)			
			Kirabu (Kibiri)	7 (4.5%)	K 14.50	-
Lobotidae	<i>Lobotes surinamensis</i>	Tripletail	Mae (Kerewa)	8 (5.2%)	K 15.00	K 1.00
Polynemidae	<i>Eleutheronema tetradactylum</i>	Fourfingered Threadfin	Moro (Kerewa)	2 (1.3%)	-	-
	<i>Polydactylus macrochir</i>	King Threadfin	E'ere (Kerewa)	9 (5.8%)	-	K 4.50
Sciaenidae	<i>Nibea squamosa</i>	Scaly Croaker	Ipomuri (Kerewa)	5 (3.2%)	K 3.00	K 1.00
Toxotidae	<i>Toxotes chatareus</i>	Seven-spot Archerfish	Borovari (Kibiri)			
			Botuari (Porome)			
			Umukehi (Urama)	6 (3.9%)	K 3.00	K 1.50
Kurtidae	<i>Kurtus gulliveri</i>	Nurseryfish	See Table 2 below	24 (15.6%)	K 1.00	K 1.20
Eleotridae	<i>Eleotris sp.</i>	Gudgeon	Upiri (Kibiri)	5 (3.2%)	K 4.13	-
	Unidentified			52 (33.8%)	-	-
<b>TOTAL</b>				<b>154</b>		

Table 2. Villages and tribes (language groups) selling Nurseryfish in the Kikori Market on the 17th, 19th and 23rd of January 2012. The local name for the Nurseryfish in each language group and the condition of the fish (fresh or smoked) are also given.

Village	Tribe	Local Name	Number (%)	Price (Kina)
Veiru	Kibiri	Ago	3 (12.5%)	K 0.40 to 0.50 (smoked)
Ero	Porome	Ebei	4 (16.7%)	K 1.00 (fresh); K 2.00 (smoked)
Babaguna	Kerewa	Hago	1 (4.3%)	K 0.50 (smoked)
Veraibari	Urama	Eba	16 (66.7%)	K 1.50 (smoked)

fishes in PNG are poorly documented (Glucksman et al., 1976). There is preliminary evidence in the Sepik River of increased human use of exotic fish as well as declines of some native species associated with the spread of exotics (Dudgeon and Smith 2006). Long-term monitoring programs and Market Surveys in the Kikori Delta and surroundings are urgently needed to evaluate population trends, not only for the Nurseryfish but all native species.

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Dion Wedd of the Territory Wildlife Park and Tim Berra setting gill nets for Nurseryfish on Marrakai Creek, a tributary of the Adelaide River, 65 km east of Darwin, NT, Australia, the locality of most of the Nurseryfish studies listed in the literature cited. Photo: Kate Paneros



Adelaide River at sunrise about 1 km downstream from mouth of Marrakai Creek, 65 km east of Darwin, NT.

Photo: Tim Berra

