



Compliance state of biosecurity measures in fish farming of three regions of Ivory Coast (Sub-Saharan zones).

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1 SUMMARY

The objective of this study was to show the compliance rates to biosecurity measures of Ivory Coast's fish farming according to biosecurity practices. Surveys were carried out in forty eight fish farms in parts of South Comoé, Lagoons and Agnéby from March to August 2011 in south. The method of "snowball" was used through a questionnaire presented to the fish farm owners and employees. Compliance rates respectively varied from 0 % to 71.43 %, from 19.05 % to 80.95 % and from 23.81 % to 76.19 % respectively in the South-Comoé, Lagoons and Agnéby. Agnéby Region recorded the highest average of compliance rate to biosecurity measures. These results would be use by government or veterinarians for planning or establishing biosecurity measures according to regions' Compliance rate of the recommended measures.

Résumé

Ce travail a eu pour but de montrer le taux d'observance des mesures biosécuritaires dans les fermes piscicoles de la Côte d'Ivoire. Des enquêtes ont été menées sur quarante huit exploitations piscicoles des régions du Sud-Comoé, des Lagunes et de l'Agnéby de mars à août 2011. La méthode dite "boule de neige" a été utilisée à travers un questionnaire présenté aux propriétaires et aux employés. Les taux d'observance des mesures de biosécurité recommandée ont varié de 0 % à 71.43 %, de 19.05 % à 80.95 % et de 23.81 % à 76.19 % respectivement dans les régions du Sud-Comoé, des Lagunes et de l'Agnéby. La région de l'Agnéby a enregistré la plus grande moyenne de taux d'observance des mesures de biosécurité. Les résultats de cette recherche pourraient être utilisés par le gouvernement ou les vétérinaires pour la prévention ou l'établissement des mesures de biosécurité en fonction des taux d'observance des régions.

2 INTRODUCTION

In breeding, biosecurity is all dispositions which prevent against diseases or pathogens. The preventive treatments of animals, the radiation of

water with UV rays, and the quarantine are some methods which prevent of biological risks. The first vocation of biosecurity is to control



biological risks that could appear in breeding (Hegngi et al., 2003; Dvorak, 2009). Biosecurity is an important factor for breeders because it can reduce financial losses that could be caused by the introduction of diseases or pathogens (Gifford et al., 1987). Yet, in several sectors of breeding practices of biosecurity or its compliance is sporadic and variable. These situations are observed on cattle farming (Sanderson et al., 2000; Faust et al., 2001; Hoe and Ruegg, 2006), pig farming (Amass and Clark, 1999 ; Broes, 2002 ; Pinto and Urcelay, 2003), poultry farming (Nespeca et al., 1997 ; Vaillancourt and Carver, 1998), and fish farming (Delabbio et al., 2005 ; Bondad-Reantaso et al., 2005). Haynes et al. (1979) defined compliance in medicine as the behaviour of someone who follows medical recommendations. As in medicine, breeders can define compliance of biosecurity measures in aquaculture as the application of recommended measures which are based on the : disposition of breeding equipments in parallel, parasitological analysis of fishes, present of areas for visitors, present of dipping-tanks for cars disinfection, work clothes for employees, protection of breeding equipments, knowledge of biosecurity measures, insulation of farm with a fence, quarantine, preventive treatment of fishes, frequency of treatment, knowledge of fishes diseases, application of sanitary bins, incineration of dead fishes, disinfection of materials before use,

disinfection of materials after use, non exchange of materials between farmers, reduction of visitors number by month, non contact of visitors with water, parasitological analysis of water, visit of veterinarian, and type of drugs of treatment (Racicot and Vaillancourt, 2009). In developing countries, the compliance of biosecurity practices has become a priority after the appearance of serious epidemics or epizootics diseases of bred animals. For example, in Ivory Coast, after the appearance of pig's plague in 1996 (El Hicheri et al., 1998) and of bird's flu in 2006 (Filani, 2006) that had decimated several thousand bred animals and caused great financial losses, the government has demanded the application of biosecurity measures on breeding. In the world, majority breeders except for fish breeding, apply these measures, fish breeding is also exposed to the same problems of biosecurity like others farms (Perera et al., 2008). But, there are not surveys on biosecurity measures in Ivory Coast's aquaculture. Researches carried out in Ivory Coast's aquaculture were on reproduction, growth, diet, exploitation systems, and management of bred fishes (Hem and Nunez, 1994; Hem et al., 1995; Legendre and Ecoutin, 1996; Ouattara et al., 2005; Coulibaly et al., 2007; Fao, 2008). This survey therefore has the aim of evaluating compliance rates of Biosecurity measures in Ivoirians' fish farming.

3 MATERIALS AND METHODS

3.1 Description of survey area: The survey was carried out in three regions of Ivory Cost (figure 1) which were regions of "Lagoons, Agnéby and "SouthSouth-Comoé. The region of "Lagoones" was located at 5°25' north latitude

and - 4° 20' west longitude. "Agnéby" region was at 6° 00' north latitude and - 4° 00' west longitude and the region of "South-Comoé" had been locate at 5° 30' north latitude and 3° 15' west longitude.

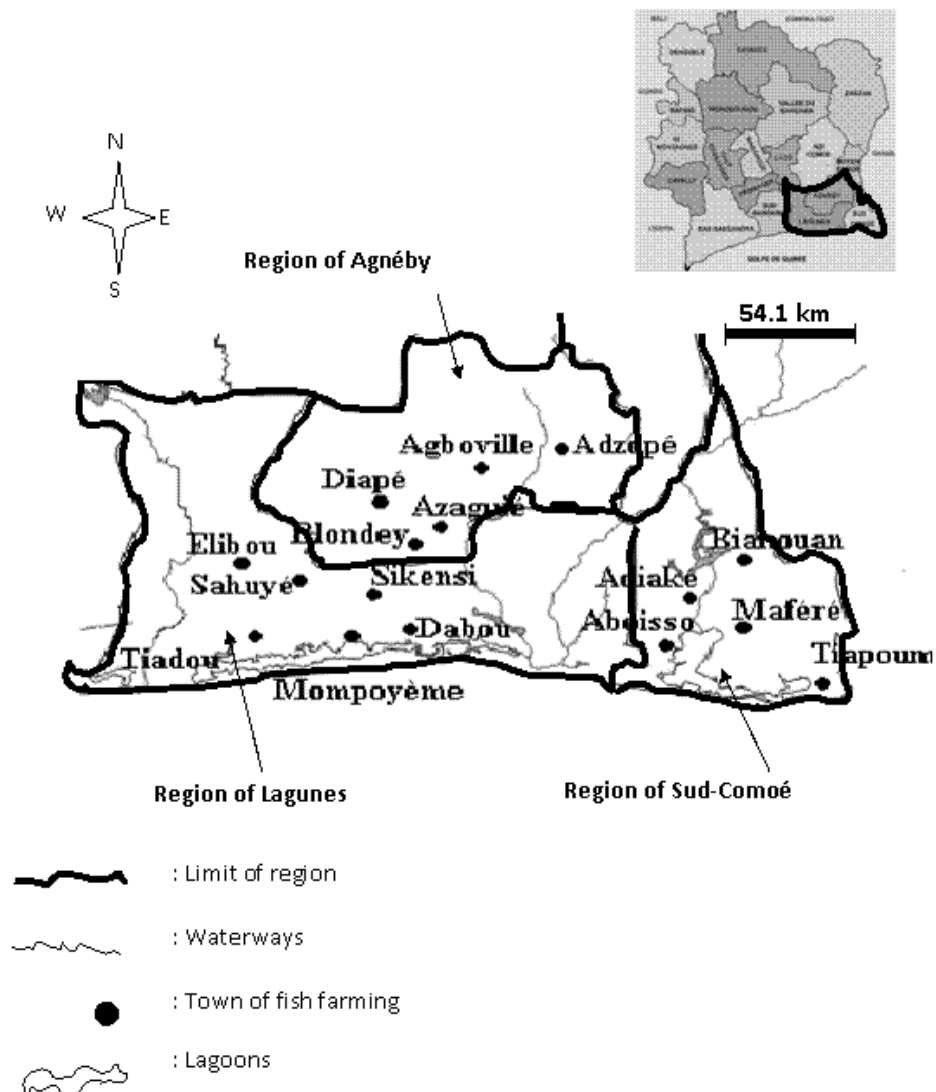


Figure 1: Localization of fish farming towns in Ivory Coast.

3.2 Methods of sampling and farms choice : Fish Farmers were sampled according to the “snowball” method used by Subedi et al. (2003) and Delaunay et al. (2008). The choice of fish farms was based on two selecting criteria: the presence of at least one employee in the farm and a number of at least ten equipments for breeding. Those criteria were chosen to make sure of a continuous work was done on fish farms (Racicot and Vaillancourt, 2009). Forty eight fish farms were used for this study. Data were collected through four sampling campaigns

from March to August 2011. It was carried out through a questionnaire that was presented to employees. The prospection number and the name of the town where fish farming was identified.

3.3 Determination of compliance rates of biosecurity measures: The main aspects of biosecurity measures proposed by Arthur et al. (2008) were considered as recommended measures of Biosecurity in breeding. They were based on: Disposition of breeding equipments, Parasitological analysis of fishes, Areas for

visitors, Dipping-tanks for cars disinfection, Work clothes for employees, Protection of breeding equipments, Knowledge of biosecurity measures, Insulation of farm with a fence, Quarantine, Treatment of fishes, Frequency of treatment, Knowledge of fishes diseases, Sanitary bins, Incineration of dead fishes, Disinfection of materials before use, Disinfection of materials after use, Exchange of materials between farmers, Number of visitors by month, Contact of visitors with water, Parasitological analysis of water, Visit of veterinarian, and Drugs of treatment. The Variables' acronyms are in parenthesis.

4 RESULTS

The figure 2 presents values of Compliance rate of biosecurity measures observed in the fish farming of "South-Comoé" region. There Compliance rates varied from 0 % to 71.43 %. Fish farming of Abo31, Abo32, Abo33, Abo34, Tiap35, Tiap36, Tiap37, Adk40 and Adk41 had respectively compliance rates of 23.81 %, 19.05

In fish farming, compliance rates of biosecurity measures were determinate following the formula:

$$Rc = N_{am} / T_{rm} \times 100 \text{ with:}$$

Rc : Compliance rate,

N_{am} : Number of measures applied by breeder,

T_{rm} : Total of recommended measures.

Data were treated with statistic analysis and qualitative variables had been subject to a code system and Analysis of variance (ANOVA). The Excel and Statistica 7.1 logistics were used to carry out different statistic analysis and figures.

of biosecurity measures observed in the fish farming %, 23.81 %, 23.81 %, 0 %, 4.76 %, 14.29 % and 23.81 %. These rates were at least than 25 %. These of Bia37, Maf38 and Maf39 had respectively rates values of 47.62 %, 71.43 % and 61.90 %, all situated between 26 % and 75 %.

Figure 2: Histogram of compliance rates of biosecurity measures in fish farming of "South-Comoé" region.

Results of compliance rates of biosecurity measures in “Lagunes” region are represented by the figure 3. In this region, compliance rates varied from 19.05 % to 80.95 %. Fish farming of Sah20 and Tiad19 had respectively applied 23.81 % and 19.05 % of recommended measures. Compliance rates of 52.38 %, 52.38 %, 33.33 %, 47.62 %, 71.43 %, 61.90 %, 52.38 %, 66.67 %, 57.14 %, 38.10 %, 28.57 %, 38.10 %, 47.62 %, 38.10 %, 28.57 % and 28.57 % were observed respectively in fish farming of Any1, Any2, Any3, Any4, Any5, Sah20 and Tiad19.

Compliance rates of 52.38 %, 52.38 %, 33.33 %, 47.62 %, 71.43 %, 61.90 %, 52.38 %, 66.67 %, 57.14 %, 38.10 %, 28.57 %, 38.10 %, 47.62 %, 38.10 %, 28.57 % and 28.57 % were observed respectively in fish farming of Any1, Any2, Any3, Any4, Any5, Sah20 and Tiad19. Only the fish farming of Any2 had registered 80.95 % as Compliance rate.

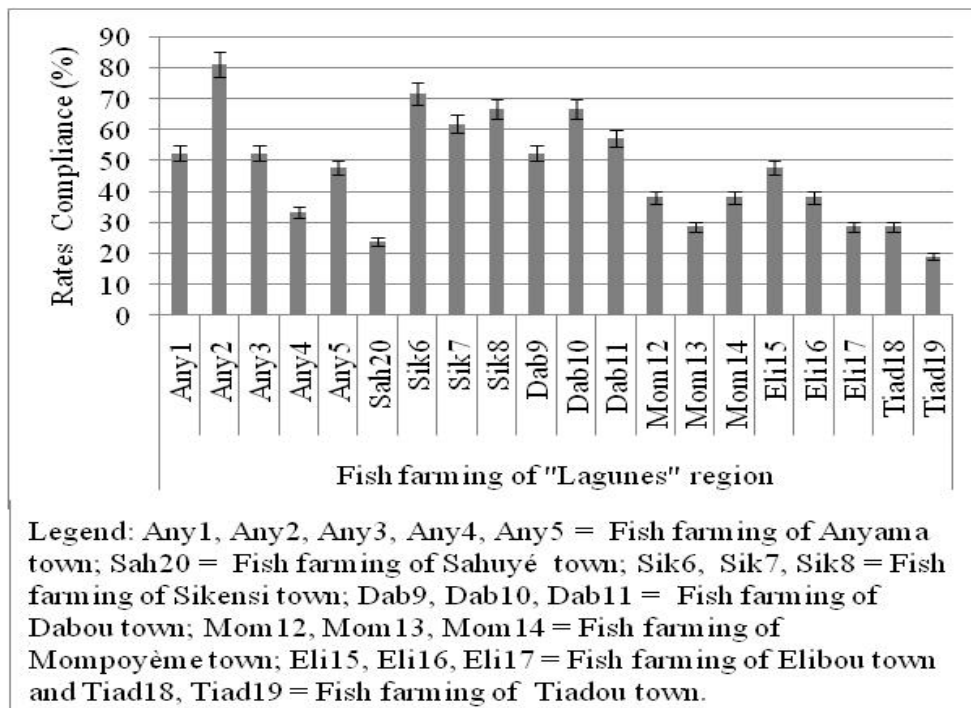


Figure 3: Histogram of compliance rates of biosecurity measures in fish farming of “Lagoones” region.

As indicated by the figure 4, Aza21, Aza23, Diap24, Adz25, Adz26, Adz27, Blo28, Blo29, Blo30, Blo31, Blo43, Blo44 and Agb48 were fish farming of “Agnéby” in which compliance rates values were situated between 26 % and 75 %.

These of Agb45, Agb46 and Agb47 had each 23.81 % of Compliance rate. Only the fish farming of Aza22 had a Compliance rate of biosecurity measures higher than 75 %.

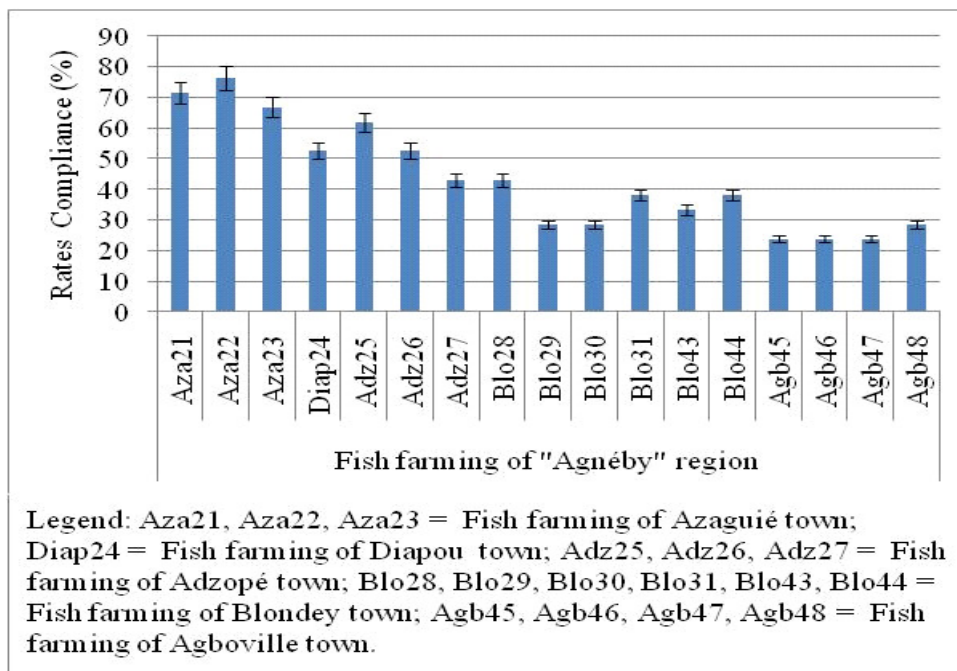


Figure 4: Histogram of compliance rates of biosecurity measures in fish farming of “Agnéby” region.

The figure 5 shows the comparison of three regions according to observed Compliance rate values. There was observed that fish farming of “Agnéby” region possessed the highest Compliance rate (46.27 %). These lagoons region were in the second place with 42.79 %. The

region of “South-Comoé” was the region, which had the weakest Compliance rate (31.67 %). However, according to ANOVA differences between averages compliance rates of three regions were not significant ($P > 0, 05$).

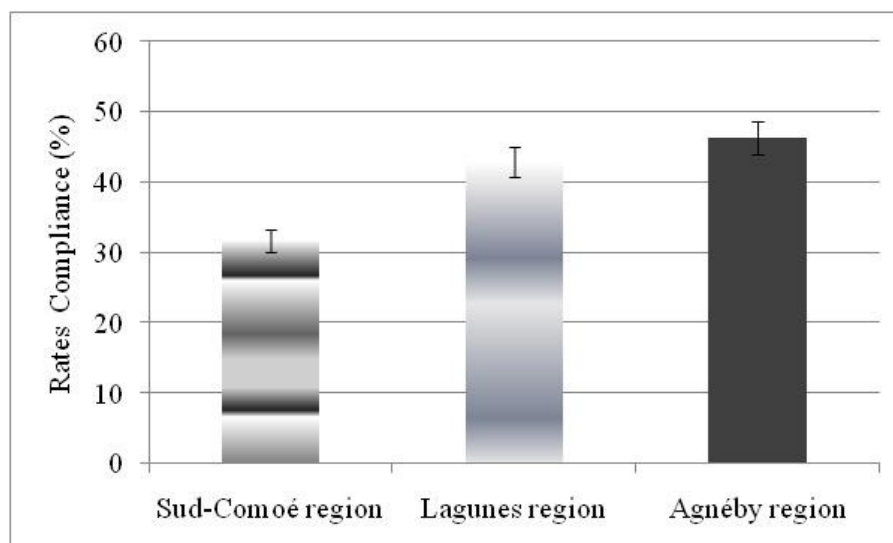


Figure 5: Histogram of average Compliance rate in three studied regions.



5 DISCUSSION

Fish farming that had compliance rates between 0 and 25 % were considered as no compliance to biosecurity measures according to Haynes et al. (1979). Application of biosecurity measures was intermediate if value rates were between 26 % and 75 %. Compliance rate was qualified good when it was higher than 75 %. According to this step, fish farming could be divided in three categories that have different practices of biosecurity measures. Thus, fish farming of “South-Comoé” region can be gathered together in two groups: one in which there is no compliance of biosecurity measures and another where compliance is intermediate. The situation observed in this region is contrary to recommendations of Blanco et al. (2001); Craig et al. (2006) and FAO (2010). In the region of lagoons and “Agnéby” a third group of fish farmers who applied more than 75 % of recommended measures of biosecurity was observed. This group was represented by only one fish farming each region whom the owner

had received a training in aquaculture. Weak rate values registered in others groups could be explained by the lack of a training of their owners or employees. Thus, in forty eight fish farming studied only two of them had good compliance of biosecurity measures. The majority of fish breeders did respect the recommended measures of biosecurity to avoid or reduce pathogen problems in their farms as indicated by Boutin (2001) and Ricou (2006). Lotz (1997); Barcelo and Marco (1998); Amass and Clark (1999), Sanderson et al. (2000) and O’Byren and Lee (2003) observed that the lack of knowledge or of understanding is the first traditional reason which explains the little compliance by the majority of farmers. Others reasons such as the lack of training, information, communication, and time, audit programs of biosecurity, potential risks, and the economic constraint can explain this situation (Vaillancourt and Carver, 1998; Barclay, 2004; Brister and Zimmer, 2010).

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