

STRENGTHENING GHANAIAN INDUSTRIAL PURSE SEINE FISHERY MONITORING IN THE GULF OF GUINEA

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SUMMARY

Taking into account the significant development of the Ghanaian surface fishery in the late 1990s along with various uncertainties raised during assessment working groups in catch species composition and length structure, it is proposed a collaborative project aiming at strengthening the statistical monitoring system of this fishery and the scientific coordination of this monitoring between coastal and fishing countries.

RESUME

Afin de répondre au développement significatif de la pêche de surface ghanéenne depuis la fin des années 90 et aux diverses incertitudes soulevées lors des groupes de travail d'évaluation quant aux compositions spécifiques et aux structures de taille des captures, il est proposé un projet de collaboration visant au renforcement du suivi statistique de cette pêche ainsi que la coordination scientifique de ce suivi entre pays côtiers et pays pêcheurs.

RESUMEN

Teniendo en cuenta el desarrollo significativo de la pesquería de superficie ghanesa a finales de los noventa, junto con las diferentes incertidumbres que han surgido durante las reuniones de evaluación en cuanto a la composición por especies de las capturas y su estructura por edad, se propone un proyecto en régimen de colaboración con miras a reforzar el sistema de seguimiento estadístico de esta pesquería, así como la coordinación científica de este seguimiento entre países costeros y pesqueros.

KEYWORDS

*Tuna fishery, purse seine, pole and line, statistical monitoring,
species composition, length structure*

1. Context

With the development of a purse seine fleet in the late 1990s, Ghanaian catches reported as Task I to the ICCAT have been estimated at about 60,000 t to 80,000 t per year, making Ghana one of the major components of the tropical fishery operating in the Eastern Atlantic Ocean. In spite of some sampling efforts and progress obtained by Ghanaian scientists in the collection of fishery statistics, certain uncertainties and potential biases in Tasks I species composition and in size distribution as well as a very low coverage for Task II have stunted diagnostics in stocks assessments as well as analyses concerning the efficiency of protection plans for juveniles of tropical tunas based on time-area closures.

In order to improve Ghanaian statistics and to reduce uncertainties in stock assessment and other analyses on tropical tunas, the Standing Committee on Research and Statistics (SCRS) of the ICCAT strongly recommended the organisation of a Working Group devoted to, among other issues, the improvement of Ghanaian statistics. As a consequence, an ICCAT Working Group on Ghanaian tuna statistics was held in Madrid in 2011 (phase II, 30 May-3 June 2011) during which recent Ghanaian catch, effort, and size data were revised and alternative

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procedures to estimate past time series were proposed. Based on the fact that (1) Ghanaian purse seiners, contrary to the SCRS thoughts before analyzing Task II data, are operating in the same fishing grounds and are using similar fishing modes (a combination of free school and FAD-associated sets) as the EU purse seine fishery operating in the Gulf of Guinea, and (2) recognizing the good quality of statistics provided by Ghana for the period for which a scientific cooperation was fruitfully conducted between Ghanaian (Marine Fisheries Research Division, MFRD), Côte d'Ivoire (Centre de Recherche Océanologiques d'Abidjan, CRO) and EU scientists (Institut de Recherche pour le Développement, IRD), technical recommendations to improve future data collection were done, such as to reinitialize the collaboration between Ghanaian, Ivorian and EU sampling teams.

Persons in charge of tuna statistics in these CPCs had a meeting with the ICCAT Secretary on the 28/09/2011 and identified actions that should be held in the near future through a collaborative project between the IRD and Ghana. This project was approved by the SCRS and it is included in the tropical species 2012 work plan as addendum.

2. Objective of the project

The overall objective of the project is to strengthen the statistical monitoring of the industrial purse seine fishery in the Gulf of Guinea with a focus on the Ghanaian fishery. Considering that a baitboat fishery exists in Ghana closely related with the purse seine fishery, the project will pay attention to port sampling and data processing of this fishery too.

3. Project activities

The project will be organized in three main components focusing respectively on i) port sampling, ii) data management and iii) coordination and data processing.

4. Port sampling

Objective: Ensure that all vessels from any flag landing in each unloading harbor, i.e. Dakar (Senegal), Abidjan (Côte d'Ivoire), and Tema and Takoradi (Ghana) are sampled according to established and common procedures agreed by the ICCAT. This specific objective will be attained through three specific actions:

ACTION 1: Ensure the training of Ghanaian samplers in the field and check the collection and management of data

Data collection methods used on purse seiners by European, Senegalese and Ivorian scientists and technicians at unloading ports have been coordinated and harmonized since the early 1990s through various European projects³. These methods are supported by - exhaustive logbook collection (following the ICCAT reference logbook), - species-specific size sampling at unloading according to a stratified sampling scheme (quarter, fishing mode, and 'ET' fishing zone), - exhaustive collection of landings documents, - VMS data for all trips and - bycatch species landed for local market (Faux Poisson: quantities, species and length composition).

Due to the difficulty to collect significant samples of fish onboard cargo carrier and because of the resulting loss of information, a specific protocol will be design to complete sampling on board carriers with the aim to identify names of purse seiners or bait boats involved in transshipment as well as dates of operations and quantities loaded.

The project will set in place in 2012 a major training session (TR1) in order to instruct the Ghanaian team to protocols, data collection forms and sampling task monitoring, and data entry according to standard procedures. This theoretical and practical course will take place in Tema, Ghana, during 15 days and will be made by three scientists one from IRD, one from IEO and one from CRO. All ten MFRD personnel working on tuna fisheries

³ Pallarés P. and Petit C., 1998. Tropical tunas: New sampling and data processing strategy for estimating the composition of catches by species and size. Collect. Vol. Sci. Pap. ICCAT, 48(2), 230-246.

Pianet R., Pallarés P., Petit C., 2000. New sampling and data processing strategy for estimating the composition of catches by species and sizes in the European purse seine tropical tuna fisheries. IOTC-WPDCS/2000/10.

will be concerned. A second training session (TR2) will take place in 2013, in order to verify that everything has been well implemented.

ACTION 2: Adopt measures allowing any vessels landing in either country to be sampled by national sampling team

In order to ensure that all vessels fishing tropical tuna in the eastern Atlantic are monitored and their catch is sampled, it would be important that the SCRS prepares a recommendation on this issue. A protocol at the ministerial level should be signed by all countries involved where vessels land frequently to enable tracking of tuna statistics.

ACTION 3: Identify and adopt data exchange protocols for the collection of logbook, sampling data, and vessel characteristics

Unloading their capture in any of the three countries, vessels should be sampled by any national team that is in the best position to do so. Data exchange agreement and protocols should then be identified in order to ensure exhaustive vessel monitoring, to share the information so each country is able to establish their national statistics and to avoid double counting.

During the training course on data collection methods (TR1), data exchanges protocols will be identified and written down. These data exchange protocols will concern: i) the monitoring of vessel characteristics participating to the fishery (i.e. according to the fields of the current EU vessel database entitled “Turbobat”), ii) exchange for logbook and sampling data (scan and numerical data).

5. Data Management

Objective: Ensure that the Ghanaian team has at her disposal and handle with the adequate expertise English versions of the same tools for data entry, data management, and data processing used by the European, Senegalese, and Ivorian scientists.

The information system presently in place for the management of data relative to the European fleet and associated flags is composed of 4 dedicated tools developed by IRD in collaboration with IEO:

- AVDTH, a dedicated tool developed for data entry of logbooks and associated documents (well plans, landing/transshipment records, etc.) as well as size samples. This tool is presently in its version 3.3 and is in three languages (French, Spanish and English). The Ghanaian team was trained in previous versions of this software (through JDIMP funds) and most recent data have been entered using this tool. Nevertheless, some training on the new version would be needed;
- AKADO, a control tool making various validation and controls of data entered in AVDTH. As it allows identification of erroneous data entry, this tool is very important for data quality insurance. It is presently only available in a French version and is therefore not easily usable by the Ghanaian team.
- T3+ is a software performing:
 1. complementary tests on raw data,
 2. data consolidation from several AVDTH databases into a common database
 3. data processing, including sample standardization, samples extrapolation and species composition corrections,
 4. raw, intermediate and processed data storage into a unique, server oriented database. A new version of the software is presently in test and will be available in 2012. The core version is in English language, but a review and completion of fisheries technical terms would be necessary. Based in data processing system underlying T3 a version adapted to Ghanaian fisheries was developed using the JDIMP funds. However, some assumptions made at the time that the adapted version was developed (such as to consider a small fishing area closed to Ghana) have drastically changed with the new information provided by logbooks. Therefore, this tool, under development, should take into account the specific characteristics of the Ghanaian fishery and be available to the Ghanaian team. Training would be needed to use it properly.
- ObServe is a software dedicated to management of observer data onboard purse seiners. ObServe allows data input onboard with various quality controls and calculations, and easy-to use consolidation into a centralized database. Various generic tools are presently being developed in order to produce statistical products (observer reports, global statistics, etc...). This tool is essential to help Ghanaian authorities and Ghanaian scientists to assess the compliance of the Ghanaian fleet during time-area

closures recommended by the Commission of ICCAT. However, considering that the current Ghanaian observer programme is quite different to observer programmes conducted on the European and associated fleets and taking into account that, following the recommendations of the joint t-RFMOs by-catch WG, a process to harmonize the PS observer programmes among t-RFMOs has started, the procedure to incorporate the Ghanaian observer data to this software would need further analyses and discussions.

This specific objective will be attained through four specific actions:

ACTION 4: Definition of specifications for software adaptations

The adaptations to be made on the existing software (AVDTH, AKADO, T3+, and ObServe) in order to make them completely operational for the Ghanaian team will be discussed and established during a four-day meeting (WG1). This meeting will require the participation of fisheries and computer scientists from Ghana and IRD.

ACTION 5: Update AVDTH English version used by Ghana and train local team using it

Ghanaian samplers currently use an old version of AVDTH which it is necessary to update to the current version. This includes:

- Distribution and installation of the version 3.3,
- Training on the version 3.3, 15 days, Tema
- Converting previous data to AVDTH 3.3 data model, using the ConvertXX tools,
- Improving the English translation of the user interface and reference data.

ACTION 6: Translation and improvement of data validation software (Akado)

Quality checks on AVDTH data are currently divided into four stages:

- i. Some basic checks are first performed at acquisition time (that is to say without crossing data) in AVDTH,
- ii. The AKADO software then enables to perform more sophisticated checks, in particular through data check crossing,
- iii. The ANAPO software uses VMS data to validate the positions of activities (i.e. sets),
- iv. Some additional checks are conducted when AVDTH data are imported into T3+. These checks mainly aim at (1) rebuilding of the foreign key relationships between activity and sampling tables, (2) controlling the presence/absence of well plans. The success of these controls is mandatory to import data into the T3+ database, in which no foreign key error is allowed.

Two ways to improve data validation can be envisaged:

- i. On a minimum effort basis, the translation and improvement of the readability of the errors reports generated by AKADO could be conducted to assist the samplers in the interpretation of warnings on data entries to facilitate the correction process.
- ii. A second more tedious option would be to design one new library that could regroup all the existing controls, plus extra controls that should be defined. This library should not have a graphical interface itself. It should then be reused by several programs: the data acquisition software, the import module of T3+, a standalone application (AKADO 2), etc. Some checks could be shared with observation data. Graphical reports should not be generated by the library itself, but by each implemented software using the library's API. As T3+, ObServe and the checks library use the same technology, it is possible to reuse advanced controls already developed for the ObServe project.

ACTION 7: Adaptation and translation of processing software (T3+) for Ghanaian statistics case taking in account mix fisheries (i.e., purse seiners cooperating with baitboats and large purse seiners operating alone). The processing performed by T3/T3+ strongly depends on the nature and the collection protocol of the raw data (AVDTH). As such, there are differences between the French and Spanish data on the one hand and the Ghanaian data on the other hand. The Ghanaian data format therefore requires T3+ to be adapted. However, the goal here would be to rely on the current version of T3+ and to improve its generic character, its flexibility and, and its adaptability regarding the variability and potential heterogeneity in the data sources (e.g. absence of well plans, no information on the geographic origin of the samples, see below).

Quality and completeness of Ghanaian data:

- i. samples are often made on cargo landings, aggregating catches from other boats (seiners and pole line) transshipped at sea, and nothing is known about their origin, the potential position of sets, the gear type, date of fishing, boat owner, or types of sets,

- ii. no well plans,
- iii. frequent absence of schools types (in logbooks and samples),
- iv. mixed set type (other boat used as a fish aggregator).

Overview of major planned changes:

- i. evolution of the data model in order to be able to handle non-georeferenced samples, non-linked to trips and activities,
- ii. integration of the owner concept, serving as boats grouping unit. The underlying idea is that within one owner's fleet resides a pool of practices that influence the quality and completeness of data collected about it. We can then apply different levels of data checks and processing, in accordance with ship-owner,
- iii. flexibility when selecting samples for the correction of the species composition: ability to use samples from other fleets, in addition to or exclusive, possibility to use only a subset of samples of a fleet, by filtering on the ship-owner criterion for example,
- iv. ability to arbitrarily assign positions to activities that do not have or that are considered doubtful. In order to make this relocation easy, it will be possible to define groups of activities and to relocate them in spatial areas:
 - i. activities groups may be defined by filtering on ship-owners, on boats or on trips, in addition to a time range,
 - ii. zones types for relocation will be mainly ET zones, but other ones could be proposed,
- v. ability to modify the temporal resolution of the strata from month to year (currently this resolution is fixed as quarter), to overcome the poor quality of the samples timestamp.

Improvement of the user interface:

- i. to a more user-friendly interface
- ii. data visualization after each processing step, including simple map representation

Translation:

The core version of T3+ is in English, but the translation should be improved, especially concerning fisheries technical terms.

Distribution packages:

T3+ is a server side application. The Ghanaian team will have three ways to enjoy T3+:

- i. installing the system on a server located in their own office (including the database and the program). To do so, we propose to provide, install and configure a server thanks to this project,
- ii. benefit of the IRD's IT infrastructure by installing the system in France and using it through Internet,
- iii. A third proposal could be to build an embedded version of the system, to facilitate the installation on personal workstations (like laptops).

ACTION 8: Improve and transfer ObServe software for introduction and management of observer data. Originally developed and used by the IRD, ObServe tends to be shared by multiple agencies. In this context multi-institutional development of a few additional functions would make operation particularly efficient, while allowing each to keep managing their own data. The functions considered are:

- iv. Synchronization of two central databases repositories: This function will automatically synchronize the reference data of two (or more) organizations' databases. This way, it would be easy to maintain data from several countries homogenous and comparable.
- v. Trips synchronization between central databases: The goal is to enable organizations' databases to easily exchange observation trips and merge their data sets for joint studies.

These functions guaranty an extremely easy to use system, without particular computer competences.

Translation

At the moment the software is in French and Spanish. Both user interface and reference data should be translated in English.

6. Coordination and data processing

Objectives: Insure a good coordination between technical and scientific teams. Insure adequacy and evolution of data collection and analysis procedures and tools. Enhance common analysis and scientific contributions to ICCAT WG.

ACTION 9: Participation of Ghana to the annual coordination meeting of EU and associated scientific teams monitoring tuna surface fisheries. During these annual meeting organized alternatively in France and Spain in April-May, sampling collection activities, database and tools are regularly discussed and revised. Data are processed in common allowing comparison and share of samples. Common scientific contributions to ICCAT WG occurring in September are identified and planned. The project will take in charge participations of Senegalese, Ivoirian and Ghanaian scientists to these meetings (WG2 and WG3) in order to facilitate exchange and improve regional coordination between national teams.

7. Persons involved

Project participants

IRD (Institut de Recherche pour le Développement, France)

- Chavance Pierre, scientist, co-coordinator for IRD
- Gaertner Daniel, scientist, co-coordinator for IRD
- Fonteneau Alain, scientist
- Chassot Emmanuel, scientist
- Cauquil Pascal, computer scientist
- Floch Laurent, database administrator
- Damiano Alain (or Dewals Patrice), regional tuna sampling coordinator

MFRD (Marine Fisheries Research Division, Ghana)

- Bannerman Paul, scientist coordinator for MFRD
- Ayivi Sylvia, scientist
- Priscilla Ankamah, technician
- Victor Anaba, principal technician
- Vlivinyui Anaglate, scientist
- Jones Tetteh, database
- Eric Sawyer, technician

Other collaborations

CRO (Centre de Recherches Océanologiques, Côte d'Ivoire)

- Amandé Monin Justin, scientist (*if integrated in Ivoirian public scientific staff*)
- Guilavogui Athanase, port sampler coordinator
- Barrigah Simeon, port sampler

CRODT (Centre de Recherche Océanographiques de Dakar Thiaroye, Senegal)

- Ngom Fambaye, scientist
- Diatta Justin, port sampler

IEO (Institut Espagnol d'Océanographie, Spain)

- Delgado de Molina Alicia, scientist
- Ariz Javier, scientist
- Rojo Vanessa, port sampling regional coordinator

Calendar

Component	Action	2012			2013												2014															
		10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5											
Port sampling	Action 1: Training	TR1								TR2																						
	Action 2: Sampling authorisations																															
	Action 3: Data exchange protocols																															
Data management	Action 4: Software specifications	WG1																														
	Action 5: AVDTH				<i>Developpement</i>																											
	Action 6: AKADO																															
	Action 7: T3 +																															
Coordination	Action 8: ObServe																															
	Action 9: Coordination								WG2													WG3										

Budget

Component	Action	Content	Persons concerned	Budget IRD	Budget Ghana	Total Budget
PORT SAMPLING	ACTION 1: Trainings	15 days training in Tema in 2012 (TR1) and 7 days in 2013 (TR2)	4 technicians from IRD (1), IEO (1) and CRO (2) and the full Ghanian team	18675		18675
	ACTION 2: Sampling authorisations	<i>to be defined</i>	ICCAT, Ivorian and ghanian managers	no cost	no cost	no cost
	ACTION 3: Data exchange protocols	1-2 days meeting during the training session 1	1 technician from IRD and data manager from Ghana		Included in Action 1	
DATA MANAGEMENT	ACTION 4: Software specifications	Define precisely the software developpement to be done. This will be done during a for days meeting in Sète (Fr) - WG1	IRD/computer scientists and fishery scientists of IRD and MFRD		2900	2900
	ACTION 5: AVDTH	Update software English version used by Ghana and train local team using it	2 scientists from IRD/CRO and the full Ghanian team		Training included in Action 1	
	ACTION 6: AKADO	Translation and improvement of data validation software	IRD/Computer scientist and computing private company	8000		8000
	ACTION 7: T3 +	Translation and adaptation of processing software T3+	IRD/Computer scientist and computing private company	17000		17000
	ACTION 8: ObServe	Transfer and eventually adapt software	IRD/Computer scientist and computing private company	8000		8000
COORDINATION AND DATA PROCESSING	ACTION 9: Coordination	Participation of Ghana to the annual coordination meeting in Europe in may 2013 and may 2014 - WG2 and WG3	One scientist and the port sampler coordinator from Ghana, Senegal and Côte d'Ivoire (6 persons)	12320	6160	18480
EQUIPMENT		Equipment for Ghanian team	- Computers (3 and 1 server) - Ichtyometers(10)		8000	8000
TOTAL				63995	17060	81055

Unit price	
pdg	145 € PD Ghana Travel Fr-Ghana
tgf	1 000 € or international
pdf	90 € PD France Travel RCI- Ghana or
trg	200 € regional