OVERVIEW OF THE JAPANESE LONGLINE FISHERY FOR BLUEFIN TUNA IN THE ATLANTIC OCEAN, UP TO 2011

A. Kimoto[1], T. Itoh[1], O. Sakai[1] and M. Miyake[1]

SUMMARY

This paper overviews the operation pattern, fish size, and trends in total catch, effort and nominal CPUE of the Japanese longline fishery in the Atlantic for bluefin tuna up to December 2011. In the both the West and East Atlantic (including adjacent seas), the recent fishing grounds for bluefin changed and/or shrank substantially, due to the introduction of the IQ system for Japanese longline vessels. In the East Atlantic, the Japanese longline vessels operated almost solely in the northeast Atlantic (north of 40°N). The total catch in the West Atlantic has been relatively stable between 280 and 420 tons in the past five years, whereas the caches in the east Atlantic substantially decreased from 2200 to 1100 tons, following the reductions in the national quota. The size data of Japanese longline catches have been improved since August 2008 (100% coverage of individual weight) collected by the Fisheries Agency of Japan. The nominal CPUEs in the West Atlantic fluctuated significantly since the 2007 fishing year, showing considerably high values for the 2007, 2009, and 2011 fishing years. These high indices might be, at least partially, related to the abundance of relatively small-sized bluefin (135-150 cm, 50-60 kg) in the catch. In addition, the jump in the CPUE in 2011 fishing year was also due to the good catch of medium size fish (165-185 cm, 95-120 kg) from November to January, which was a similar size range that appeared in the northeast fishing ground between October and November. In the northeast Atlantic, the CPUEs showed a steep increasing trend since the 2009 fishing year, and the size of bluefin caught showed continuous contributions from the 2003 year-class.

RÉSUMÉ

Ce document présente un aperçu général du mode de fonctionnement, de la taille des poissons, des tendances de la prise totale et de l'effort et de la CPUE nominale de la pêcherie palangrière japonaise dans l'océan Atlantique concernant le thon rouge et couvrant la période courant jusqu'en décembre 2011. Tant dans l'Atlantique Ouest que dans l'Atlantique Est (mers adjacentes comprises), les zones récentes de pêche de thon rouge ont varié et/ou ont été considérablement réduites, en raison de l'introduction du régime de quota individuel pour les palangriers japonais. Dans le cas de l'Atlantique Est, les palangriers japonais opéraient presque uniquement dans l'Atlantique Nord-Est (Nord de 40ºN). La prise totale réalisée dans l'Atlantique Ouest a été relativement stable et s'est située entre 280 et 420 tonnes au cours des cinq dernières années, alors que les prises réalisées dans l'Atlantique Est ont connu une baisse considérable, passant de 2.200 à 1.100 t, comme suite aux réductions du quota national. Les données de taille des prises palangrières japonaises s'améliorent depuis le mois d'août 2008 (couverture de 100% du poids individuel) ; ces données sont recueillies par l'Agence des pêches du Japon. Les CPUE nominales dans l'Atlantique Ouest présentent des fluctuations considérables depuis l'année de pêche 2007 et affichent des valeurs nettement élevées pour les années de pêche 2007, 2009 et 2011. Ces indices élevés pourraient, du moins en partie, avoir un rapport avec l'abondance du thon rouge de taille relativement réduite (135-150 cm, 50-60 kg) dans la capture. En outre, la hausse de la CPUE au cours de l'année de pêche 2011 était également due aux bonnes prises de poissons de taille moyenne (165-185 cm, 95-120 kg) réalisées entre novembre et janvier, qui représentaient une gamme de tailles similaire à celle apparue dans la zone de pêche du Nord-Est entre octobre et novembre. Dans l'Atlantique Nord-Est, les CPUE présentaient une tendance rapide à la hausse depuis l'année de pêche 2009 et la taille des thons rouges capturés signalait la contribution continue de la classe d'âge de 2003.

[1]NRIFSF. 5-7-1, Orido, Shimizu, Shizuoka, 424-8633. Japan. aikimoto@affrc.go.jp

RESUMEN

En este documento se presenta una visión de los patrones de operación, las tallas de los peces, las tendencias en la captura total y el esfuerzo y la CPUE nominal de la pesquería de palangre japonesa de atún rojo en el Atlántico hasta diciembre de 2011. Tanto en el Atlántico oeste como en el este (mares adyacentes incluidos), los caladeros de atún rojo han experimentado cambios y/o se redujeron notablemente debido a la introducción del sistema de cuotas individuales para los palangreros japoneses. En el Atlántico este, los palangreros japoneses operaron casi únicamente en el Atlántico nororiental (norte de 40º N). La captura total en el Atlántico oeste se ha mantenido relativamente estable entre 280 y 420 t en los cinco últimos años, mientras que las capturas en el Atlántico este experimentaron un fuerte descenso pasando de 2.200 a 1.100 t, siguiendo las reducciones en la cuota nacional. Los datos de talla de las capturas de palangre japonesas han mejorado desde agosto de 2008 (una cobertura del 100% de los pesos individuales) y son recopilados por la Agencia de Pesca de Japón. La CPUE nominal en el Atlántico occidental fluctuó significativamente desde el año pesquero 2007, mostrando valores considerablemente elevados para los años pesqueros 2007, 2009 y 2011. Estos índices elevados podrían estar relacionados, al menos parcialmente, con la abundancia de atún rojo de talla relativamente pequeña (135-150 cm, 50-60 kg) en la captura. Además, el incremento súbito de la CPUE en el año pesquero 2011 se debió también a las buenas capturas de ejemplares de talla mediana (165-185 cm, 95-120 kg) de noviembre a enero, que tienen un rango de tallas similares al registrado en los caladeros noroccidentales entre octubre y noviembre. En el Atlántico nordeste, las CPUE mostraban una marcada tendencia ascendente desde el año pesquero 2009, y la talla del atún rojo capturado mostraba contribuciones continuas de la clase anual de 2003.

KEYWORDS

Bluefin tuna, catch and effort, CPUE, longline fishery, individual vessel quota, operating pattern, fish size

1. Introduction

The Japanese longline fishery covers a long historical period for a wide geographical distribution area of bluefin tuna (*Thunnus thynnus*) in the Atlantic Ocean (including the Mediterranean Sea). This temporal/spatial wide coverage of this fishery makes the information important in providing abundance trends for this species. Japanese vessels are very mobile and their operational practice and fishing techniques have been constantly modified during its history (Miyake *et al*, 2010), and the fishing patterns and area of fishing for bluefin changed and/or shrank substantially in recent years, due to the introduction of IQ (individual vessels quota) system and limited entry system to the Japanese longline vessels (Japan, 2012a).

For a better understanding of complex change in Japanese longline fishery, this paper overviews the operation pattern, fish size, and trends in total catch, effort and nominal CPUE of the Japanese longline fishery in the Atlantic for bluefin tuna up to December 2011. The year in this report used a calendar year or a fishing year; 2012FY refers to the period from August 1, 2011 to July 31, 2012.

2. Materials and Methods

Various types of data were used. Historical total catch and effort data between 1975 and 2011 were obtained from the logbook by the National Research Institute of Far Seas Fisheries (NRIFSF). Data from logbook were crosschecked with ten-day report and daily report that Fisheries Agency of Japan (FAJ) collected, in order to estimate final total catch. The FAJ has the ten-day reporting program since August 2008 which legally requires all tuna vessels operating in the Atlantic Ocean to submit the catch information every ten-day period (three times per month, i.e. early-, middle- and late-periods of a month) by radio or facsimile to FAJ (Ministerial Order of January 22, 1963 and as amended on July 25, 2008, Japan, 2012a). Data from the program allows obtaining total catch of Japanese longline fishery on a timely manner. The total catch in the most recent year, 2011, was obtained only from the ten-day report and daily report, as logbook collection has not been completed.

The operational pattern and the number of fishing vessels that actively engaged in fishery in recent years were also analyzed, using the Japanese longline logbook data collected by the NRIFSF. The coverage of the logbook of the Japanese longline fleet has been 99-100 % in 2009 and 2010, and it was estimated to be about 85% in 2011 (Japan, 2012b).

The total number of catch and hooks were compiled for nominal CPUE series by the traditional three areas for the period between 1975 and 2012 fishing years; West Atlantic Area (off US and Canadian coast north of 35°N), Northeast Atlantic Area (between 45°W and 5°E and north of 40°N to 65°N in the area defined for the east Atlantic stock), and East Atlantic Area (30° to 40°N, off Gibraltar to western Mediterranean Sea). The area definitions are seen in Figure 1, and the detailed data set used were described in **Table 1**. The Northeast Atlantic Area was exploited by the Japanese longline fleet around 1990, and has been constantly exploited since then, i.e. for more than 20 years. The other two data series have longer histories, being available since the mid-1970s. Total accumulative numbers of observations (set by set data) throughout the period to 2012FY for the nominal CPUEs are 56,998 in the West Atlantic Area, 87,676 in the Northeast Atlantic Area, and 64,294 in the East Atlantic Area, after eliminating some anomalies due to a technical error.

3. Recent fishery

The patterns and areas of tuna fishing by the Japanese longline fleet have changed through the history (Miyabe and Hiramatsu, 1994, Miyabe 2003, Oshima *et al*. 2009, and Oshima and Miyabe 2009). Especially in the recent fishing years (Kimoto *et al*., 2010a and 2010b, and **Figure 3**), the fishing grounds for bluefin changed and/or shrank substantially, due to the introduction of IQ (individual vessels quota) and limited entry system to the Japanese longline vessels, since possibly August 2007 voluntarily by the fishermen's association and August 2009 by law (Japan, 2012a).

Fishing season for Japanese longliners for bluefin usually starts in August in the Northeast Atlantic Area (**Figure 1**). The fishing area in the East Atlantic shifts towards west in Oct-Dec (40°-60°N) and in January (around 45°N): then it starts shrinking (Kimoto *et al*. 2010a). However, the area operated appears to get smaller in recent years, especially since the IQ system has officially adopted by law. In the East Atlantic, the Japanese longline vessels operated almost solely in the Northeast Atlantic Area (north of 40N) and rarely in the East Atlantic Area. In the West Atlantic, the fishing ground for bluefin also shrank and changed substantially between years.

The number of vessels has reduced significantly due to the introduction of IQ system voluntarily possibly since 2007FY (**Figure 4**), while the total TAC has gradually reduced. Especially in the recent three years, the number of operating vessels in each area (defined in **Figure 2**) was decreased mainly because only A certain number of fishing vessels (decided by lottery) are allowed fishing in the East and West Atlantic respectively since the IQ system was officially introduced by law in August 2009. Most of Japanese longline vessels operate in the area 4 (defined in **Figure 2**).

Following the relevant ICCAT recommendations, FAJ introduced many regulations. For example, a national observer program on the fishing vessels has been continuously implemented in the Atlantic in accordance with the 2006 East Atlantic and Mediterranean bluefin tuna Recommendation [Rec. 06-05]. Japan's observer program in the north Atlantic carried out 12 and 11 trips in 2011 and 2012FYs, respectively (Japan 2012). These trips covered 42.9 and 40.7 percent of the total number of fishing vessels target bluefin tuna in the North Atlantic Ocean. In addition, all tuna vessels in the Atlantic are required to attach a tag to each of the all bluefin captured and report the weight of individual fish with its tag number (Ministerial Order on April 2, 1975 and amended on July 25, 2008), together with the name of vessel and location of catch in real time. The Japanese Government also started to implement bluefin tuna catch documents (BCDs) for all bluefin tuna products in accordance with the 2007 Recommendation on an ICCAT bluefin tuna Catch Documentation Program [Rec. 07-10] (Japan 2009).

4. Catch (Task I)

In the West Atlantic, the annual catch was more than 3,000 t from late 1970s to 1980s, but then rapidly reduced to around 500 t since 1982 due to the imposition of quotas (**Figure 5**). The average catch of last five years was about 400 t. In the East Atlantic, excluding the Mediterranean, the catch widely fluctuated until the 1990s, having reached a peak of around 4,000 t in the mid-1990s, and decreased gradually since then. The average catch in the last five years was about 1,600 t. In the Mediterranean, the catch fluctuated between 100 t and 1,000 t since the 1970s, and less than 100 t since 2008. In the last two years, there was no catch in that area. Those

fluctuations and declines in the East Atlantic and the Mediterranean are mostly related with various ICCAT and national regulatory measures (including quota) and fishing environment.

5. Size

The size data for bluefin tuna caught by the Japanese longline fishery have been collected through the research programs by the NRIFSF and observer program by the Fishery Agency of Japan (Kimoto *et al*., 2010a). Since August 2008, Fishery Agency of Japan has started to tag (for identification) and collect the weight of all of the individual bluefin tuna caught by the Japanese longliners as explained in the previous texts (Japan, 2012a). Therefore length data converted from these reported weights, using weight-length relationship by ICCAT (Anon, 2011), are available practically for all the fish caught since 2009FY; the number of available size data being 23,451, 17,899, 13,526, 2,890 in 209FY, 2010FY, 2011FY, and 2012FY, respectively.

The length frequencies by year, month, and longitude were shown in **Figure 6**. In the West Atlantic, majority of bluefin captured and measured in 2010FY came from the period between December and February in 60-80W, and its size range was between 180 and 200cm in fork length (FL) (120-170kg in round weight). Substantial number of bluefin were measured in January 2011 (2011FY) in 40-60W, with the 2 modes: 135-150cm (50-60kg) and 165-185cm (95-120kg). In 2012FY, the fishing season started relatively earlier and Japanese vessels operated solely in 40-60W in the West Atlantic. The range of size between September and October was 200-250cm (180-300kg), and relatively larger than the following months which was 180-200cm (120-170kg). In the Northeast Atlantic Area, main fishing ground and area are in 0-20W in October. The size frequency in 2010FY showed 2 modes with the ranges of 145-165cm (60-95kg) and 165-190cm (95-150kg). The frequency in 2011 and 2012FYs became a single mode with ranges of 165-185cm (95-120kg), and 180-200cm (120-170kg), respectively. These sizes of bluefin caught showed continuous contributions from 2003 year class, and were observed in the both West and Northeast Atlantic Area.

6. Catch, Effort, and Nominal CPUE in fishing years

Figure 8 shows trends in nominal CPUE using catch and effort data of the Japanese longline fishery in **Figure 7** by three regions (West, Northeast and East Atlantic Areas). The area definition is given in Figure 1, and fishing years were used in these calculations. The total number of hooks deployed in all three areas was decreased in the recent five years, while the total number of catch has been relatively stable in the West Atlantic Area, or declining in the Northeast and East Atlantic Area. The recent nominal CPUEs in the West Atlantic Area have substantially fluctuated, and showed relatively high values in 2007, 2009, and 2011FYs. These high indices might be, at least partially, related to the abundance of relatively small-sized bluefin (135-150cm, 50-60kg) in the catch (**Figure 6**). In addition, the jump of the CPUE in 2011FY was also due to the good catch of medium size fish (165-185cm, 95-120kg) from November to January (**Figure 6**). In the Northeast Atlantic Area, nominal CPUEs showed a steep increasing trend since 2007FY, and reached a highest value in 2012FY. The Japanese longline vessels in the East Atlantic obviously operated almost solely in the Northeast Atlantic Area (north of 40N) since 2009 FY, and rarely in the south of 40N and the Mediterranean Sea (East Atlantic Area). Thus the nominal CPUEs in the East Atlantic Area were not available in the most two recent years. It is noted that similar nominal CPUEs were observed between for entire fleet and for vessels with scientific observers in recent years, in each of the West and Northeast Atlantic Areas (Japan 2011 and 2012c).

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Table 1. The detailed data set used for the total number of catch, hooks for the nominal CPUEs by the traditional three areas.

Main effect / Area	*West Atlantic Area*	*Northeast Atlantic Area*	*East Atlantic Area (Area 5 + Med.)*
Fishing Year	1976-2012	1990-2012	1975-2012
Month	Nov, Dec, Jan, Feb	Aug-Oct, Nov, Dec, Jan-Mar	Mar, Apr, May, Jun-Jul
Area (Figure 1)	West of 45W	East of 45W and north of 40N	East of 45W and south of 40N, and Med.
Material of main line	Nylon, others (since 1994)	Nylon, others (since 1994)	Nylon, others (since 1994)
Material of branch line	Nylon, others (since 1994)	Nylon, others (since 1994)	Nylon, others (since 1994)
Hooks between floats	5– 13 (individual)	4 - 7, 8 - 12 hooks	4 - 7, 8 - 13 hooks

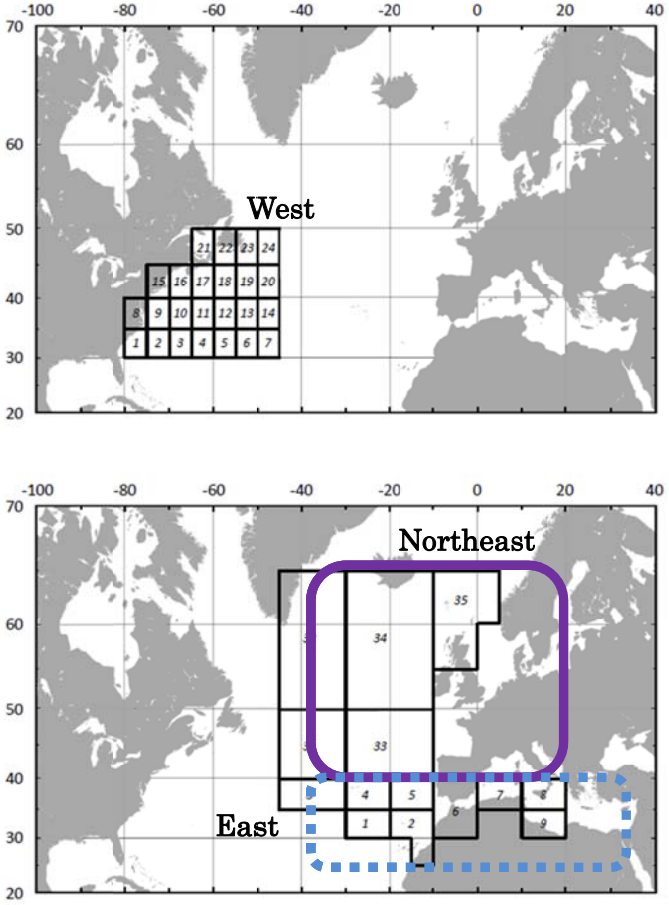

Figure 1. Areas considered in total bluefin catch, hooks, and nominal CPUE. Upper panel indicates area stratification (1-24) used for the West Area. Lower panel shows the same information for the Northeast and East Areas. Numbers from 31 through 35 and from 1 through 9 denote for these area, respectively.

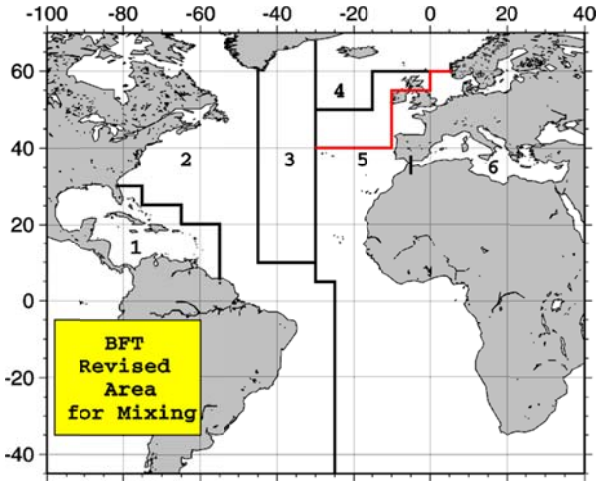

Figure 2. Area definition developed at the workshop on bluefin mixing in 2001. The division between area 4 and 5 (second line from the top) is used for CPUE analysis apart from the original definition.

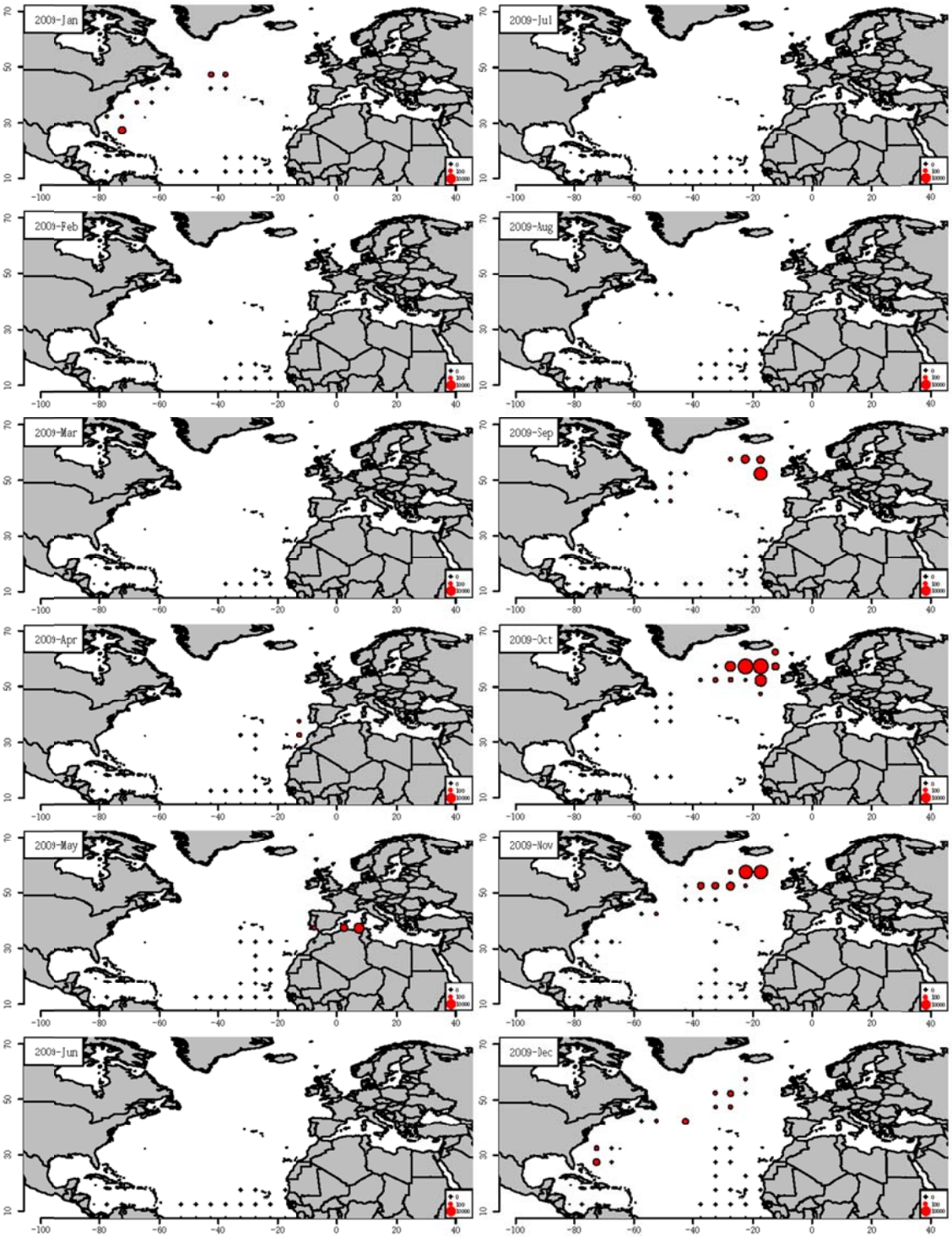

Figure 3. Monthly distributions of bluefin catch by Japanese longliners by 5x5 degree area in 2009.

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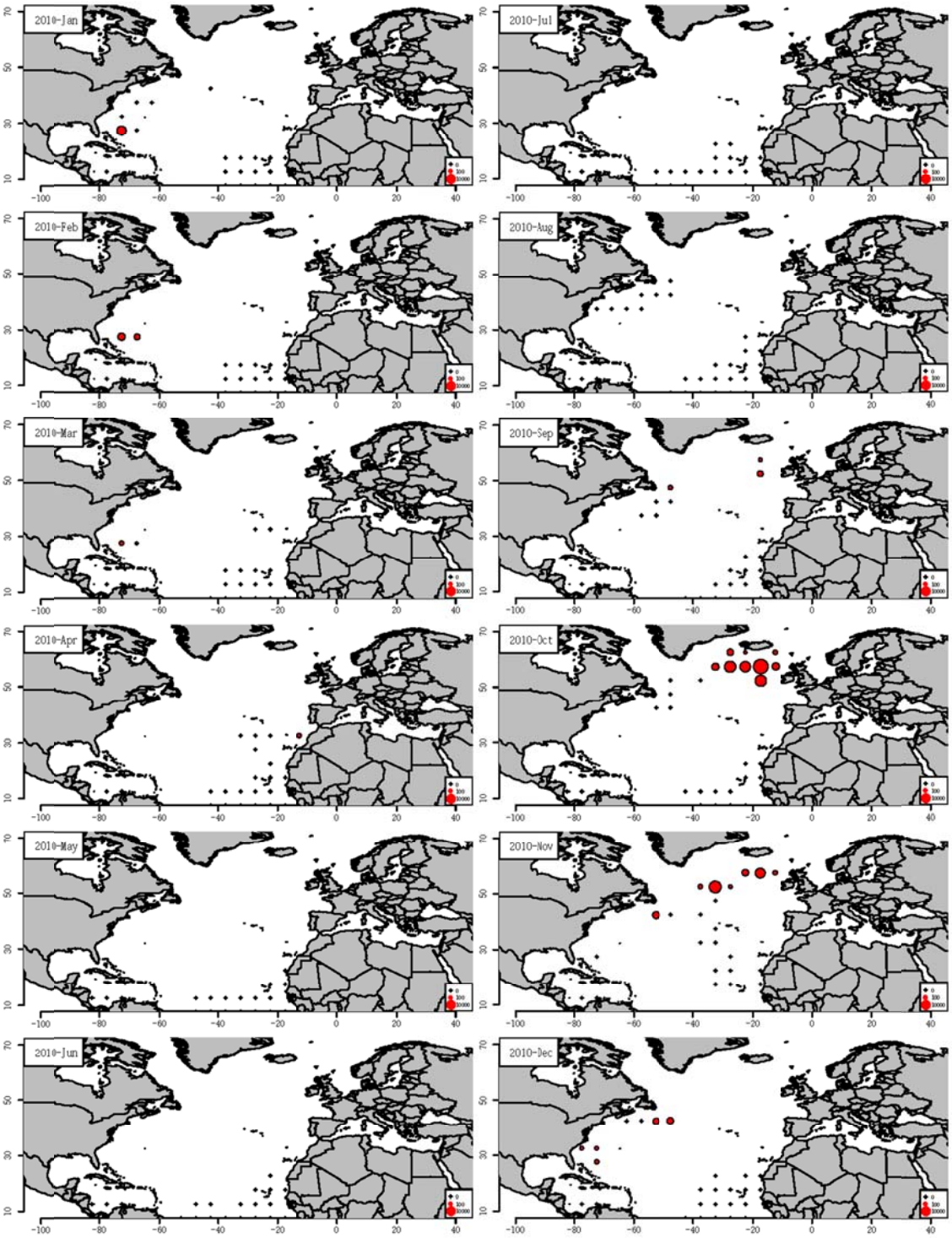

Figure 3. Continued (Year=2010)

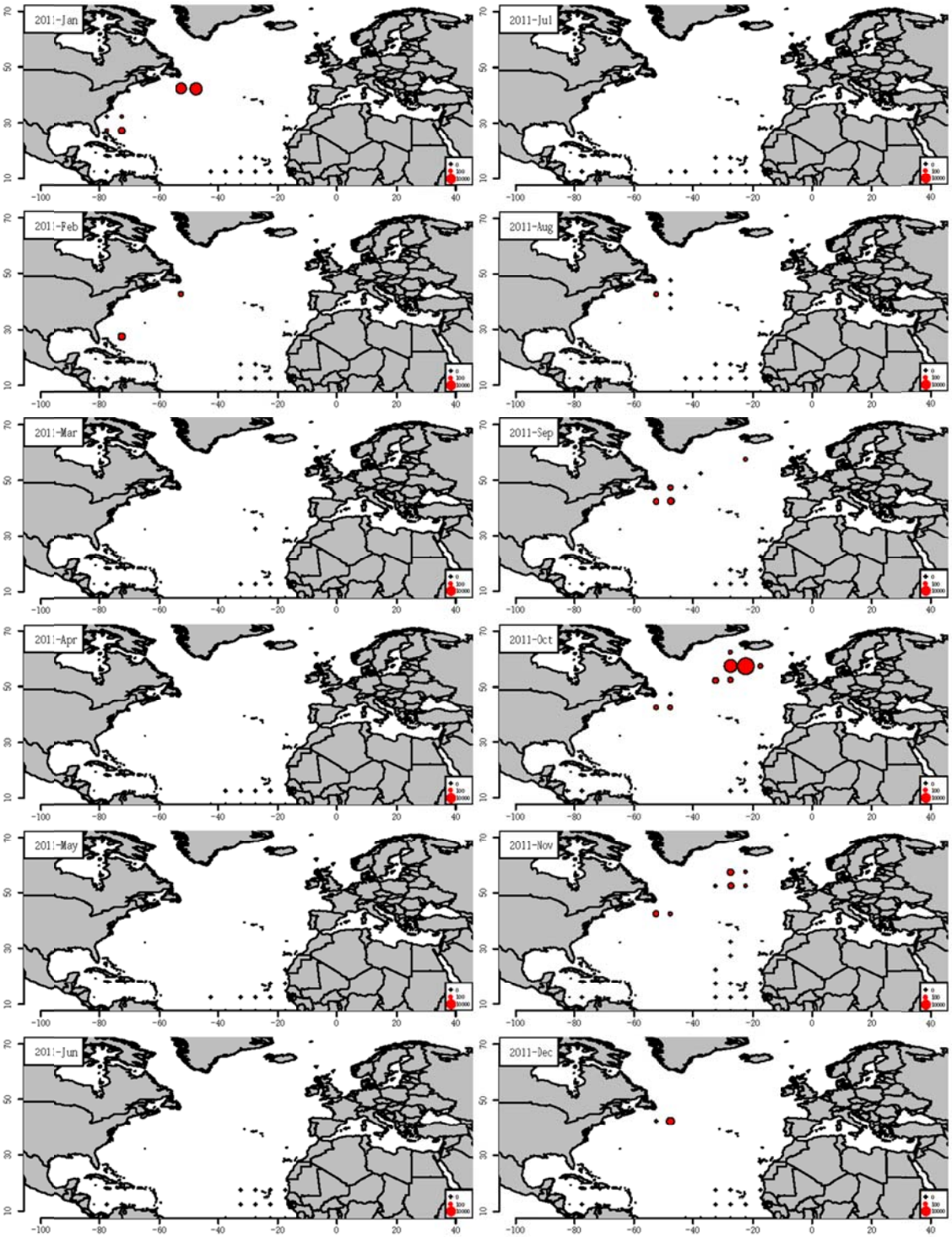

Figure 3. Continued (Year=2011)

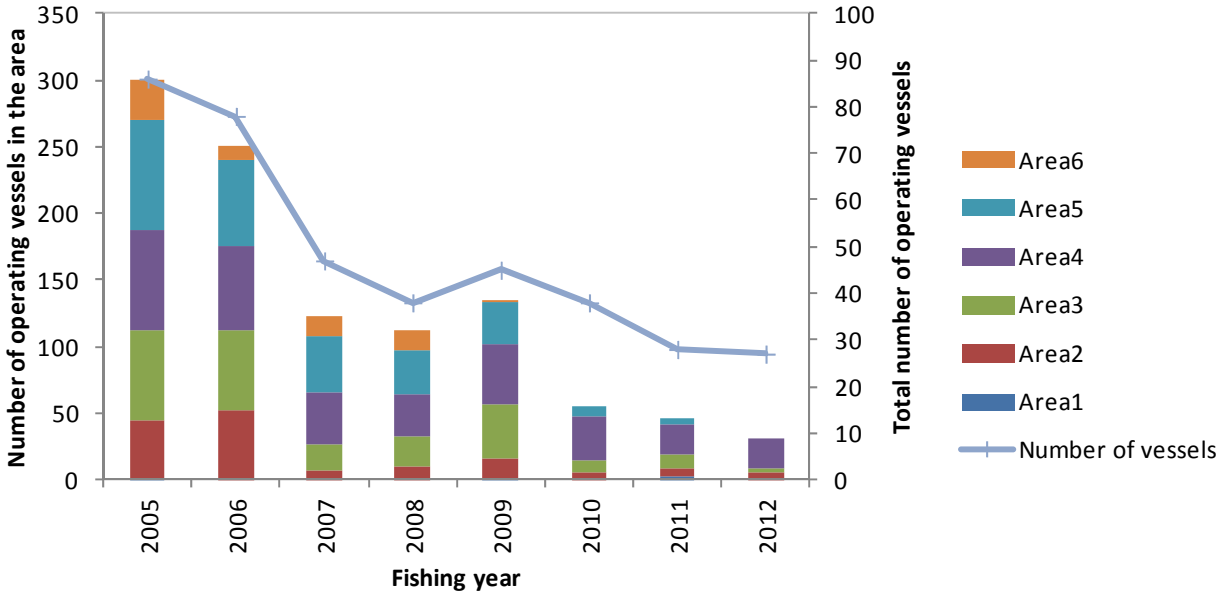

Figure 4. Total number of operating vessels which caught bluefin tuna in the north Atlantic and the Mediterranean Sea, and the number of operating vessels with bluefin tuna in the 6 original areas (Figure 2) in the period between 2005FY (Aug. 2004 to Jul. 2005) and 2012FY.

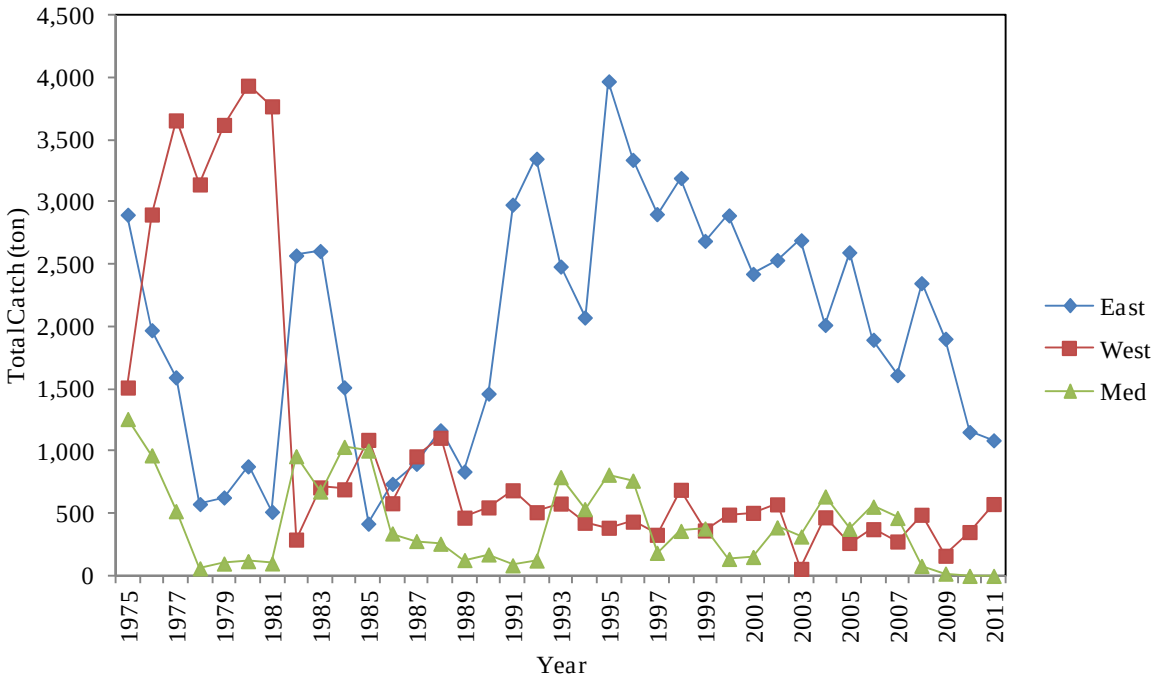

Figure 5. Historical total catch trends (TASK I) in the West and East Atlantic and the Mediterranean Sea in a calendar year.

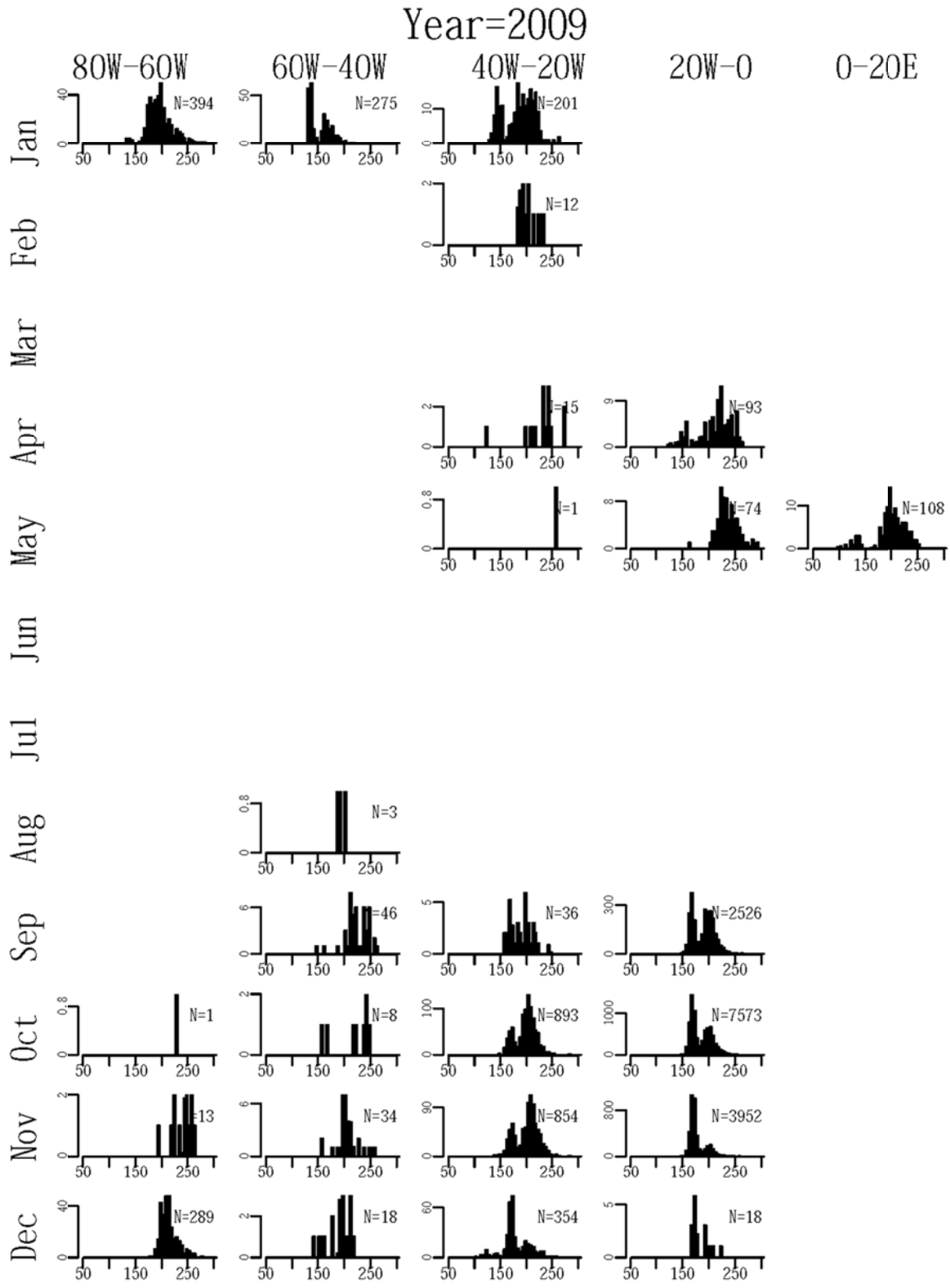

Figure 6. Length frequencies of bluefin tuna by year, month and longitude in 2009.

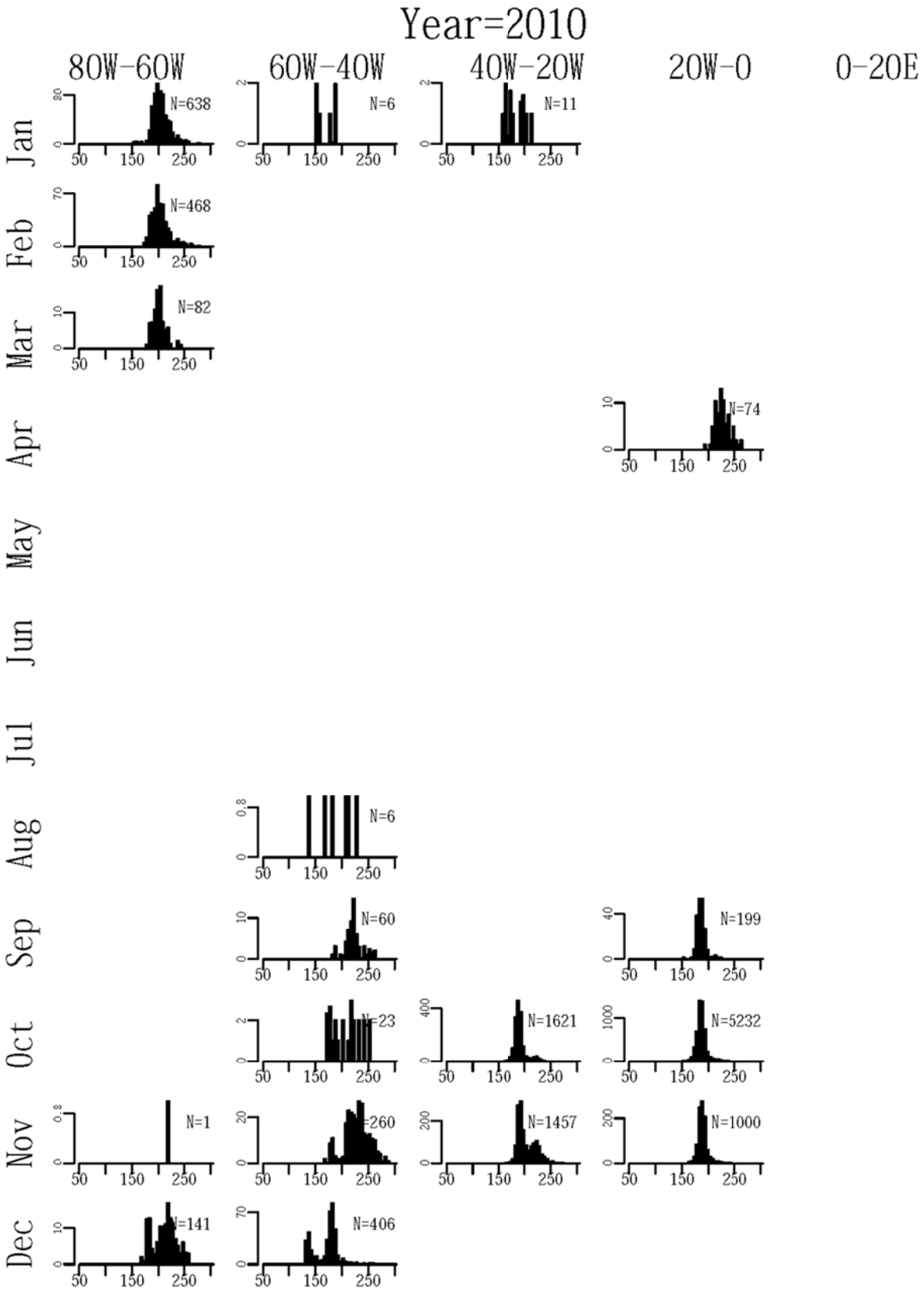

Figure 6. Continued (Year=2010).

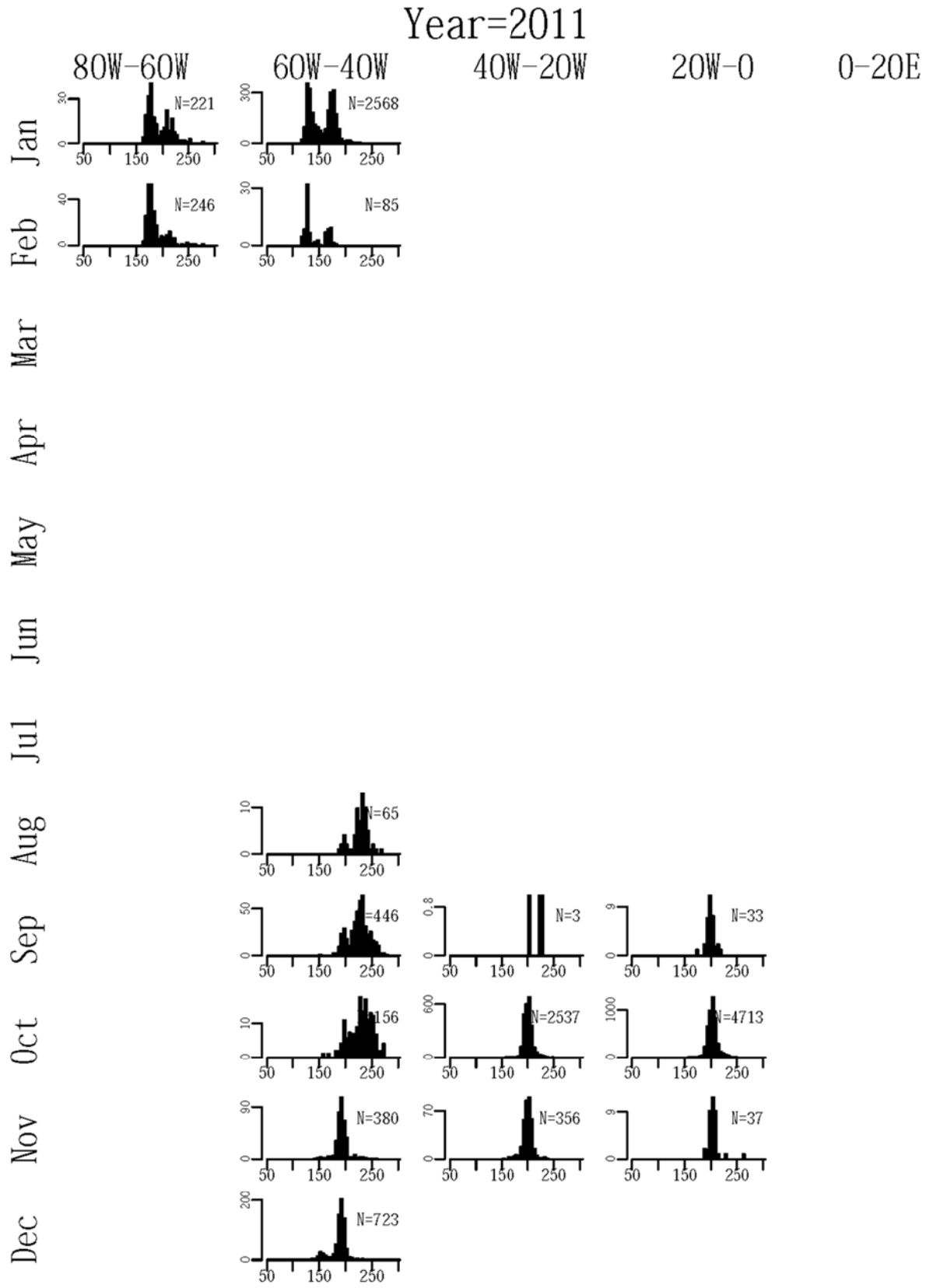

Figure 6. Continued (Year=2011).

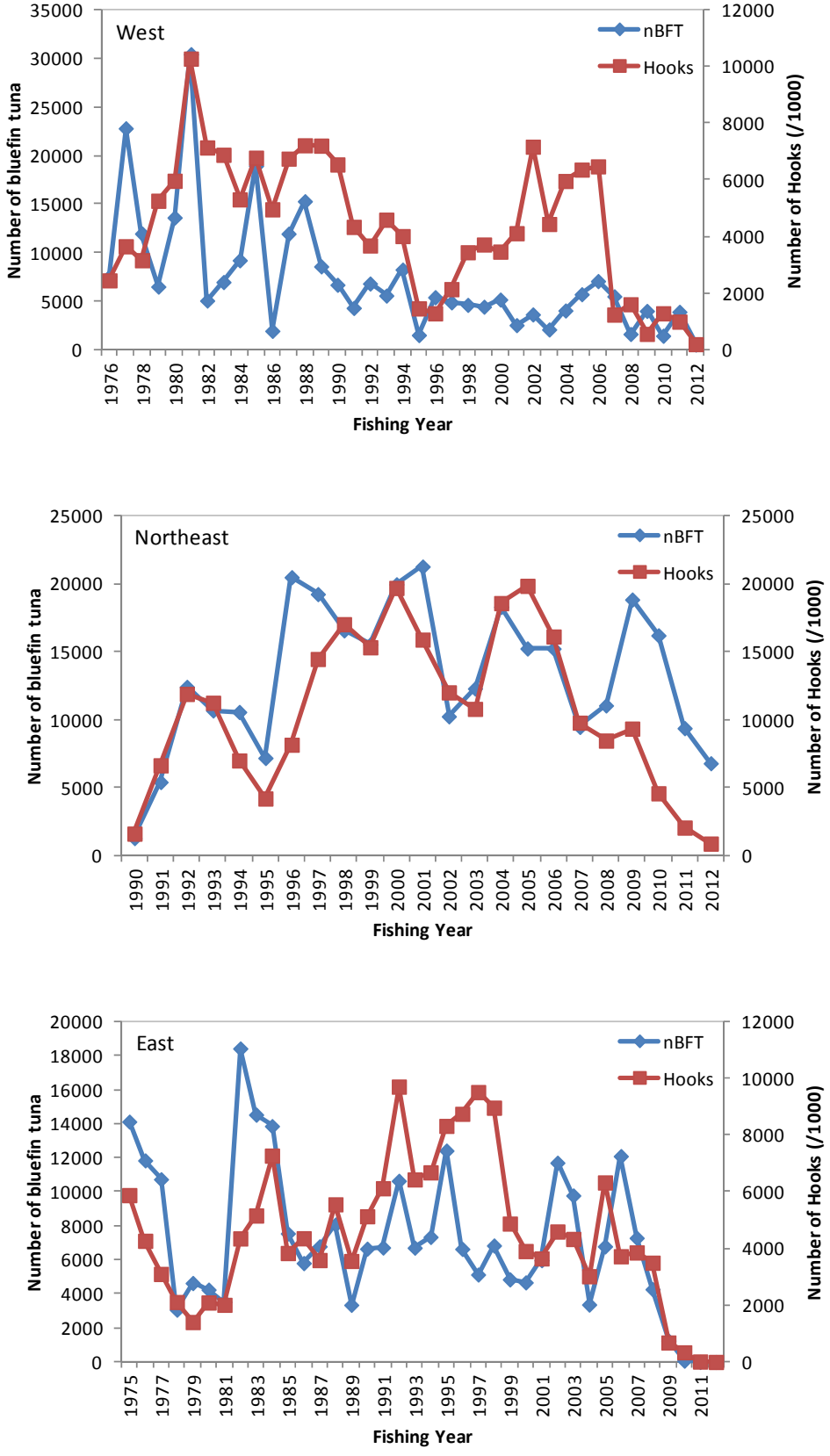

Figure 7. The historical trends of the total number of bluefin and hooks for three areas in the Atlantic. Upper panel, West Atlantic; middle panel, Northeast Atlantic; lower panel, East Atlantic.

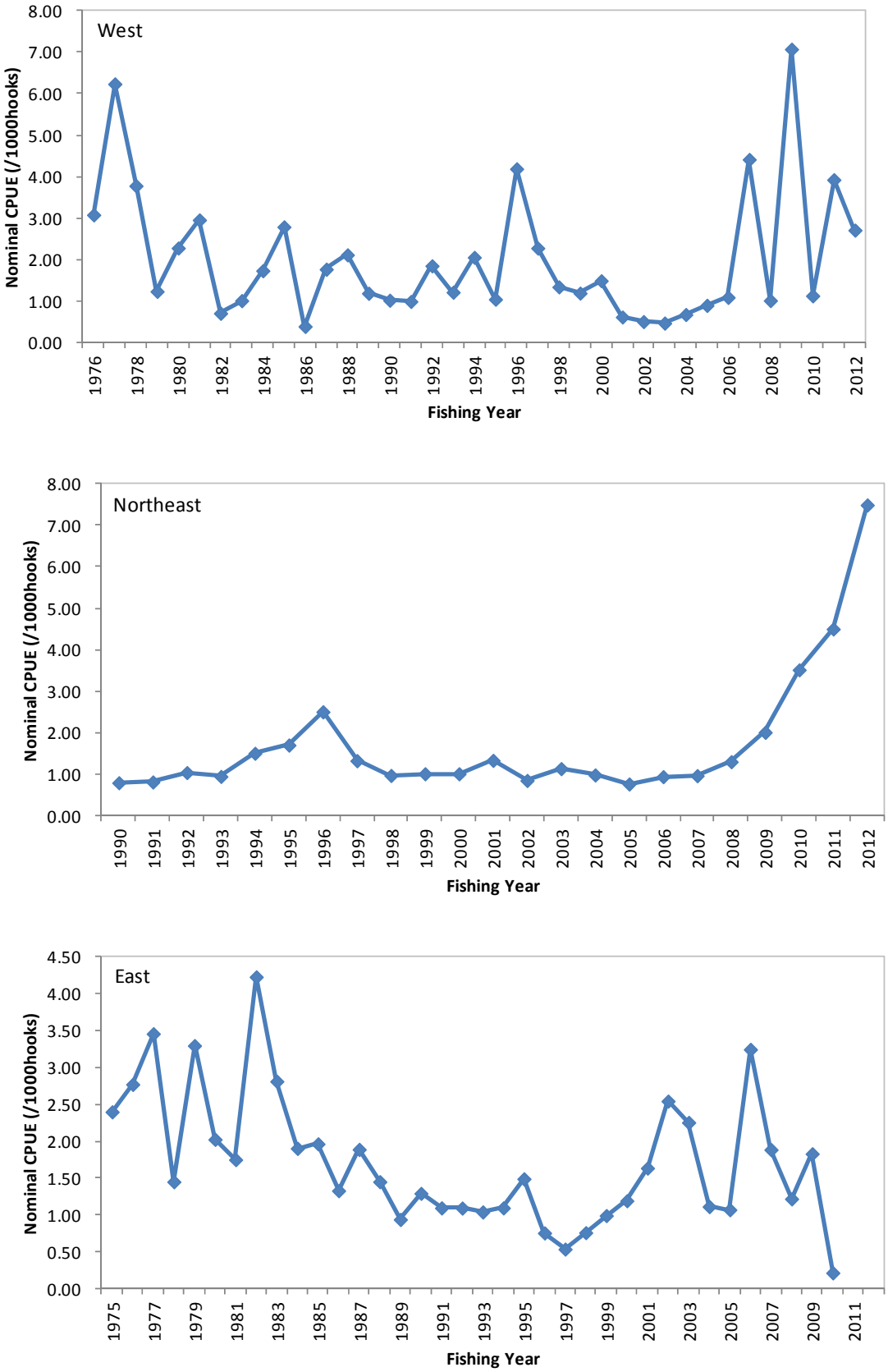

Figure 8. The historical trends of the nominal CPUE for three areas in the Atlantic. Upper panel, West Atlantic; middle panel, Northeast Atlantic; lower panel, East Atlantic.