

**REVISION OF HISTORICAL LANDINGS STATISTICS OF BLUE MARLIN
(*MAKAIRA NIGRICANS*) CAUGHT BY THE
FRENCH FISHING FLEETS IN THE NORTH ATLANTIC**

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SUMMARY

Blue marlin is harvested in the French Antilles, mainly around moored fish aggregating devices (MFADs). This fishery started in the 80s and the commercial fishing fleet composed of small-scale vessels reached its full potential in the second half of the 2000s and then steadily declined. A catch assessment survey operated by the fisheries information system (SIH) of Ifremer, implemented from 2008, allows a robust estimation of catches and effort for all fisheries in the Antilles. The data on catch estimates of blue marlin are presented here to revise the historical catch statistics in the ICCAT database.

RÉSUMÉ

Le makaire bleu est pêché dans les Antilles françaises, principalement sous des dispositifs ancrés de concentration de poissons (DCPd). Cette pêcherie a débuté dans les années 80 et la flottille de pêche commerciale, composée de navires de petite taille, a atteint son plein potentiel dans la seconde moitié des années 2000, avant de connaître une baisse constante. Une étude d'évaluation des captures opérée par le Système d'informations halieutiques (SIH) d'Ifremer, mise en œuvre depuis 2008, permet d'estimer de manière fiable la prise et l'effort de toutes les pêcheries des Antilles. Les données sur les estimations de captures de makaire bleu sont présentées ici pour réviser les statistiques historiques de captures dans la base de données de l'ICCAT.

RESUMEN

La aguja azul se captura en las Antillas francesas, principalmente alrededor de dispositivos de concentración de peces fondeados (DCPf) Esta pesquería se inició en la década de 1980 y la flota pesquera comercial compuesta por buques de pequeña escala alcanzó su pleno potencial en la segunda mitad de la década de 2000 para luego disminuir de forma constante. Una prospección de evaluación de la captura operada por el sistema de información pesquera (SIH) del Ifremer, implementada a partir de 2008, permite una estimación sólida de las capturas y el esfuerzo para todas las pesquerías de las Antillas. Los datos sobre estimaciones de captura de aguja azul se presentan aquí para revisar las estadísticas históricas de captura en la base de datos de ICCAT.

KEYWORDS

Catch statistics, Catch Assessment Survey, Blue marlin, French Antilles

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1. Evolution of the methodology for catch estimates

Until recently, statistics on large pelagics fisheries in the French Antilles islands of Martinique and Guadeloupe were used to be merged and prepared by scientists for the reporting to ICCAT and/or to the European Commission for ICCAT. Following this procedure, Reynal *et al.* (2015a) proposed a reconstruction of effort and landings for the blue marlin (*Makaira nigricans*) in Martinique and Guadeloupe, based on the reconstitution of the number of vessels per year belonging to the FAD fishing fleets, on the one hand, and the average landings per vessel established by the fisheries information system (SIH) of Ifremer, on the other hand. From 2008, the Fisheries Information System of Ifremer, mandated and co-financed by the French Fisheries Directorate (DGAMPA) has carried out a catch assessment survey (ObsDeb, Weiss *et al.*, 2018) to address the need for better quality and robustness of catch estimates per species and effort for all fisheries/métiers where declarative forms were deemed not reliable enough. Since its establishment in Martinique and Guadeloupe, the ObsDeb programme became the norm for reporting the French statistics to end-users. From 2012 until now, with the improvement in statistics reported by fishers, declarative forms for vessels ≥ 10 m in Martinique were included in the ObsDeb statistical process. The inclusion of declarative forms is a step in preparing a future where information from logbooks is smoothly integrated into ObsDeb as and when it further develops.

2. Monitoring of the small-scale fisheries in French outermost regions

Small-scale fisheries are socially important and an integral part of the European coastal areas (Guyader, 2013) but are often affected by inherent under representation in fisheries monitoring programmes, notably in Europe where vessels less than 12 meters represent almost 75% of the total European fleet. In France, 75% of the fleets from North Sea, Atlantic or Mediterranean Sea are under 12 meters in length overall and outermost regions small-scale fleets (Martinique and Guadeloupe, French Guiana or La Reunion) represent more than 90% of the total fleet. In France like in most part of the world, these fleets are considered “data poor” especially in the outermost regions small-scale fleets where declarative data (logbooks, fishing or sales notes, VMS data) are only beginning to develop.

The French Antilles (Guadeloupe and Martinique) are characterized by a wide diversity of fisheries, mainly for large pelagic species harvested around moored fish aggregation devices and free schools, demersal and benthic species (fish, crustaceans, gastropods) and small pelagic species. Blue marlin with other species like dolphinfish, yellowfin tuna is harvested in the French Antilles, mainly around moored fish aggregating devices (MFADs) (Reynal. *et al.* 2015b). This fishery started in the 80s (see Ramos *et al.* 2019 for a review of MFADs development in Martinique and Guadeloupe) and the commercial fishing fleet composed of small-scale vessels (under 12 meters) reached its full potential in the second half of the 2000s. The fleet operating in this fishery and the fishing effort then steadily declined in Martinique but also in Guadeloupe (Guyader 2019).

In order to face the lack of data from log-book/fishing declarative forms, The Obsdeb program started in 2007 as a pilot project to provide a full estimation of catches per species and effort for all fisheries in the area (Demanèche, 2013). As soon as 2008, it became the norm for the French authorities to produce catch statistics in Guadeloupe and Martinique.

3. The ObsDeb survey

The fishing trips landings observation programme is based on a sampling plan adapted to each monitored region (Weiss *et al.*, 2018a). This sampling plan sets out for each observer the schedule of landing sites (group of ports) to be visited and the fleets to be surveyed. For each fishing trip sampled, the observer reconstructs with the fishers the course of the trip (fishing effort, gear used and fishing ground location, landings by species and associated costs), and the number of fishing trips per gear/métier for the past week. The principle of the protocol is as follows: each observer is in charge of a portfolio of ports, which are grouped into observation units. The sampling plan is based on a random selection of days \times observation units, emphasising the sampling effort in the most active and diversified observation units. This is thus a cluster sampling, where each observer monitors all trip returns of the day for the selected observation unit (**Table 1**). This protocol guarantees the statistical representativeness of the samples obtained and allow the statistical theory of sampling to be applied to the calculation of effort and landings estimators and their associated accuracies.

In order to optimise the accuracy of the ObsDeb estimates, a telephone survey is also conducted in parallel aimed at estimating the fishing activity calendar at a finer scale. During these telephone interviews, only the métiers practised and the number of days at sea during the last week are collected. This allows a better allocation of sampling effort and a better allocation of fishing vessels in the strata. In Guadeloupe, exhaustive fuel consumption per vessel is also used to consolidate total fishing effort estimation. The full details of the calculation used for the estimates are given in Weiss *et al.* (2018b) but this document is still on restricted access and can be provided on demand.

To illustrate the outcomes of the ObsDeb sampling programme until 2017, total effort and catches estimates including confidence intervals are given in are given in **Figure 1** for Martinique and in **Figure 2** for Guadeloupe.

4. Blue marlin statistics (BUM)

In 2014 a review of the methodology to estimate blue marlin (BUM) catches was carried out by Reynal *et al.* (2015b) and a time series of catches since the start of the fisheries were put together. The historical series of catches proposed by Reynal *et al.* (2015a) included the average estimates for both Martinique and Guadeloupe and added the lower and upper bounds of confidence intervals for both islands together (**Table 2**). The control column of **Table 2** demonstrates that it is exactly the upper bounds of the estimates which were uploaded in the ICCAT database in 2015.

In 2021, an agreement was reached between DGAMPA and Ifremer in France to assess and validate that the correct value to be used in the historical series would be the average estimates; this is thought to be more in line with usual statistical procedures and to ensure comparability and continuity with the new catch assessment survey (ObsDeb) available and used officially since 2008. **Table 3** provides the estimates from ObsDeb since 2008 for both Martinique and Guadeloupe and from declared catches in the Atlantic North East and the Mediterranean. Indeed, there has never been blue marlin caught in mainland France (North east Atlantic and Mediterranean) and the few specimens reported in the database were due to mislabelling and need to be removed (figures indicated with an Asterisk in **Table 3**)

In 2018, the ObsDeb estimation protocol was reviewed for all regions (Weiss, 2018b) resulting in a more robust and standardized outcomes but providing estimates slightly different from the initial procedures. In summary, from 2008 onward, the difference between the current ICCAT database figures and the proposed revision comes from the use of the full time series of revised estimates from ObsDeb (2008-2020) instead of the former estimates from Reynal *et al.* (2015) until 2012 and the initial estimates from ObsDeb from 2013 onward (**Table 3** and **Figure 3**).

In conclusion, the best estimates of French catches for blue marlin in the French islands of Martinique and Guadeloupe is the average of the series developed by Reynal *et al.* (2015) from 1985 until 2007, then a combination of the ObsDeb programme for vessels <10m with the catch declaration from fishers for vessels ≥10m in Martinique, and the full ObsDeb programme in Guadeloupe for 2008 onward (**Figure 3**). The full data series is presented in **Table 4**.

The ICCAT database was updated with this new historical catch series in September 2021 and was labelled as preliminary until the consideration by the ICCAT SCRS. After this update, there were still some elements of the ICCAT database needing to be deleted due to duplication (**Table 5**). These are 6 tonnes in the Atlantic North in 2015 from a large purse seiner operating in the Atlantic South (ETRO) and 126 and 215 tonnes in 2018 and 2019 when by-catch of other large pelagics (in ETRO) were incidentally pooled with the previous figures of Martinique and Guadeloupe landings. The elements to be deleted by ICCAT are shaded in yellow in **Table 5**.

5. Discussion

Following this update of historical data for the blue marlin, the same procedure will be undertaken for all other species caught by French fisheries and reported in the ICCAT database. Since 2022, further work was carried out to standardize the data treatment procedures in order to respond to ICCAT's annual data call. Additionally, the geographic location was improved and redefined. These measures will contribute to elaborate further historical series of large pelagic species in the following years.

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Table 1. Characterisation of ObsDeb protocol for Guadeloupe and Martinique.

	Guadeloupe	Martinique
Number of observers	4	4
Number of on-site observations per observer and week	4	4
Constraint: minimum number of days off between 2 visits of the same group of ports	1	1
Possibility to sample on a Saturday	Yes	No
Population targeted	All registered vessels less than 12m. (excl. St-Barthelemy and St-Martin)	All registered vessels less than 12m.

Table 2. Comparison between the figures given by Reynal *et al.* (2015) and the figures in the ICCAT Database as of June 2021 (shaded columns).

Year	Martinique		Guadeloupe		Antilles (Martinique + Guadeloupe)			ICCAT DB - maxi (GP + MQ)
	Average	ICCAT DB	Average	ICCAT DB	Mini	Average	Maxi	
1985	11	11	0	0	7	11	15	0
1986	11	11	0	0	7	11	15	0
1987	36	36	0	0	24	36	50	0
1988	36	36	0	0	24	36	50	0
1989	36	36	10	10	32	45	62	0
1990	40	40	24	24	46	64	85	0
1991	45	45	29	29	53	73	97	1
1992	45	45	43	43	65	88	115	0
1993	49	49	90	90	106	140	179	0
1994	54	54	95	95	113	149	191	0
1995	54	54	100	100	116	154	197	0
1996	64	64	133	133	150	198	252	0
1997	89	89	143	143	175	232	299	0
1998	109	109	148	148	192	257	332	1
1999	123	123	162	162	213	285	370	0
2000	134	134	171	171	228	305	396	1
2001	148	248	181	181	245	329	428	0
2002	159	159	181	181	253	340	443	0
2003	159	159	181	181	253	340	443	0
2004	164	164	181	181	256	345	450	0
2005	179	179	181	181	266	360	470	0
2006	179	179	181	181	266	360	470	0
2007	176	176	176	176	260	352	461	0
2008	172	251	289	131	356	461	584	0
2009	184	123	188	135	269	372	498	0
2010	153	117	121	121	214	274	344	0
2011	201	123	137	136	232	338	461	0
2012	105	105	118	118	192	285	395	0
2013		78		68				
2014		153		120				
2015		91		67				
2016		80		36				
2017		128		32				
2018		78		40				
2019		106		34				
2020		217		46				
2021		83		16				
2022		90		43				

Table 3. Estimates from ObsDeb programme for Martinique and Guadeloupe and from declared catches in the Atlantic North and the Mediterranean. Figures with * are errors or duplication of data.

Year	Martinique			Guadeloupe			Atlantic North + Mediterranean
	Lower band	Average	Upper band	Lower band	Average	Upper band	Declared catches
2008	141	251	360	92	131	170	1*
2009	66	123	180	95	135	174	
2010	61	117	173	87	121	156	
2011	67	123	181	101	136	172	0
2012	64	105	147	92	118	144	0
2013	40	78	115	47	68	90	0
2014	96	153	212	79	120	163	0
2015	64	91	118	46	67	88	0
2016	53	81	110	25	36	46	1*
2017	87	128	170	23	32	42	1*
2018	48	78	108	31	40	49	6*
2019	71	105	140	26	34	43	6*
2020	119	217	316	29	46	64	1*
2021		83			16		1*
2022		90			43		0

Table 4. Proposed revision of the French historical catches of blue merlin (*Makaira nigricans*) in the Atlantic North and adjacent waters.

Year	Martinique	Guadeloupe	Atlantic North + Mediterranean	Total
1985	11	0		11
1986	11	0		11
1987	36	0		36
1988	36	0		36
1989	36	10		46
1990	40	24		64
1991	45	29		74
1992	45	43		88
1993	49	90		139
1994	54	95		149
1995	54	100		154
1996	64	133		197
1997	89	143		232
1998	109	148		257
1999	123	162		285
2000	134	171		305
2001	148	181		329
2002	159	181		340
2003	159	181		340
2004	164	181		345
2005	179	181		360
2006	179	181		360
2007	176	176		352
2008	251	131	0	383
2009	123	135		258
2010	117	121		239
2011	123	136	0	260
2012	105	118	0	223
2013	78	68	0	145
2014	153	120	0	273
2015	91	67	0	158
2016	81	36	0	116
2017	128	32	0	161
2018	78	40	0	118
2019	105	34	0	140
2020	217	46	0	264

Table 5: Extraction of ICCAT database as of January 2024 filtered for EU-France and BUM for the last 2 decades. Yellow cells are data to be deleted from this database.

Lustrum	YearC	EU.FRA-FR	EU.FRA-FR-ETRO	EU.FRA-FR-GP	EU.FRA-FR-MED	EU.FRA-FR-MQ	
2000	2000				171	134	
	2001				181	148	
	2002				181	159	
	2003				181	159	
	2004	0			181	164	
	2005	2005				181	179
		2006			1	181	179
		2007			6	176	176
		2008	1		12	131	251
		2009			8	135	123
	2010	2010	0		42	121	117
		2011			25	136	123
		2012	0		42	118	0
		2013	0		18	68	78
		2014	0		30	120	0
	2015	2015	6		32	67	91
		2016	0		56	36	0
		2017			59	32	128
		2018	126		47	40	0
	2020	2019	215		39	34	0
		2020	0		23	46	0
2021		1		35	16	1	

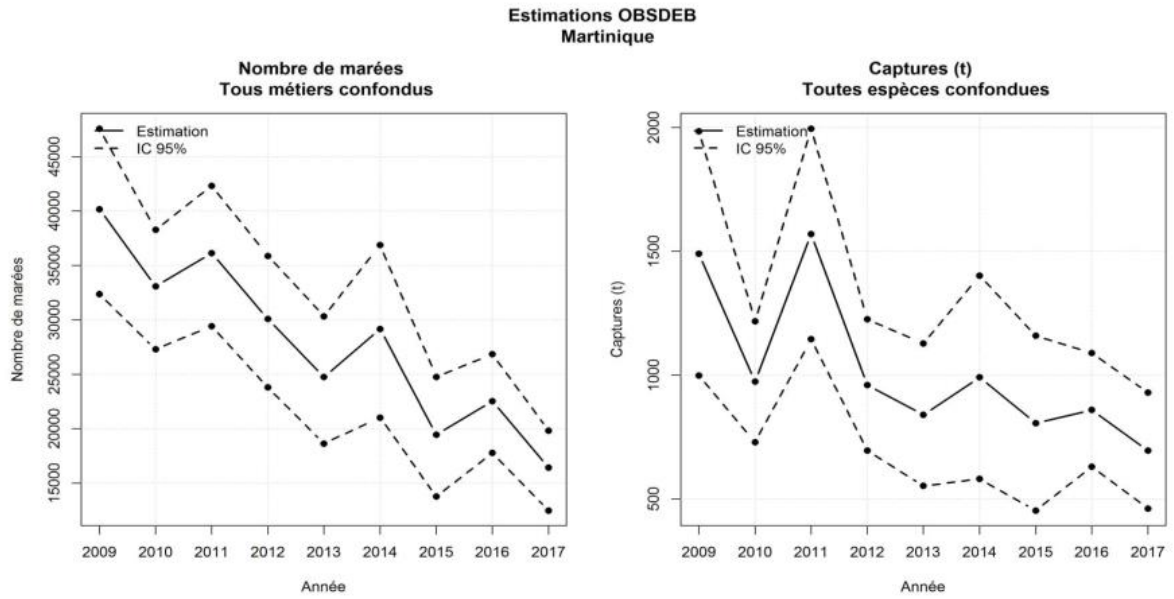


Figure 1. Total number of trips (left panel) and total catches in tonnes (right panel) estimated by ObsDeb in Martinique (in Weiss *et al.*, 2018).

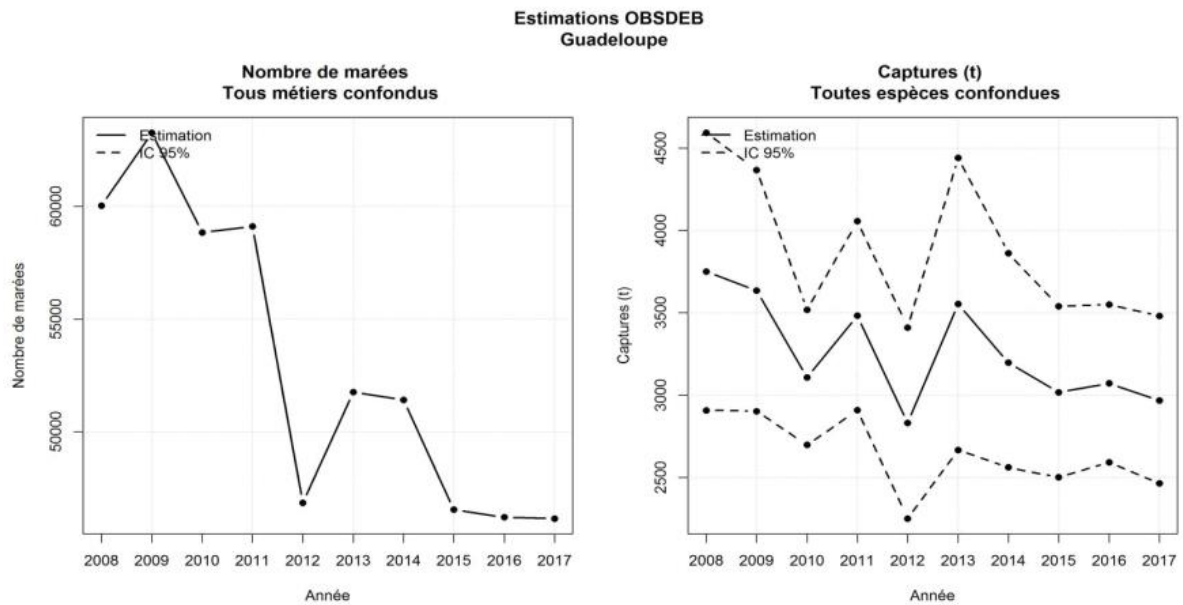


Figure 2. Total number of trips (left panel) and total catches in tonnes (right panel) estimated by ObsDeb in Guadeloupe (in Weiss *et al.*, 2018).

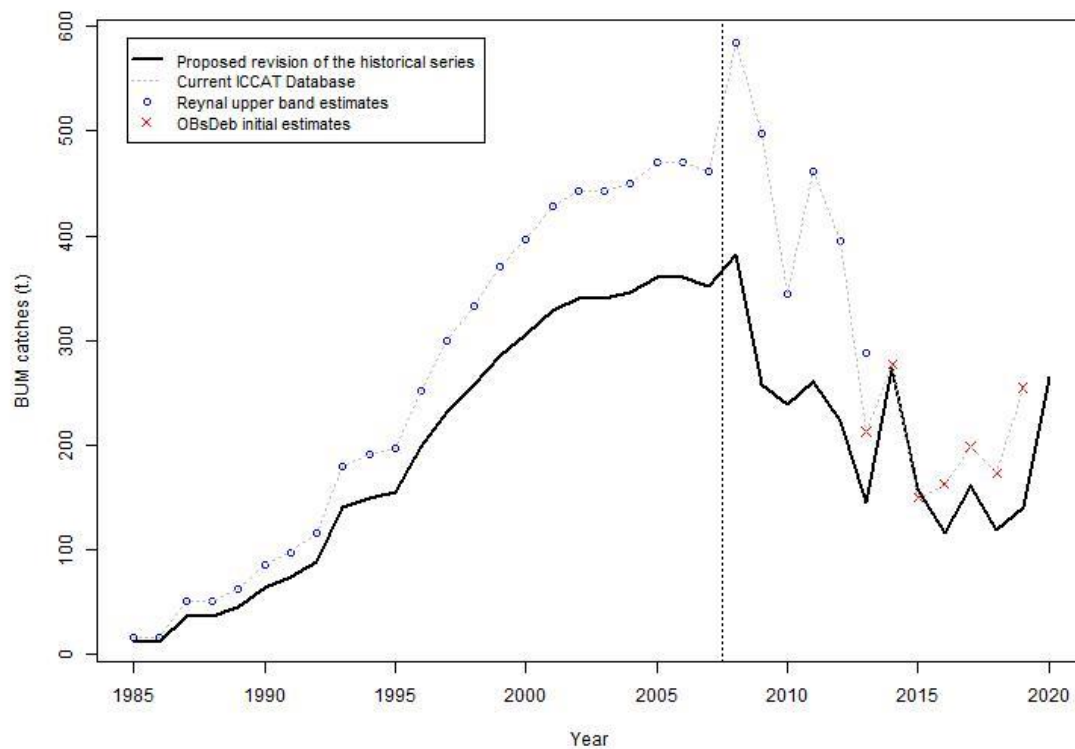


Figure 3. Comparison between the current and revised series of BUM French landings in the North Atlantic. The vertical dashed lines indicates the moment between year 2007 and 2008 separating the use of science based estimates and port sampling estimates.