BLUEFIN TUNA WEIGHT FREQUENCIES FROM SELECTED MARKET AND AUCTION DATA RECOVERED BY GBYP

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SUMMARY

The first two forms of auction, trade and market data of Atlantic bluefin tuna for the period of 1995 to 2012, gathered within the scope of the ICCAT GBYP, were formally approved by the ICCAT SCRS in 2014. These data were further filtered excluding less reliable records according to the standards set by the SCRS BFT Species Group in 2015 and finally a unique dataset on 209,491 individual bluefin tuna weights was created, with all relevant information on fish product and fishing operation. The dataset was used to develop extensive series of graphics on weight frequencies, based on fish origin, year, fishing area and fishing gear. These selected market data have potentially great value because they might fill some important gaps in ICCAT data collections and therefore serve for improved stock assessment.

RÉSUMÉ

Les deux premières formes de ventes à la criée, de données du commerce et de marché du thon rouge de l'Atlantique pour la période de 1995 à 2012, regroupées dans le cadre de l'ICCAT-GBYP, ont été officiellement approuvées par le SCRS de l'ICCAT en 2014. Ces données ont été filtrées plus avant, sauf les registres moins fiables, selon les normes établies par le groupe d'espèces sur le thon rouge du SCRS en 2015 et enfin un jeu de données unique sur 209.491 poids individuels de thon rouge a été créé, contenant toutes les informations pertinentes sur les produits de poisson et les opérations de pêche. Le jeu de données a été utilisé pour développer une série étendue de graphiques sur les fréquences des poids, basée sur l'origine du poisson, l'année, la zone de pêche et l'engin de pêche. Ces données de marché sélectionnées ont une valeur potentiellement importante car elles pourraient combler certaines lacunes importantes dans les collections de données de l'ICCAT et elles servent donc à améliorer l'évaluation des stocks.

RESUMEN

Las dos primeras formas de subasta del atún rojo del Atlántico, de datos comerciales y de mercado reunidos en el marco del ICCAT/GBYP para el periodo 1995 a 2012 fueron aprobados formalmente por el SCRS en 2014. Estos datos fueron más filtrados excluyendo registros menos fiables según los estándares establecidos por el Grupo de especies de atún rojo en 2015 y, por último, se creó un único conjunto de datos de pesos de 209.491 ejemplares de atún rojo, con toda la información pertinente sobre el producto y la operación de pesca. El conjunto de datos se utilizó para desarrollar una amplia serie de gráficos sobre frecuencias de peso, basada en el origen del pez, el año, la zona de pesca y el arte de pesca. Estos datos seleccionados del mercado tienen un gran valor potencial porque podrían rellenar algunas lagunas importantes en las colecciones de datos de ICCAT y servir, por tanto, para realizar mejores evaluaciones de stock.

KEYWORDS

Bluefin tuna, data collections, size distribution, market, trade

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1. Introduction

The possible use of auction, trade and market data in Atlantic bluefin tuna (*Thunnus thynnus*) stock assessment process has been reiteratively questioned for the last few years by the ICCAT SCRS. These data have still not been included into the ICCAT databases nor are currently available to SCRC scientists, due to confidentiality limits. They are potentially of significant scientific value and their availability might improve the future bluefin assessment, because they might fill some important data gaps in ICCAT data collections.

Within the scope of ICCAT GBYP data recovery activities in Phase 4, following the SCRS Bluefin tuna assessment meeting in 2012 (Anon., 2012) and a recommendation of the GBYP Steering Committee (2012), Mielgo Bregazzi (2015) delivered a comprehensive and extended collection of auction, trade and market data for the period of 1995 to 2012. Within the framework of a GBYP contract, these data have been closely checked by the author, selecting only reliable and documented data, using all sources for validation in order to avoid any uncertainty such as double counting. He presented three sets of data, named Form 1, Form 2 (a and b) and Form 3 (a and b), to the ICCAT SCRS for its evaluation and analysis.

In 2014, the SCRS Bluefin Tuna Species Group set a procedure for approving these market data, requesting a coordinating team for validating all data (Anon., 2014); in case it will not possible to enforce the procedure, the first two data sets (Form 1 and Form 2) will be considered automatically validated by the SCRS. Due to the difficulties encountered for setting-up the coordinating team, finally the first two data sets were considered validated, while the third one still needs to be validated because it is impossible to check the documents without the commitment of all concerned CPCs and the support of national scientists, due to the heterogeneity of data sources. Both the two validated forms contain information on bluefin tunas fished in the Northeast Atlantic and Mediterranean Sea only, and without taking into account tuna catches by Japanese long liners. The forms were compiled as independent data sets.

Form 1 contains information extracted from daily auction reports, from all major Japanese fish auction markets for the period from 2000 to 2012. These are collections of market data concerning individual fish, with details such as year, area and fishing gear, fish origin (wild or farmed), product conservation (fresh) and product presentation (dressed, gilled and gutted, belly meat or other). The original collection includes data on 209,491 fish and about 16,475 tons.

Form 2 contains information gathered from different corporate records (company catch report, live transfer reports, vessel logbooks, vessel/farm caging declarations, internal company reports on various farming parameters and conditions, sampling reports etc.), pertaining to various fishing and farming companies. It contains records on 2,582 wild “fish” (Form 2a) and 99,342 farmed “fish” (Form 2b), for the period from 1995 to 2008. It is essential to note that not all of these records are for the individual fish and a total of 615,994 bluefin tunas are included in all these records, for about 63,936 tons; in some cases the information is grouped for multiple individuals. These records provide detailed information on the fish origin (wild or farmed), product conservation (live, fresh or frozen) and product presentation (whole, dressed, gilled and gutted and other) and in the same time they provide information on the catch (area, year, gear).

2. Methods

In order to obtain weight frequencies, two forms (Form 1 and Form 2 - both a and b) have been combined, using their common fields. For this purpose, only certain high reliable records from data sets have been selected, according to the methodology discussed by the SCRS Bluefin tuna Species Group. All records that were not clearly referred to a single fish were removed. Also, records referred to fish that had presentation other than whole (RWT), gilled and gutted (GG) or dressed (DR) were excluded, as well as those that had unknown weight.

Dressed weight (DR) was converted to round weight (RWT) using the ICCAT formula: RWT= 6.19709 + 1.23034 *DR. Although this formula is developed for transforming the weight for western bluefin tuna, it was used in default of the one developed for the eastern stock. For converting gilled and gutted weight (GG) to round weight (RWT), the ICCAT conversion formula for eastern bluefin tuna stock was used: RWT= -1.6151 + 1.33725 *GG. Round weights were later converted in weight classes of 10 kg, in a way that class 0 included weights equal or greater than 0 kg and less than 10 kg. All fish of weight of more than 600 kg were prudentially removed. Nevertheless, bluefin tuna individuals of more than 700 kg were enlisted in a separate table in this paper, for keeping duly record of them.

After less reliable and partly incomplete data have been removed, the combined dataset remained with 243,176 records, which corresponded to the number of bluefin tuna individuals with known round weight (**Table 1** and **Table 2**). The dataset includes also consolidated information on fishing operation (year, gear and area) and product information (fish origin), which was used to develop graphs on weight frequencies (number of individuals) depending on several different factors.

3. Results

Total weight frequencies, of all bluefin tuna in the dataset, irrespective of fish origin (wild/farmed) or area of the catch were given in the **Figure 1**.

Weight frequencies of wild fish, irrespective of the area of catch are given in the **Figure 2**, further broken down by fishing gear and year of catch. Weight frequencies of wild bluefin caught in Atlantic are shown in **Figures 3** to **Figure 8** and in Mediterranean in **Figure 9** to **Figure 16**.

Weight frequencies of farmed fish, irrespective of the area of catch are showed in **Figure 17**, further broken down by fishing gear and the year of catch. Weight frequencies of farmed bluefin caught in Atlantic are shown in the **Figures 18** and **Figure 19** and those fished in Mediterranean are shown in **Figures 20** and **Figure 21**.

Finally, all bluefin tuna specimens having a duly recorded weight of more than 700 kg were enlisted on **Table 3**. These 113 specimens are all in the range between 705 to 780 kg, except one fish which had a weight of 1,056 kg. This specific individual has clear market documents, which have been checked in detail, but it is well over the maximum scientifically documented record Cort *et al*. (2013).

4. Discussion

The data set that has been prepared from the trade, market and auction files is the result of a very difficult and long process, which sometimes included detailed checks for each single record, often revising again the original documents that were sometimes not extremely clear. As detailed above, all data showing uncertainties against the procedure that was agreed by the SCRS Bluefin tuna Species Group were discarded from the data set.

It was noticed that purse-seine catches, in the first part of the years 2000s, included several sub-adult or very young adult fish, because of an experiment carried out by a farm, which asked some PS to catch these small tunas in the Gulf of Lion for subsequently fattening them in cages and market them on the Japanese market. This experiment was not successful, but these fish are among those included in the data set, because it was impossible to separate them for the other usual catches. Anyway, as a matter of fact, even these fish were part of the PS catch in these years.

The data are necessarily partly biased by the market itself, because buyers usually make a selection of the fish which are going to the Japanese market, but this bias cannot be defined, because it depends on many quality factors (quality of the fish, integrity of the body, fat content, etc.). Furthermore, several bluefin tunas were sold on the Japanese market under different presentations than those admitted by the procedure established for selecting the data, which were discarded because of the uncertainties of the related conversion factors.

The giant tunas were excluded from the data set used for this study; in any case, for preserving the existing information, after checking that the supporting documents are related to each fish, it was decided to attach the list to this paper, even if the frequency of giant fish seems quite high compared to the current knowledge, while one specimens is well over the maximum scientifically documented so far for *Thunnus thynnus*.

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Table 1. Number of records on bluefin tuna individuals used for obtaining weight frequencies, by year of catch, origin (wild/farmed) and the area of catch

Year catch	Wild			Farmed			TOTAL
	Atlantic	Mediterranean	Total	Atlantic	Mediterranean	Total	
1995					31	31	31
1996					45	45	45
1997					244	244	244
1998		75	75		1.208	1.208	1.283
1999		78	78		3.440	3.440	3.518
2000		42	42		8.499	8.499	8.541
2001	154	871	1.025		20.871	20.871	21.896
2002	100	6.491	6.591		34.960	34.960	41.551
2003	67	4.746	4.813		42.304	42.304	47.117
2004	16	4.017	4.033		32.861	32.861	36.894
2005	17	3.844	3.861		20.228	20.228	24.089
2006	129	2.928	3.057		13.315	13.315	16.372
2007	170	1.793	1.963		6.664	6.664	8.627
2008	48	3.173	3.221		8.188	8.188	11.409
2009	44	575	619	99	13.059	13.158	13.777
2010		37	37	107	3.199	3.306	3.343
2011	3	275	278	147	2.973	3.120	3.398
2012	31	1.010	1.041				1.041
TOTAL	779	29.955	30.734	353	212.089	212.442	243.176

Table 2. Number of records on bluefin tuna individuals used for obtaining weight frequencies, by fishing gear, origin (wild/farmed) and the area of catch

Fishing gear	Wild			Farmed			TOTAL
	Atlantic	Mediterranean	Total	Atlantic	Mediterranean	Total	
LL	120	15.806	15.926				15.926
PS		12.522	12.522		212.089	212.089	224.611
TRAP	659	1.627	2.286	353		353	2.639
TOTAL	779	29.955	30.734	353	212.089	212.442	243.176

Table 3. Individual records of bluefin tuna with weight over 700 kg.

Year of Catch	Producer/Vessel Nationality	Fishing Gear	Fishing Area	Origen	Weight (kg)
2002	EU ESP	LL	Mediterranean	Wild	1.056,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	780,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	780,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	780,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	780,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	780,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	780,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	780,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	780,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	780,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	775,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	770,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	770,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	770,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	770,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	770,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	770,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	770,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	770,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	760,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	760,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	760,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	760,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	760,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	760,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	760,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	760,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	760,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	760,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00

Year of Catch	Producer/Vessel Nationality	Fishing Gear	Fishing Area	Origen	Weight (kg)
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	750,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	745,00
2002	TUN	PS	Mediterranean	Farmed	742,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
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2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
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2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	740,00
2008	TUR	PS	Mediterranean	Farmed	732,40
2004	EU FRA+LBY	PS	Mediterranean	Farmed	730,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	730,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	730,00
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2004	EU FRA+LBY	PS	Mediterranean	Farmed	730,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00

Year of Catch	Producer/Vessel Nationality	Fishing Gear	Fishing Area	Origen	Weight (kg)
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	720,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	710,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	710,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	710,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	710,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	710,00
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2004	EU FRA+LBY	PS	Mediterranean	Farmed	710,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	707,00
2004	EU FRA+LBY	PS	Mediterranean	Farmed	705,00

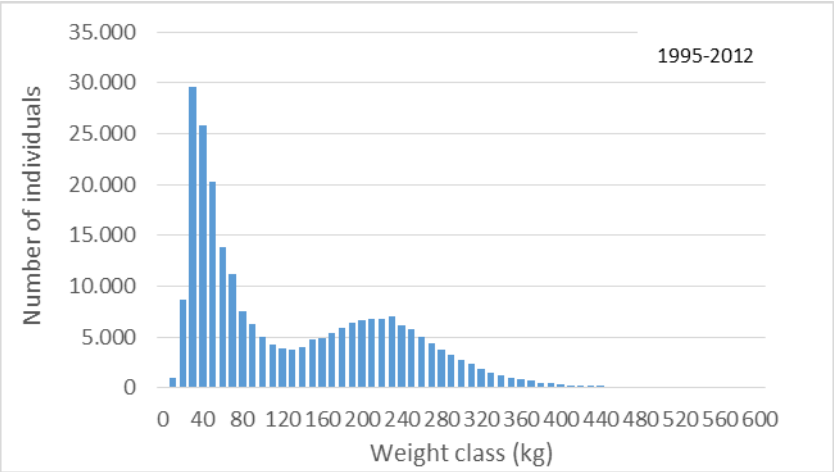

Figure 1. Weight frequencies (total individuals) of both wild and farmed bluefin tuna caught in the Atlantic and in the Mediterranean in all years (1995-2012), by all gears, from the trade, market and auction files.

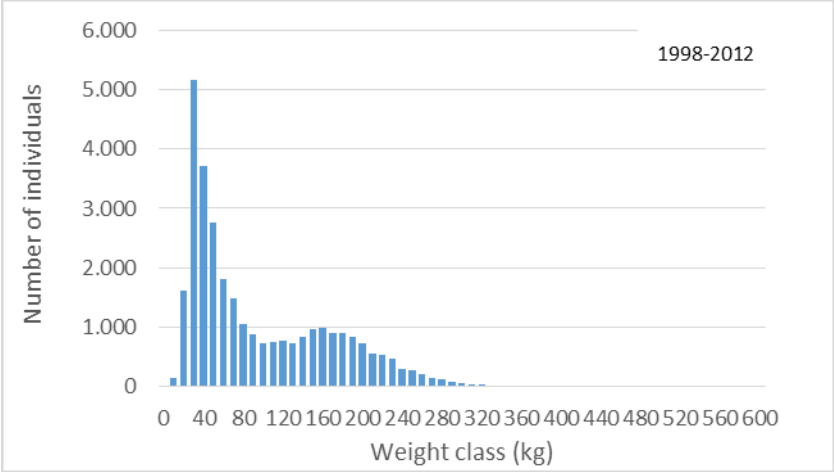

Figure 2. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Atlantic and in the Mediterranean in all years (1998-2012), by all gear, from the trade, market and auction files.

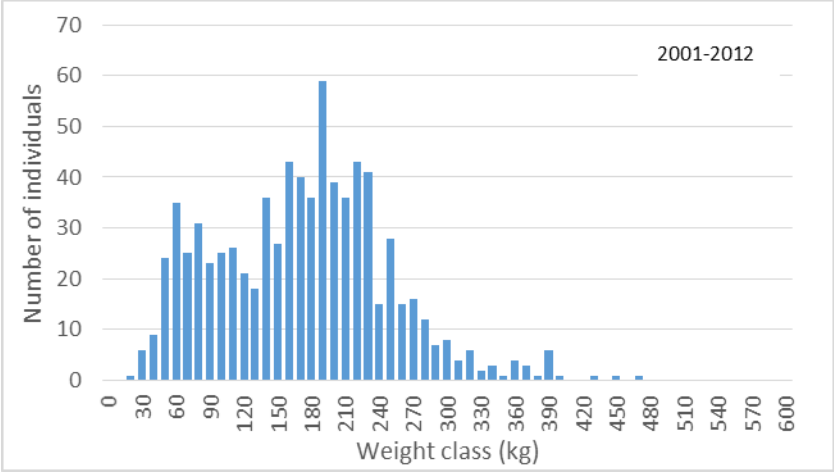

Figure 3. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Atlantic in all years (2001-2012) by all gear, from the trade, market and auction files.

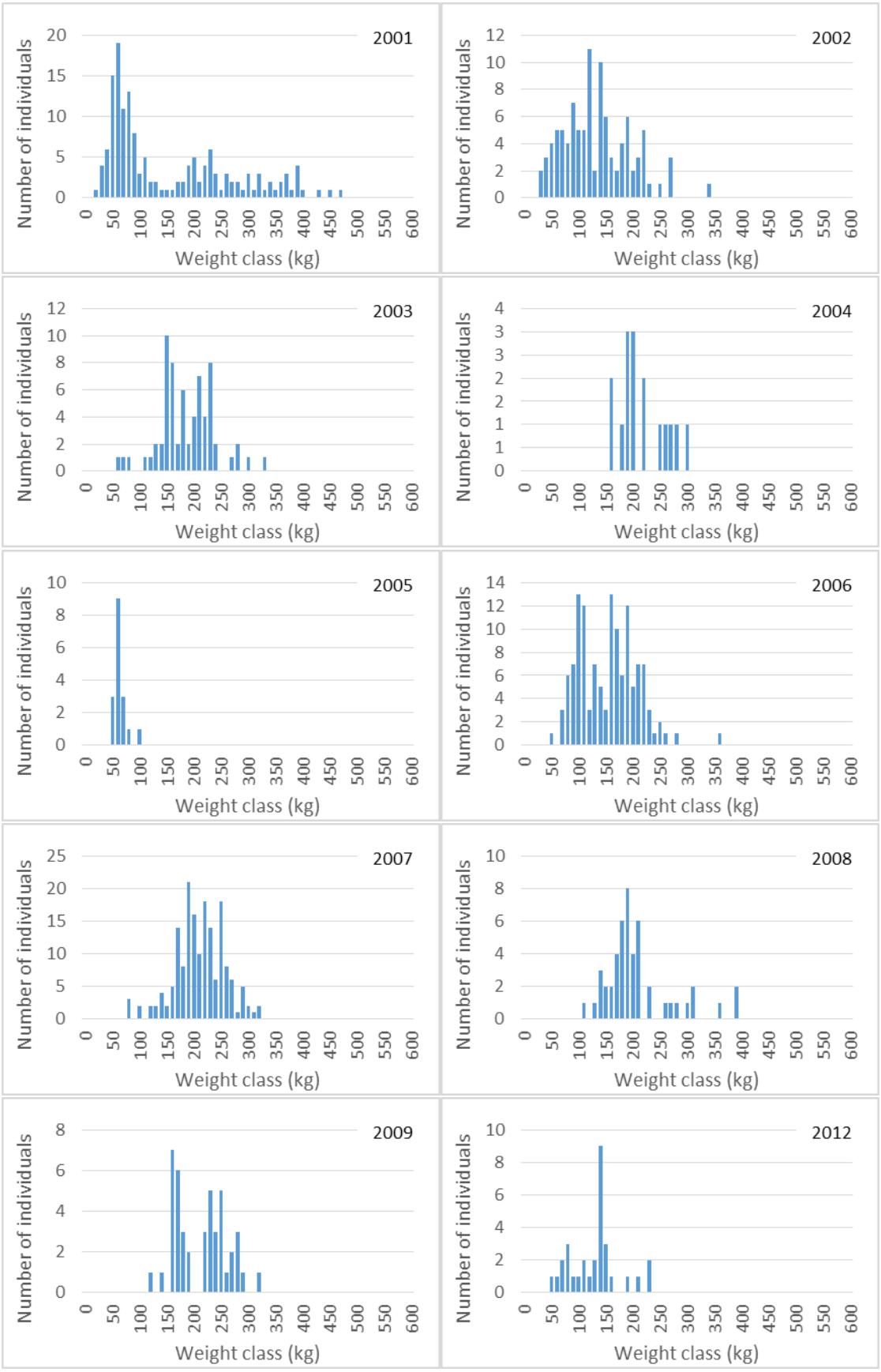

Figure 4. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Atlantic by all gears, by year (2001-2009 and 2012), from the trade, market and auction files.

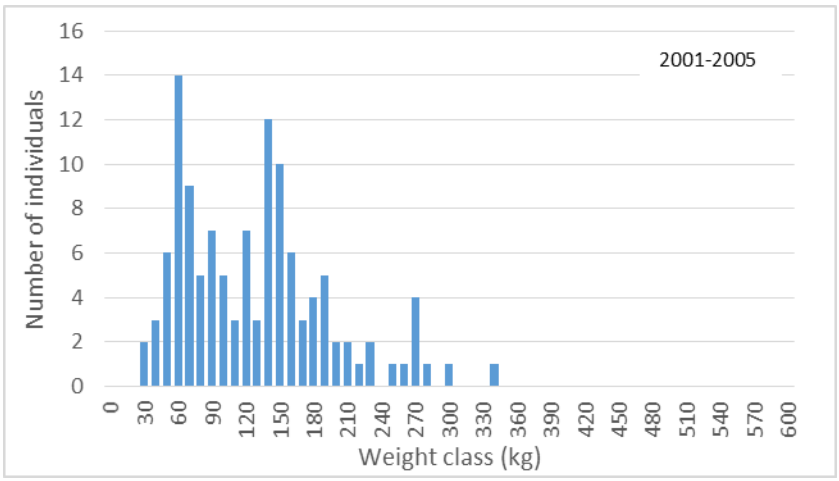

Figure 5. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Atlantic in all years (2001-2005) by long lines, from the trade, market and auction files.

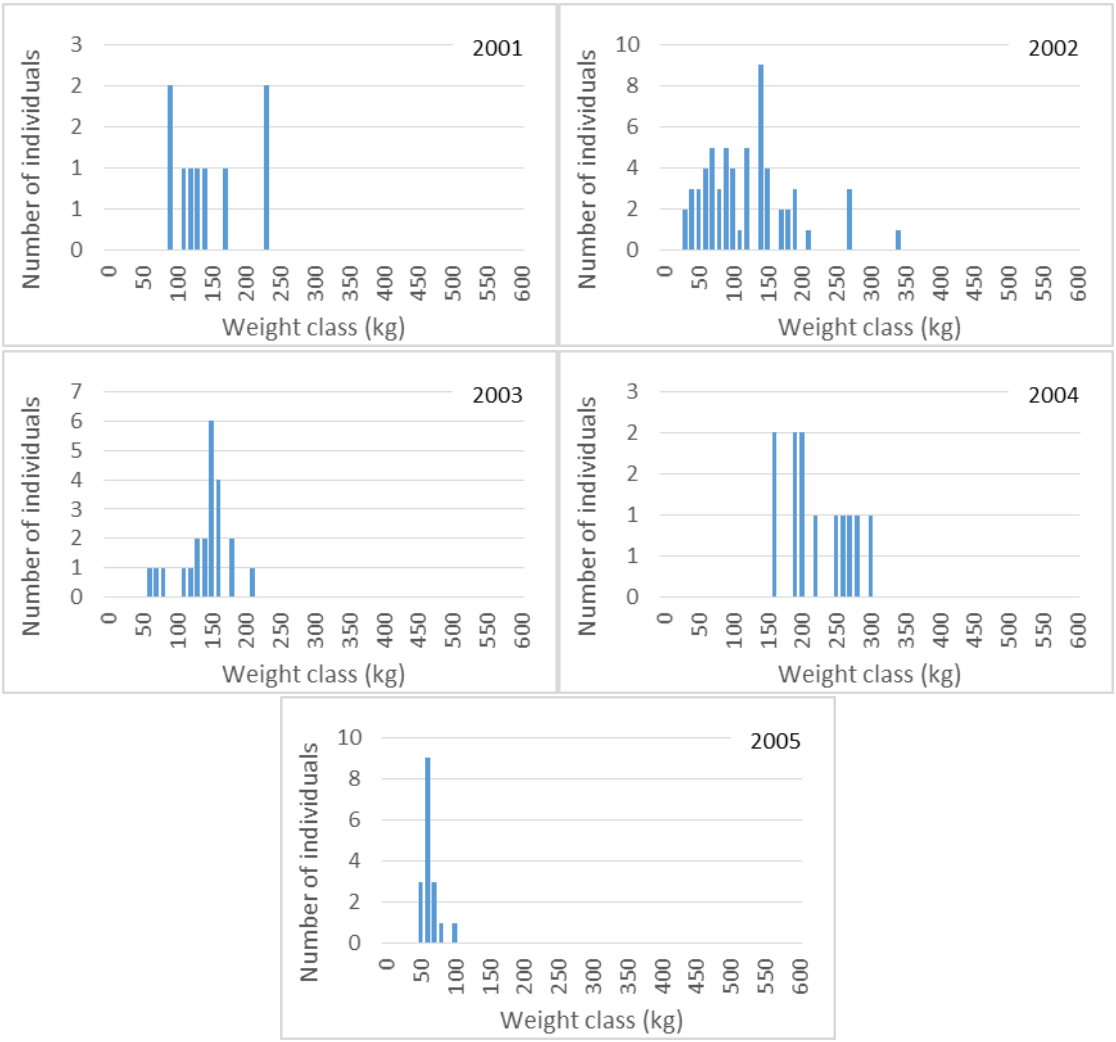

Figure 6. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Atlantic by long lines, by year (2001-2005), from the trade, market and auction files.

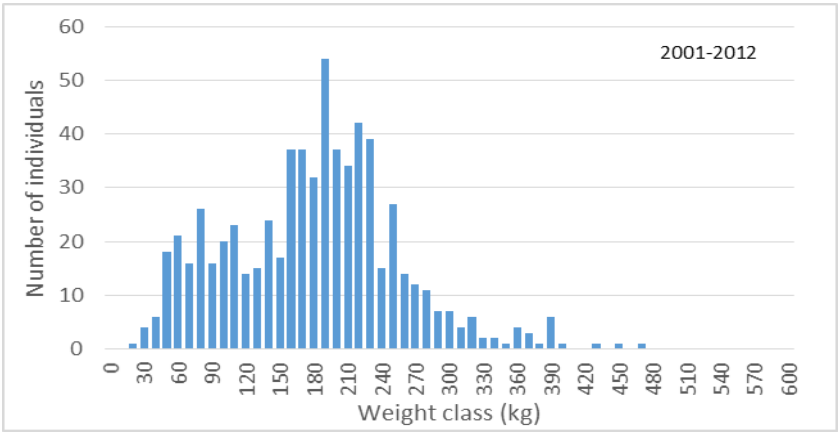

Figure 7. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Atlantic in all years (2001-2012) by traps, from the trade, market and auction files.

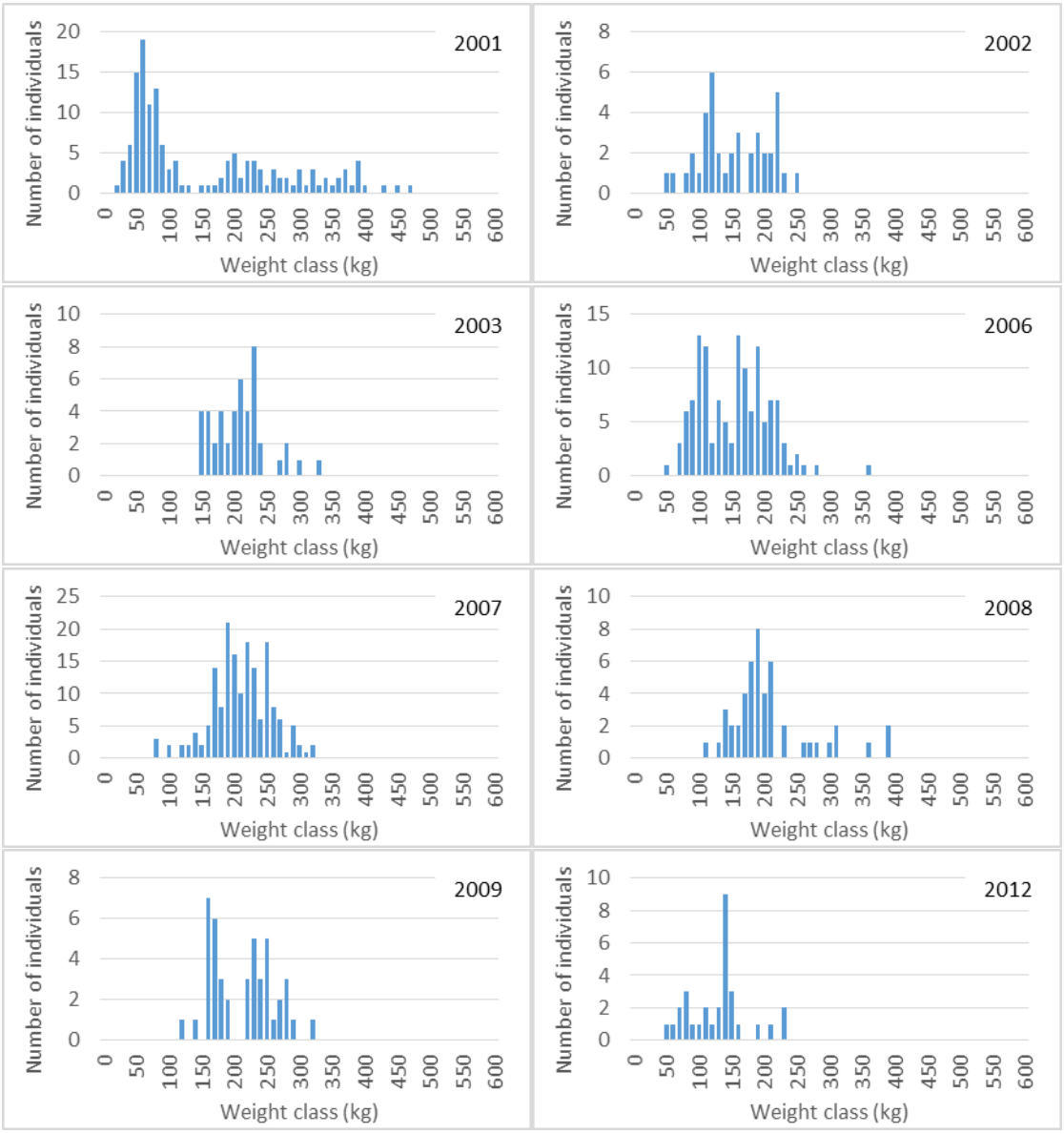

Figure 8. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Atlantic by traps, by year (2001-2003, 2006-2009 and 2012), from the trade, market and auction files.

Figure 9. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Mediterranean in all years (1998-2012) by all gear, from the trade, market and auction files.

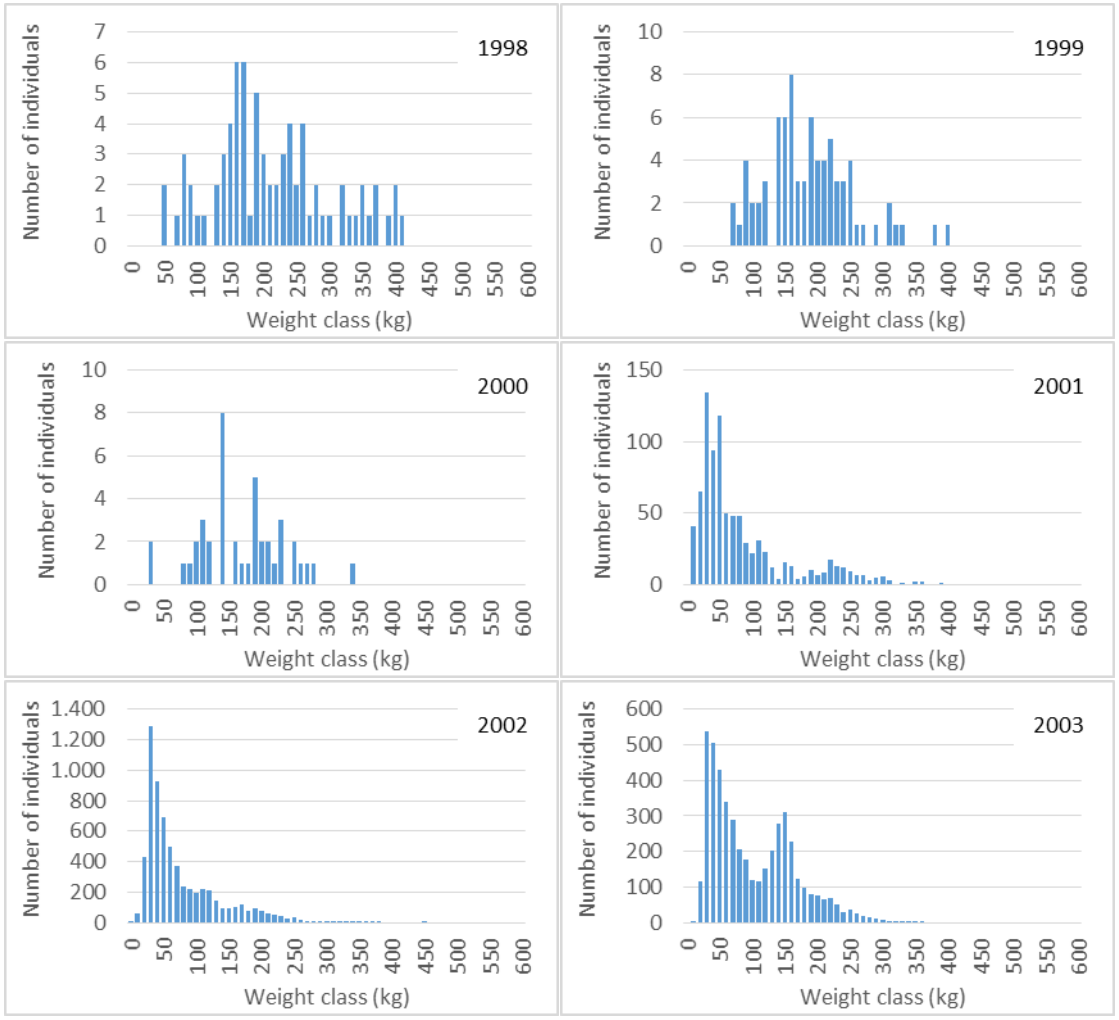

Figure 10-1. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Mediterranean by all gear, by year (1998-2012) from the trade, market and auction files.

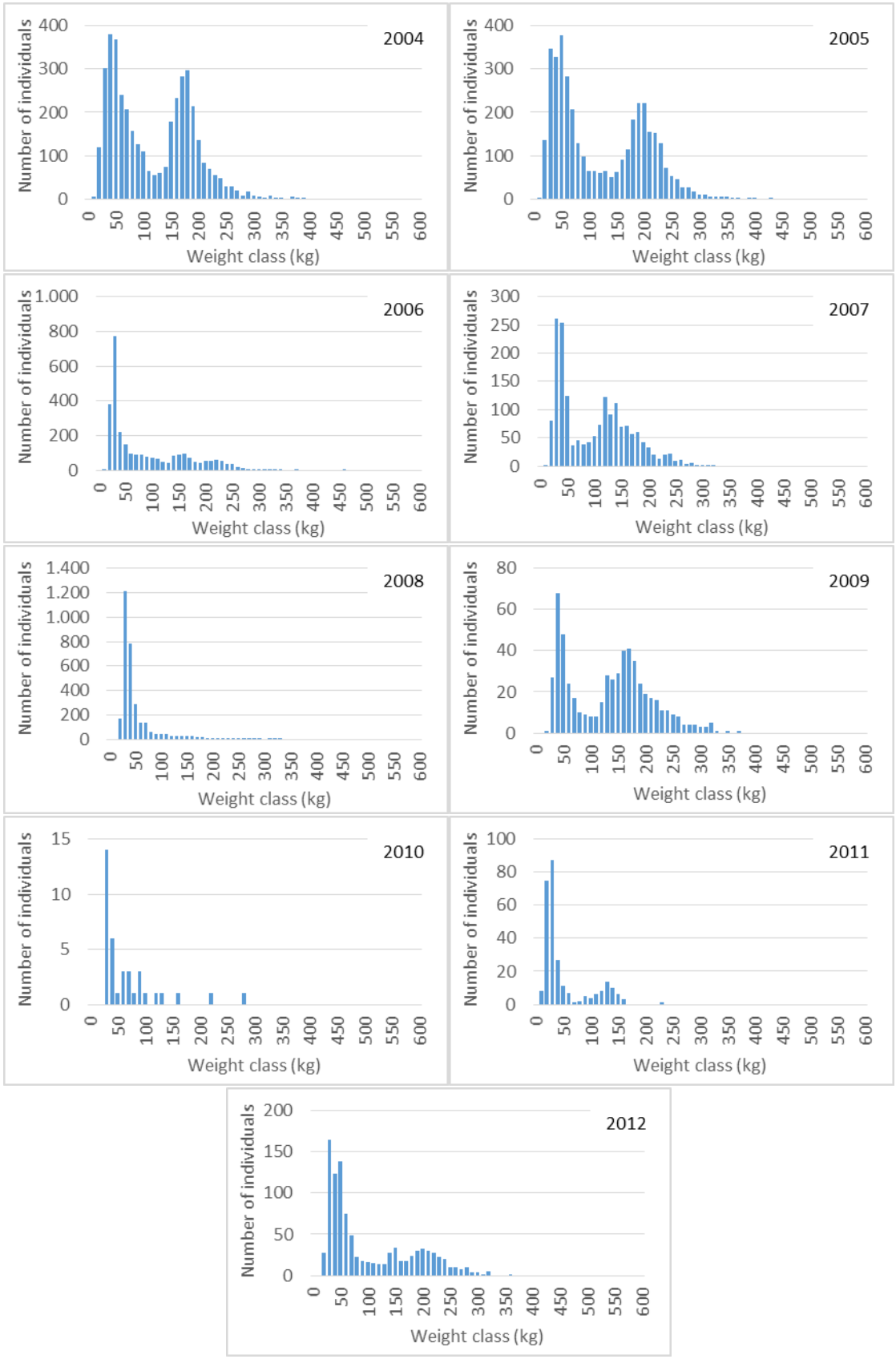

Figure 10-2. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Mediterranean by all gear, by year (1998-2012) from the trade, market and auction files.

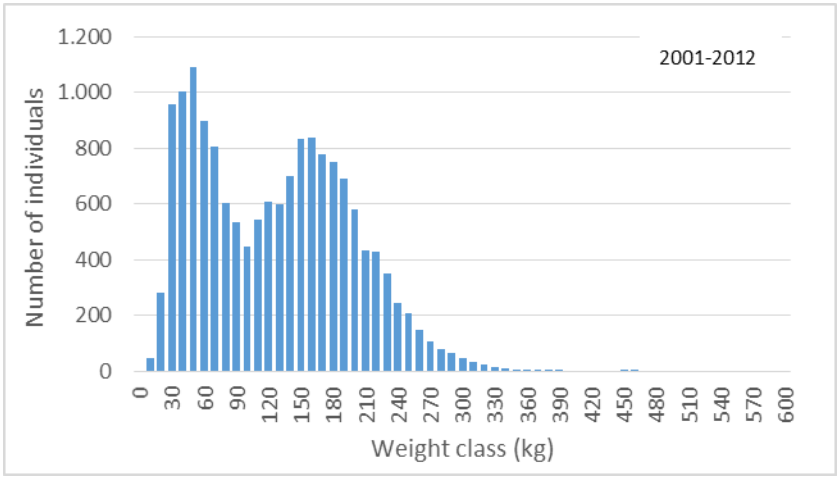

Figure 11. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Mediterranean in all years (2001-2012) by long lines, from the trade, market and auction files.

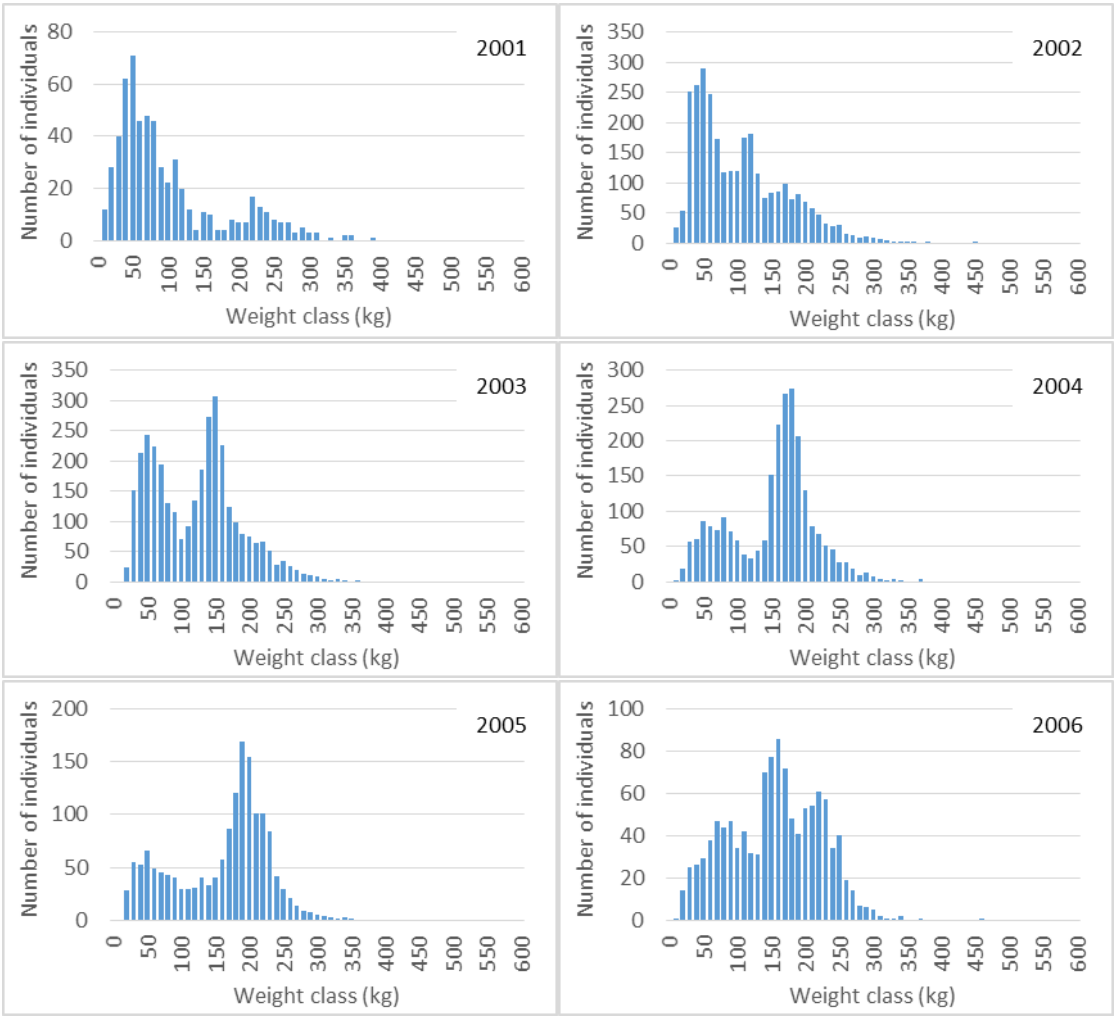

Figure 12-1. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Mediterranean by long lines, by year (2001-2012), from the trade, market and auction files.

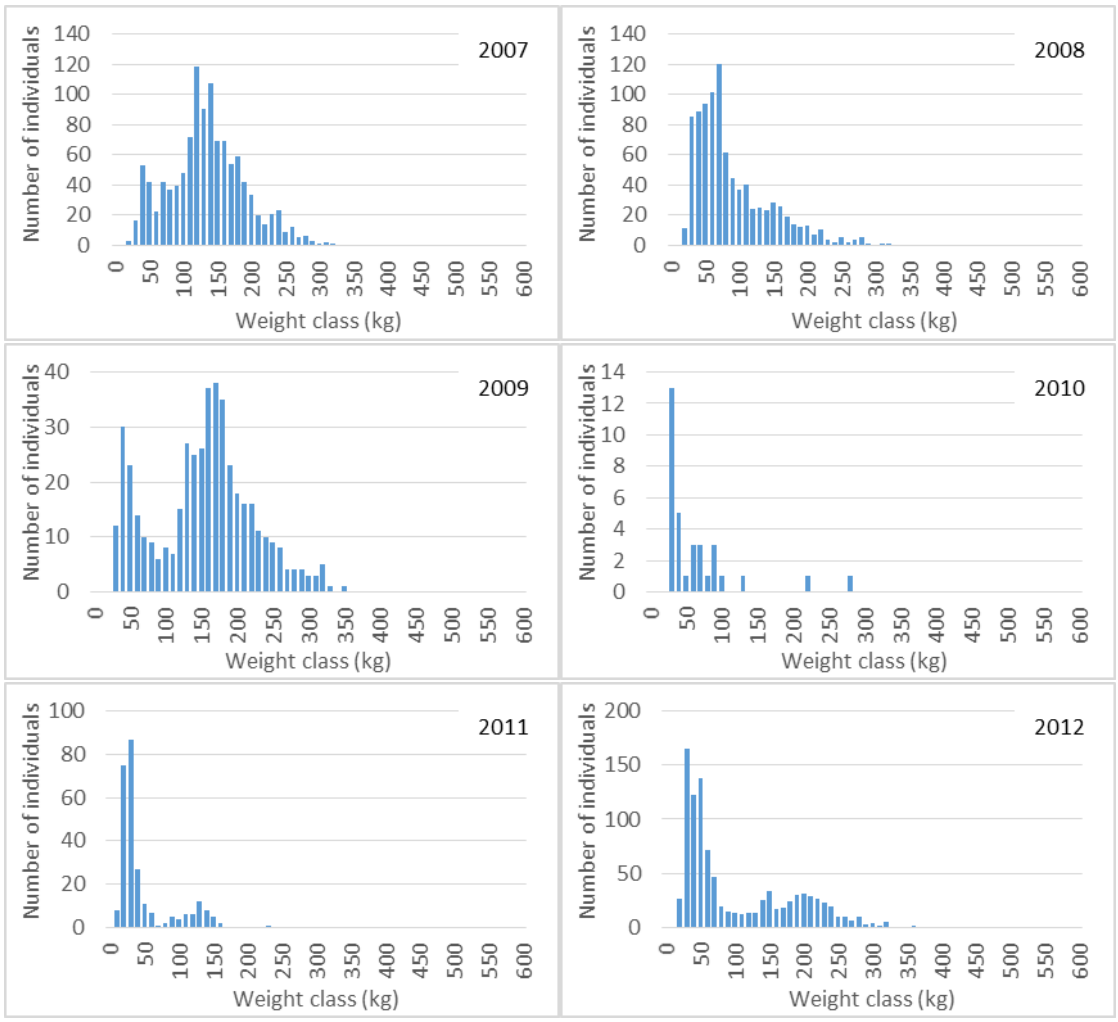

Figure 12-2. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Mediterranean by long lines, by year (2001-2012), from the trade, market and auction files.

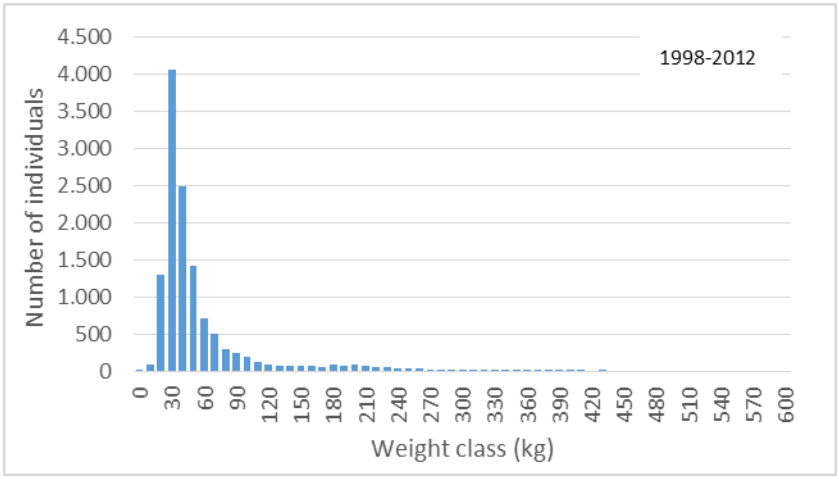

Figure 13. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Mediterranean in all years (1998-2012) by purse seine, from the trade, market and auction files.

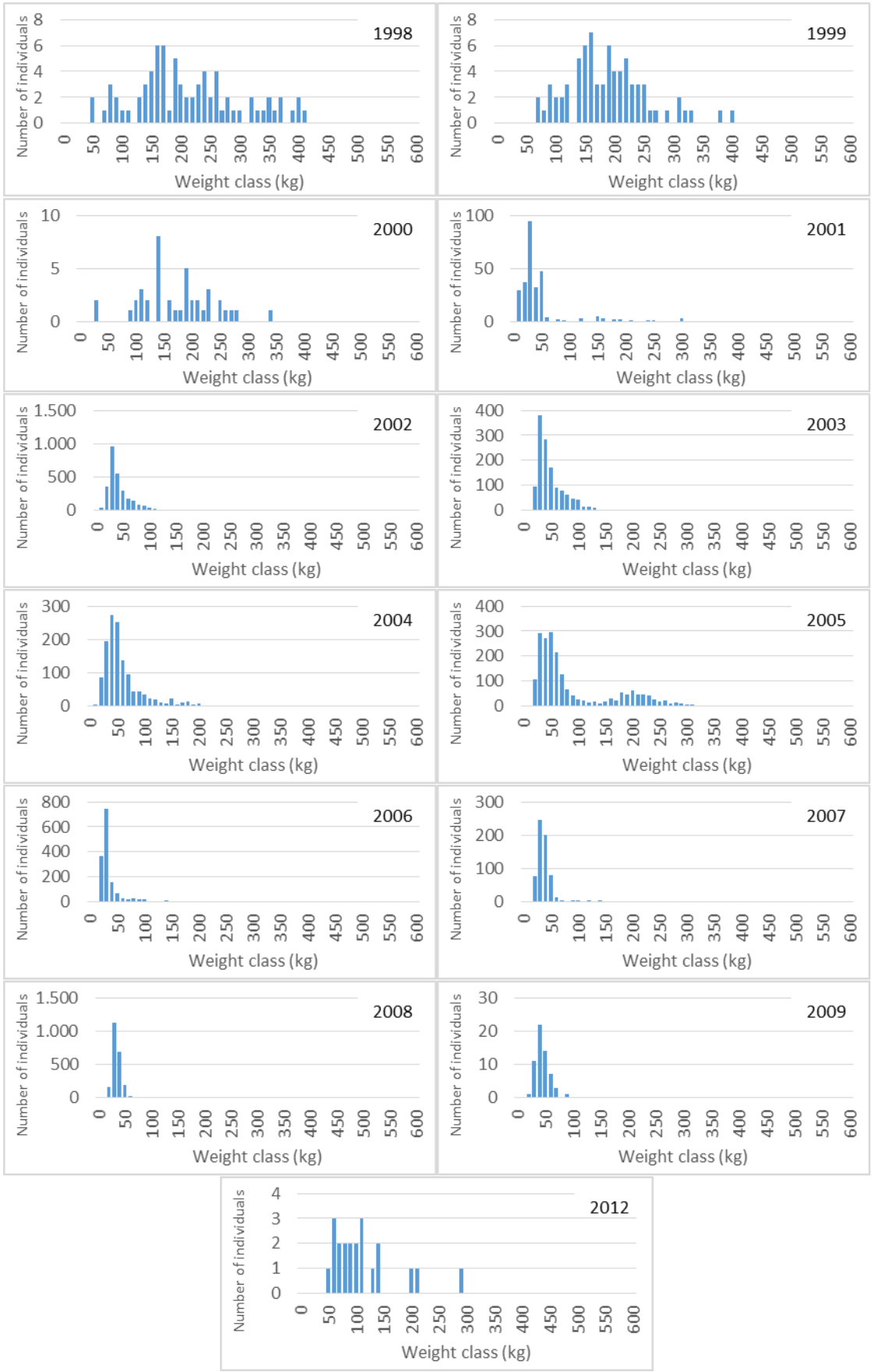

Figure 14. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Mediterranean by purse seine, by year (1998-2009 and 2012) from the trade, market and auction files.

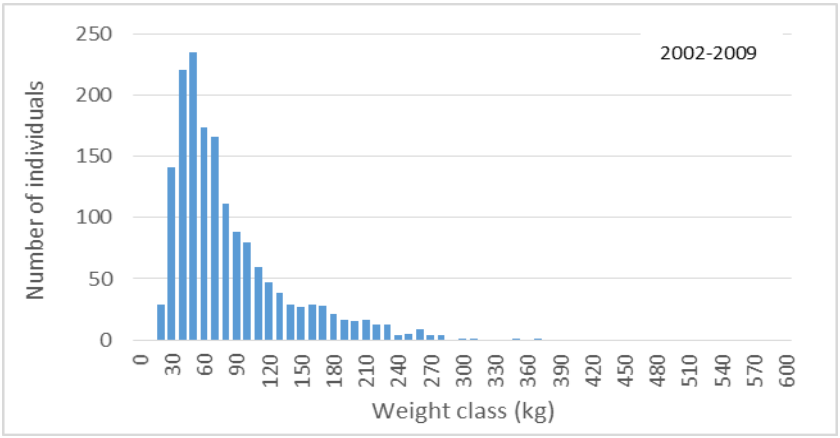

Figure 15. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Mediterranean in all years (2002-2009) by traps, from the trade, market and auction files.

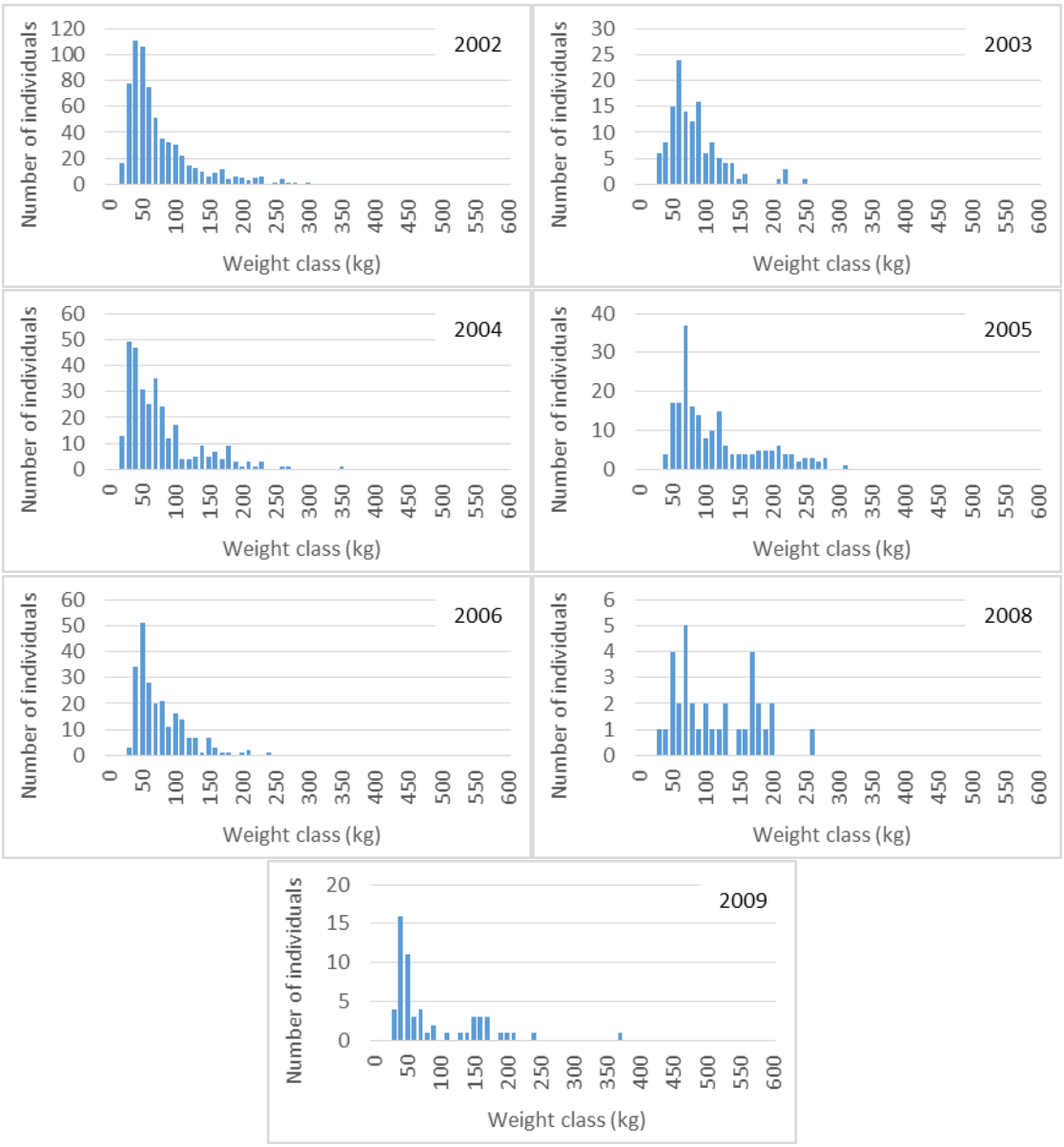

Figure 16. Weigh frequencies (total individuals) of wild bluefin tuna caught in the Mediterranean by traps, by year (2002-2006, 2008 and 2009), from the trade, market and auction files.

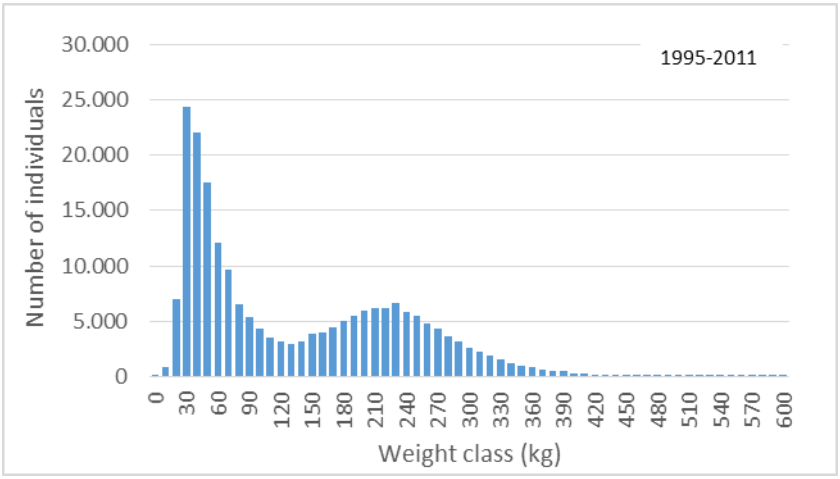

Figure 17. Weigh frequencies (total individuals) of farmed bluefin tuna caught in the Atlantic and in the Mediterranean in all years (1995-2011) by all gear, from the trade, market and auction files.

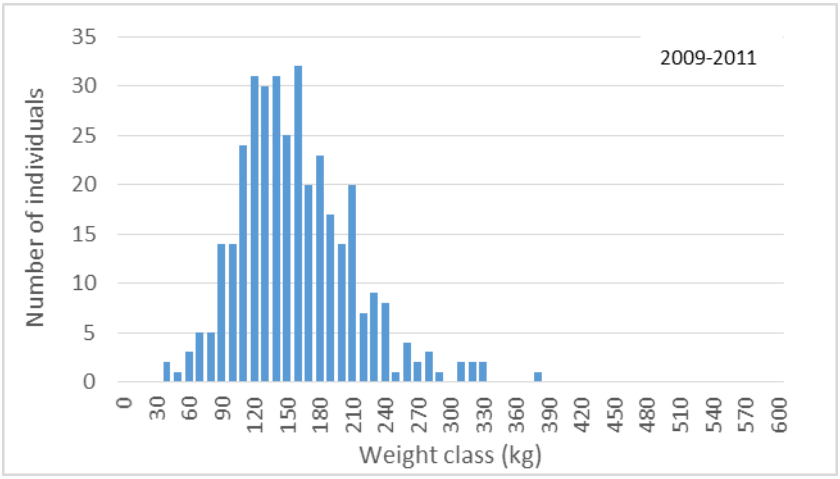

Figure 18. Weigh frequencies (total individuals) of farmed bluefin tuna caught in the Atlantic in all years (2009-2011) by traps, from the trade, market and auction files.

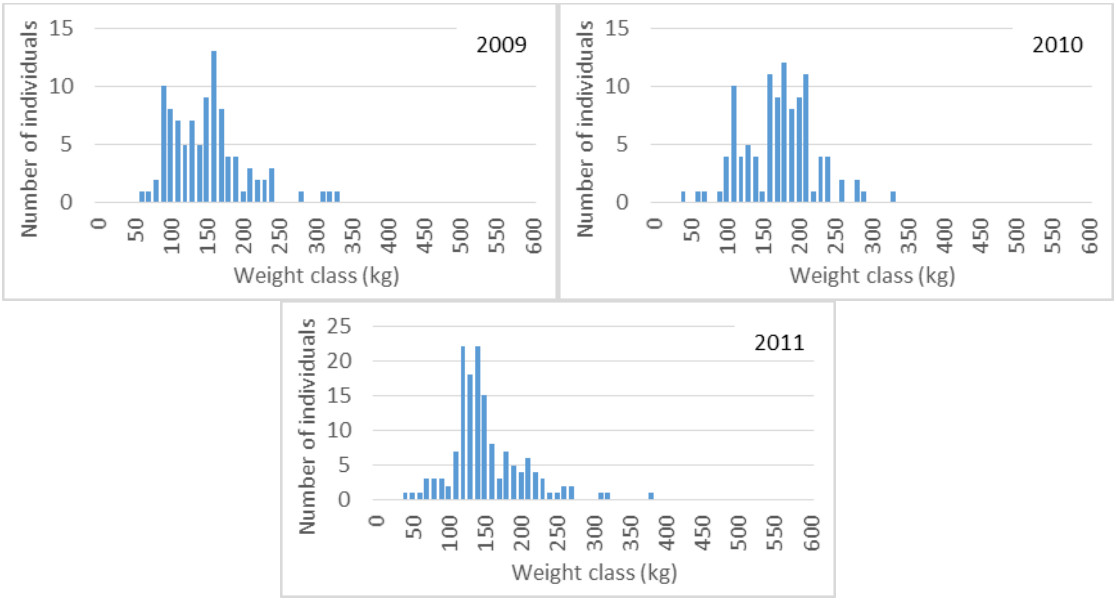

Figure 19. Weigh frequencies (total individuals) of farmed bluefin tuna caught in the Atlantic by traps, by year (2009-2011), from the trade, market and auction files.

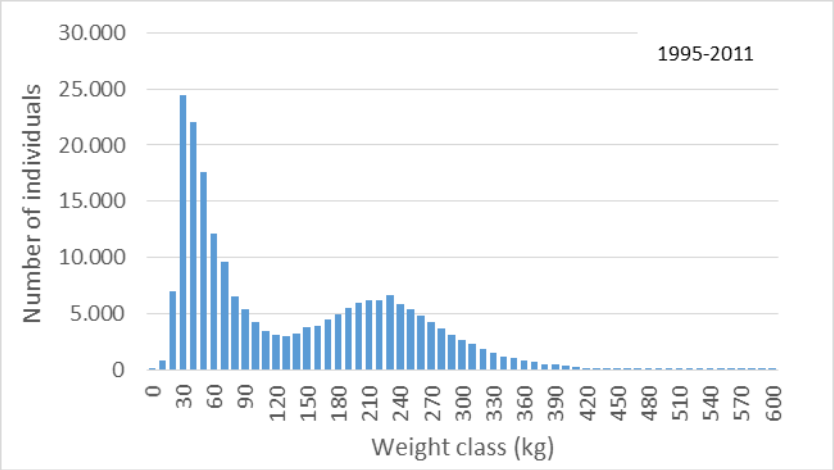

Figure 20. Weigh frequencies (total individuals) of farmed bluefin tuna caught in the Mediterranean in all years (1995-2011) by purse seine, from the trade, market and auction files.

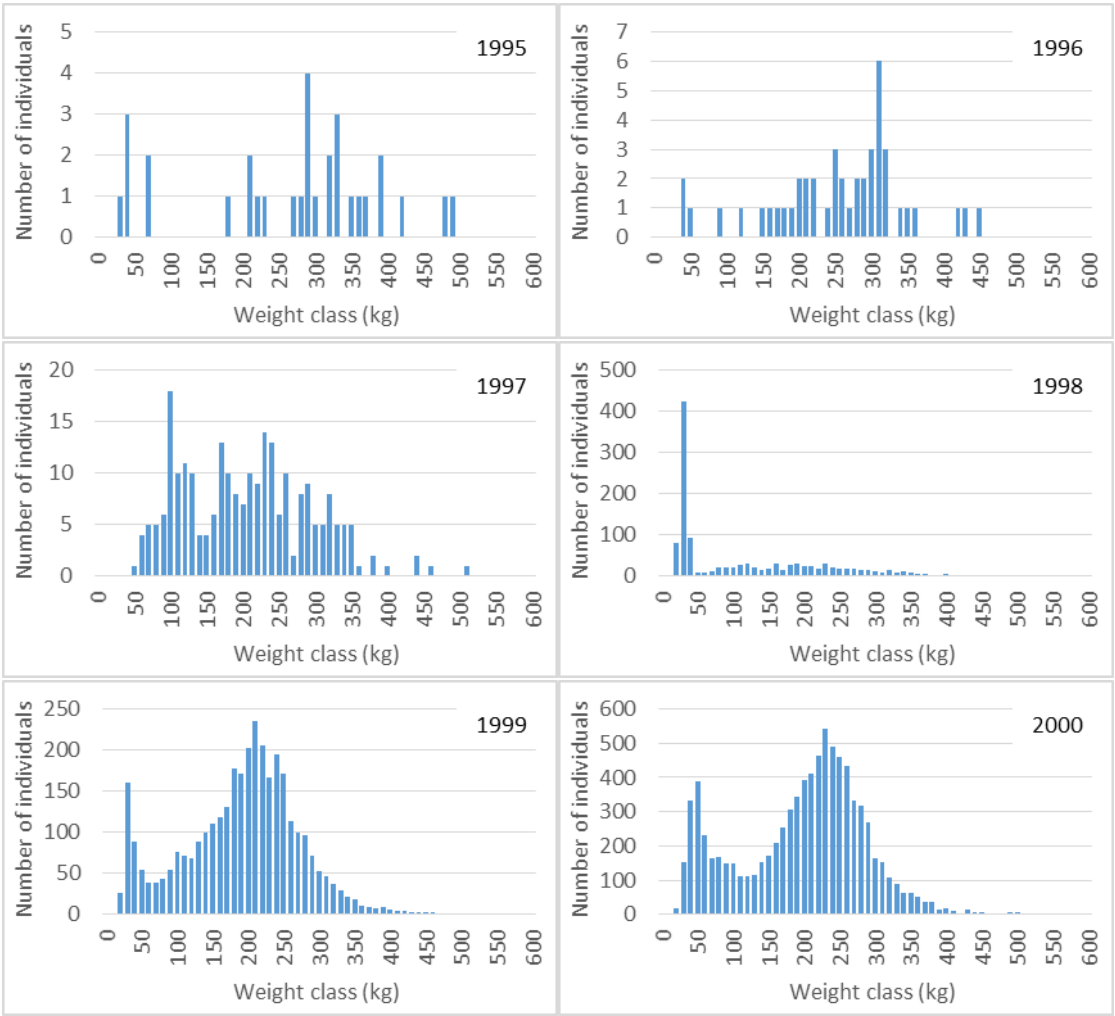

Figure 21-1. Weigh frequencies (total individuals) of farmed bluefin tuna caught in the Mediterranean by purse seine, by year (1995-2011), from the trade, market and auction files.

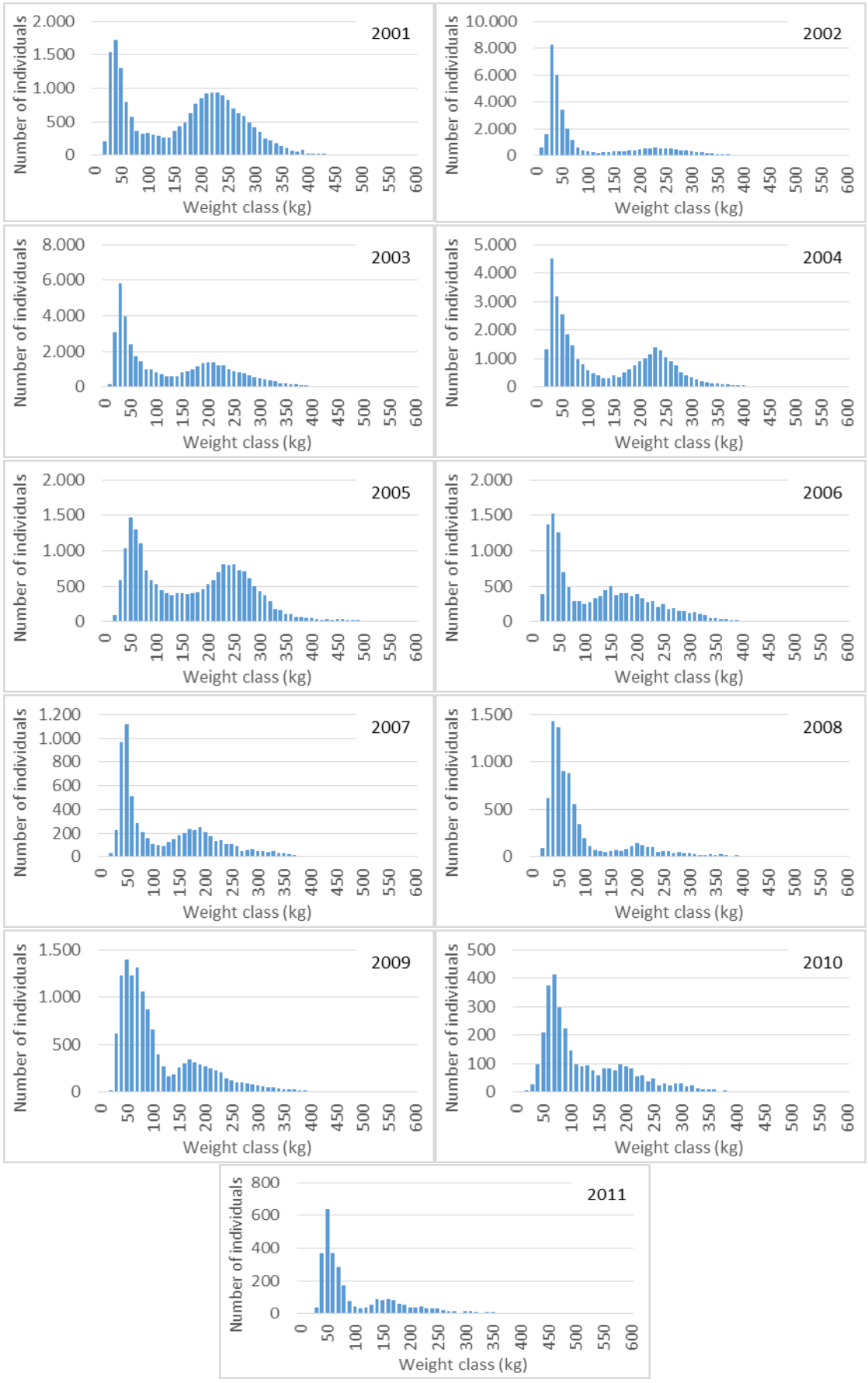

Figure 21-2. Weigh frequencies (total individuals) of farmed bluefin tuna caught in the Mediterranean by purse seine, by year (1995-2011), from the trade, market and auction files.