

Original Research Article

Anthropological Study of the Perceptions of Neighboring Households Related to the Causes and Consequences of Pollution in the *Ebrié* lagoon of Koumassi (Abidjan)

Aymard Gngangoran Gboudjou^{1*}, Célestin Yao Amani², Kouamé Guy Marcel Bouafou³¹Institute of Anthropological Sciences for Development (ISAD), Félix Houphouët-Boigny University, Abidjan, Ivory Coast²Institute of Anthropological Sciences of Development (ISAD), Félix Houphouët-Boigny University, Abidjan, Ivory Coast³Department of Science and Technology, Ecole Normale Supérieure of Abidjan, Ivory Coast**Article History**

Received: 22.03.2022

Accepted: 25.04.2022

Published: 30.04.2022

Journal homepage:<https://www.easpublisher.com>**Quick Response Code**

Abstract: Our study aimed to analyze the perceptions of riparian households related to the causes and consequences of the pollution of the Koumassi *Ebrié* lagoon. It is based on the mixed approach combining quantitative and qualitative method, using documentary research, direct field observations, the survey by questionnaire, semi-directive individual interviews and Focus Group. The results obtained first show the socio-demographic profile of households. For this purpose, the average household size is 6 people. In addition, households operate such as fishing, lagoon transport, selling fish products, fish smoking. In addition, the average income of households is between 10,000 and 50,000 FCFA. The causes mentioned by households, at the origin of the pollution of the *Ebrié* Lagoon of Koumassi are: (1) household waste spills and domestic wastewater from activities, at the same time, riparian and abidjanese populations, directly in the lagoon, (2) wastewater spills from the activities of the industries installed near the lagoon and (3) the use of toxic products (pesticides) by certain fishermen for their activity (fishing). Finally, the results of the study show that the pollution of the Koumassi *Ebrié* lagoon impact the fishery resources, the environment and habitats of respondents. Also the study reveals the impact of pollution on health, food, rituals and household leisure.

Keywords: Causes, Consequences, Pollution, *Ebrié* lagoon of Koumassi, households.

Copyright © 2022 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

This study is part of the realization of our doctoral thesis whose theme is: "pollution of the *Ebrié* lagoon and resilience measures of riparian populations in the municipality of Koumassi (Abidjan). Numerous studies have been conducted around the world, Africa and Côte d'Ivoire on the causes and consequences of watercourse pollution (Dejoux C, 1988, Elskens M, 2010, Boualla N *et al.*, 2011; Aka A *et al.*, 2013; Koulai E, 2013; Kouamé I, 2017; Tia L, 2017; Koffi S *et al.*, 2020).

Despite the fact that following the third World Water Forum, held in March 2003 in Kyoto, Japan, the United Nations has stored the right to water among fundamental human rights, we are witnessing a very advanced degradation of the oceans, seas, lakes and lagoons (Aka A *et al.*, 2017; Begout M, 2017; Eba B,

2020; Agbohessi P & Toko I, 2021; Ivorian Anti-pollution center, 2021).

The city of Abidjan in Côte d'Ivoire and its streams are not left out of this sad finding. Indeed, the *Ebrié* lagoon, the most important Ivorian and West African lagoon system (Varlet F, 1978, Anoh P, 2010) in the 1950s and 1960s, is the victim of unprecedented pollution. Indeed, the strong industrialization of the city of Abidjan, with its 586 industrial establishments, doubled by its increasing and non-mastered urbanization has strongly influenced or even polluted the natural environment, the *eBrie* lagoon (Tastet J & Guiral D, 1994; Yao M *et al.*, 2009; Tuo A *et al.*, 2013; Anoh P *et al.*, 2019; Ivorian Anti-pollution center, 2021).

The completion of this study obeys a double interest. First, it is justified by the indispensable role of

*Corresponding Author: Aymard Gngangoran Gboudjou

Institute of Anthropological Sciences for Development (ISAD), Félix Houphouët-Boigny University, Abidjan, Ivory Coast

this watercourse for well-being and socio-economic development for its riparian populations. Because the *Ebrié* lagoon crosses the entire city of Abidjan, it promotes certain activities such as fishing, fishing equipment, fish conditioning, lagoon transport, trade (Scheren P *et al.*, 2004), sand extraction, aquaculture, leisure, etc. (Kouassi B & Amani C, 2017, Gboudjou A *et al.*, 2021). This recalls the indispensable role of this watercourse for well-being and socio-economic development for its riparian populations and the factors of their installation that we have previously studied in 2021 (Gboudjou A *et al.*, op, cit).

Second, the interest of this study is based on the fact that the majority or all of all these works address the pollution of the *Ebrié* lagoon, trafficking in sciences such as chemistry, physics, toxicology ... (characteristics Physico-chemical, potability of water, chemical pollutants, etc.). Our contribution to all work on the pollution of the *Ebrié* lagoon will be from the angle of anthropology supported by physiology.

In addition, the degradation of the *Ebrié* lagoon is likely to have negative consequences for aquatic resources, the environment, the way of living of riparian households (health, food, economic activities, etc.). It is in this context that it seems appropriate to wonder what are the causes and consequences of the pollution of the Koumassi *Ebrié* lagoon on riparian households?

Thus, our study aims to analyze the perceptions of riparian households related to the causes and consequences of the pollution of the Koumassi *Ebrié* lagoon. It is specifically (1) present the socio-demographic profile of the riparian households of the Koumassi *Ebrié* lagoon, (2) identify the causes of the pollution of the Koumassi *Ebrié* lagoon according to the perception of riparian households and (3) expose the Perceptions of riparian households related to the consequences of the pollution of the Koumassi *Ebrié* lagoon on fisheries resources, their environment, habitat, health, food and activities.

I. METHODOLOGY OF THE STUDY

I.1. Study site

The study was carried out in the commune of Koumassi. Located in the southern area of Abidjan and on the island of small Bassam, Koumassi is one of the thirteen (13) municipalities that make up the district of Abidjan. It extends over an area of 8.74 km². This municipality is limited to the north by the municipality of Marcory, to the south by that of Port-Bouët, southeast and northeast by the *Ebrié* lagoon, which makes it a peninsula with a beautiful lagoon facade. Its proximity to the port of Abidjan and Félix Houphouët-Boigny airport offers geoeconomic assets.

I.2. Populations and sample

This is a mixed-type cross-sectional study, which combines quantitative and qualitative approaches

on perceptions of riparian households related to the causes and consequences of the pollution of the Koumassi *Ebrié* lagoon. As part of our study, we opted for non-probabilistic sampling technique. From this technique, we have retained accidental type sampling, also known as "convenience sampling" for the quantitative pane of the study, and the intentional sampling still called "reasoned choice sampling" for the qualitative component. To achieve the size of our sample, respondents were recruited in the study area and in some structures dealing with environmental pollution issues. These targets fulfilled the following inclusion criteria : the occupation of an administrative function in connection with the management of environmental issues ; the occupation of a function of responsibility within a local community ; the exercise of an active activity related to the lagoon ; the dwelling in an area not far from the bank. At the end of this process, we totaled 510 households and 12 representatives of state and private structures related to the object of our study : the CIAPOL, the ONAD, the MINEF, the MINASS, the RRC, the MINED, the PABC, UNDP, AfDB, BM, Red Cross, WHO, UNEP, Koumassi City Hall. In addition, individual interviews and Focus Groups took place with the different households on the study site (see list of acronyms and abbreviations).

I.3. Data collection and analysis techniques

The realization of this study based on a mixed analysis is based on a set of data collection techniques. For the knowledge of our object we use documentary research. It consisted of consulting memorations and articles dealing with various forms of pollution, environmental field study reports, particularly on the berries present in Abidjan. The questionnaire was the main tool for the collection of quantitative data. In addition, semi-structured interviews were conducted with target riparian households on the study site using a maintenance guide. Finally, direct observation made it possible to make field visits to inventory the pollution factors and the activities of the populations related to the lagoon. The interviews recorded by means of a dictaphone, have been analyzed by thematic content. Then, all the verbatim with common characters have been grouped under a generic title in accordance with the major themes selected in the interview guides (N'da P, 2007; Gboudjou A & al, op, cit).

II. RESULTS OF THE STUDY

II.1. Socio-demographic profile of riparian households of the Koumassi *Ebrié* lagoon

II.1.1. Sex of household leaders and household installation duration on the edge of the Koumassi *Ebrié* lagoon

The heads of the riparian households of the Koumassi *Ebrié* Lagoon are 42.2% of male and 57.8% female sex. The lifetime of these households surveyed or installed on the edge of the Koumassi *Ebrié* lagoon varies from five (5) years to more than 15 years (see Table I).

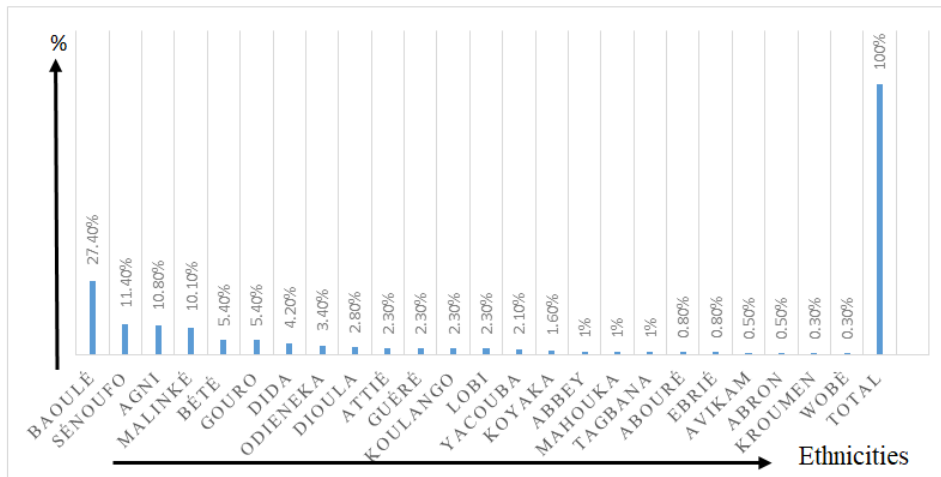
Table I: Household life surveyed on the edge of the Koumassi *Ebrié* lagoon

Lifetime	Percentage of respondents
10 à 15 ans	12%
5 à 10 ans	19,2%
Less than 5 years	33,7%
More than 15 years	35,1%
Total	100%

II.1.2. Nationalities, ethnicities and religions of households riparian of the *Ebrié* lagoon of Koumassi

The results of our study show that 75.7% of respondent households are of Ivorian nationality and

24.3% are foreign nationalities (Malian, Burkinabe, Beninese). As for the Ivorian households, there are several ethnic groups, including the *Baoulé* (27.4%), *Senoufo* (11.4%), the *Bété* (5, 4%) See Graph 1.



Graph 1: Proportion of ethnic groups in Ivorian households

II.1.3. Educational levels of heads of households bordering the *Ebrié* lagoon of Koumassi

Our results reveal that household heads have varying levels of education : 10.4% have a higher level of education; 37.5% have a secondary education level; 26.5% have a primary level of education, 23.1% with

no level of education and 2.5% come from Koranic school. Concerning the religious beliefs of the households bordering the *Ebrié* lagoon of Koumassi, 56.5% of them are of Christian religion, 37.6% are of Muslim religion and 5.9% come from other religions (Buddhist, animist, pedah, Mormon).

Table II: Nationality of households bordering the *Ebrié* lagoon of Koumassi

Nationality (Country)	Percentage
Ivorian	75,7%
Malian	6%
Burkinabe	5,7%
Beninese	4,5%
Togolese	3,52%
Nigerian	2,22%
Guinean	1%
Ghanaian	0,98%
Senegalese	0,19%
Congolese	0,19%
Total	100

II.1.4. Monthly income levels of households bordering the *Ebrié* lagoon of Koumassi (in FCFA)

The monthly income levels of households bordering the *Ebrié* lagoon of Koumassi (in FCFA) are

diverse. The highest monthly incomes are in the bracket of more than 250,000 FCFA while the lowest monthly incomes are in the bracket of 5,000 to 10,000 FCFA (see Table III).

Table III: Monthly income of heads of households

Tranche of monthly income (in FCFA) households	Percentage of households
No monthly income	12,9 %
5000 -10 000	17,6%
10 000-50 000	29,2%
50 000 - 100 000	18,2 %
100 000-150 000	10,4%
150 000-200 000	6,3%
200 000-250 000	3,1%
plus de 250 000	2,3%
Total	100

1 US dollar = 500 FCFA

II.1.5. Sizes of households bordering the *Ebrié* lagoon of Koumassi

The smallest household size in the present study is one (1) person and the largest size is more than six (6) people (see Table IV).

Table IV: Size of households bordering the *Ebrié* lagoon of Koumassi

Household size (in number of people)	Percentage of households
1	1,8%
2	10,2%
3	16,9%
4	17,3%
5	20,0 %
6	11,0%
More than 6	22,8%
Total	100%

II.2. Perception of the causes of pollution of the *Ebrié* lagoon of Koumassi by households

The most numerous fringe of households, i.e. 89.3%, believe that the *Ebrié* lagoon of Koumassi is polluted. However, 10.7% of them think the opposite. According to our surveys, the households questioned

affirm that the pollution of the *Ebrié* lagoon of Koumassi is caused, in large part by the activities of the local populations and the activities of the Abidjan populations, respectively at 45% and 30%. The opinions of households on the causes of pollution of the *Ebrié* lagoon of Koumassi are recorded in Table V.

Table V: Perception of the causes of pollution of the *Ebrié* lagoon of Koumassi by households

Sources of pollution in the <i>Ebrié</i> lagoon of Koumassi	Percentage of households surveyed
Activities of local populations	45%
Activities of Abidjan populations	30%
Activities of industries	15%
Activities of local fishermen	10%
Total	100%

At the end of individual interviews and focus groups, concerning pollution practices related to the operation of public and private structures located in the area studied, three categories were designated by households and city hall officials. Firstly, households highlighted the dumping of industrial waste by certain commercial structures present in the Koumassi industrial zone. This state of affairs was mentioned by all of the respondents as a factor in the pollution of the lagoon. Among these industrial wastes, we note the residues of tar, paint oil, tin cans and waste water drainage from treatment centers. Secondly, the neighboring households maintain that the major sources of pollution of the *Ebrié* lagoon of Koumassi are on the one hand the connection of the evacuation channels of domestic and industrial wastewater to the lagoon and on

the other hand, the dumping of household waste by the small municipal collectors directly in the *Ebrié* lagoon.

Thirdly, households blame certain fishermen for the pollution of the *Ebrié* lagoon in Koumassi. According to households, there are fishermen who use chemicals to catch fish, which then have an impact on water quality. These products are supposed to attract and kill fish. One of the major problems concerning this type of pollution is the ignorance of the exact number of fishermen acting in this way. Furthermore, following individual interviews and focus groups, it appears that the *Ebrié* lagoon of Koumassi receives industrial pollution from the Koumassi industrial zone (chemical pollution). It is therefore wise to pay particular attention to it with regard to industrial chemical pollutants.

According to CIAPOL experts, potentially 21 companies present on this site reject metals. Of these 21 companies, 18 potentially release PAHs and VOCs, 16 release hydrocarbons, 13 release phenols, 12 release cyanides and 10 release BTEX. The *Ebrié* lagoon of Koumassi also receives domestic discharges: 215kg NH₄/J and solid waste.

II.3. Perception of local households related to the consequences of pollution of the *Ebrié* lagoon of Koumassi on fishery resources, their environment, habitat, health, food and activities

II.3.1. Health of fisheries resources

At the end of our surveys, 56.5% of households believe that the pollution of the *Ebrié* lagoon of Koumassi can contaminate the fish species present in the *Ebrié* lagoon of Koumassi, while 28.6% believe the opposite and 14.9% don't know what to say. In addition, our results show that 56.5% of households have observed diseases in fish species present in the *Ebrié* lagoon of Koumassi, while 15.4% have not observed anything and 28.1% do not know what to say. Households have noticed the following anomalies in fish species from the *Ebrié* lagoon of Koumassi : dwarfism, "drugged fish", fish with bulging eyes, bad smelling fish, even dead fish.

II.3.1.1. Recording of cases of intoxication or poisoning after consumption of fishery resources

Our study reveals that 3.1% of households have observed cases of food poisoning or poisoning after consumption of fish products (fish, crabs, shrimps, crayfish) from the *Ebrié* lagoon of Koumassi. However, the vast majority of households, i.e. 79.1%, saw nothing and 17.8% of them said they did not know if there had been cases of poisoning or food poisoning after consumption of fish products from of the *Ebrié* lagoon of Koumassi. The results of the study show that the

households responded that they saw cases of food poisoning manifestations such as stomachache (0.94%), pimple on the skin and stomachache (1.2 %), diarrhea (0.96%).

II.3.1.2. Consequences of the pollution of the *Ebrié* lagoon of Koumassi on the environment and the habitats of the neighboring communities

The results of the study show that 78.4% of the households questioned say that the pollution of the *Ebrié* lagoon of Koumassi does indeed cause inconvenience in their habitat, while 21.6% say the opposite. Respondents experience "visual nuisances" (20.8% of respondents), smell "bad odors (41.1% of respondents) and disapprove of "other inconveniences" such as the presence of mosquitoes and floods (38, 1% of respondents).

II.3.2. Consequences of the pollution of the *Ebrié* lagoon of Koumassi on neighboring households

II.3.2.1. Perception of households of the current state of the *Ebrié* lagoon of Koumassi on the health of local residents

The results of the study show that 71.6% of households bordering the *Ebrié* lagoon of Koumassi claim that the current state of the lagoon can give them diseases. Among them, 20.8% think the opposite and 7.6% do not know if the pollution of the *Ebrié* lagoon in Koumassi affects their health. Recurrent diseases due to pollution of the *Ebrié* lagoon of Koumassi mentioned by households are : Malaria 29.3%, typhoid fever 23%, diarrhea 7.6%, respiratory infections 9%, skin diseases 2.7%. Tables VI and VII below give an overview of the various recurrent pathologies encountered in the health centers of the study area from 2017 to 2021. The data presented in the tables take into account all patients, both men and women. Women, babies, teenagers, adults, and seniors.

Table VI: Pathologies Identified at the Urban Community Health Facility (Fsucom) in the Houphouët Boigny Housing Estate in the "Great Camp" District

Diseases	2017	2018	2019	2020	2021	Total	%
Malaria	2054	1294	778	1189	1258	6573	31,95%
Acute respiratory infections	881	921	871	1115	1084	4872	23,70%
Dermatoses (Diseases of the skin)	810	289	727	787	765	3378	16,42%
Diarrhea	525	414	668	776	857	3240	15,75%
Fever Typhoid	562	310	445	500	689	2506	12,18%
Total General	4832	3228	3489	4367	4653	20569	100%

Source: FSUCOM City Houphouët Boigny (2017-2021)

Table VI shows the recurrent illnesses among respondents living near the *Ebrié* lagoon in Koumassi who attend the urban community health center in Houphouët Boigny, at the "Grand Campement". The table indicates a predominance of malaria (31.95% of cases) and acute respiratory infections (23.70% of cases).

As for Table VII, it indicates the recurrent illnesses among respondents living near the *Ebrié* lagoon of Koumassi, and listed in the community-based urban health center of the Aklomiabla city. It highlights a predominance of malaria (45.36% of cases) and acute respiratory infections (18.40% of cases).

Table VII: Pathologies identified at the community-based urban health center (CSUCOM) in Aklomiabla city

Diseases	2017	2018	2019	2020	2021	Total	%
Malaria	2058	1952	2618	2932	2158	11718	45,36%
Acute respiratory infections	985	887	772	1014	1092	4750	18,40%
Fever Typhoid	928	756	934	815	889	4322	16,73%
Dermatoses (Diseases of the skin)	452	649	574	582	675	2932	11,34%
Diarrhea	562	456	258	347	488	2111	8,17%
Total General	4985	4700	5156	5690	5302	25833	100%

II.3.2.2. Abnormalities noted in children, born during the last five years in the study area, by households

The results of the study show that 6.1% of households noticed abnormalities in their children who were born during the last five years, while 93.9% replied in the negative. The different types of anomalies noticed by households in their children are : Weight of babies less than 2500g 2%, Skin diseases and death of

infants and children 3.1% and Malformation of babies at birth 1%. Table VIII below shows the number of newborns living near the *Ebrié* lagoon in Koumassi whose birth weight is less than 2500g and identified at the community urban health training in the city of Houphouët Boigny, in the “Grand Campement” district. There is a high rate of newborns weighing less than 2500g, between 9.91% and 13.13%.

Table VIII: Number of newborns whose birth weight is less than 2500g recorded at the urban community health training of the Houphouët Boigny housing estate in the “Grand Campement” district

Years	2017	2018	2019	2020	2021
Total number of newborns during the period	974	928	771	670	597
Number of newborns whose birth weight is less than 2500g during the period	111	92	98	88	76
Percentage of newborns whose birth weight is less than 2500g during the period	11,40 %	9,91 %	12,71 %	13,13 %	12,7 %

Source: FSUCOM City Houphouët Boigny (2017-2021)

Table IX presents the number of newborns from the *Ebrié* lagoon of Koumassi whose birth weight is less than 2500g and listed at the urban health center

with a community-based Aklomiabla city. There is also a high rate of newborns whose weight is less than 2500g. This rate is between 12.06% and 17.12%.

Table IX: Number of newborns whose birth weight is less than 2500g from the Community-based City of Cité Aklomiabla

Years	2017	2018	2019	2020	2021
Total number of newborns during the period	203	146	135	234	174
Number of newborns whose birth weight is less than 2500g during the period	31	23	18	33	21
Percentage of newborns whose birth weight is less than 2500g during the period	15,27 %	17,12 %	13,33 %	14,1 %	12,06 %

Source: CSUCOM Aklomiabla (2017-2021)

II.3.2.3. Consequence of the pollution of the *Ebrié* lagoon of Koumassi on the food/nutritional practices of the households surveyed

II.3.2.3.1. Reduction in the consumption of fishery products due to the pollution of the *Ebrié* lagoon in Koumassi

The pollution of the *Ebrié* lagoon of Koumassi has had a diverse impact on the consumption of fish products by households. This is the reduction in the consumption of these fish products among the respondents. Data from household surveys highlighted the following proportions with regard to respondents' observation of a reduction in their consumption of fish products : 29.5%, 17.5% and 17.6% decrease respective consumption of fish, crabs and shrimps.

Also, the pollution of the *Ebrié* lagoon of Koumassi has had a diverse impact on food consumption among the respondents, in particular the quantity and frequency of meals: 29.15% of households believe that they have a drop in the quantity of meals and in 29 .8%, there is a drop in the number of meals/day.

II.3.2.4. Impacts of the pollution of the *Ebrié* lagoon of Koumassi on the economic activities of local households

Our surveys reveal that the vast majority of households (80.9%), in the exercise of their economic activities, are not impacted by the pollution of the *Ebrié* lagoon. However, a non-negligible fringe of households, i.e. 19.1% carrying out activities such as

(fishing, lagoon transport, sale of fish products, fish smoking) is impacted.

II.3.2.5. Impact of the pollution of the *Ebrié* lagoon of Koumassi on the ritual and leisure practices of the communities of neighboring households

From this study, it appears that 20.3% of households believe that the pollution of the *Ebrié* lagoon of Koumassi disturbs them in their ritual practices and leisure activities, while 79.7% of them do not. At the end of the individual interviews and the focus groups, it follows that the transformations undergone by the *Ebrié* lagoon of Koumassi due to the economic and social activities for which they are solicited find their counterparts in the transformations of perceptions and other beliefs associated with this lagoon. The physical aspect of the lagoon (color of the water considered cloudy and blackish, presence of waste) has led households that consider themselves to be "lagoon peoples" to abandon certain practices aimed at transmitting skills and social values to new generations. These practices concern learning through fishing, swimming, canoe navigation and nautical combat strategies. For local households, the aspect of the lagoon no longer allows this type of activity at the risk of exposing themselves to diseases. The insalubrity of the lagoon is evoked as a reason for the modification of certain popular habits : doing the laundry or the dishes, taking a bath, collecting water for cooking or drinking. To these activities, we must add certain playful practices such as playing the game of *awalé* on the edge of the lagoon and doing canoe competitions. These types of activities reinforce the social and perpetuate "the cultural identity of the people".

III. DISCUSSION OF THE RESULTS

III.1. Sociodemographic profile of the social categories surveyed

III.1.1. Current population of the lagoon area of Côte d'Ivoire

Our study has shown that the households bordering the *Ebrié* lagoon of Koumassi are cosmopolitan. They are mainly composed of people of Ivorian origin without forgetting the presence of people of foreign origin. Regarding the populations of Ivorian origins we can notice the presence of various ethnic groups from all the regions of Ivory Coast : *Abbey*, *Abouré*, *Adjoukrou*, *Andoh*, *Attié*, *Baoulé*, *Bondoukouen*, *Dioula*, *Djimini*, *Ebrié Gouro*, *Mahouka*, *Kouyaga*, *Koro*, *Kroumen*, *Nafana*, *Senoufo*, *Tagbana*, *Yacouba*. These data are different, with a few exceptions, from those of (Aka A, 2010) who maintains that the lagoon shores of Côte d'Ivoire at the beginning of the 16th century and the 17th century were characterized by the occupation of the *Avikam*, the *Alladian*, *Éhotilé*, *N'zima* or *Apolo*, *Abouré* and *Essouma*. Our study revealed the existence of households of foreign nationalities, bordering the *Ebrié* lagoon of Koumassi : Beninese, Burkinabe, Congolese, Ghanaians, Guineans, Malians, Nigerians, Senegalese

and Togolese. Similar results had already been found by (Tia L & Séka S, 2015) who demonstrated that the populations of the precarious and bordering districts of the lagoon shores of the cities of Abidjan are mainly made up of Ivorians and foreigners from ECOWAS. And other countries on the African continent. Abundant in the same direction, (Aka A, 2010) shows that the Adjoukrou, indigenous populations, have cohabited for many decades with Ivorians from other regions of Côte d'Ivoire, in particular the *Abidji*, the *Ahizi*, *Appoloniens*, the *Baoulés*, the *Malinkés*, etc... and foreigners from countries in the West African sub-region (Benin, Burkina Faso, Ghana, Mali, Togo, etc.) found in the fishing and trade sectors.

III.1.2. Household size and composition

In our study, the smallest household size is one (1) person, or 1.8%, and the highest size is more than six (6) people, or 22.8%. In a study conducted by (Tia L, 2017) in the municipalities of Marcory and Treichville, he demonstrated that the average household size is 5.66 people per household. This agrees with our results. In addition, our results on household size are consistent with preliminary data from the 2021 RGPH which reveals that the average household size in Côte d'Ivoire is five people (Fraternité Matin, 2022). In addition, the results of our study have shown that the heads of households bordering the *Ebrié* lagoon of Koumassi are 42.2% male and 57.8% female. These results are also consistent with studies by (Tia L & Séka S, 2015), which showed that the heads of households are predominantly female (54.9%). However, the results of our study differ from those highlighted in the Guinea RGPH 3 data analysis report, in 2017. In Guinea, in both urban and rural areas, households of five (5) people are almost identical in terms of proportion, respectively 11.5% and 11.6%. Going in the same direction as the results obtained in Guinea, the results of (Briand A & Loyal A, 2017) indicate that on the whole of Bamako or on the six precarious districts of Ouagadougou studied, the surveys reveal that the heads of households are mostly men (86% and 92% respectively). Women "heads of household" are most often single, widowed or divorced women.

III.1.3. Economic activities of the populations living along the lagoon shores

The results of our study have highlighted the existence of various economic activities in the study area. These activities, carried out by both Ivorians and non-Ivorians, include fishing (fish, shrimp, crabs), the sale of fresh and smoked fish, small businesses (restaurants, maquis, street vendors, bistros, garbadrome), lagoon transport, artisanal soap making, etc.). Our results are substantially similar to those of (Anoh P, 2010) which reveal that the populations of the shores of the lagoons are exclusive fishermen even if some peoples who were originally fishermen have subsequently abandoned fishing activities profit from trade as shown by our study with the practice of many

commercial activities by the residents of the *Ebrié* lagoon of Koumassi. In the Grand-Bassam region, lagoon fishing was the main economic activity of the *Abouré Ehè* and *Ossouhon* peoples (Vanga F, 2007). He goes on to say that the fishing activity concerns fish and shellfish. Shrimp fishing was an individual activity, while fish and crab fishing was often practiced collectively, data that agrees with ours. This is confirmed by (Aboya N, 2014) who maintains that currently, due to the influence of the urbanization of Abidjan, the lifestyle of *Ébrié* has changed considerably. In fact, *Ébrié* no longer deals with fishing as an economic activity. He therefore ceded fishing to foreigners, in particular the communities from Benin and Nigeria, settled in Abobodoumé and those from Ghana, based in Vridi (Port-Bouet) and on the island of Ossibissa (Yopougon).

III.2. Causes or factors of pollution of the *Ebrié* lagoon of Koumassi

The results of our study show that the majority of the households surveyed index (1) the waste resulting from the activities of the local populations, (2) the waste resulting from the activities of the Abidjan population, (3) the waste resulting from the activities of the industries installed on the lagoon borders, (4) as well as the activities of some fishermen (use of pesticides, very often to catch fish), these pesticides (thiodan, gammaline, gramoxone) are used to catch fish in certain parts of the *Ebrié* lagoon of Koumassi, with regard to the causes of the pollution of the *Ebrié* lagoon of Koumassi. The fishermen, to increase the yield, carry out prohibited fishing techniques such as the use of pesticides and fertilizers. In Benin, fishermen plant acadjas on the bodies of water (implantation of heaps of branches planted on the bodies of water) to fish (Mama D, 2010). Similarly, other fishermen use pesticides and aqueous plant extracts on surface waters to fish (Yèhouénon A, 2005). According to (Sankaré Y *et al.*, 1994), the pesticides most commonly used by fishermen are endosulfan or thiodan and lindane or gammaline. These inappropriate practices mainly destroy fingerlings, contaminate aquaculture species and pollute surface water resources. These results agree with our results. The drainage of organic waste by the sewage collectors of the city of Abidjan is also incriminated. These results are identical to those of (Kenfaoui A, 2008 ; Laurent F, 2013) who had already shown that the drainage of organic waste by sewage collectors from domestic and industrial activities constitutes sources of pollution of lagoon water. In addition, the results obtained from CIAPOL experts revealed that the sources of pollution in the *Ebrié* lagoon of Koumassi are cement factories, textile industries, agri-food industries (industrial pollution), artisanal fishermen, local populations; the people of Abidjan; household waste collectors. These results are consistent with the data from our surveys, which showed that the populations questioned mentioned the same sources of lagoon pollution mentioned by the CIAPOL experts.

These results corroborate those of previous studies which have identified two distinct sources of lagoon pollution caused by industrial activities and pollution caused by the activities of local populations (Adingra A & Kouassi M, 2011; Akpo M & al, 2016). The food and textile industries are dominant sources of industrial pollution, producing around 85% of waste volume and 95% of pollutant loads (CIAPOL, 2017). Industries manufacturing pesticides, glues and wood preservatives produce toxic substances.

III.3. Consequence of the pollution of the *Ebrié* lagoon of Koumassi

III.3.1. Consequence on fishery resources and on the food supply of populations living near the lagoon water body

The respondents mentioned certain anomalies in the fish such as dwarfism, fish with protruding eyes, drugged fish according to them, bad smelling fish, even dead fish. Thus, in addition to our observations and those of the respondents, it is clearly established that the *Ebrié* lagoon of Koumassi is polluted. Under these conditions, fish have to deal with several environmental stressors, such as varying levels of oxygen, photosynthesis, food, pollutants and many more. These sources of stress have the potential to bring instability to the physico-chemical balance of waters and to have an effect on the physiological condition of the individuals who live there (Carr G & Rickwood C, 2008). If the stress is prolonged, the metabolic energy of fishery resources can be diverted towards their survival (respiration, blood circulation) to the detriment of their growth or reproduction. This ultimately leads to harmful consequences for the population of these resources : reduced mobility, damage to hematological parameters and several histopathological lesions on the gills, digestive tract, liver and kidney of fish (Iwama A & al, 2004 ; Agbohessi P & Toko I, 2021). It is now indisputable that the herbicides used in the fields or by fishermen make aquatic ecosystems their final receptacles, making the species that live there vulnerable (Katrijn M & al, 2007 ; Agbohessi P & al, 2015 cited by Agbohessi P & Toko I, 2021).

III.3.2. Consequence of pollution on the health of local populations in lagoon areas and on their financial resources

The results of our study show the predominance in the study area of diseases such as malaria, typhoid fever, respiratory infections, diarrhea, dermatoses. These types of diseases are characteristic of heavily polluted lagoon areas, from which the local populations suffer. And residents of the *Ebrié* lagoon in Koumassi are no exception. Similar results were obtained in a study by the OECD (2008). According to this study, every year, 30,000 Chinese children died of diarrhea due to water pollution. In the deltas of the Pearl River (Canton) and Chang Jiang (Shanghai), which represent two thirds of China's GDP (Gross Domestic Product), dozens of villages have appeared

due to industrial pollution with a prevalence of carcinogenic diseases. Due to its impact on the state of natural resources, on the health of populations, but also on certain economic sectors which depend on quality water (such as fishing), pollution finally has long-term economic consequences which can only put into perspective the double-digit growth posted for a long time by the Chinese economy.

Among all the pollution suffered by the lagoon environment, microbial pollution is one of the most worrying, given the epidemiological risks. Contaminated water and lack of sanitation lead to the transmission of diseases like diarrhea, typhoid, etc. (WHO, 2019). Since 1970, the Vibrionaceae have been mainly implicated in the cholera epidemics that affect the populations living along the Ébrié lagoon (Coulibaly T & al, 2017 ; Gadou V, 2019).

The data collected during our study show many low-weight newborns (less than 2500g) in the study area and cases of male and female infertility have been observed by the local populations. These data are similar to data from reports from health centers in the study area, which also reveal these anomalies. In October 1989, Reporterre published an article entitled "Sterility : the pesticides in question". The newspaper then revealed the results of a German study highlighting the link between pesticides and the deterioration of human reproductive cells. At the time, 15% of French couples wishing to have a child were unable to conceive within the timeframe corresponding to their wish. In the same year, the pioneering study by the University of Bonn (Germany) showed the reprotoxic nature of organochlorine pesticides, including the famous pyralene from Monsanto. Their effects on fertility have since been confirmed.

III.3.3. Consequence of pollution on the environment and the living environment

Our study reveals that the pollution of the *Ebrié* lagoon of Koumassi negatively influences the environment, in particular the living environment of the residents. These impacts are, among others, bad smells, the proliferation of harmful insects (mosquitoes), visual nuisances linked to the presence of household waste on the lagoon water body. This constitutes a brake for any seaside tourist activity. In addition, the presence of invasive plants (hyacinths) on the lagoon water should also be noted, which creates enormous difficulties for fishermen and lagoon transporters. In 2015, similar results were demonstrated by the ORE (Regional Environmental Observatory) showing that the eutrophication of an environment due to pollution mainly induces a decrease in biodiversity as well as in water quality. These degradations are linked to various factors : an increase in the volume of algae and biomass, degradation of the water (appearance, color, smell, etc.). The decomposed elements will clog the bottom of watercourses, thus destroying the living

environments of invertebrates and the spawning grounds of fish (ORE, 2015). These effects can also affect tourist activity, which can be threatened when water quality deteriorates (ORE, op cit). Moreover, according to ORE (2015), plants invading lakes, ponds, rivers, canals and farms are becoming a real scourge. The damage to the environment and the economy is enormous, giving rise to disastrous effects for agriculture, fishing, electricity production, transport, public health, livelihoods, living conditions and social structure.

CONCLUSION

Our study aimed to analyze the perceptions of neighboring households related to the causes and consequences of pollution in the *Ebrié* lagoon of Koumassi. It appears from this study that the households bordering the *Ebrié* lagoon of Koumassi are cosmopolitan. There are households of Ivorian and foreign origin (Beninese, Burkinabe, Malian). The average household size is 6 people. In addition, households engage in activities such as fishing, lagoon transport, sale of fish products, fish smoking. In addition, household income is between 5,000 and 250,000 FCFA.

Then the study highlighted the causes of the pollution of the *Ebrié* lagoon of Koumassi according to the households. The causes mentioned by the households, at the origin of the pollution of the *Ebrié* lagoon are : (1) the dumping of household waste and domestic wastewater from the activities of both the local and Abidjan populations, directly into the lagoon, (2) discharges of wastewater from the activities of industries installed on the edge of the lagoon in the latter and (3) the use of toxic products (pesticides) by certain fishermen for their activity (fishing).

At the end of this study, the households bordering the *Ebrié* lagoon of Koumassi perceive the consequences of the pollution of this lagoon at several levels. In terms of fish resources, households have noticed the following anomalies in fish species from the *Ebrié* lagoon of Koumassi : dwarfism, "drugged fish", fish with protruding eyes, bad smelling fish, even dead fish. At the level of their environment and habitats the respondents experience "visual nuisances" "bad smells" and dislike "other inconveniences" such as the presence of mosquitoes and flooding. In terms of their health, households have noticed a recurrence of illnesses due to the pollution of the *Ebrié* lagoon in Koumassi. Among other diseases evoked by the latter we have : malaria, typhoid fever, diarrhea, respiratory infections, skin diseases. In terms of their diet, data from household surveys have highlighted a reduction in their consumption of fish products and a drop in the quantity of meals and the number of meals per day.

In terms of their economic activities, a significant segment of households carrying out

activities such as (fishing, lagoon transport, sale of fish products, fish smoking) is impacted. At the level of household rituals and leisure, the physical aspect of the lagoon (color of the water considered cloudy and blackish, presence of waste) has led households who consider themselves to be "lagoon peoples" to abandon certain practices aimed at transmitting skills and social values to new generations. These practices concern learning through fishing, swimming, canoeing and nautical combat strategies, washing clothes or dishes, taking a bath, collecting water for cooking or drinking.

In perspective, we will study the resilience measures developed by households in order to curb the negative effects of the pollution of the Ebrié lagoon of Koumassi on their daily lives.

List of acronyms and abbreviations

AfDB : African Development Bank

BM : World Bank

CIAPOL : Ivorian Anti-pollution Center

FCFA : Francs of the African Financial Community

MINASS : Ministry of Sanitation and Safety

MINEDD : Ministry of the Environment and Sustainable Development

MINEF : Ministry of Water and Forest

WHO : World Health Organization

ONAD : National Office for Sanitation and Drainage

PABC : Cocody Bay Development Project

UNDP : Nations Program for Development

UNEP : United Nations Environment Program

RRC : Disaster Risk Reduction

BIBLIOGRAPHY

- Adingra, A. A., & Kouassi, A. M. (2011). Pollution in the Ebrié Lagoon and Its Impacts on the Environment and Riparian Populations. *Fiches Techniques et Documents de Vulgarisation*, 48-53.
- Toko, I. I. (2021). Effets toxiques des herbicides à base du glyphosate sur les poissons et autres animaux aquatiques: approche bibliographique. *International Journal of Biological and Chemical Sciences*, 15(6), 2685-2700.
- AKA, A. (2010). Contribution of lagoon transport and activities induced in development. *Review of tropical geography and environment*, n° 1.
- AKA, A. M., Wognin, A. V., Amani, E. M., Irie Bi, T. G., Coulibaly, A. S., & Monde, S., (2017). Analysis of the physico-chemical and bacteriological parameters of the waters of the Ebrié lagoon estuary (southeast of Côte d'Ivoire), *European Journal of Scientific Research*, 147(3), 301-314.
- Akpo, M. A., Saidou, A., Balogoun., Yabi, I., & Bigou, L. B. (2016). Evaluation of the performance of soil fertilitis management practices in the Okpara river basin in Benin. *European Scientific Journal*. FOL-12 (33) P370.
- Anoh, K. P. (2010). Comparative strategies for the exploitation of lagoon bodies in Côte d'Ivoire. *Overseas notebooks*, 251, 347-36.
- Anoh, K. P., & Yao-Assahi, N. (2019). Industries and urbanization in Abidjan Sud. *Revue to geography, regional development and SUDS development (Regardsuds)*, 2, 21-33.
- Begout, M. L., Salima, A., Julien, B., Thibaut, L., & Laurence, B. (2017). Become and effects of persistent organic pollutants (PCB, PBDE) on the reproduction of fish, the development and survival of descendants - *Fish'n'pops*. ANR 13-CESA-020 FISH'N'POPS, AUTO-SAISINE. (HAL-01605259).
- Boualla, N., & Benziane, A. (2011). Experimental study on the elimination of nitrates by adsorption on activated and undertaken clays of the Sebkhia of Oran (Algeria). *Africa Science*, 7(2).
- Briand, A., & Loyal, A. (2017). The demand for urban drinking water services : an analysis of the consent to pay from Bamakois households and precarious districts of Ouagadougou. In *Regional & Urban Economy Revue* 2017/1 (January), 33-66.
- Carr, G. M., & Rickwood, C. J. (2008). Document on the water quality index for biodiversity. Report prepared for the partnership for biodiversity indicators, World Conservation Monitoring Center, Cambridge, 64 p.
- Ivorian anti-pollution center (CIAPOL). (2017). Feasibility study of the depollution of Abidjan berries on the Ebrié lagoon. Ivory Coast. Phase 1 Diagnostic of the current state, Ciapol, Abidjan.
- Ivorian anti-pollution center (CIAPOL). (2021). Pollution sources of the Koumassi bay and actors involved. Preliminary report.
- Coulibaly T. H. (2017). *Agricultural development projects and mutations in the agrarian landscape in Kiembara countries (north of Côte d'Ivoire)*. Unique doctoral thesis, Félix Houphouët Boigny d'Abidjan - Cocody University (Ivory Coast), 288 p.
- Dejoux, C. (1988). Pollution of African continental waters. Acquired experiences, current situation and perspectives. *trav.doc.inst.fr.rech.sci.dev.coop* (213): 513p.
- Eba, B. (2020). Lagunaire insalubrity and social representations of the "Attiké" producing in the district of Abidjan (Ivory Coast). *European Scientific Journal, ESJ*, 16 (11), 223-241. <https://do.org/10.19044/esj.2020.v16n11p223>.
- Elskens, M. (2010). Wastewater analysis - Measurement of pollution. <https://do.org/10.51257/a-v2-p4200>.
- Gadou, V. (2019). Molecular epidemiology of β -lactamases of expanded spectrum products resistant to aminosides and fluoroquinolones in the district of Abidjan, Ivory Coast. Bacteriology. University Félix Houphouët-Boigny (Abidjan, Ivory Coast); N° Order 2186/2019, 2019. French.

- Gboudjou, A., Amani, C., Adiko, F., & Boudjou, U. (2021). Anthropological study of human facility factors in Koumassi polluted lagoon areas (Abidjan). *Ziglôbitha, Arts Review, Linguistics, Literature & Civilizations*. RA2LC. Special n° 03, December 2021, 277-294.
- Iwama, A., Oguro, H., Negishi, M., Kato, Y., Morita, Y., Tsukui, H., ... & Nakauchi, H. (2004). Enhanced self-renewal of hematopoietic stem cells mediated by the polycomb gene product Bmi-1. *Immunity*, 21(6), 843-851.
- Katrijn, M. A. H., Piet, S., & Peter, A. V. (2007). Monitoring and Model Pesticide Fate in *Surface Water At The Catchment Scale*. ECOLOGICAL MODELING, 209, 53-64.
- Kenfaoui, A. (2008). Save water preserving pollution. *Review HTE*, 140 : 94-96.
- Koffi, S. Y., Boua, C. A., & Trokoureya, A. (2020). Evaluation of the impact of contamination to pesticides of water, on the fish and health of man, sectors IV and V of the eBrie lagoon (Ivory Coast). RAMES. *Sciences of structures and matter*, 259-7.
- Kouassi, B. A. G., & Amani, Y. C. (2017). Problem of sustainable management of urban public spaces in Côte d'Ivoire : Case of the municipality of Treichville (Abidjan). *Review of tropical geography and environment*, n° 2.
- Kouamé, A. F. (2017). *Contributions of the morphobathymetry to the characterization of the sedimentary dynamics of Côte d'Ivoire's fluvio-lagoon environments during the last four decades (1975 - 2015)*, single doctoral thesis, UNIV. Felix Houphouët Boigny, 196 p.
- Kouamé, K. I. (2007). *Physico-chemical water pollution in the Akouedo discharge area and analysis of the risk of contamination of the Abidjan sheet by a model of simulation of flows and the transport of pollutants*. Doctoral Thesis, University of Adjamé, Ivory Coast, 212 p.
- Koulai, E. (2013). *Exploitation of the waters and sustainable development of Fisheries in Lagunes Aby*. Single PhD Thesis, Felix University Houphouët Boigny University, Abidjan.
- Laurent, F. (2013). *Agriculture and Water Pollution : Modeling Processes and Analysis of Territorial Dynamics*. Environmental Sciences, University of Maine, p. 188.
- Mama, D. (2010). *Methodology and results of the diagnosis of the eutrophication of Lake Nokoué (Benin)*. Thesis of the University of Limoges, p. 150.
- N'da, P. (2007). *Methodology and practical guide of the research thesis and the doctoral thesis in Letter, Arts, Social and Social Sciences: Information, Standards and Recommendation Academic, Technical and Practices Current*, Harmattan, Paris.
- OECD. (2015). *Outlook for the OECD environment by 2050*.
- Sankaré, Y., Kaba, N., & Etien, N. (1994). Poisoning fishing in tropical brackish waters (Ivorian lagoons): Effects on the environment. *African agronomy*, 6(2), 151-162.
- Scheren, P., Kroeze, C., Janssen, F., Hordijk, L., & Ptasiniski, K. J. (2004). Integrated Water Pollution Assessment of the Ebrier Lagoon, Ivory Coast, *West Africa. Journal of Marine Systems*, 44, 1-17.
- Tastet, J. P., & Guiral, D. (1994). *Geology and sedimentology* ". In *environment and aquatic resources of Ivory Coast*, t. II. Lagunaries, ORSTOM publishing, PP. 35-58.
- Tia, L. (2017). Management of residual materials and lagoon pollution in Abidjan : responsibilities, strategies and perspectives. *European Scientific Journal*, *ESJ*, 13(2), 378. <https://do.org/10.19044/esj.2017.v13n2p378>.
- Tia, L., & Séka, S. G. (2015). Private actors and drinking water supply of the populations of the municipality of Abobo (Ivory Coast). *Canadian Review of Tropical Geography*, 2(2), 15-28.
- Tuo, A. D., Yeo, K. M., Metongo, S. B., Trokoury, A., & Bokra, Y. (2013). Contamination of Sediment Sediments by Heavy Metals in Ebrie Lagoon (Abidjan, Ivory Coast). *International Journal of Chemical Technology*, 5, 10-21.
- Vanga, A. F. (2007). Socio-economic impact of the decline in lagoon fisheries in the department of Grand Bassam (Ivory Coast). *African Agronomy*, 19(1), 81-92.
- Varlet, F. (1978). *The regime of the lagoon, Ivory Coast. Essential physical traits* ". Coll. Works and documents, No. 83, Paris: ORSTOM.
- Yao, K. M., Metongo, B. S., Trokourey, A., & Bokra, Y. (2009). Water pollution in the urban area of a tropical lagoon by oxidizable matter (Ebrie Lagoon. Ivory Coast). *International Journal of Chemical Science*, 3, 755-770.
- Yèhouénu, A. P. E. (2005). *Residues of chemical pesticides synthesis in waters, sediments and aquatic species of the Ouée River and Lake Nokoué watershed*. Unique doctoral thesis at the University of Abomey-Calavi, Benin, p. 217.

Cite This Article: Aymard Gngorran Gboudjou, Célestin Yao Amani, Kouamé Guy Marcel Bouafou (2022). Anthropological Study of the Perceptions of Neighboring Households Related to the Causes and Consequences of Pollution in the *Ebrié* lagoon of Koumassi (Abidjan). *EAS J Humanit Cult Stud*, 4(2), 85-95.