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UPDATE OF ICHTHYOFAUNA AND ITS CONSERVATION STATUS IN THE AGHIEN LAGOON, CÔTE D'IVOIRE

Konan Koffi Félix[1*], Assi Sonan Romuald[1], Boussou Koffi Charles[1], Gourène Germain[2]

[1] *Jean Lorougnon Guédé University, Department of Environment, POB 150 Daloa, Côte d'Ivoire*

[2] *Nangui Abrogoua University, Department of Sciences and Environment Management, 02 POB 801 Abidjan 02, Côte d'Ivoire*

*Corresponding Author, Email: konanfelix@yahoo.fr

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ABSTRACT

This study focused on the diversity of fish fauna, its conservation status and its vulnerability in the Aghien freshwater lagoon (southeast of Côte d'Ivoire). For the fish data collection, two sampling approaches were used: experimental fishing and artisanal fishing. As a result, 80 species observed in this lagoon are distributed into 55 genera, 27 families and 10 orders. The best represented orders are the Perciformes, Siluriformes, Osteoglossiformes, Characiformes, Cyprinodontiformes and Pleuronectiformes. The Cichlidae, Mormyridae and Clupeidae represented the best diversified family. With an occurrence of 100%, the most frequent species are: *Brycinus longipinnis, Chrysichthys nigrodigitatus, Pellonula leonensis, Schilbe intermedius* and *S. mandibularis*. In the whole fish population, according to IUCN red list, four species where described as Near Threatened (*Coptodon walteri, Marcusenius furcidens, Galeoides decadactylus* and *Cynoglossus senegalensis*), four as Vulnerable (*B. brevis, Rhexipanchax nimbaensis, Enteromius raimbaulti* and *Tilapia busumana*) and one as Endangered species (*Pseudotolithus senegalensis*). These categories of species that have a conservation interest according to the IUCN Red List represent respectively 10.26% of the whole population. Fish population of the Aghien Lagoon are divided into seven classes ranging from "low" to "very high" vulnerability, regarding the vulnerability to stress due to fishing pressure.

How to Cite

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INTRODUCTION

Freshwater fish have an essential part of ecosystem services in the continental environment. Indeed, ichthyofauna has an important socio-economic value and represents an essential component for the functioning of hydrosystem (Da Costa and Konan, 2005; FAO, 2007; Dirican et al., 2012; N'zi et al., 2015). Indeed, the greatest species diversity is found along the continental shelves, in reefs associated with islands and freshwater habitats, where isolation due to mountain outcrop, island systems and fluctuations of sea level has created opportunities for speciation (Leidy and Moyle, 1997). Fish, as permanent biomass of aquatic ecosystems (Jennings et al., 2008), constitutes more than half of all vertebrate species and contributes diversely to the diversity and functioning of aquatic ecosystems, as well as to human health and well-being. Nevertheless, many marine and freshwater fish species are threatened by a critical population decline and are increasingly at risk of local or global extinction (Helfman 2007; Darwall and Freyhof, 2016). The concentration of people and cities around freshwater systems and increasing human demands for water have led to high levels of degradation and threats to biodiversity in fresh waters. Effects of human activities manifest as widespread catchment disturbance, deforestation, riparian loss, water pollution, river corridor engineering, dams and water diversions, extensive wetland drainage, groundwater depletion, aquatic habitat loss and fragmentation, establishment of introduced alien species and overfishing (Dudgeon et al., 2006). Pollutants that affect freshwater fishes are derived from direct discharges by industries, mining developments, land-based runoff from agriculture and urban areas, and atmospheric deposition. The Aghien Lagoon is a freshwater lagoon located in the southeast of Côte d'Ivoire, in the north part of the Ebrié Lagoon. All wastewater (domestic, industrial, agricultural, port activities, etc.) from Abidjan City and its agglomeration are drained in Ebrié Lagoon waters without any treatment. Such pollutants seriously threaten the balance of aquatic organisms and ecosystems. Thus, the current study aimed to describe the fish community and access conservation status of its different species.

MATERIALS AND METHODS

Study area

The Aghien Lagoon is located in the north of the Ebrié Lagoon between latitudes 5°22' N and 5°26' N and longitudes 3°49' W and 3°55' W (Figure 1). Along 19 km, with a catchment area of 340 km^2, the Aghien Lagoon is separated from the rest of the Ebrié Lagoon by the Potou Lagoon. The Aghien and Potou lagoons communicate via a natural channel. The Aghien Lagoon is subject to a hydrographic network composed of the Mé (4020 km²), Bété (220 km²) and Djibi (80 km²) rivers. The Bété and Djibi rivers open directly into the Aghien Lagoon, while the Mé River opens into the natural channel separating the Aghien and Potou lagoons (Ettien, 2010). The Aghien Lagoon is a freshwater environment strongly influenced by these continental inputs. Located in an estuarine zone, the ichthyofauna of this hydrosystem is influenced by marine and continental species. This environment promotes a rich biodiversity with intense fishing activity (Bédia et al., 2009; Traoré et al., 2014; Assi et al., 2019).

Data collection

Regarding the ichthyological fauna, two sampling approaches were used for sampling: experimental fishing and artisanal fishing between June 2014 and May 2015. The sites chosen for the experimental fishery took into account the hydrological zonation, accessibility, sources of supply of the lagoon and anthropic activities. Thus, three fishing sectors have been identified. The upstream sector is located near the mouth of the Djibi and Bété rivers, the downstream sector near the natural channel connecting the Aghien and Potou lagoons, under the influence of the mouth of the Mé River. The middle zone is a transition zone between upstream and downstream. The experimental fishing was carried out with 30 mesh nets of between 10 and 40 mm side length. Each of these gillnets was 50 m long and 2.5 to 3.5 m high. At each sampling occasion, fishing was done overnight (17.00 to 7.00) and during the day (7.00 to 13.00). Regarding the artisanal fishing, the data collection team ensured to check the catches of the fishermen in the study area to complete the list of species. During this study, the artisanal fishing was carried out using: seines (with mesh sizes varying from 12 to 17 mm), gillnets (with mesh sizes varying from 20 to 40 mm) and various types of traps.

The identification of collected specimens was performed at species level, based on the key proposed by Paugy et al. (2003a and b), Sonnenberg and Busch (2009), Fricke et al. (2019), as well as Froese and Pauly (2019). When the identification was problematic, specimens were preserved in ethanol for further laboratory analysis. When possible, the status of the inventoried species was documented (threatened species, rare, extinct, endemic, etc.) by using the Red List of IUCN (2018) and the database of Froese and Pauly (2019). The vulnerability of fish species to fishing pressure was determined according to Cheung et al. (2005) and Froese and Pauly (2019).

Occurrence (F) provides information on the continued presence of a species in an ecosystem (Dajoz, 2000):

$$F\ (\%) = (p\ /\ P) * 100;$$

p is number of samples where species *i* appears and *P* is total number of samples.

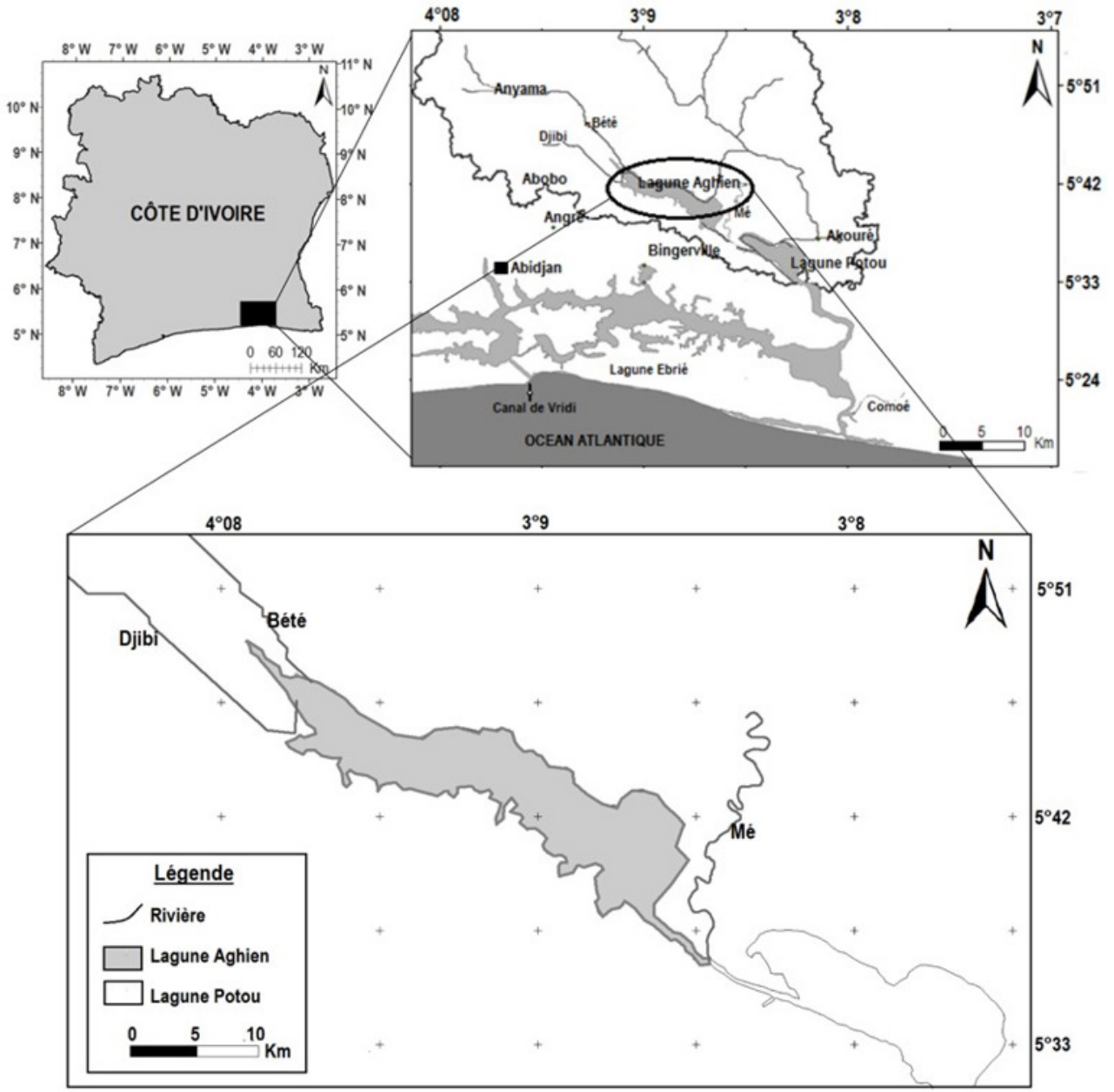

Fig 1. Location of the study area (Aghien Lagoon, southeast of Côte d'Ivoire)

RESULTS

Diversity and frequency of occurrence of fish species in the Aghien Lagoon

The 80 species sampled in this lagoon are divided into 55 genera, 27 families and 10 orders (Table 1). The best represented orders are the Perciformes (11 families, 23 genera, 30 species), the Siluriformes (4 families, 8 genera, 15 species), the Osteoglossiformes (2 families, 7 genera, 11 species), the Characiformes (2 families, 4 genera, 9 species), the Cyprinodontiformes (2 families, 2 genera, 3 species) and the Pleuronectiformes (2 families, 2 genera, 2 species).

The other orders are: the Clupeiformes (1 family, 4 genera, 5 species), the Cypriniformes (1 family, 2 genera, 3 species), the Mugiliformes (1 family, 2 genera, 2 species) and the Eleopiformes (1 family, 1 genera, 1 species).

At the level of the fish families, the Cichlidae (8 genera, 14 species) constitute the best diversified family, followed by the Mormyridae (6 genera, 10 species) and the Clupeidae (4 genera, 5 species). The Alestidae, Clariidae and Gobiidae are represented, respectively, by 3 genera, 7 species; 3 genera, 6 species; 3 genera, 1 species. The Claroteidae, Schilbeidae, Cyprinidae, Eleotridae, Mugilidae, Carangidae and Polynemidae are represented by two genera. The 14 other families are present with one genre.

Table 1. Conservation status, vulnerability and habitat of the fish species encountered in the Aghien Lagoon (Côte d'Ivoire) (UICN, 2018; Froese & Pauly, 2019)

Order	Family	Species	Conservation status	Vulnerability	Habitat
Characiformes	Alestidae	*Alestes baremoze*	Least Concern (LC)	Low vulnerability (22 %)	benthopelagic
		Brycinus brevis	Vulnerable (VU)	Low vulnerability (23 %)	demersal
		Brycinus imberi	Least Concern (LC)	Low vulnerability (10 %)	demersal
		Brycinus nurse	Least Concern (LC)	Low to moderate vulnerability (29 %)	pelagic
		Brycinus longipinnis	Least Concern (LC)	Low vulnerability (15 %)	pelagic
		Brycinus macrolepidotus	Least Concern (LC)	Low to moderate vulnerability (31 %)	pelagic
		Micralestes occidentalis	Least Concern (LC)	Low vulnerability (10 %)	pelagic
	Hepsetidae	*Hepsetus odoe*	Least Concern (LC)	Low vulnerability (21 %)	demersal
Cypriniformes	Cyprinidae	*Ethmalosa fimbriata*	Least Concern (LC)	Low vulnerability (21 %)	pelagic
		Odaxothrissa ansorgii	Least Concern (LC)	Low vulnerability (14 %)	pelagic
		Pellonula leonensis	Least Concern (LC)	Low vulnerability (10 %)	pelagic
		Pellonula vorax	Least Concern e (LC)	Low vulnerability (13 %)	pelagic
		Sardinella rouxi	Data deficient (DD)	Low vulnerability (17 %)	pelagic
		Clypeobarbus hypsolepis	Least Concern (LC)	Low vulnerability (10 %)	benthopelagic
		Enteromius ablabes	Least Concern (LC)	Low vulnerability (23 %)	benthopelagic
		Enteromius raimbaulti	Vulnerable (VU)	Low vulnerability (14 %)	benthopelagic
Cyprinodontiformes	Nothonbranchiidae	*Epiplatys olbrechtsi*	Least Concern (LC)	Low vulnerability (10 %)	benthopelagic
	Poeciliidae	*Rhexipanchax schioetzi*	Least Concern (LC)	Low vulnerability (11 %)	benthopelagic
		Rhexipanchax nimbaensis	Vulnerable (VU)	Low vulnerability (14 %)	benthopelagic
Mugiliformes	Mugilidae	*Neochelon falcipinnis*	Data deficient (DD)	Low to moderate vulnerability (31 %)	demersal
		Mugil cephalus	Least Concern (LC)	Moderate vulnerability (42 %)	benthopelagic
Osteoglossiformes	Mormyridae	*Brienomyrus brachyistius*	Least Concern (LC)	Low vulnerability (19 %)	benthopelagic
		Marcusenius senegalensis	Least Concern (LC)	Moderate vulnerability (35 %)	demersal
Osteoglossiformes	Mormyridae	*Marcusenius ussheri*	Least Concern (LC)	Low to moderate vulnerability (34 %)	demersal
		Marcusenius furcidens	Near Threatened (NT)	Moderate vulnerability (35 %)	demersal
		Marcusenius sp.			
		Mormyrops breviceps	Least Concern (LC)	Moderate to high vulnerability (52 %)	demersal
		Mormyrus rume	Not Evaluated (NE)	High vulnerability (63 %)	demersal
		Petrocephalus bovei	Not Evaluated (NE)	Low vulnerability (13 %)	demersal
		Petrocephalus pellegrini	Least Concern (LC)	Low vulnerability (11 %)	demersal
		Pollimyrus isidori	Not Evaluated (NE)	Not Evaluated (NE)	demersal
	Notopteridae	*Papyrocranus afer*	Least Concern (LC)	Moderate vulnerability (38 %)	demersal

Order	Family	Species	Conservation status	Vulnerability	Habitat
Eleopiformes	Eleopidae	*Elops lacerta*	Least Concern (LC)	Low to moderate vulnerability (32 %)	demersal
Perciformes	Carangidae	*Caranx hippos*	Least Concern (LC)	Moderate vulnerability (41 %)	demersal
		Trachinotus teraia	Least Concern (LC)	Moderate vulnerability (38 %)	demersal
	Channidae	*Parachanna obscura*	Not Evaluated (NE)	Moderate to high vulnerability (47 %)	demersal
	Cichlidae	*Chromidotilapia guntheri*	Least Concern (LC)	Low vulnerability (25 %)	benthopelagic
		Coptodon guineensis	Least Concern (LC)	Low vulnerability (19 %)	benthopelagic
		Coptodon zillii	Not Evaluated (NE)	Low to moderate vulnerability (27 %)	benthopelagic
		Coptodon walteri	Near Threatened (NT)	Low to moderate vulnerability (27 %)	benthopelagic
		Hemichromis bimaculatus	Least Concern (LC)	Low vulnerability (19 %)	benthopelagic
		Hemichromis fasciatus	Least Concern (LC)	Low vulnerability (14 %)	benthopelagic
		Oreochromis niloticus	Least Concern (LC)	Low to moderate vulnerability (30 %)	benthopelagic
		Sarotherodon caudomarginatus	Least Concern (LC)	Low vulnerability (22 %)	demersal
		Sarotherodon melanotheron	Not Evaluated (NE)	Low vulnerability (16 %)	demersal
		Tilapia busumana	Vulnerable (VU)	Low vulnerability (25 %)	demersal
		Pelmatolapia mariae	Least Concern (LC)	Low to moderate vulnerability (28 %)	demersal
		Tilapia sp.			
		Tylochromis intermedius	Least Concern (LC)	Low to moderate vulnerability (30 %)	benthopelagic
		Tylochromis jentinki	Least Concern (LC)	Low vulnerability (22 %)	benthopelagic
	Eleotridae	*Eleotris senegalensis*	Least Concern (LC)	Low to moderate vulnerability (29 %)	demersal
		Eleotris vittata	Least Concern (LC)	Low to moderate vulnerability (35 %)	demersal
		Kribia kribensis	Least Concern (LC)	Low vulnerability (10 %)	demersal
	Gerreidae	*Gerres nigri*	Least Concern (LC)	Low vulnerability (20 %)	benthopelagic
	Gobiidae	*Awaous lateristriga*	Not Evaluated (NE)	Low to moderate vulnerability (28 %)	demersal
		Bathygobius soporator	Least Concern (LC)	Low to moderate vulnerability (29 %)	demersal
		Gobioides sagitta	Least Concern (LC)	Moderate to high vulnerability (52 %)	demersal
	Haemulidae	*Pomadasys jubelini*	Least Concern (LC)	Moderate vulnerability (36 %)	demersal
	Monodactylidae	*Monodactylus sebae*	Not Evaluated (NE)	Low vulnerability (13 %)	demersal
	Polynemidae	*Galeoides decadactylus*	Near Threatened (NT)	Low to moderate vulnerability (31 %)	demersal
		Polydactylus quadrifilis	Least Concern (LC)	Moderate vulnerability (44 %)	demersal
	Sciaenidae	*Pseudotolithus senegalensis*	Endangered (EN)	Moderate vulnerability (42 %)	demersal
	Sphyraenidae	*Sphyraena afra*	Least Concern (LC)	Very high vulnerability (78 %)	demersal
Pleuronectiformes	Paralichthyidae	*Citharichthys stampflii*	Least Concern (LC)	Low vulnerability (15 %)	demersal
	Cynoglossidae	*Cynoglossus senegalensis*	Near Threatened (NT)	High vulnerability (64 %)	demersal

Order	Family	Species	Conservation status	Vulnerability	Habitat
Siluriformes	Claroteidae	*Auchenoglanis occidentalis*	Least Concern (LC)	Moderate vulnerability (38 %)	demersal
		Chrysichthys auratus	Least Concern (LC)	Low to moderate vulnerability (27 %)	demersal
		Chrysichthys maurus	Least Concern (LC)	Moderate to high vulnerability (46 %)	demersal
		Chrysichthys nigrodigitatus	Least Concern (LC)	High vulnerability (60 %)	demersal
	Clariidae	*Clarias anguillaris*	Least Concern (LC)	Moderate to high vulnerability (54 %)	demersal
		Clarias gariepinus	Least Concern (LC)	Very high vulnerability (79 %)	benthopelagic
		Clarias ebriensis	Least Concern (LC)	Low to moderate vulnerability (26 %)	demersal
		Gymnallabes typus	Least Concern (LC)	Low vulnerability (25 %)	demersal
		Heterobranchus isopterus	Least Concern (LC)	Moderate to high vulnerability (50 %)	demersal
		Heterobranchus longi-filis	Least Concern (LC)	High to very high vulnerability (69 %)	demersal
	Malapteruridae	*Malapterurus electricus*	Least Concern (LC)	High to very high vulnerability (74 %)	benthopelagic
Siluriformes	Schilbeidae	*Parailia pellucida*	Least Concern (LC)	Low vulnerability (22 %)	demersal
		Parailia spiniserrata	Least Concern (LC)	Low vulnerability (11 %)	demersal
		Schilbe intermedius	Least Concern (LC)	High vulnerability (63 %)	demersal
		Schilbe mandibularis	Least Concern (LC)	Low to moderate vulnerability (29 %)	demersal

The following 12 families emerged as monospecific: the Nothobranchiidae, Notopteridae, Elopidae, Channidae, Gerreidae, Haemulidae, Monodactylidae, Sciaenidae, Sphyraenidae, Paralichthyidae, Cynoglossidae and Malapteruridae.

The genus *Brycinus* is the most abundant with five species. It is followed by the *Marcusenius* (4 species). The genera *Coptodon, Chrysichthys* and *Clarias* are represented by three species. The other genera are represented by two or one species. Furthermore, *Marcusenius* sp. and *Tilapia* sp. could not be identified to species level. The ichthyofauna of the Aghien Lagoon contains 27 species with marine or estuarine affinity and an introduced species in Côte d'Ivoire (*Oreochromis niloticus*). The five species with an occurrence of 100% and considered as very frequent species are: *Brycinus longipinnis, Chrysichthys nigrodigitatus, Pellonula leonensis, S. intermedius* and *S. mandibularis*. Other species observed with a frequency of occurrence greater than 50% are: *Parailia pellucida, Polydactylus quadrifilis, Elops lacerta, Hemichromis fasciatus* and *Hepsetus odoe*. The following seven species, with the occurrence between 20 and 39%, are classified as accessory species in the catches: *Tylochromis intermedius, B. macrolepidotus, B. nurse, Cynoglossus senegalensis, Neochelon falcipinnis, Sarotherodon melanotheron* and *Pollimyrus isidori*. The other 40 species of the ichthyofauna of the Aghien Lagoon with the occurrences of less than 20% are described as accidental species.

Conservation status and vulnerability

Conservation status and vulnerability of the identified species, *Neochelon falcipinnis* and *Sardinella rouxi* (2.56%), are described as Data Deficient (DD). The conservation status of eight observed species (10.26%) has not yet been evaluated (NE) (Figure 2). The majority of Aghien Lagoon species have been described as Least Concern (LFA) species, representing 75.64% of fish population.

The species on the Red List of IUCN that have a conservation interest are:

- four vulnerable (VU) species: *B. brevis* (Alestidae), *Rhexipanchax nimbaensis* (Poeciliidae), *Enteromius raimbaulti* (Cyprinidae) and *T. busumana* (Cichlidae),
- four species described as Near Threatened (NT): *Coptodon walteri* (Cichlidae), *Marcusenius furcidens* (Mormyridae), *Galeoides decadactylus* (Polynemidae) and *C. senegalensis* (Cynoglossidae);
- one Endangered (EN) species: *Pseudotolithus senegalensis* belonging to the Sciaenidae family.

These three categories of species that have a conservation interest according to the IUCN Red List represent, respectively, 3.85%, 5.13% and 1.28% of the whole population. Regarding the vulnerability to stress due to fishing pressure, the fish population of the Aghien Lagoon are divided into seven classes ranging from "low" to "very high" vulnerability (Figure 3).

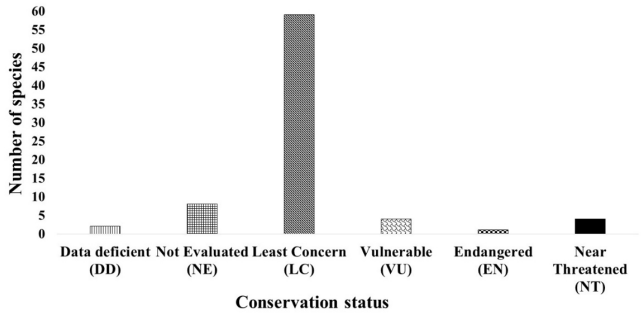

Fig 2. Distribution of fish species collected in the Aghien Lagoon according to their conservation status based on the IUCN classification

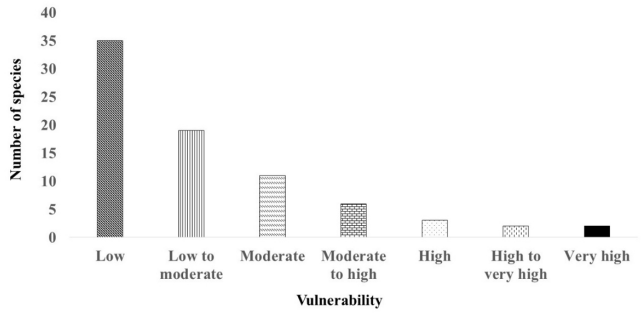

Fig 3. Distribution of fish species collected in the Aghien Lagoon according to their level of vulnerability to fishing pressure based on the Fishbase classification

Low vulnerability species are the most common with 35 species, accounting for 44.87% of all species. Nineteen species (24.36%) belong to the "low to moderate" vulnerability class and 11 species (14.10%) are classified as "moderate" vulnerability. Vulnerability categories described as "moderate to high" and "high" are represented by six species representing 7.69%, and three species (3.85%), respectively.

The categories "high to very high" and "very high" vulnerability are each represented by two species (2.56% of the whole Aghien fish population). These include *Heterobranchus longifilis* and *Malapterurus electricus* belonging to the ”high to very high” vulnerability, and *Sphyraena afra* and *Clarias gariepinus* belonging to the ”very high” category.

Habitat and distribution area of the ichtyofauna of the Aghien Lagoon

The ichthyological fauna of the Aghien Lagoon can be grouped into three classes according to the ecological niche occupied in the hydrosystem. These include benthopelagic, demersal and pelagic fish. The demersal species were the most observed fish in the Aghien Lagoon (48 species, i.e. 61.54% of all identified species). This class is followed by benthopelagic fish, with 21 species, or 26.92% of all species observed. The minority class sampled in the lagoon is represented by pelagic fish (9 species, or 11.54% of all species).

The investigations carried out at the fish distribution area of the Aghien Lagoon showed that with the exception of Mugilidae *N. falcipinnis* (1.25% of all identified species) which is widely distributed in marine and coastal areas, other fish species have a wide distribution at the African scale. In addition, 17 fish species (21.25% of all identified species) have a much smaller distribution at the West African scale. In addition, *C. walteri, Mormyrops breviceps, M. furcidens, B. brevis* and *R. nimbaensis* and *T. busumana* are species with very restricted distribution: Ghana, Nigeria, Senegal, Niger, Guinea, Liberia and the Ivory Coast.

DISCUSSION

The present study carried out on the Aghien Lagoon showed 80 fish species against 45 species observed by Bédia (2015) on the same hydrosystem. This difference would be essentially related to the number of sampling sectors, the methods used and the survey periods. Indeed, during the study of Bédia (2015) on the Aghien-Potou Lagoon complex, two sampling stations were selected with only one on the Aghien Lagoon. This small number of stations did not obtain an important specific richness. This confirms that increasing fishing effort by increasing the number of sampling campaigns in space and time increases the probability of catching more species. The use of various fishing gear and the combination of methods allow an efficient inventory of the species richness of a hydrosystem (Seegert, 2000). The lagoon studied showed that Perciforms, Siluriforms, Osteoglossiforms and Characiformes are the orders containing the most families, genera and species as also observed by Teugels et al. (1988), Da Costa and Konan (2005), Konan et al. (2006) and Aliko (2012) in this ichthyological province. The ichthyofauna of the Aghien Lagoon is dominated by the Family Cichlidae with the most genera and species. According to Blaber (2000) and Chikou (2006), the dominance of this family is due to their diet flexibility. The Cichlidae dominated the ichthyological population of the Aghien Lagoon in terms of the number of species observed. This family is followed by the Mormyridae, Clupeidae, Alestidae, Clariidae and Gobiidae. Several authors have reported a similar composition of fish populations in various Ivorian and West African hydrosystems: the Sine-Saloum Estuary in Senegal and the Gambia Estuary in Gambia, the Ebrié Lagoon in Côte d'Ivoire, Nikoué in Benin (Villanueva, 2004), Aghien and Potou in Côte d'Ivoire (Bedia, 2015) and the fish holes in Benin (Aissi, 2018). Da Costa (2003), Da Costa and Konan (2005) and Aliko et al. (2010) also mentioned this composition in other freshwaters in Côte d’Ivoire.

Species such as *B. longipinnis, C. nigrodigitatus, P. leonensis, S. intermedius* and *S. mandibularis*, with an

occurrence percentage of 100%, have a high degree of presence and abundance in the Aghien Lagoon. Their important presence would be due to the characteristics of the environment that are favorable to them.

In addition, the species richness recorded in the Aghien Lagoon (80 species) during this work represents 52.29% of the total species richness of the Ebrié Lagoon complex (153 species) to which it belongs (Albaret, 1994). When the species richness is reduced to the area of the specific hydrosystem, the Aghien Lagoon appears much richer (80 species per 20 km^2 or 4 species per km^2) than the Aby Lagoon with 67 species for an area of 424 km^2 (0.16 species per km2) (Koffi, 2015). According to Pérez-Hernández & Torrez-Orozco (2000), variations in the diversity of fish observed between lagoons could depend on the characteristics of these lagoons (temporal variations, geographical location and size of lagoons), sampling effort and the type of fishing gear used.

The results according to the classification of the International Union for the Conservation of Nature (IUCN) of fish species collected at the Aghien Lagoon have shown that the great majority of fish species (75.64% of fish population) has been classified in "Least Concern" category. In addition, 83.33% of the species in this population have a vulnerability to fishing pressure between "low" and "moderate" according to Cheung et al. (2005) and Froese and Pauly (2019) classification. This result shows that the majority of fish species in the lagoon do not face significant threats. Conservation status is an indicator for assessing the extent of risk of a species. However, since this indicator is not fixed, as it may change over time according to the increase or decrease of threats to species, its reassessment is therefore regularly required (IUCN, 2018). Moreover, among this population there is a significant percentage of species with a particular status. These are 11.53% of species with a strong conservation interest (IUCN 2018) and 16.66% of species with a higher vulnerability than the "moderate" category (Cheung et al., 2005).

These species, with their limited geographic distribution and declining population, are experiencing deterioration in the ecological quality of their environment (IUCN, 2018). On the other hand, fishing and water pollution can be a source of species loss or even loss of some species (Cheung et al., 2005; Kantoussan, 2007; IUCN 2018). Fishing affects fish communities through changes in total biomass as well as in the species composition of population (Bianchi et al., 2000; Pet-Soede et al., 2001). Traoré et al. (2014) reported the presence of important agricultural activities around the Aghien Lagoon. Therefore, this environment is likely to receive wastewater inputs from agriculture by the use of pesticides and fertilizers on farmland. Traoré et al. (2015) also noted that these leaching waters introduced large quantities of pesticides of various kinds. These threats could lead to irreversible changes if monitoring is not in place.

Concerning the habitats described by Froese & Pauly (2019), it appeared that 61.54% of the inventoried species are demersal, 26.92% are benthopelagic and 11.54% are pelagic.

More than half of the fish species in the Aghien Lagoon are freshwater fish. These species live closer to the bottom than to the surface. In addition, 98.75% of the species identified in the Aghien Lagoon have a wide distribution at the African scale, or even Eurasia (Paugy et al., 2003a and b; Sonnenberg and Busch, 2009; Fricke et al., 2019; Froese and Pauly, 2019).

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SAŽETAK

AŽURIRANO STANJE IHTIOFAUNE I NJENOG KONZERVACIJSKOG STATUSA U AGHIEN LAGUNI, OBALA BJELOKOSTI

Istraživanje se usredotočilo na raznolikost ihtiofaune te njen status očuvanja i osjetljivosti u slatkovodnoj laguni Aghien (jugoistočno od Obale Slonovače). Za prikupljanje podataka o ribama korištena su dva pristupa uzorkovanja: eksperimentalni i tradicionalni ribolov. Kao rezultat, 80 vrsta zabilježenih u laguni raspoređeno je u 55 rodova, 27 porodica i 10 redova. Najčešće zastupljeni redovi su Perciformes, Siluriformes, Osteoglossiformes, Characiformes, Cyprusinodontiformes i Pleuronectiformes. Cichlidae, Mormyridae i Clupeidae predstavljale su najraznolikije porodice. Sa pojavnošću od 100%, najčeste vrste su bile: *Brycinus longipinnis, Chrysichthys nigrodigitatus, Pellonula leonensis, Schilbe intermedius* i *S. mandibularis*. U ukupnoj ribljoj populaciji, a prema IUCN crvenoj listi, četiri vrste su opisane kao „skoro ugrožene" (*Coptodon walteri, Marcusenius furcidens, Galeoides decadactylus* i *Cynoglossus senegalensis*), četiri su zabilježene kao „osjetljive" (*B. brevis, Rhexipanchax nimbaensis, Enteromius raimbaulti* i *Tilapia busumana*) i jedna vrsta kao „ugrožena" (*Pseudotolithus senegalensis*). Kategorije vrsta koje imaju interes za očuvanje prema IUCN crvenoj listi predstavljaju 10,26% od cjelokupne populacije. Populacija ribe u Aghien laguni podijeljena je u sedam klasa u rasponu od „niske" do „vrlo visoke" osjetljivosti, u pogledu osjetljivosti na stres i ribolovni pritisak.

Ključne riječi: ihtiofauna, status očuvanja, osjetljiv, Aghien laguna, zapadna Afrika

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