



Letter to the Editor

Counting pirogues and missing the boat: Reply to Chaboud et al.'s comment on Belhabib et al. "Fisheries catch misreporting and its implications: The case of Senegal"


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ABSTRACT

The job of fisheries scientists is to provide evidence that can be used for fisheries management both in tactical terms (i.e., from one year to the next) and strategically, in term of their broad orientations. Catch reconstructions, which consider all fisheries in a given area, can help with the latter, but they are often contested, as broad assumptions must often be made to reconcile and harmonize divergent data sets. Here, *contra* Chaboud et al. (Comment on "Fisheries catch misreporting and its implications: The case of Senegal") on Belhabib et al. (2013, 2014b), we justify the assumptions and methods we used, in close collaboration with Senegalese government agencies, to reconstruct the historic and current artisanal catch of Senegal and the illegal catch taken by foreign industrial vessels in Senegalese waters. This done, we argue that such work, rather than haggling about the number of pirogues deployed decades ago, is a current task of fisheries scientists working on Senegalese fisheries, and by extension, elsewhere in West Africa, where the conflict between artisanal and foreign industrial fisheries is most acute.

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1. Introduction

It is always gratifying to see one's work taken seriously enough by one's colleagues to inspire further exchanges. What is at stake in the debate opened by Chaboud et al. (*in press*), however, is not only the catch of Senegalese pirogues, but the idea, implicit in their comments, that the detailed reconstructions we provide are not only erroneous and useless, but done without references to the literature on, and local connections to, the countries whose fisheries catches we work on. Here, we recall some of their numerous claims (whose starts are *in italics*) and refute them.

1.1. Small scale fisheries

We agree with the need of good fisheries statistics, but...

Chaboud et al. suggest that catch reconstructions do not provide an acceptable alternative to official data such as generated by the Centre de Recherche Océanographique de Dakar-Thiaroye (CRODT) or supplied by other institutions to the United Nations Food and Agriculture Organization (FAO). We agree—at least as far as the data FAO receives are concerned. What catch reconstructions are primarily meant to do, indeed, is to highlight the need for better statistics, and illustrate the benefit that could be gained by all countries from improved statistics (Pauly, 2013). If Chaboud et al. consider the CRODT to be the provider of Senegal's 'official' data, then their claim is misleading, because CRODT data are not straightforwardly available within Senegal, at least not in the last decade.

As the list of co-authors of Belhabib et al. (2013, 2014a) attests, the study involved contributions from several Senegalese

institutions, and their methods, assumptions, data used and results were evaluated and reviewed during a multi-stakeholder workshop led by the first author and held in Dakar in March 2013, and, after some revisions, again in June 2013, in a lengthy session involving the last author and the Director of the Département des Pêches Maritimes (DPM) and his senior staff, at the seat of the DPM. The first and last authors also had in November 2013 a lengthy conversation with the Minister of Fisheries of Senegal, who subsequently used the illegal catch estimate of Belhabib et al. (2014a) in a campaign against illegal fishing¹.

... the methodology used to "reconstruct" catches from...

Chaboud et al. suggest that we did not rely on available information and that consequently, our reconstruction has led to "huge overestimates". We used and cited around 90 source references, including official reports, along with direct interviews with fishers, online material and national databases. The study includes substantial feedback from the Directorate of Fisheries (DPM, including co-authorship of the Fisheries Centre Working Paper underlying the study, i.e., Belhabib et al., 2013), USAID/COMFISH staff (who co-authored the Working Papers Belhabib et al., 2013, 2014a), the Department of Surveillance (DPSP, whose staff co-authored the Working Paper Belhabib et al., 2014a) and from fishers' organizations which helped identify issues in Belhabib et al. (2013), such as the statistical collection methods that were actually applied in the field. In spite of our efforts, we could not access recent

¹ <http://www.bbc.com/news/world-africa-25621864>.

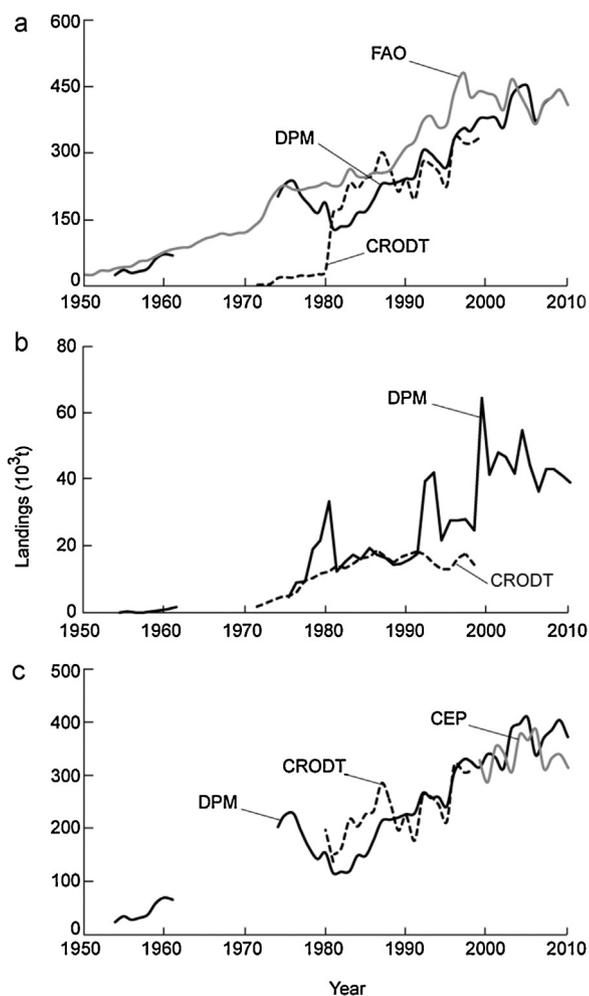


Fig. 1. Illustrating the discrepancies between 'official' Senegalese catch time series (redrawn from [Belhabib et al., 2013](#)); (a) 'total catch' as produced by the Centre de Recherche Océanographique de Dakar-Thiaroye (CRODT), by the Département des Pêches Maritimes (DPM) and by the Food and Agriculture Organization of the United Nations (FAO), based on data submitted by Senegal; (b) 'industrial catches', as produced by the DPM and CRODT, and (c) 'artisanal catches', as produced by the DPM, CRODT and the Cellule d'Etude et Planification (CEP). As might be noted, these catch time series tend to converge in recent years, but exhibited major differences in the period for which [Chaboud et al.](#) suggest that data from the CRODT were correct, while the other data sets were 'wrong'. In contrast, our job, when performing a catch reconstruction, is to find ways to harmonize multiple data sets, which is best done by taking contextualized information into account (see text).

CRODT data or library material for our study. However, earlier CRODT data obtained indirectly were compared to DPM data and information, which suggested that in the past, there were considerable discrepancies between data from both institutions. In contrast, since the CEP harmonizes these data they tend to converge ([Fig. 1](#)).

... the proposed catch estimates affect the credibility...

[Chaboud et al.](#) fear that the proposed catch estimates affect the credibility of Senegalese institutions. As described above, the catch reconstruction work documented in [Belhabib et al. \(2013\)](#) was performed in close collaboration with, and benefited from regular feedback from, various Senegalese institutions, whose staff co-authored the resulting contributions.

This was proper, since the purpose of a reconstruction is not to criticize institutions for not having collected certain data types, but rather to estimate, for the benefit of these institutions, what

is missing from official estimates, e.g., due to a lack of financial resources ([Barry et al., 2004](#)), or the unwillingness of fishers to share information ([Ndiaye, 2013](#)).

The recent use of our results by the Senegalese Minister of Fisheries, when launching his campaign against illegal foreign fishing, suggests that rather than fearing a loss of their credibility, Senegalese fisheries institutions have realized that Senegal could lose control of their EEZ to illegal fishing, which is the key problem that our reconstruction addressed.

... landing estimates by CRODT are not based on monthly catch effort surveys...

[Chaboud et al.](#) explain the sampling methods followed by CRODT, wherein observers collected catch data per fishing trip and gear on every working day. The survey design is described in [Ferraris et al. \(1994\)](#) for earlier years and in [Barry et al. \(2004\)](#), [Chavance and Chavance \(2004\)](#) and other references cited in [Belhabib et al. \(2013\)](#) for later years. [Deme et al. \(2012\)](#), whose first author is a CRODT staff, show a threefold increase in effort between 2004 (when the effort targeting sardinella was left unsampled) and the 2005 census, due to hundreds of pirogues left uncounted in 2004. Moreover, they highlight that the fishing effort accounted for by CRODT only covered three major fishing areas, but excluded Sine Saloum, which means there was a systematic under-estimation of the effort (per gear) by which the catch sample was being raised. Also, as stressed in [Belhabib et al. \(2013\)](#), although surveys were well designed, data collection relies partly on fishers' willingness to share their catch data; field interviews by D.B and V.K. strongly suggested the absence of such willingness (see also [Ndiaye, 2013](#)).

... these extrapolations are supposed to correct effort values from CRODT...

[Belhabib et al. \(2013, 2014b\)](#) make no claim at all as to the extended effort, and neither do they "correct" the effort estimated by CRODT. The number of pirogues used for extrapolation by [Belhabib et al. \(2013\)](#) was the official number supplied by the Senegalese DPM.

... thus, they consider that fishing effort was equivalent to the number of registered pirogues...

There is nothing wrong with using the number of pirogues in different years as a measure of effort, as long as the number of trips undertaken per year does not vary strongly between years. What matters here is that the pirogues be counted accurately; however, hundreds of them were unaccounted for ([Deme et al., 2012](#)). This is confirmed by a survey funded by the World Bank, whose unpublished results, to which we had access, also suggested a massive underestimation of the number of pirogues.

... therefore extrapolation factors proposed by [Belhabib et al.](#), are built from fishing effort definitions and estimates different from those used in the estimation procedures by CRODT.

Yes, that is correct, and we never claimed otherwise.

... they are based on four census data [...] combined with some erroneous considerations...

[Chaboud et al.](#) do not explain why the approach taken is supposed to be erroneous. The rationale behind the approach taken is that increasing data coverage (in more recent years) implies better reporting ([Ferraris et al., 1994](#); [Barry et al., 2004](#); [Deme et al., 2012](#)). The discrepancies illustrated in [Fig. 2a](#) and [c](#) in [Belhabib et al. \(2013\)](#), comparing total and artisanal fisheries catch estimates from CRODT and DPM, illustrate that the level of under-reporting was higher in the past when CRODT did not exist, but decreased

as coverage by CRODT and DPM increased; this is highlighted by increasing convergence between CRODT and DPM estimates (see also Fig. 1).

Belhabib et al. say that CRODT data are available until 1999 only. . .

We did obtain more recent CRODT data near the end of our study; however, the sources of the data firmly insisted on anonymity, and the associated report, which was provided for background only, was not to be cited. Clearly, there is a transparency issue within the CRODT which will have to be resolved by the Senegalese authorities.

Belhabib et al. are also wrong when presenting data collection methodology of the DPM. . .

Chaboud et al. state that our description of the data collection by the DPM was erroneous because we supposedly stated that it was (entirely by implication) based on registration of fish sales by fishmongers from landing centres rather than fuel vouchers. Yet, we wrote “*department of fisheries relies at least in part [emphasis added] on a system where declarations by registered fishers of expected catches are exchanged for fuel subsidy vouchers*”. Moreover, this description, which incidentally doesn’t affect the result at all, was adapted from Ndiaye (2013) and personal communications from local experts.

2. Industrial fisheries

CRODT relies on catch data supplied by domestic and reflagged vessel operators themselves (Barry et al., 2004), and there are discrepancies between industrial data by DPM and CRODT (Belhabib et al., 2013). Although Barry et al. (2004) and Ferraris et al. (1994) assert that foreign vessels have onboard observers as mandated by the DPSP, at least part of their catch data are not originating with these observers, but were obtained from foreign vessel owners themselves (Operation AMLEP 2012). We also note that, in Senegal, only vessels over 300 GRT are supposed to have onboard observers, and that many vessel operators deny them access, as documented in Belhabib et al. (2013). The DPSP staff co-authored the working paper on illegal fisheries (Belhabib et al., 2014a), not cited by, Chaboud et al., and which provides a comprehensive description of the methods used to estimate industrial fisheries.

. . . they are based on an estimate of the number of Senegalese seiners, mean CPUE and activity level in the Senegalese area. . .

Chaboud et al. claim that catch data estimated for tuna vessels were too high when compared to the data by ICCAT, due to us having overestimated vessel numbers.

We estimated vessel numbers from data in French colonial archives (Rieuciau, 1984), and DPM reports; however, the number of tuna vessels was missing for many years, which Chaboud et al. interpret as zero vessels, as demonstrated by their use of an average of “2.5 vessels” from 1950 to 2010. However, an absence of records does not necessarily mean an absence of vessels. In such cases, it is appropriate to interpolate between records (rather than set values to zero), as long as there is evidence that fishing continued. Clearly, such interpolation misses inter-annual fluctuations of vessel numbers. However, an interpolated number of vessels in cases where a fishery is known to have existed is more appropriate than assuming that a fishery that is not monitored does not exist.

Here again data and estimates [...] are not coherent with existing data in terms of number of vessels. This could have been avoided with minimal consultation of available national datasets and documents. . .

We use of data and information from numerous sources, all duly cited in our tables and text.

. . . there is also a methodological error regarding the use of the classical formula. . .

Chaboud et al. suggest that the fleets whose catches we estimated using a Monte Carlo approach were too heterogeneous to be pooled in the same analysis and that the variance would be “huge”. We accounted for the heterogeneity of fleets in the Monte Carlo approach, and the coefficient of variation we obtained was 28%. We leave it to the reader to decide whether this variation is huge or not.

. . . regarding discards, most references used by Belhabib et al. are relative to shrimp trawl [...] Thus the proposed discards estimate is then highly overestimated. . .

Of the six references listed in Table 8 of Belhabib et al. (2013), only two refer exclusively to shrimp trawlers. Thus, for example, Kelleher (2005) uses an average for the trawl fishery (including finfish and shrimps), Gulland and Garcia (1984) and Monoyer (1980) all refer to finfish fisheries, with discard rates that were actually within the same range as shrimp fisheries discards. Hence, the discards presented in Belhabib et al. (2013, 2014b) are not over-estimated, and certainly not “highly overestimated”. Indeed, shrimp trawl discards, estimated at around 67% (Caverivière and Rabarison Andriamirado, 1988), were similar to finfish trawl discards (65–72%) for the same time period (Monoyer, 1980).

The authors underline a correlation between the decrease of legal landings and increase of illegal catch. . .

Yes, there was a correlation. There is strong evidence that Eastern European and Russian vessels resorted to fishing illegally in Senegal after their access agreement to Senegalese waters was revoked, as described in Belhabib et al. (2014a), and in fact, a Russian vessel was arraigned since we published our estimates of their illegal catches. Interestingly, in contrast to what is stated by Chaboud et al., illegal fisheries do not only target small-pelagic fishes. They share in their statement a deeply ingrained, but false notion, also held by the Senegalese public, which is due to the small-pelagic fishery being well covered by local media because it threatens the livelihood of the many artisanal fishers. The working paper on illegal fisheries in Senegal jointly written with the DPSP, DPM and USAID/COMFISH (Belhabib et al., 2014a) and its more detailed version (Koutob et al., 2013) present evidence, however, of the presence of fleets targeting demersal species (notably Chinese vessels, and Flag of Convenience fleets). Chaboud et al. appear to not be aware of these recent developments.

3. Conclusions

Several conclusions can be drawn from this, besides the fact, perhaps obvious at this point, that the technical issues raised by Chaboud et al. are of little general interest.

One of these conclusions is that the best way to critique a paper is to show alternative results derived with what one thinks are better data, methods and more credible assumptions, but addressing the same issue (here, total catches by all fishing sectors). In such cases, the better paper that results will overshadow the original paper (see also Cheung et al., 2013).

Another conclusion is that fisheries research being an applied field, our work must always be relevant to policy makers and meet their need for strategic information. In the case of Senegal, the issue is not the absolute catch of pirogues in one year or the other, but its trend over the medium and long term, and more specifically, where their catch is being made. Senegalese pirogues increasingly

operate in the waters of neighboring countries, but land their catch in Senegal, mainly because the fish stock they traditionally targeted at home have declined, in part because of foreign illegal fishing. This is the dynamic that Senegalese decision makers must deal with, and where innovative approaches are needed that attempts quantifying (preferably in economic terms) the parts played by different actors, including illegal fishing vessels, the plague of West Africa.

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