

SIZE DISTRIBUTION OF PORBEAGLE (*Lamna nasus*) INFERRED FROM A DATA MINING IN THE SPANISH LONGLINE FISHERY TARGETING SWORDFISH (*Xiphias gladius*) IN THE ATLANTIC FOR THE 1987-2017 PERIOD

J. Mejuto¹, A. Ramos-Cartelle, B. García-Cortés and J. Fernández-Costa

ABSTRACT

A total of 5,136 size observations of porbeagle were recovered for the period 1987-2017. The GLM results explained very moderately the variability of the sizes considering three main factors, suggesting minor but significant differences in some cases especially for the year factor and non-significant differences in other factors depending on the analysis. The greatest differences in the standardized mean length between some zones were caused by some large fish of unidentified sex. The standardized mean length data for the northern zones showed stability throughout the time series, very stable range of mean values and very few differences between sexes. The size distribution for northern areas indicated an FL-overall mean of 158 cm. The size showed a normal distribution confirming that a small fraction of individuals of this stock/s is available in the oceanic areas where the North Atlantic fleet is regularly fishing and the fishes are not fully recruited to those areas and / or this fishing gear up to 160 cm. The data suggests that some individuals could sporadically reach some intertropical areas of the Atlantic.

RESUMEN

Un total de 5.136 observaciones de talla de marrajo sardinero fueron recuperadas para el periodo 1987-2017. Los resultados del GLM explicaron muy moderadamente la variabilidad de las tallas considerando tres factores principales, sugiriendo diferencias significativas en algunos casos especialmente para el factor año, y diferencias no significativas en otros casos según el tipo de análisis. Las mayores diferencias en la talla media estandarizada entre algunas de las zonas fueron causadas por algunos peces grandes de sexo no identificado. Los datos de talla media estandarizada de las zonas del Norte mostraron estabilidad a lo largo de la serie dentro de un rango de valores medios muy estable con diferencias muy escasas entre sexos. La distribución de tallas para zonas del Norte indicó que la FL media global fue 158 cm. La talla mostró una distribución normal confirmando que la pequeña fracción de individuos de este stock/s disponibles en áreas oceánicas donde pesca esta flota en el Norte no se recluta plenamente a esas zonas y/o a este arte de pesca hasta los 160 cm. Los datos sugieren que algunos individuos de esta especie podrían alcanzar de forma esporádica hasta algunas áreas intertropicales dentro del Atlántico.

KEY WORDS: shark, porbeagle, size, biology

¹ Instituto Español de Oceanografía, P.O. Box 130, 15080 A Coruña. Spain
tunidos.corunha@ieo.es
<http://www.co.ieo.es/tunidos/>

1. Introduction

The porbeagle (*Lamna nasus*) is a large-highly migratory Lamnidae shark distributed across the North Atlantic (including the Mediterranean Sea) and also in a circumglobal band in the southern Atlantic, southern Indian, southern Pacific and Antarctic Oceans (Anon. 2004, Compagno 2001, Karamidas 2019). It is a long-lived pelagic shark that mainly inhabits cold and also some temperate waters. It is among the most cold-tolerant of the large pelagic sharks commonly found in the cold, continental offshore fishing areas as well as in the epipelagic layers of cold oceanic waters from the surface down to at least 700 m. The temperature in the brain and eyes of the porbeagle is around 5° C warmer than the water where this species lives (Carey *et al.* 1969, 1985). This species is considered a slow-growing and late maturing shark.

This species could be distributed in water temperatures colder than 18° and down to 1°C but usually between 5°-10°C (Campana and Joyce 2004). The preference for cold water habitats with schools of high prey availability conditions its geographic distribution. In the Atlantic, porbeagle is more prevalent in the respective boreal and austral regions near or around continents (Anon. 2010) but in some cases presenting an almost continuous distribution in high latitudes of cold waters between both sides of the North Atlantic. Sporadic records or rare occurrence of this species are also described in other areas and some individuals have been cited from warmer waters (Compagno 2001). These are some of the reason why the areas of overlapping between porbeagle distribution and most temperate and tropical tuna and tuna-like fisheries are regularly very scarce.

Some tagging data suggest that this species carries out broad seasonal and repetitive migratory movements among some areas (Stevens *et al.* 1983, Stevens 1990, Francis *et al.* 2008, Kohler *et al.* 2002, Pade *et al.* 2009). Occurrence of porbeagle in some areas is related to the seasonal mackerel migrations or local abundance of other small pelagic bony fish. Like many other highly migratory shark species, it tends to segregate by size and sex, depending on biological processes (feeding, mating, gestation, parturition). Over the course of history, the greater or lesser extent to which individuals aggregate, depending on the zone and season, has had a major impact on the development of the most important targeted fisheries done by some non-tuna related fleets of the North Atlantic which have in some cases been operating since 1960s or even for centuries in some countries. In addition to these targeted fisheries historically developed and described in some NE and NW Atlantic areas (Campana *et al.* 2002, Anon. 2004, ICES 2007, Campana and Gibson 2008) some individuals may be sporadically caught as a rare bycatch in a variety of fisheries-gears in the Atlantic Ocean including surface and bottom longlines, pelagic and bottom trawls, gillnets and handlines. Some of these gears are used for targeting tuna or tuna-like species, but the areas having the most intense fisheries targeting temperate and tropical tuna or tuna-like species are usually allocated outside the major porbeagle distribution areas or in their margins owing to high thermal dependence of the tuna or tuna-like species and the fact that most have a preference for temperate and/or warm waters. However some individuals of porbeagle could be sporadically caught and reported as a bycatch in some tuna and tuna-like fisheries (i.e. Domingo *et al.* 2002, Matsunaga and Nakano 2002, Mejuto and González-Garcés 1984, Mejuto 1985). Catches of other similar shark species may be misidentified as porbeagle in some cases which would lead to disproportionate amounts being officially reported (i.e. FAO statistics) in regard to other shark species that are close in taxonomic level or similar in common local names (Fernández-Costa and Mejuto 2010).

The Spanish surface longline fleet targeting swordfish (*Xiphias gladius*) has sporadically caught some porbeagle individuals as a very low bycatch. First descriptions of porbeagle as a minor bycatch in this fishery probably dated from the early eighties when main part of this fleet was operating in oceanic areas of the NE Atlantic regularly between 35°-45° latitude N and eastern of 25°W (Mejuto and González-Garcés 1984, Mejuto 1985). These authors estimated annual catches for this fleet providing size at sex, size-weight relationships by sex, etc. During those years the porbeagle accounted around 6.6% of the catch of shortfin mako and porbeagle species combined. However, in subsequent years due to the fact that this fleet shifted fishing grounds moving toward the South and West, it would be predictable a considerable reduction of this porbeagle bycatch ratio in the later periods. Other authors have also described the presence of porbeagle as a very sporadic bycatch in this longline fleet (González-Garcés and Rey 1984, Rey *et al.* 1988, Moreno 1992, Buencuerpo *et al.* 1998).

Various studies on this species have been carried out in this fleet since 1983. Data on catch levels, size composition by sex, identifying biases in catch official reports because species misidentification, length-weight relationships and conversion factors, as well as estimating catch rates standardized based on scientifically verified data, were some of the studies previously provided (i.e. Mejuto and González-Garcés 1984, Mejuto 1985, Fernández-Costa and Mejuto 2010, Mejuto *et al.* 2010^{a,b,c}). In order to complement the aforementioned scientific studies, the present document analyzes records gathered from the mid 1980s in order to obtain

additional size data of porbeagle for the North and South Atlantic ICCAT sampling areas where this surface longline fleet has operated.

2. Material and methods

Length data (FL cm) were obtained through a data mining work initiated in year 2009 to retrieve length records of porbeagle caught as a low-prevalence bycatch in surface longline fishery targeting swordfish. The data analyzed comes mostly from scientific records obtained at landing ports, recorded by scientific samplers on board, or recorded in personal records of fishing that were voluntarily provided to us under a collaborative science action. The fork-length size (FL cm) was the measure considered in all cases, using the lower limit of each size class of 5 cm.

Observations were recorded by year and allocated according to the geographical position of the catch initially considering 5x5 degree grids. They were classified into four zones (ICCAT sampling areas: NW, NE, SE, SW) for descriptive and analytical purposes. The NE and NW zones were denominated as "North" and the SW and SE zones were denominated as "South". Sex was identified according to the presence or absence of pterygopodia-claspers and recorded when possible. In some specimens the sex was not identified and in such case these observations were classified as sex "indet." Therefore, three levels of sex were considered in some of the analyses (female, male, indet.) while in other analyzes only those observations with identified sex (female, male) were considered.

Descriptive analyzes of the basic statistics of the length data were obtained for each year and for different combinations of the main variables considered (year, zone, sex). Being aware that at least the North and South Atlantic stocks are different in terms of the structure assumed for the assessment and that exchanges between the two hemispheres are highly unlikely based on the results of genetic analyzes and other evidence, considering that the number of observations available from the southern hemisphere is very limited; a preliminary exploratory exercise was performed with all the available data and using a GLM model under a hypothesis of normality to assess the possible significance of the main factors considered (year, zone, sex) and explain the observed variability of lengths. However, more detailed analyzes and specific GLMs were performed for Northern observations considering the two defined zones (sampling areas) and two or three levels of "sex", respectively.

3. Results and discussion

A total of 5,136 length observations (FL cm) of *Lamna nasus* were recovered for the period 1987-2017. Of these 4,770 and 366 observations belonged to the North or South zones and were obtained between the periods 1987-2017 or 1994-2017, respectively (**figure 1**). The data suggests that some individuals could sporadically reach some intertropical areas within the Atlantic. The information available from 2009 is considered scarce and unrepresentative due to the regulatory measures implemented at the domestic level². Therefore, the length data recorded in years after 2008 correspond to discarded-released live fish. However, all available observations were included in the analyses, although the authors recommend not using those observations from years after 2008.

Tables 1-11 summarize the number of observations available of the length variable during the period 1987-2017 for the zones observed in the Atlantic (North and South), by level of sex or sexes combined and by zones. The tables also include descriptive statistics by year (FL mean, Standard Deviation, Min, Max and CVs).

3.1 Total Atlantic areas (North and South)

Initial descriptive analyzes were performed considering all available observations from the North and South zones. The authors are aware of the relatively few observations available from the southern zones and of some "spot" observations of very small specimens that appeared in 2011 in a very specific area of the South Atlantic. So, the results of combining the data from all the zones would primarily represent the Northern zones. Descriptive analysis of the length distribution of all individuals showed an almost perfect unimodal / normal distribution (FL mean: 157.36, Std.: 37.12, Median: 160) (**figure 2**).

² REGLAMENTO (UE) No 23/2010 DEL CONSEJO de 14 de enero de 2010 para la captura del porbeagle en aguas internacionales.

The GLM results for the complete set of observations suggested that the three main factors considered (year, zone, sex) were significant, although the model explained very moderately the observed variability. The zone factor was in this case the most important due to the size differences between some of the zones considered, followed by the year factor and to a lesser extent sex. The FL lsmean values of the year factor generally showed stability throughout the series, especially during the period 1987-2005, suggesting moderate differences between the zones of both hemispheres (North vs. South). The NW zone presented the highest FL lsmean values in relation to the other three zones considered (**figure 3**). Moderate but significant difference between FL lsmean values was identified between the two defined zones within the North (NE-NW) with values of 159 cm and 175 cm, respectively. However, this difference was mainly caused by a group of fish with largest sizes and sex "indet.". When that group "indet." was excluded, the difference in FL lsmean values between the two northern areas was not significant and the numerical difference between the two was irrelevant. On the other hand, the FL lsmean values of the sex variable indicated that the differences are probably significant but minor. The mean values of their FL means are almost imperceptible and are in the range of about 3 cm between the two levels with identified sex considered. However, FL lsmean for the sex category "indet." would be about 15 or 19 cm higher in relation to the FL lsmean values of the two categories with identified sex (female, male), thus confirming that a part of the largest individuals with sex "indet" were the ones that contributed the most to the differences in FL lsmean values between zones and levels of sex. Variability chart, box-plots and standard deviation by year as well as overall average FL is provided (**figure 4**).

3.2. Northern Atlantic areas

Considering the availability of observations, subsequent analyzes focused on those observations from the northern areas. The results provided interesting information for the number of records available for the period 1987-2017.

3.2.a. Male and female sexes: The analysis considered those observations in which the sex was identified (males, females). The descriptive analysis indicated that the FL mean for the whole of that series was 158 cm. The sizes of the individuals showed an almost perfect unimodal/normal distribution (FL mean: 158.45, Std.: 35.40, median: 160) suggesting that the fraction of individuals of this stock/s available in the oceanic fishing areas where this fleet is fishing in the Northern areas, and/or because selectivity of the fishing gear, are not fully recruited until approximately 160 cm FL. Their period of availability in these oceanic areas or for this fishing gear is probably very short considering the shape of the distribution. The stepwise model to assess potentially significant factors (year, zone, sex) using AICs suggests the existence of significant differences between some of the years considered but not among others. The zones considered in the North (NW and NE) did not result with significant differences when the observations with identified sexes were considered. The sex factor was statistically significant in this case, although in the analyzed series as a whole the difference between the mean sizes would be quantitatively irrelevant, only about 3 cm in terms of their FL overall means. Considering these results and that an assessment of this species by sex is not probably feasible, we chose to focus the following analyzes from the North by zone and levels of sex combined. However, plots by sex are also included for merely descriptive purposes (**figure 5**).

3.2.b. Sexes combined: Descriptive analysis of the size distribution for the Northern zones and the three combined levels of sex (males + females + indet.) indicated that the FL mean was 158 cm. The size distribution also showed an almost perfect unimodal/normal distribution (FL mean: 158.83, Std.: 35.89, median: 160) (**figure 6**) confirming that the fraction of individuals of this stock/s available in the oceanic fishing areas where this fleet is fishing, and/or because selectivity of this fishing gear, are not fully recruited until approximately 160 cm FL. Their period of availability in the oceanic areas or gear is probably very short considering the shape of the distribution. The GLM results for the set of observations from the North suggested that the three main factors considered (year, zone, sex) were significant, although the model explained the variability of size observed very moderately. The year factor was shown in this case as the most important due to the significant differences between some of the years, followed by a significant effect but lesser for the other two factors considered such sex and zone. However, the most relevant differential element for the FL lsmean between the NE and NW zones was caused by those fish of unidentified sex which provided some of the largest individuals observed (**figures 7-8**).

The FL lsmean values of the year factor generally confirmed stability throughout the whole series analyzed especially for the period 1987-2007. Significant but very moderate difference of FL lsmean values was identified between the two zones defined within the North (NE-NW) with values of 159 cm and 175 cm, respectively (**figure 7**). However, this difference reiterates that it was mainly caused by the group of fish with sex "indet."

who provided some of the largest size records. When said groups of fish were eliminated from the analysis, the differences between the FL means from both northern zones were not significant and their numerical differences become irrelevant. On the other hand, the FL mean values of the sex variable indicated that the differences are probably significant but very small in the range of about 3 cm between the two categories with sex identified. However, the FL mean for the sex category “indet.” would be about 15 or 19 cm higher in relation to the FL mean values of the two categories with sex identified (female, male), thus confirming that a part of the largest individuals than they were not sexed contributed the most to the differences in FL means between sex and the Northern zone levels. Variability chart, box-plots and standard deviation by year as well as overall average FL is provided (**figure 9**). The authors reiterate their recommendation not to use length data after 2009.

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References

- Anonymous. 2004. COSEWIC Assessment and status report on the porbeagle shark *Lamna nasus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. VIII:43pp.
- Anonymous. 2010. Report of the 2009 porbeagle stock assessments meeting (Copenhagen, Denmark, June 22 to 27, 2009). Collect. Vol. Sci. Pap. ICCAT, 65(6): 1909-2005.
- Buencuerpo, V., Ríos, S. and Morón, J. 1998. Pelagic sharks associated with the swordfish, *Xiphias gladius*, fishery in the Eastern North Atlantic Ocean and Strait of Gibraltar. Fish. Bull. 96:667-685.
- Campana, S. E. and Gibson J. 2008. Catch and stock status of porbeagle shark (*Lamna nasus*) in the Northwest Atlantic to 2007. NAFO SCRS Doc 08/36. Serial number N5537: 29p.
- Campana, S.E. and Joyce W.N. 2004. Temperature and depth association of porbeagle shark (*Lamna nasus*) in the northwest Atlantic. Fish. Oceanogr. 13 (1):52-64.
- Campana, S.E., Joyce, W., Marks, L., Natanson, L.J., Kohler, N., Jensen, C.F., Mello, J.J. and Pratt, H.L. 2002. Population dynamics of the porbeagle in the Northwest Atlantic Ocean. North American Journal of Fisheries Management 22:106-121.
- Compagno, L. J. V. 2001. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Volume 2. Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes). FAO Species Catalogue for Fishery Purposes. No. 1, Vol. 2. Rome, FAO. 2001: 269p.
- Carey, F.G., Casey, J.G., Pratt, H.L Jr., Urquhart, D. and McCosker, J.E. 1985. Temperature, heat production and heat exchange in lamnid sharks. Mem. S. California Acad. Sci., 9: 92-108.
- Carey, F.G. and Teal, J.M. 1969. Mako and Porbeagle: warm bodied sharks. Comp. Biochem. Physiol., 28: 199-204.
- Domingo, A., Mora, O. and Cornes, M. 2002. Evolución de las capturas de elasmobranchios pelágicos en la pesquería de atunes de Uruguay, con énfasis en los tiburones azul (*Prionace glauca*), moro (*Isurus oxyrinchus*) y porbeagle (*Lamna nasus*). Collect. Vol. Sci. Pap. ICCAT, 54(4):1406-1420.
- Fernández-Costa, J. and Mejuto, J. 2010. A short note on the FAO statistics for porbeagle shark (*Lamna nasus*) in the Atlantic and its relation to other Lamnids. Collect. Vol. Sci. Pap. ICCAT, 65(6): 2031-2050.

- Francis, M. P., Natanson, L.J. and Campana S.E. 2008. The biology and ecology of the porbeagle shark, *Lamna nasus*. In Sharks of the open ocean, Biology and conservation (eds. M.D. Camhi, E.K. Pikitch and E.A. Babcock, Blackwell Publishing, Oxford UK. Chapter 4: 105-113.
- González-Garcés, A. and Rey, J.C. 1984. La pesquería española de pez espada (*Xiphias gladius*), 1973-1982. Collect. Vol. Sci. Pap. ICCAT, 20(2): 419-427.
- ICES. 2007. Report of the working Group on Elasmobranch Fishes: Porbeagle in the North Atlantic. ICES. WGEF Report 2007.
- Keramidas, I., Ugarković, P., De Maddalena, A. and Giovos, I. 2019. An additional record of *Lamna nasus* (Bonnaterre, 1788) from Croatia, Adriatic Sea. J. Black Sea/Mediterranean Environment Vol. 25, No. 1: 87-92.
- Kohler, N. E., Turner, P. A., Hoey, J.J., Natanson, L.J. and Briggs, R. 2002. Tag and recapture data for three pelagic shark species: blue shark (*Prionace glauca*), shortfin mako (*Isurus oxyrinchus*), and porbeagle (*Lamna nasus*) in the north Atlantic ocean. Collect. Vol. Sci. Pap. ICCAT, 54(4): 1231-1260.
- Matsunaga, H. and Nakano, H. 2002. Preliminary results of standardized CPUE for porbeagle caught by Japanese longline fishery in the Atlantic Ocean. Collect. Vol. Sci. Pap. ICCAT, 54(4):1381-1385.
- Mejuto, J. 1985. Associated catches of sharks, *Prionace glauca*, *Isurus oxyrinchus*, and *Lamna nasus* with NW and N Spanish swordfish fishery, in 1984. ICES, C.M. 1985/H: 42.
- Mejuto, J. and González-Garcés, A. 1984. Shortfin mako, *Isurus oxyrinchus*, and porbeagle, *Lamna nasus*, associated with longline swordfish fishery in NW and N Spain. ICES, C.M. 1984/G: 72.
- Mejuto, J., García-Cortés, B. and Ramos-Cartelle, A. 2010^a. Retrospective estimation of porbeagle (*Lamna nasus*) catches in the Spanish surface longline fishery targeting swordfish in the North Atlantic. Collect. Vol. Sci. Pap. ICCAT, 65(6): 2077-2081.
- Mejuto, J., Ortiz, M., García-Cortés, B., Ortiz de Urbina, J. and Ramos-Cartelle, A. 2010^b. Historical data and standardized catch rates of porbeagle (*Lamna nasus*) caught as by-catch of the Spanish surface longline fishery targeting swordfish (*Xiphias gladius*) in the Atlantic Ocean. Collect. Vol. Sci. Pap. ICCAT, 65(6): 2006-2030 (2010) 2006.
- Mejuto, J. Punzón, A. and González, F. 2010^c. Report of EC-Spain on the Atlantic *Lamna nasus*: ICES and ICCAT meeting 2009. Collect. Vol. Sci. Pap. ICCAT, 65(6): 2094-2097.
- Moreno, J.A. 1992. Grandes tiburones pelágicos de interés pesquero del Atlántico Nororiental y Mediterráneo Occidental. Sistemática general. Biología, distribución y aspectos pesqueros de Lamnidae y Alopiidae. 288pp.
- Pade N.G., Queiroz, N., Humphries, N.E., Witt, M.J., Jones, C.S., Noble, L.R. and Sims, D.W. 2009. First results from satellite-linked archival tagging of porbeagle shark, *Lamna nasus*: area fidelity, wider-scale movements and plasticity in the diel depth changes. Journal of Experimental Marine Biology and Ecology 370:64-74.
- Rey, J.C., Mejuto, J. and Iglesias, S. 1988. Evolución histórica y situación actual de la pesquería española de pez espada (*Xiphias gladius*). Collect. Vol. Sci. Pap. ICCAT, 27:202-213.
- Stevens, J. D. 1990. Further results from a tagging study of pelagic sharks in the north-east Atlantic. Journal of the Marine Biological Association of the United Kingdom, 70(4):707-720.
- Stevens, J.D., Dunning, M.C. and Machida, S. 1983. Occurrence of porbeagle shark, *Lamna nasus*, in the Tasman Sea. Jap. J. Ichthyol., 30(3):301-307.

Table 1. Number of observations (FL cm) of *Lamna nasus* during the period 1987-2017 for all zones considered in the Atlantic (North and South) and for combined sexes. More representative statistics are presented for each year (FL mean, Standard Deviation, Min, Max, CVs).

Year	N_Obs.	FL_mean	Std.	FL_min.	FL_max.	CV
1987	104	183.13	30.40	80	245	16.60
1988	616	159.61	35.13	60	285	22.01
1989	362	165.44	37.50	70	305	22.67
1990	321	162.68	31.29	55	230	19.23
1991	357	153.24	35.97	80	245	23.48
1992	127	172.80	39.31	60	275	22.75
1993	170	165.59	34.29	95	300	20.71
1994	477	164.86	33.27	85	285	20.18
1995	208	176.49	30.27	85	260	17.15
1996	616	151.56	30.11	70	245	19.86
1997	377	154.80	33.82	70	275	21.85
1998	212	152.71	44.95	70	270	29.43
1999	226	151.17	41.98	70	270	27.77
2000	88	142.90	40.62	75	280	28.42
2001	97	145.15	38.33	75	225	26.40
2002	83	158.67	32.67	95	260	20.59
2003	45	180.22	37.63	95	310	20.88
2004	124	161.37	33.47	65	250	20.74
2005	37	176.35	26.42	115	220	14.98
2006	173	151.82	30.30	80	215	19.96
2007	90	130.67	44.01	75	290	33.68
2008	64	137.66	41.79	55	290	30.36
2009	32	139.38	27.58	85	185	19.79
2010	2	160.00	49.50	125	195	30.94
2011	91	92.36	30.92	60	170	33.48
2012	7	137.14	32.13	85	180	23.43
2017	30	162.33	14.00	140	200	8.63
Total	5136					

Table 2. Number of observations (FL cm) of *Lamna nasus* during the period 1987-2017 for all areas of the Atlantic (North and South), for sex = female. The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs). LNF = females.

YR	N_LNF	Mean_LNF	SD_LNF	Min_LNF	Max_LNF	CV_LNF
1987	34	175.74	33.03	110	225	18.80
1988	199	155.13	32.42	60	235	20.90
1989	143	164.41	38.06	80	305	23.15
1990	171	161.08	34.69	55	230	21.53
1991	156	152.76	37.62	80	245	24.62
1992	64	174.92	41.16	60	275	23.53
1993	72	173.19	35.63	95	300	20.57
1994	213	165.14	36.17	85	285	21.90
1995	100	179.95	32.52	85	260	18.07
1996	248	147.92	29.44	75	240	19.90
1997	137	150.33	34.81	70	215	23.15
1998	103	148.16	45.55	75	235	30.74
1999	90	139.28	42.08	70	230	30.22
2000	36	128.33	30.91	80	205	24.09
2001	36	143.19	42.81	75	215	29.90
2002	40	152.00	33.14	95	220	21.80
2003	11	167.73	36.90	95	215	22.00
2004	21	150.71	31.87	100	215	21.15
2005	10	178.00	33.35	115	220	18.74
2006	59	153.14	29.94	85	210	19.55
2007	5	175.00	28.94	130	210	16.54
2008	26	135.19	34.97	85	205	25.87
2009	18	143.61	21.61	105	180	15.05
2010	0	NA	NA	NA	NA	NA
2011	47	87.34	26.04	60	155	29.81
2012	2	120.00	49.50	85	155	41.25
2017	21	159.05	11.25	140	190	7.07

Table 3. Number of observations (FL cm) of *Lamna nasus* during the period 1987-2017 for all areas of the Atlantic (North and South), for sex = male. The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs). LNM = males.

YR	N_LNM	Mean_LNM	SD_LNM	Min_LNM	Max_LNM	CV_LNM
1987	70	186.71	28.59	80	245	15.31
1988	406	161.58	36.31	60	285	22.47
1989	212	168.54	34.62	70	240	20.54
1990	148	164.26	27.00	90	215	16.44
1991	201	153.61	34.74	85	245	22.61
1992	61	168.69	36.53	95	235	21.65
1993	97	159.95	32.50	95	210	20.32
1994	264	164.64	30.81	85	280	18.71
1995	99	174.09	27.89	95	235	16.02
1996	341	152.29	29.57	70	235	19.42
1997	201	154.38	30.96	75	220	20.05
1998	103	154.37	42.02	70	260	27.22
1999	120	152.75	35.92	80	215	23.52
2000	42	140.95	36.26	75	200	25.73
2001	44	144.20	36.71	75	205	25.46
2002	19	151.32	27.83	100	200	18.39
2003	30	178.50	30.46	95	225	17.06
2004	30	171.33	35.33	100	250	20.62
2005	25	174.40	23.69	120	220	13.58
2006	109	149.77	30.33	80	215	20.25
2007	6	160.83	42.48	85	210	26.41
2008	28	149.29	31.50	95	210	21.10
2009	14	133.93	33.87	85	185	25.29
2010	0	NA	NA	NA	NA	NA
2011	42	96.43	33.79	60	170	35.04
2012	4	135.00	20.82	110	160	15.42
2017	4	185.00	12.91	170	200	6.98

Table 4. Number of observations (FL cm) of *Lamna nasus* during the period 1987-2017 for all areas of the Atlantic (North and South), for sex = indet. The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs). LNO = sex indet.

YR	N_LNO	Mean_LNO	SD_LNO	Min_LNO	Max_LNO	CV_LNO
1987	0	NA	NA	NA	NA	NA
1988	11	168.18	32.50	120	220	19.33
1989	7	92.86	40.71	75	185	43.84
1990	2	182.50	3.54	180	185	1.94
1991	0	NA	NA	NA	NA	NA
1992	2	230.00	7.07	225	235	3.07
1993	1	165.00	NA	165	165	NA
1994	0	NA	NA	NA	NA	NA
1995	9	164.44	26.63	115	200	16.19
1996	27	175.74	32.13	70	245	18.28
1997	39	172.69	39.18	120	275	22.69
1998	6	202.50	58.89	125	270	29.08
1999	16	206.25	39.81	140	270	19.30
2000	10	203.50	35.98	160	280	17.68
2001	17	151.76	33.54	100	225	22.10
2002	24	175.63	30.23	135	260	17.21
2003	4	227.50	60.62	165	310	26.65
2004	73	160.34	32.45	65	225	20.24
2005	2	192.50	31.82	170	215	16.53
2006	5	181.00	20.74	155	205	11.46
2007	79	125.57	42.77	75	290	34.06
2008	10	111.50	68.23	55	290	61.20
2009	0	NA	NA	NA	NA	NA
2010	2	160.00	49.50	125	195	30.94
2011	2	125.00	63.64	80	170	50.91
2012	1	180.00	NA	180	180	NA
2017	5	158.00	8.37	150	170	5.30

Table 5. Number of observations (FL cm) of *Lamna nasus* during the period 1987-2017 for Atlantic areas North of 5° N, for sex = females. The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs). LNF = sex female.

Yr	Stock	Obs_LNF	Mean_LNF	SD_LNF	Min_LNF	Max_LNF	CV_LNF
1987	N	34	175.74	33.03	110	225	18.80
1988	N	199	155.13	32.42	60	235	20.90
1989	N	143	164.41	38.06	80	305	23.15
1990	N	171	161.08	34.69	55	230	21.53
1991	N	156	152.76	37.62	80	245	24.62
1992	N	64	174.92	41.16	60	275	23.53
1993	N	72	173.19	35.63	95	300	20.57
1994	N	209	164.83	36.38	85	285	22.07
1995	N	100	179.95	32.52	85	260	18.07
1996	N	248	147.92	29.44	75	240	19.90
1997	N	137	150.33	34.81	70	215	23.15
1998	N	103	148.16	45.55	75	235	30.74
1999	N	90	139.28	42.08	70	230	30.22
2000	N	36	128.33	30.91	80	205	24.09
2001	N	36	143.19	42.81	75	215	29.90
2002	N	40	152.00	33.14	95	220	21.80
2003	N	11	167.73	36.90	95	215	22.00
2004	N	21	150.71	31.87	100	215	21.15
2005	N	10	178.00	33.35	115	220	18.74
2006	N	59	153.14	29.94	85	210	19.55
2007	N	5	175.00	28.94	130	210	16.54
2008	N	26	135.19	34.97	85	205	25.87
2009	N	18	143.61	21.61	105	180	15.05
2010	N	0	NA	NA	NA	NA	NA
2011	N	1	100.00	NA	100	100	NA
2012	N	2	120.00	49.50	85	155	41.25
2017	N	1	190.00	NA	190	190	NA

Table 6. Number of observations (FL cm) of *Lamna nasus* during the period 1987-2017 for Atlantic areas North of 5° N, for sex = males. The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs). LNM = sex male.

Yr	Stock	Obs_LNM	Mean_LNM	SD_LNM	Min_LNM	Max_LNM	CV_LNM
1987	N	70	186.71	28.59	80	245	15.31
1988	N	406	161.58	36.31	60	285	22.47
1989	N	212	168.54	34.62	70	240	20.54
1990	N	148	164.26	27.00	90	215	16.44
1991	N	201	153.61	34.74	85	245	22.61
1992	N	61	168.69	36.53	95	235	21.65
1993	N	97	159.95	32.50	95	210	20.32
1994	N	262	164.81	30.87	85	280	18.73
1995	N	99	174.09	27.89	95	235	16.02
1996	N	341	152.29	29.57	70	235	19.42
1997	N	201	154.38	30.96	75	220	20.05
1998	N	103	154.37	42.02	70	260	27.22
1999	N	120	152.75	35.92	80	215	23.52
2000	N	42	140.95	36.26	75	200	25.73
2001	N	44	144.20	36.71	75	205	25.46
2002	N	19	151.32	27.83	100	200	18.39
2003	N	30	178.50	30.46	95	225	17.06
2004	N	30	171.33	35.33	100	250	20.62
2005	N	25	174.40	23.69	120	220	13.58
2006	N	109	149.77	30.33	80	215	20.25
2007	N	6	160.83	42.48	85	210	26.41
2008	N	28	149.29	31.50	95	210	21.10
2009	N	14	133.93	33.87	85	185	25.29
2010	N	0	NA	NA	NA	NA	NA
2011	N	0	NA	NA	NA	NA	NA
2012	N	4	135.00	20.82	110	160	15.42
2017	N	1	200.00	NA	200	200	NA

Table 7. Number of observations (FL cm) of *Lamna nasus* during the period 1987-2017 for Atlantic areas North of 5° N, for sex = indet.. The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs). LNO = sex indet.

Yr	Stock	Obs_LNO	Mean_LNO	SD_LNO	Min_LNO	Max_LNO	CV_LNO
1987	N	0	NA	NA	NA	NA	NA
1988	N	11	168.18	32.50	120	220	19.33
1989	N	7	92.86	40.71	75	185	43.84
1990	N	2	182.50	3.54	180	185	1.94
1991	N	0	NA	NA	NA	NA	NA
1992	N	2	230.00	7.07	225	235	3.07
1993	N	1	165.00	NA	165	165	NA
1994	N	0	NA	NA	NA	NA	NA
1995	N	0	NA	NA	NA	NA	NA
1996	N	2	180.00	14.14	170	190	7.86
1997	N	17	152.06	37.79	120	225	24.85
1998	N	5	205.00	65.48	125	270	31.94
1999	N	5	188.00	49.19	140	270	26.17
2000	N	10	203.50	35.98	160	280	17.68
2001	N	7	142.86	43.48	100	225	30.44
2002	N	13	188.08	31.19	140	260	16.59
2003	N	3	248.33	53.93	210	310	21.72
2004	N	5	164.00	37.32	100	195	22.75
2005	N	2	192.50	31.82	170	215	16.53
2006	N	5	181.00	20.74	155	205	11.46
2007	N	4	232.50	66.52	170	290	28.61
2008	N	2	225.00	91.92	160	290	40.86
2009	N	0	NA	NA	NA	NA	NA
2010	N	2	160.00	49.50	125	195	30.94
2011	N	0	NA	NA	NA	NA	NA
2012	N	0	NA	NA	NA	NA	NA
2017	N	0	NA	NA	NA	NA	NA

Table 8. Number of observations (FL cm) of *Lamna nasus* during the period 1987-2017 for Atlantic areas South of 5° N, for sex = female. The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs). LNF = sex female.

Yr	Stock	Obs_LNF	Mean_LNF	SD_LNF	Min_LNF	Max_LNF	CV_LNF
1994	S	4	181.25	17.50	160	200	9.66
1995	S	0	NA	NA	NA	NA	NA
1996	S	0	NA	NA	NA	NA	NA
1997	S	0	NA	NA	NA	NA	NA
1998	S	0	NA	NA	NA	NA	NA
1999	S	0	NA	NA	NA	NA	NA
2001	S	0	NA	NA	NA	NA	NA
2002	S	0	NA	NA	NA	NA	NA
2003	S	0	NA	NA	NA	NA	NA
2004	S	0	NA	NA	NA	NA	NA
2007	S	0	NA	NA	NA	NA	NA
2008	S	0	NA	NA	NA	NA	NA
2011	S	46	87.07	26.26	60	155	30.16
2012	S	0	NA	NA	NA	NA	NA
2017	S	20	157.50	8.96	140	175	5.69

Table 9. Number of observations (FL cm) of *Lamna nasus* during the period 1987-2017 for Atlantic areas South of 5° N, for sex = male. The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs). LNM = sex male.

Yr	Stock	Obs_LNM	Mean_LNM	SD_LNM	Min_LNM	Max_LNM	CV_LNM
1994	S	2	142.50	3.54	140	145	2.48
1995	S	0	NA	NA	NA	NA	NA
1996	S	0	NA	NA	NA	NA	NA
1997	S	0	NA	NA	NA	NA	NA
1998	S	0	NA	NA	NA	NA	NA
1999	S	0	NA	NA	NA	NA	NA
2001	S	0	NA	NA	NA	NA	NA
2002	S	0	NA	NA	NA	NA	NA
2003	S	0	NA	NA	NA	NA	NA
2004	S	0	NA	NA	NA	NA	NA
2007	S	0	NA	NA	NA	NA	NA
2008	S	0	NA	NA	NA	NA	NA
2011	S	42	96.43	33.79	60	170	35.04
2012	S	0	NA	NA	NA	NA	NA
2017	S	3	180.00	10.00	170	190	5.56

Table 10. Number of observations (FL cm) of *Lamna nasus* during the period 1987-2017 for Atlantic areas South of 5° N, for sex = indet. The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs). LNO = sex indet..

Yr	Stock	Obs_LNO	Mean_LNO	SD_LNO	Min_LNO	Max_LNO	CV_LNO
1994	S	0	NA	NA	NA	NA	NA
1995	S	9	164.44	26.63	115	200	16.19
1996	S	25	175.40	33.29	70	245	18.98
1997	S	22	188.64	32.85	125	275	17.41
1998	S	1	190.00	NA	190	190	NA
1999	S	11	214.55	34.17	170	270	15.92
2001	S	10	158.00	25.19	120	190	15.94
2002	S	11	160.91	22.23	135	210	13.81
2003	S	1	165.00	NA	165	165	NA
2004	S	68	160.07	32.36	65	225	20.22
2007	S	75	119.87	33.14	75	195	27.64
2008	S	8	83.13	13.35	55	95	16.06
2011	S	2	125.00	63.64	80	170	50.91
2012	S	1	180.00	NA	180	180	NA
2017	S	5	158.00	8.37	150	170	5.30

Table 11^a. Number of observations of size (FL cm) of *Lamna nasus* during the period 1987-1998 for each zone North of 5°N and for the sex levels considered (LNF = female, LNM = male, LNO = indet.). The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs).

Year	Zone	Sp_Sex	# Observ.	FL_Mean	Std.	Min	Max	CV
1987	AT-NE	LNF	33	174.24	32.36	110	225	18.57
1987	AT-NE	LNM	69	186.45	28.71	80	245	15.40
1987	AT-NW	LNF	1	225.00	NA	225	225	NA
1987	AT-NW	LNM	1	205.00	NA	205	205	NA
1988	AT-NE	LNF	191	155.24	31.52	60	235	20.30
1988	AT-NE	LNM	372	162.73	32.03	70	285	19.69
1988	AT-NE	LNO	11	168.18	32.50	120	220	19.33
1988	AT-NW	LNF	8	152.50	52.44	80	210	34.39
1988	AT-NW	LNM	34	148.97	66.81	60	235	44.85
1989	AT-NE	LNF	139	164.78	38.10	80	305	23.12
1989	AT-NE	LNM	208	168.05	34.75	70	240	20.68
1989	AT-NE	LNO	7	92.86	40.71	75	185	43.84
1989	AT-NW	LNF	4	151.25	39.66	100	185	26.22
1989	AT-NW	LNM	4	193.75	11.81	185	210	6.10
1990	AT-NE	LNF	171	161.08	34.69	55	230	21.53
1990	AT-NE	LNM	148	164.26	27.00	90	215	16.44
1990	AT-NE	LNO	2	182.50	3.54	180	185	1.94
1991	AT-NE	LNF	155	152.35	37.40	80	245	24.55
1991	AT-NE	LNM	201	153.61	34.74	85	245	22.61
1991	AT-NW	LNF	1	215.00	NA	215	215	NA
1992	AT-NE	LNF	64	174.92	41.16	60	275	23.53
1992	AT-NE	LNM	61	168.69	36.53	95	235	21.65
1992	AT-NE	LNO	2	230.00	7.07	225	235	3.07
1993	AT-NE	LNF	72	173.19	35.63	95	300	20.57
1993	AT-NE	LNM	97	159.95	32.50	95	210	20.32
1993	AT-NE	LNO	1	165.00	NA	165	165	NA
1994	AT-NE	LNF	206	164.34	36.42	85	285	22.16
1994	AT-NE	LNM	260	164.79	30.98	85	280	18.80
1994	AT-NW	LNF	3	198.33	2.89	195	200	1.46
1994	AT-NW	LNM	2	167.50	10.61	160	175	6.33
1995	AT-NE	LNF	98	179.29	32.51	85	260	18.13
1995	AT-NE	LNM	99	174.09	27.89	95	235	16.02
1995	AT-NW	LNF	2	212.50	3.54	210	215	1.66
1996	AT-NE	LNF	248	147.92	29.44	75	240	19.90
1996	AT-NE	LNM	341	152.29	29.57	70	235	19.42
1996	AT-NE	LNO	2	180.00	14.14	170	190	7.86
1997	AT-NE	LNF	136	150.15	34.87	70	215	23.22
1997	AT-NE	LNM	201	154.38	30.96	75	220	20.05
1997	AT-NE	LNO	13	133.85	18.61	120	185	13.91
1997	AT-NW	LNF	1	175.00	NA	175	175	NA
1997	AT-NW	LNO	4	211.25	11.09	200	225	5.25
1998	AT-NE	LNF	102	148.77	45.33	75	235	30.47
1998	AT-NE	LNM	103	154.37	42.02	70	260	27.22
1998	AT-NE	LNO	3	168.33	58.59	125	235	34.81
1998	AT-NW	LNF	1	85.00	NA	85	85	NA
1998	AT-NW	LNO	2	260.00	14.14	250	270	5.44

Table 11^b. Number of observations of size (FL cm) of *Lamna nasus* during the period 1999-2009 for each zone North of 5°N and for the sex levels considered (LNF = female, LNM = male, LNO = indet.). The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs).

Year	Zone	Sp_Sex	# Observ.	FL_Mean	Std.	Min	Max	CV
1999	AT-NE	LNF	90	139.28	42.08	70	230	30.22
1999	AT-NE	LNM	120	152.75	35.92	80	215	23.52
1999	AT-NE	LNO	4	167.50	20.62	140	190	12.31
1999	AT-NW	LNO	1	270.00	NA	270	270	NA
2000	AT-NE	LNF	33	132.58	28.67	85	205	21.63
2000	AT-NE	LNM	39	145.38	33.67	75	200	23.16
2000	AT-NE	LNO	2	185.00	21.21	170	200	11.47
2000	AT-NW	LNF	3	81.67	2.89	80	85	3.53
2000	AT-NW	LNM	3	83.33	7.64	75	90	9.17
2000	AT-NW	LNO	8	208.13	38.45	160	280	18.47
2001	AT-NE	LNF	36	143.19	42.81	75	215	29.90
2001	AT-NE	LNM	44	144.20	36.71	75	205	25.46
2001	AT-NE	LNO	6	129.17	26.35	100	165	20.40
2001	AT-NW	LNO	1	225.00	NA	225	225	NA
2002	AT-NE	LNF	39	150.64	32.43	95	220	21.53
2002	AT-NE	LNM	19	151.32	27.83	100	200	18.39
2002	AT-NE	LNO	9	177.78	24.38	140	215	13.71
2002	AT-NW	LNF	1	205.00	NA	205	205	NA
2002	AT-NW	LNO	4	211.25	35.68	180	260	16.89
2003	AT-NE	LNF	9	165.00	40.62	95	215	24.62
2003	AT-NE	LNM	25	176.00	32.11	95	225	18.25
2003	AT-NE	LNO	1	225.00	NA	225	225	NA
2003	AT-NW	LNF	2	180.00	7.07	175	185	3.93
2003	AT-NW	LNM	5	191.00	17.46	175	220	9.14
2003	AT-NW	LNO	2	260.00	70.71	210	310	27.20
2004	AT-NE	LNF	21	150.71	31.87	100	215	21.15
2004	AT-NE	LNM	26	166.54	33.52	100	210	20.13
2004	AT-NE	LNO	5	164.00	37.32	100	195	22.75
2004	AT-NW	LNM	4	202.50	34.76	170	250	17.17
2005	AT-NE	LNF	10	178.00	33.35	115	220	18.74
2005	AT-NE	LNM	25	174.40	23.69	120	220	13.58
2005	AT-NW	LNO	2	192.50	31.82	170	215	16.53
2006	AT-NE	LNF	58	152.16	29.23	85	210	19.21
2006	AT-NE	LNM	108	149.58	30.41	80	215	20.33
2006	AT-NE	LNO	5	181.00	20.74	155	205	11.46
2006	AT-NW	LNF	1	210.00	NA	210	210	NA
2006	AT-NW	LNM	1	170.00	NA	170	170	NA
2007	AT-NE	LNF	5	175.00	28.94	130	210	16.54
2007	AT-NE	LNM	6	160.83	42.48	85	210	26.41
2007	AT-NE	LNO	1	170.00		170	170	NA
2007	AT-NW	LNO	3	253.33	63.51	180	290	25.07
2008	AT-NE	LNF	26	135.19	34.97	85	205	25.87
2008	AT-NE	LNM	28	149.29	31.50	95	210	21.10
2008	AT-NE	LNO	1	160.00	NA	160	160	NA
2008	AT-NW	LNO	1	290.00	NA	290	290	NA
2009	AT-NE	LNF	18	143.61	21.61	105	180	15.05
2009	AT-NE	LNM	14	133.93	33.87	85	185	25.29

Table 11^c. Number of observations of size (FL cm) of *Lamna nasus* during the period 2010-2017 for each zone North of 5°N and for the sex levels considered (LNF = female, LNM = male, LNO = indet.). The most representative statistics are provided (FL mean, Standard Deviation, min, max and CVs).

Year	Zone	Sp_Sex	# Observ.	FL_mean	Std.	Min	Max	CV
2010	AT-NE	LNO	2	160.00	49.50	125	195	30.94
2011	AT-NE	LNF	1	100.00	NA	100	100	NA
2012	AT-NE	LNF	2	120.00	49.50	85	155	41.25
2012	AT-NE	LNM	4	135.00	20.82	110	160	15.42
2017	AT-NE	LNF	1	190.00	NA	190	190	NA
2017	AT-NE	LNM	1	200.00	NA	200	200	NA

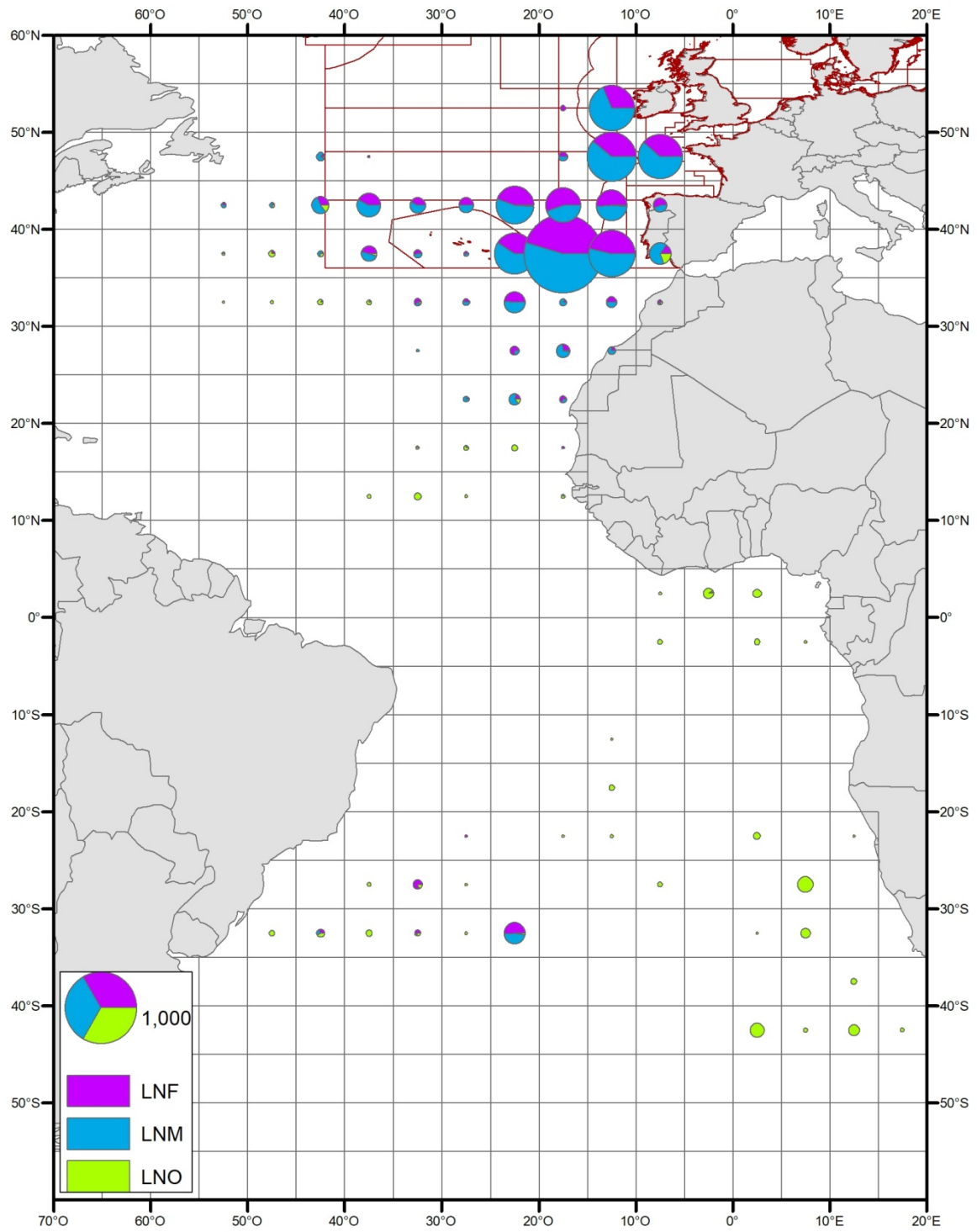
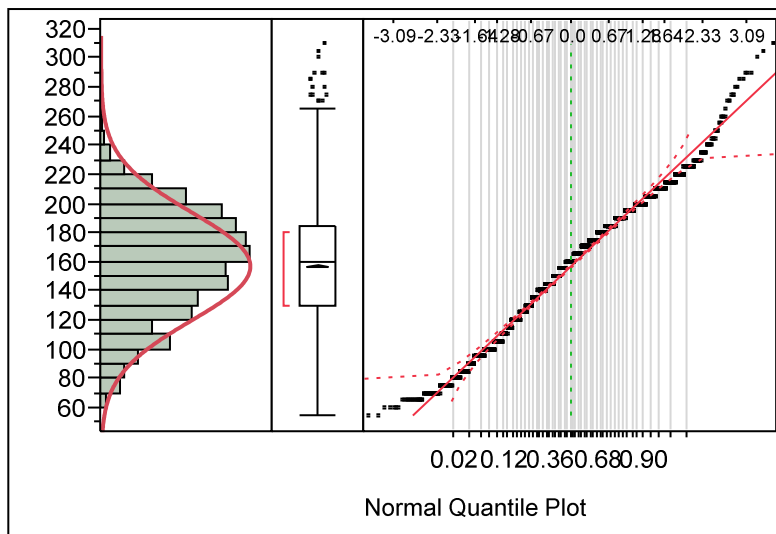


Figure 1. Map of the number of size (FL cm) observations of the porbeagle (*Lamna nasus*) available from the combined period 1987-2017. LNF = females, LNM = males, LNO = indet.



Median	160
Mean	157.36079
Std Dev.	37.117148
Std Err Mean	0.5179193
Upper 95% Mean	158.37613
Lower 95% Mean	156.34544
N	5136

Figure 2. Size distribution (FL cm) and Normal Quantile Plot of porbeagle in the North and South Atlantic for zones (NE, NW, SE, SW) and for sexes (female + male + indet.) combined, during the period 1987-2017.

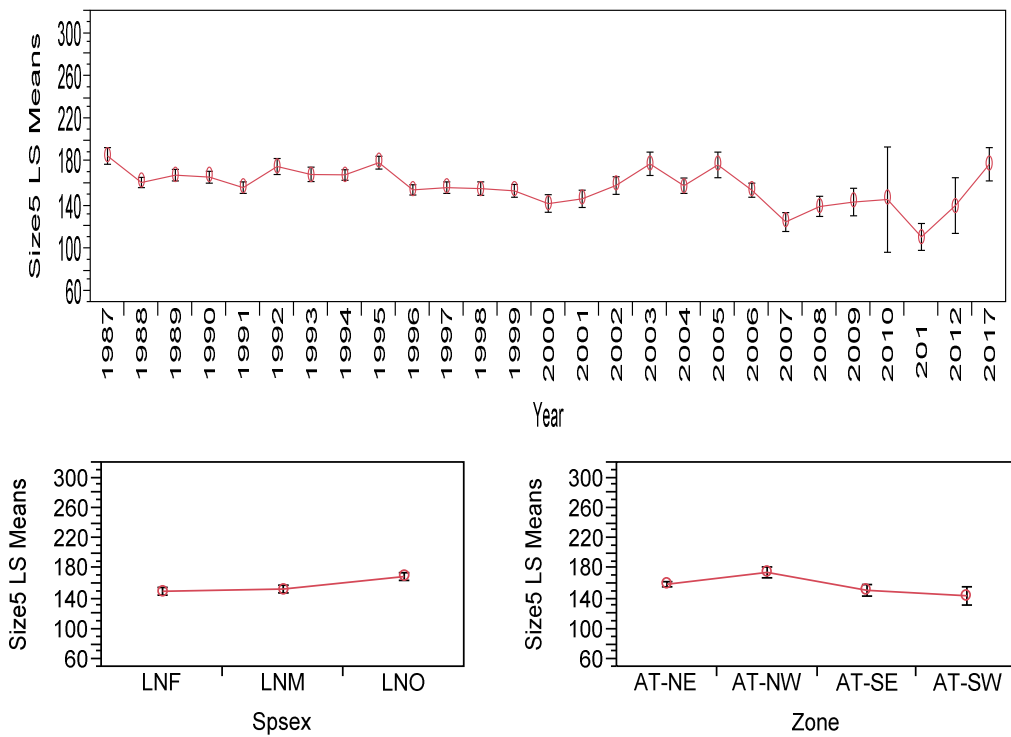


Figure 3. FL lsmeans (cm) and CI95% values of the year, sex, zone factors obtained from a GLM considering all available observations of the North Atlantic (zones NE, NW) and South (zones SE, SW). LNF = females, LNM = males, LNO = indet.

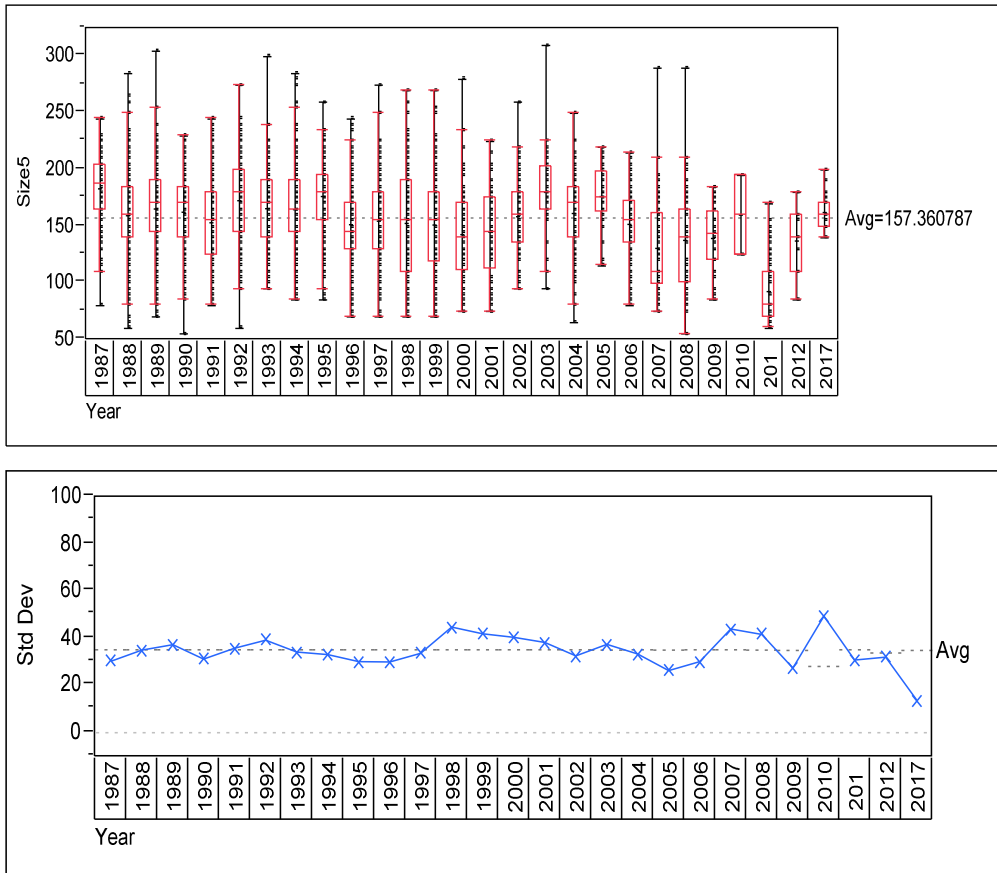
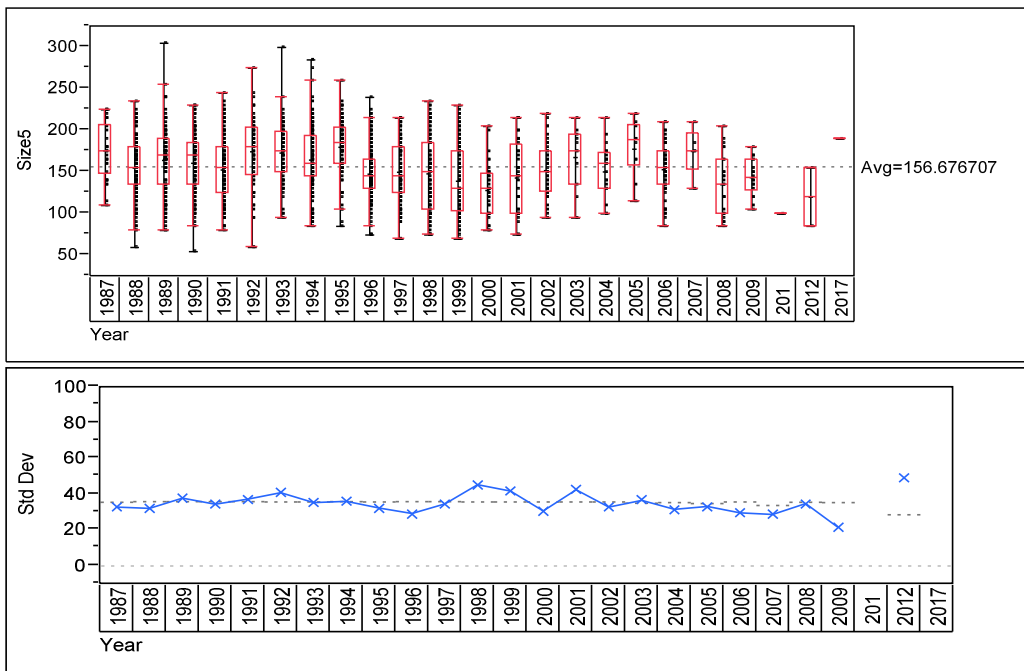


Figure 4. Variability chart, box-plots and standard deviation of size (FL cm) observed during the period 1987-2017, considering all available observations of the Atlantic (North: zones NE, NW; South: zones SE, SW) and sexes combined. (female+male+indet.)

Females



Males

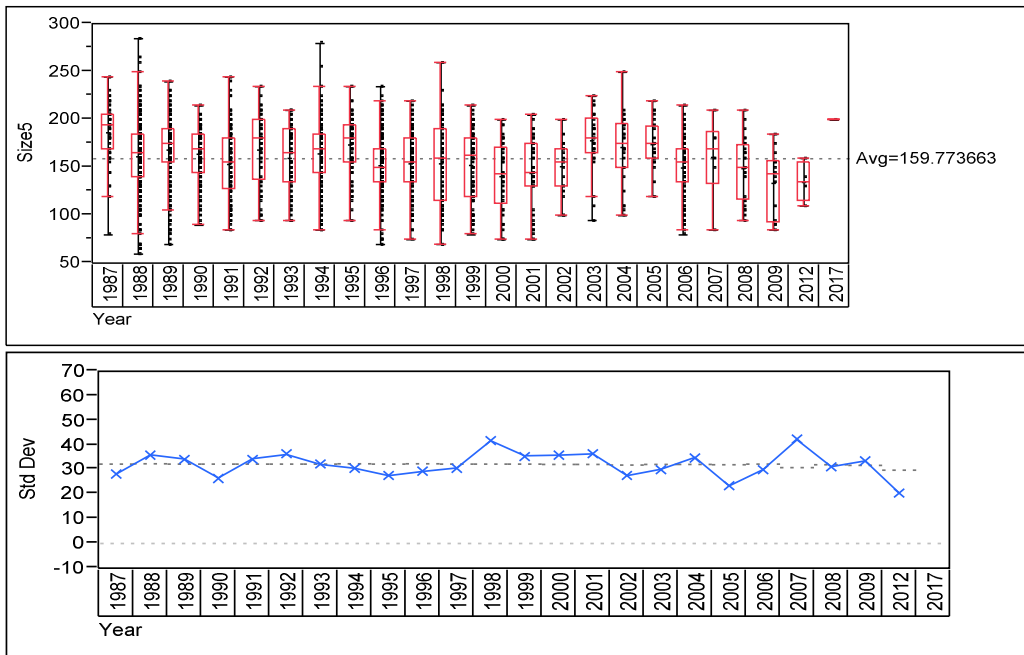
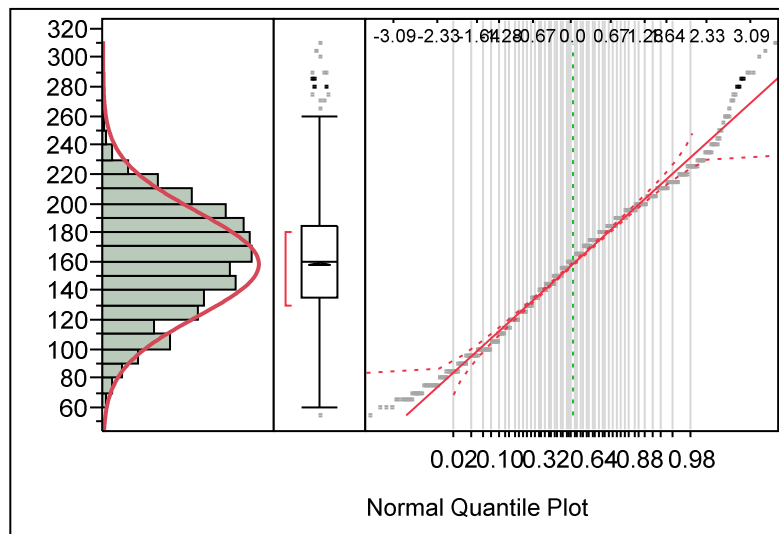


Figure 5. Variability chart, box-plots and standard deviation of the sizes (FL cm) observed during the period 1987-2017, considering all the observations available from the North Atlantic (zones: NE, NW) and for each identified sex (Females: upper panels, Males: lower panels).



Median	160.00
Mean	158.83
Std Dev.	35.89
Std Err Mean	0.5196
Upper 95% Mean	159.8468
Lower 95% Mean	157.8094
N	4770

Figure 6. Size distribution (FL cm) of porbeagle in the North Atlantic zones (NE and NW combined) and for combined sexes (female + male + indet.) during the combined period 1987-2017.

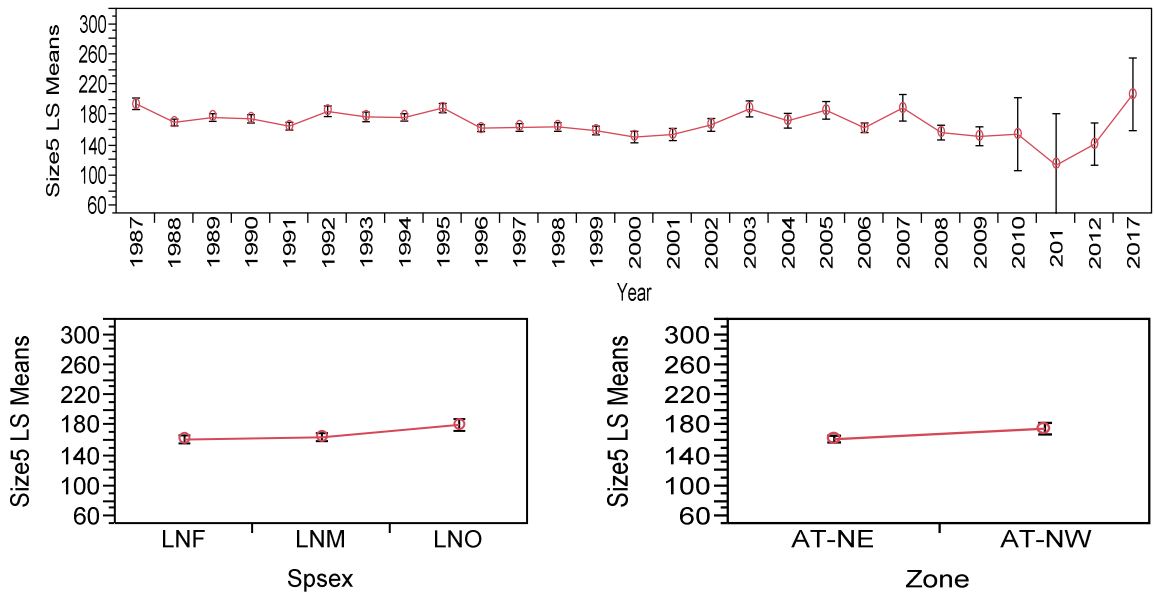


Figure 7. FL_lsmeans (cm) and CI95% values of the year, sex, zone factors obtained from a GLM considering all the observations available from the North Atlantic (zones NE, NW). LNF = females, LNM = males, LNO = indet.

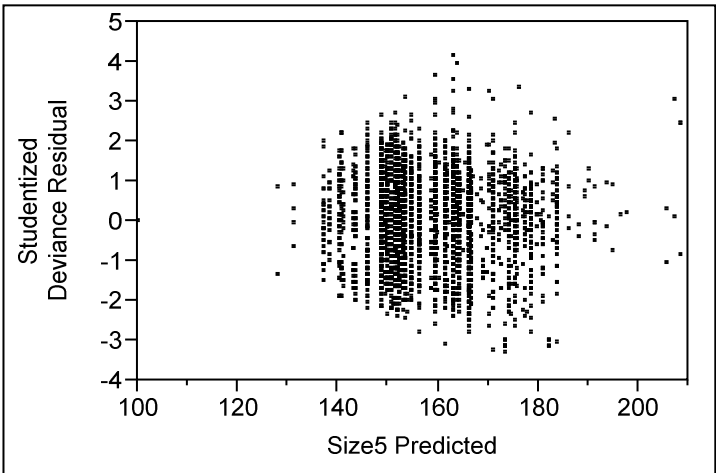


Figure 8. Studentized deviance residual by predicted size (FL cm) of the factors year, sex and zone obtained from a GLM considering all available observations of the North Atlantic (zones NE, NW).

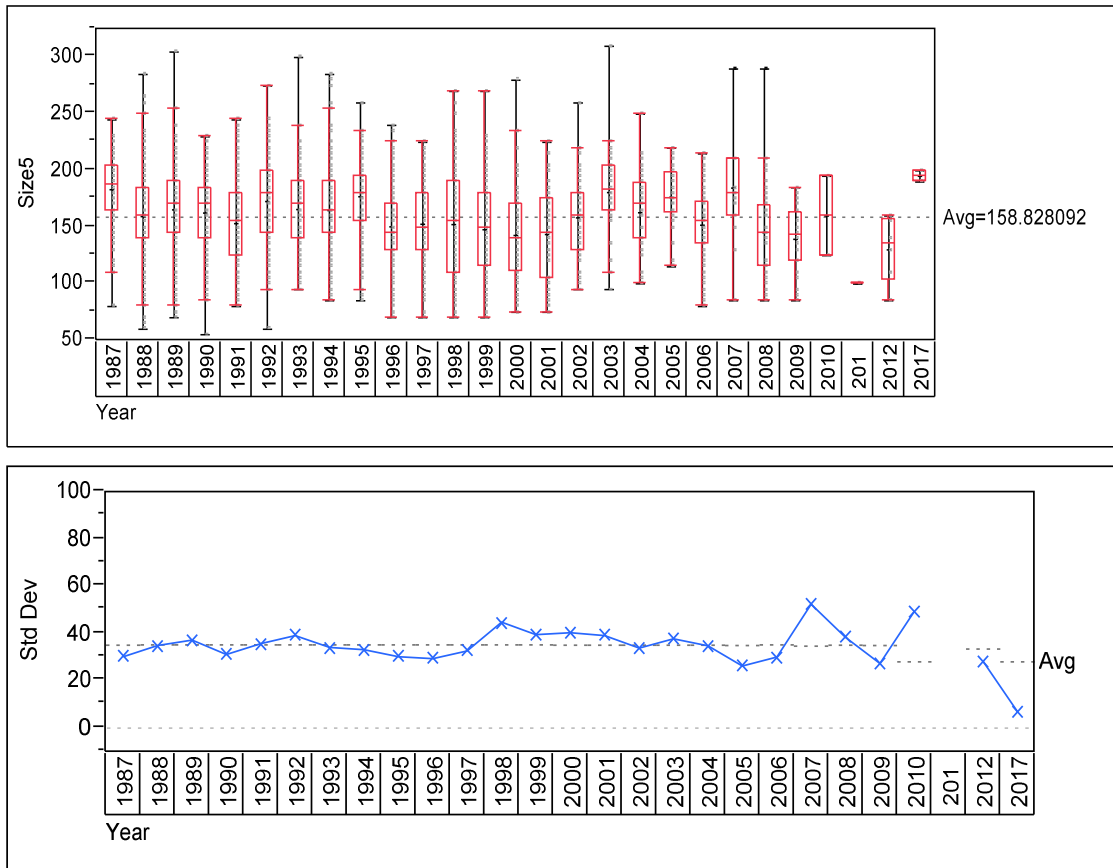


Figure 9. Variability chart, box-plots and standard deviation of the sizes (FL cm) observed during the period 1987-2017, considering all the available observations of the North Atlantic (zones NE, NW) and sexes combined (female + male + indet.).