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Results on greater forkbeard (*Phycis blennoides*), Spanish ling (*Molva macrophthalma*), roughsnout grenadier (*Trachyrincus scabrus*), bluemouth (*Helicolenus dactylopterus*) and other scarce deep water species on the 2022 Northern Spanish Shelf Groundfish Survey

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Abstract

This working document presents the results on the most significant deep fish species on the Spanish Groundfish Survey on the northern Spanish shelf in 2022. Biomass, abundance, length ranges and geographic distributions were analyzed for greater forkbeard (*Phycis blennoides*), Spanish ling (*Molva macrophthalma*), roughsnout grenadier (*Trachyrincus scabrus*), bluemouth (*Helicolenus dactylopterus*) and other scarce deep sea species. The biomass of *T. scabrus* increased slightly whereas it increased sharply for *P. blennoides, M. macrophthalma* and especially for *H. dactylopterus. Aphanopus carbo, Beryx spp*. and *Pagellus bogaraveo* were scarce as usual and *Coryphaenoides rupestris* has not been found since 2019. Recruitment was significant for *P. blennoides, M. macrophthalma* and *H. dactylopterus*.

Introduction

The bottom trawl survey on the Northern Spanish Shelf has been carried out every autumn since 1983, except in 1987, to provide data and information for the assessment of the commercial fish species and the ecosystems on the Galician and Cantabrian shelves (ICES Divisions 8c and 9a North).

The aim of this working document is to update the results (abundance indices, length frequencies and geographic distribution) of the most common deep water fish species on the bottom trawl surveys on the Northern Spanish Shelf after the results presented previously (Blanco *et al.* 2022, 2019, Fernández-Zapico *et al*. 2020, 2018, Ruiz-Pico *et al*. 2021). The species analyzed are *Phycis blennoides* (greater forkbeard), *Molva macrophthalma* (spanish ling), *Trachyrincus scabrus* (roughsnout grenadier), *Helicolenus dactylopterus* (bluemouth), and some other scarce species as *Aphanopus carbo* (black scabbardfish), *Coryphaenoides rupestris* (roundnose grenadier), *Beryx spp.* (alfonsinos) and *Pagellus bogaraveo* (blackspot seabream). Although results on *Helicolenus dactylopterus* were not included in the ICES data call, they are also updated

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considering its remarkable abundance and geographical distribution in the surveyed area, and the fact that these indices were used in the WGDEEP report when reviewing the abundance and status of the stock on the north-eastern Atlantic.

Material and methods

The area covered in the Northern Spanish Shelf Groundfish Survey on the Cantabrian Sea and Off Galicia (Divisions 8c and Northern part of 9a; SPNGFS) extends from longitude 1° W to 10° W and from latitude 42° N to 44.5° N, following the standard IBTS methodology for the western and southern areas (ICES, 2017). The sampling design is random stratified with five geographical sectors (MF: Miño-Finisterre, FE: Finisterre-Estaca de Bares, EP: Estaca de Bares - Peñas, PA: Peñas - Ajo, AB: Ajo - Bidasoa) and three depth strata (70-120 m, 121-200 m and 201-500) (Figure 1, ICES, 2017). The shallower depth stratum was changed in 1997 from 30-100 m to 70-120 m, due to the small area and scarcity of trawlable shallower grounds.

Nevertheless, some extra hauls are carried out every year, if possible, to cover shallower (<70 m) and deeper (>500 m) grounds. These additional hauls are plotted in the distribution maps, although they are not included in the calculation of the stratified abundance indices since the coverage of these grounds (shallower and deeper) are not considered representative of the area. However, the information from these depths is considered relevant due to the changes in the depth distribution of fishing activities in the area (Punzón et al. 2011) and these hauls are also used to define the depth range of the species.

The standardized indices of the deep water fishes analyzed in this report probably underestimate its real biomass due to the fact that most of its catches might happen out of the standard stratification area, in additional hauls deeper than 500 m. For this reason, the catches in standard and deeper additional hauls were plotted in this report.

Results

In this last survey 129 valid hauls were carried out, 114 of these were standard hauls and 15 additional hauls (3 of them shallower than 70 m and 12 of them between 500 m and 800 m) (Figure 1).

The total stratified fish catch in biomass per haul increased strongly in 2022, staying within the high values of the time series (Figure 2).

In 2022, as usual, most of the biomass of *P. blennoides, T. scabrus, A. carbo* and *Beryx spp*. was found in the additional deep water hauls (>500 m) in contrast to *H. dactylopterus* which was mainly found in standard hauls. *P. bogaraveo* was scarcely found, mostly out of the stratification in the shallow area (<70 m). However, the species *M. macrophthalma*, traditionally found mainly in additional deep water hauls, increased its presence in standard hauls in the last two years.

The biomass of the species *T. scabrus* increased slightly whereas it increased sharply for *P. blennoides, M. macrophthalma* and especially for *H. dactylopterus*, reaching the highest value of the time series for the last two species. Bluemouth also rose in abundance terms, reaching likewise the highest value in the overall time series. Recruitment was significant for *P. blennoides, M. macrophthalma* and *H. dactylopterus*, being also noticeable the sharply rise on juveniles abundance for the latter species. Only a few specimens of *A. carbo, Beryx spp*. and *P. bogaraveo* were found but *C. rupestris* was not since 2019.

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***Phycis blennoides* (greater forkbeard)**

In 2022, 21% of the hauls where *P. blennoides* was found were additional hauls deeper than 500 m and contained 77% of the biomass. This last year the biomass in standard hauls increased steadily, reaching the highest value of the previous eight years. The biomass in additional deep hauls increased even more compared to the previous year, reaching the highest value of the time series (Figure 3).

The geographical distribution of *P. blennoides* remained similar to previous years, being widespread in the sampling area (Figure 4).

The length distribution in standard hauls was similar to the previous year, with a great recruitment again and a mode in 18 cm (Figure 5).

The largest individuals,which ranged from around 24 cm to 66 cm, were found mostly in the additional deeper hauls, with a mode in 38 cm (Figure 6).

***Molva macrophthalma* (Spanish ling)**

In 2022, the biomass of *M. macrophtalma* increased sharply again in standard hauls, reaching the highest value of the time series, as it had already happened the previous year, whereas it decreased slightly in additional hauls deeper than 500 m (Figure 7). Unlike other years in the time series, although following the line of last year, most of the biomass (65 %) was found in standard hauls (70 - 500 m) which were 85 % of the total hauls with *M. macrophtalma*.

The species kept on being widespread in the study area but presented more spots this last survey (Figure 8).

The strong increase of recruitment in standard hauls shown the previous year is repeated in this last survey, showing a mode in 24 cm, and it is noticeable in the increment on the range of sizes, showing a second class of size, with a mode in 39 cm (Figure 9).

In contrast, in additional deeper hauls larger specimens, up to 123 cm, were found (Figure 10).

***Trachyrincus scabrus* (roughsnout grenadier)**

T. scabrus has been found mostly in additional hauls (>500 m) in the last decade. In 2022, this species was caught in five hauls, being all of them deep hauls, out of the standard stratification, and catches increased slightly compared to the previous year (Figure 11).

The geographical distribution showed more or less the same pattern during the time series, being captured in the deep hauls throughout the study area. However, the point of biomass usually caught in recent years on southern MF sector, was not caught this last survey (Figure 12).

Specimens ranged from 40 mm to 245 mm, although more abundance of large specimens (145 to 200 mm) was found, with a mode in 180 mm (Figure 13).

***Helicolenus dactylopterus* (bluemouth)**

Although bluemouth is not requested for ICES DCF Data Call, the biomass and abundance are significant in the area and useful for the assessment of the stock (ICES, 2017).

H. dactylopterus has mainly been found in standard hauls, therefore the catches of the additional deeper hauls are not plotted.

In 2022, both the biomass and abundance rose sharply, increasing five times the biomass value of the previous year and almost four times that of abundance. Both values, which were already high the previous year comparing to the time series, have reached the highest values in the overall time series (Figure 14).

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The geographical distribution of *H. dactylopterus* remained similar to the previous year, with greater biomass in the Galician area, but striking in this last survey, and the usual spot in the easternmost Ajo-Bidasoa sector (Figure 15).
Length distribution showed a moderate sign of recruitment, with a small mode in 6 cm, and also a strong increment in the abundance of a second size class individuals ranged among 11 cm and 37 cm, with a marked mode in 12-13 cm (Figure 16).

Other scarce deep water species

Other species scarcely caught in the survey were *Aphanopus carbo*, *Beryx spp.* and *Pagellus bogaraveo.* They have been mainly found out of the standard stratification, the first three species in deeper additional hauls (>500 m) whereas *P. bogaraveo* in shallower additional hauls (< 70 m).
The species *C. rupestris* has continued to be absent since 2019.
A. carbo was caught in three hauls among 559 m and 608 m in easternmost Cantabrian sea (Figure 17 and Figure 18), with a total of six specimens which ranged from 87 to 104 cm.
Beryx spp. were found in two hauls between 540 m and 589 m in Galician waters and in three hauls among 530 m and 609 m in the Cantabrian sea (Figure 19 and Figure 20). Five specimens were *B. decadactylus*, ranged among 25 and 32 cm, and one was *B. splendens* with 29 cm.
Forty nine specimens of *P. bogaraveo* between 8 and 28 cm were found among 40 and 92 m depth in three hauls in the Cantabrian Sea (Figure 21 and Figure 22).

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Figures

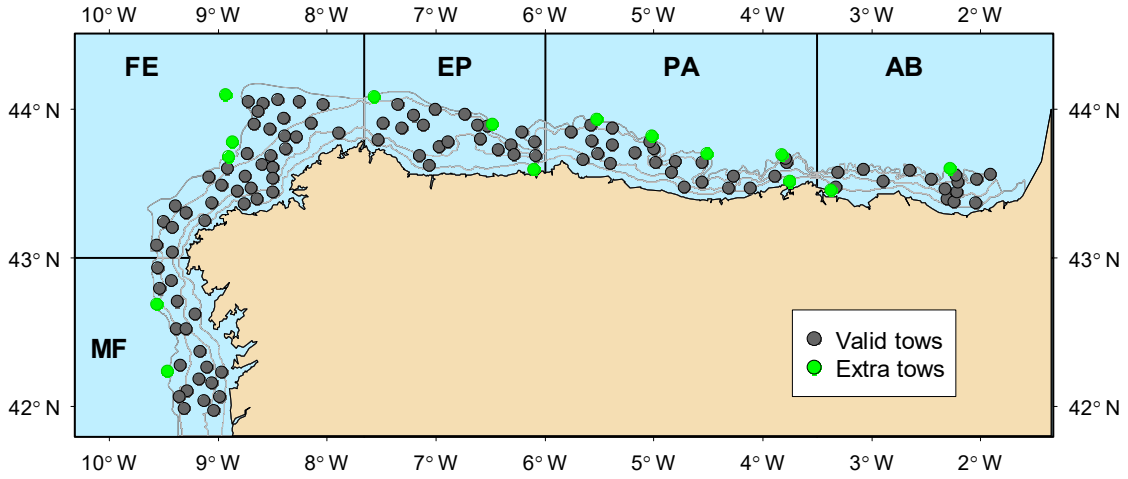

Figure 1 Stratification design and hauls on the Northern Spanish shelf groundfish survey in 2022; Depth strata are: A) 70-120 m, B) 121 – 200 m and C) 201 – 500 m. Geographic sectors are MF: Miño-Finisterre, FE: Finisterre-Estaca, EP: Estaca-cabo Peñas, PA: Peñas-cabo Ajo, and AB: Ajo-Bidasoa

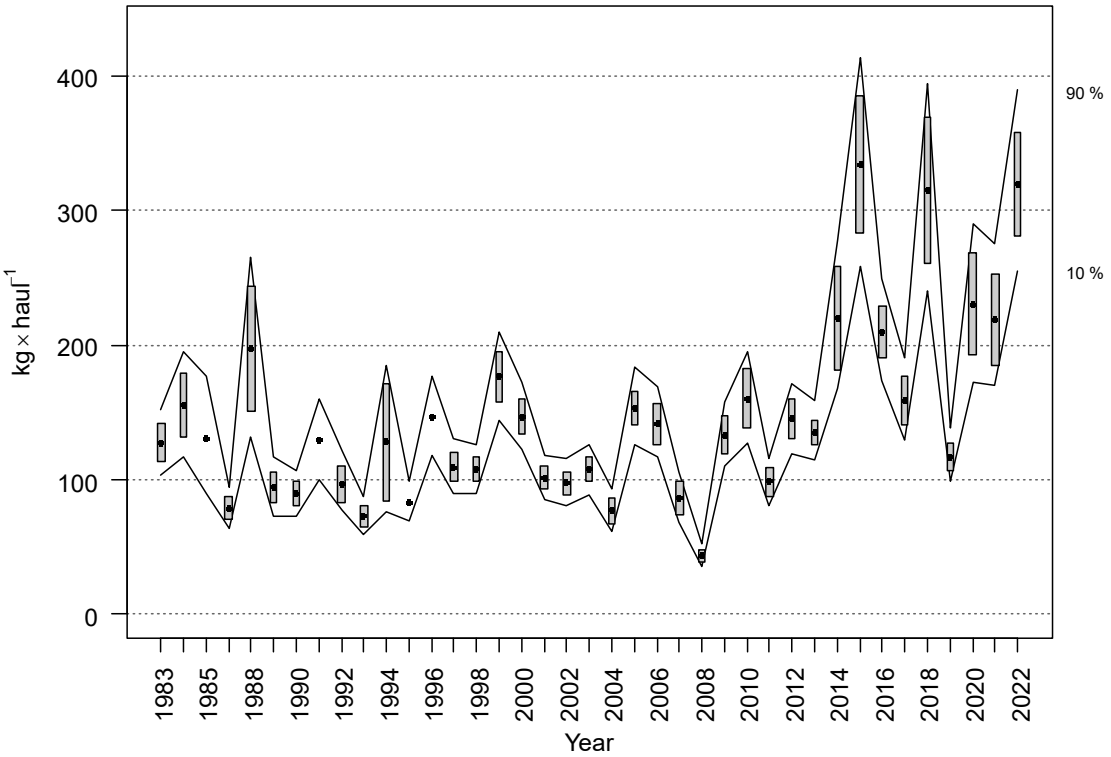

Figure 2 Evolution of the total fish catch in biomass on the Northern Spanish shelf groundfish survey, only standard hauls (>70 m & <500 m considered within the standard sampling stratified to the area.

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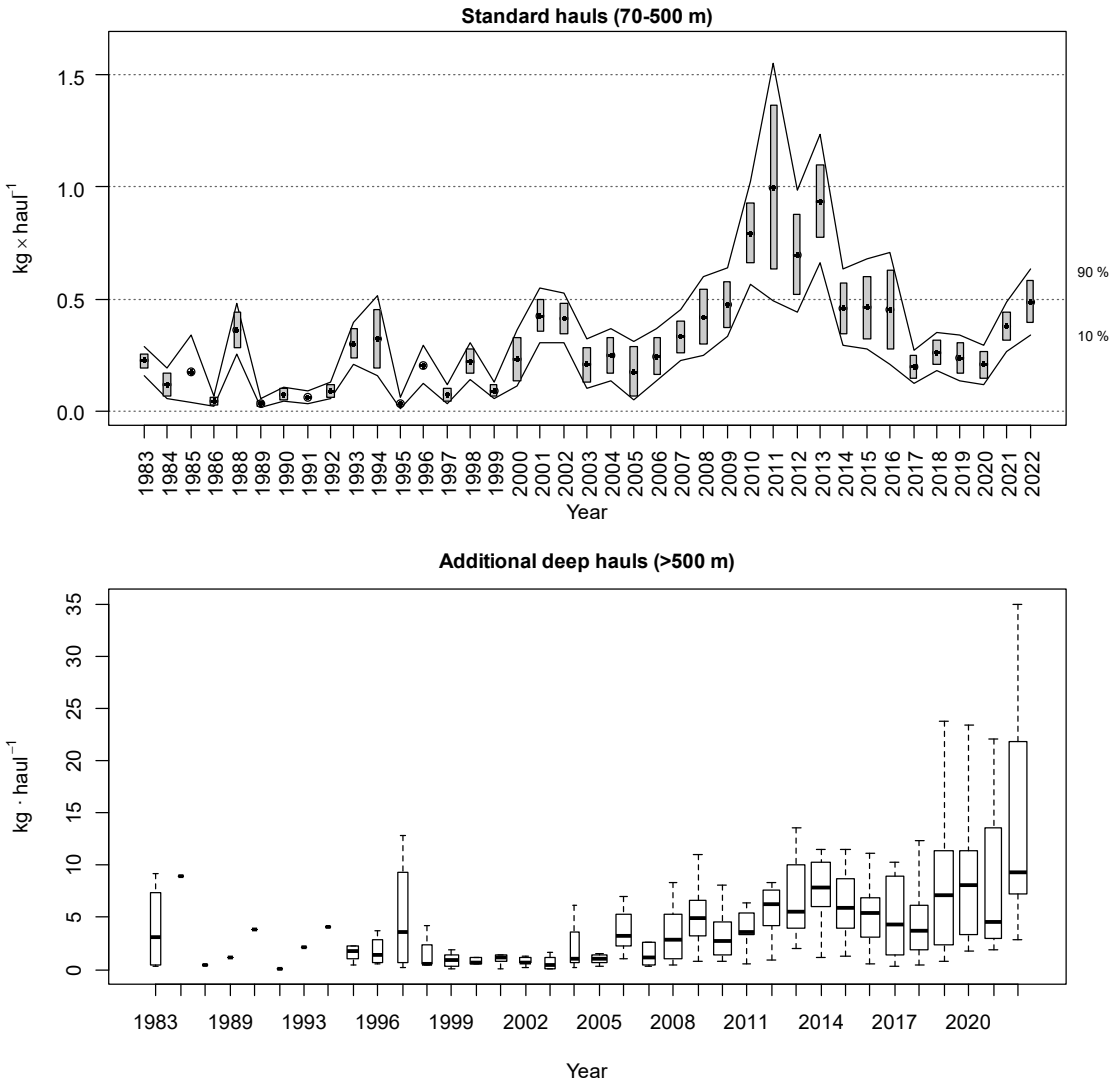

Figure 3 Evolution of *Phycis blennoides* stratified biomass index in standard hauls and additional deep hauls during the North Spanish shelf bottom trawl survey time series. For the standard hauls boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000). For the additional deep water hauls boxplots represent the median and interquartiles of the biomass catches in the deep hauls performed.

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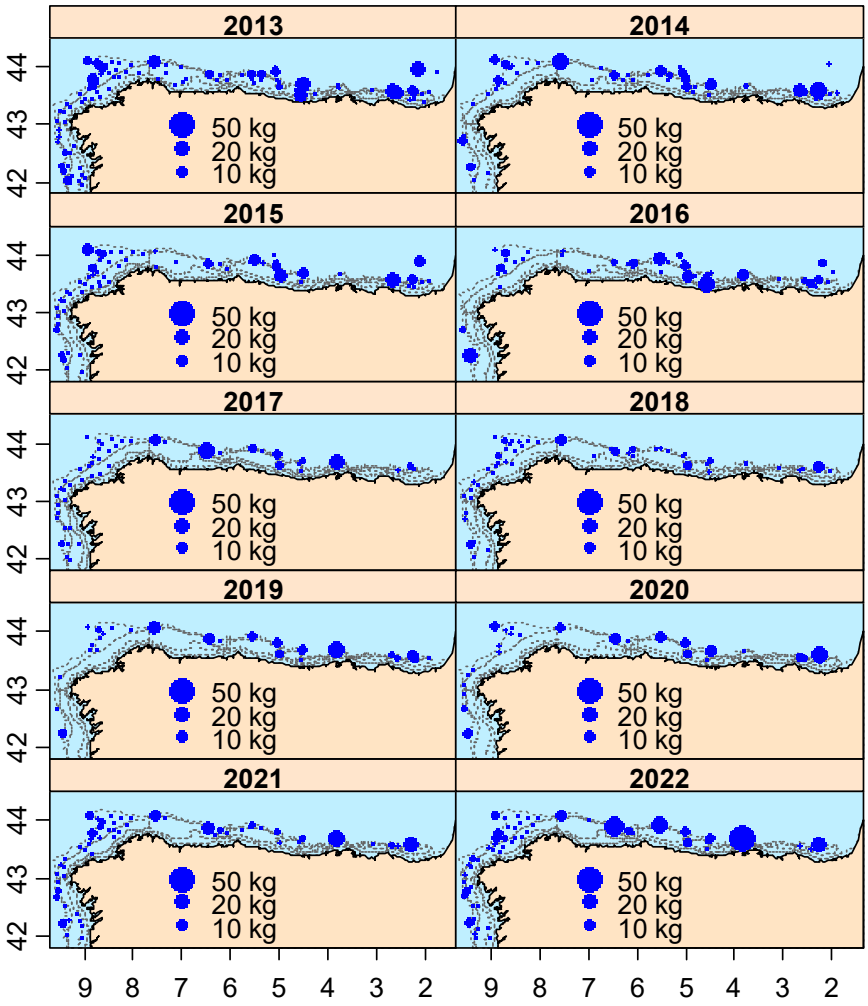

Figure 4 Geographic distribution of *Phycis blennoides* catches (kg·haul^{-1}) in the Northern Spanish Shelf bottom trawl surveys in the last decade

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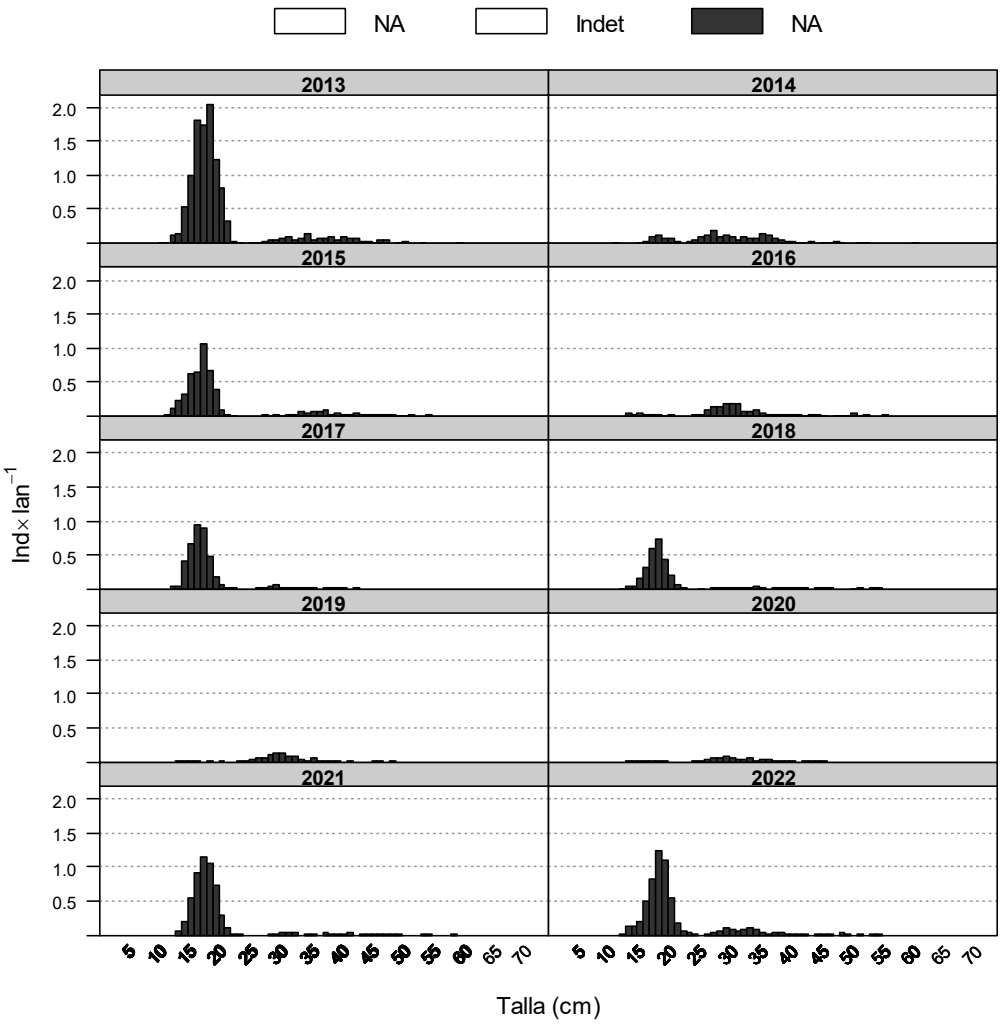

Figure 5 Mean stratified length distributions of *Phycis blennoides* in Northern Spanish Shelf surveys in the last decade

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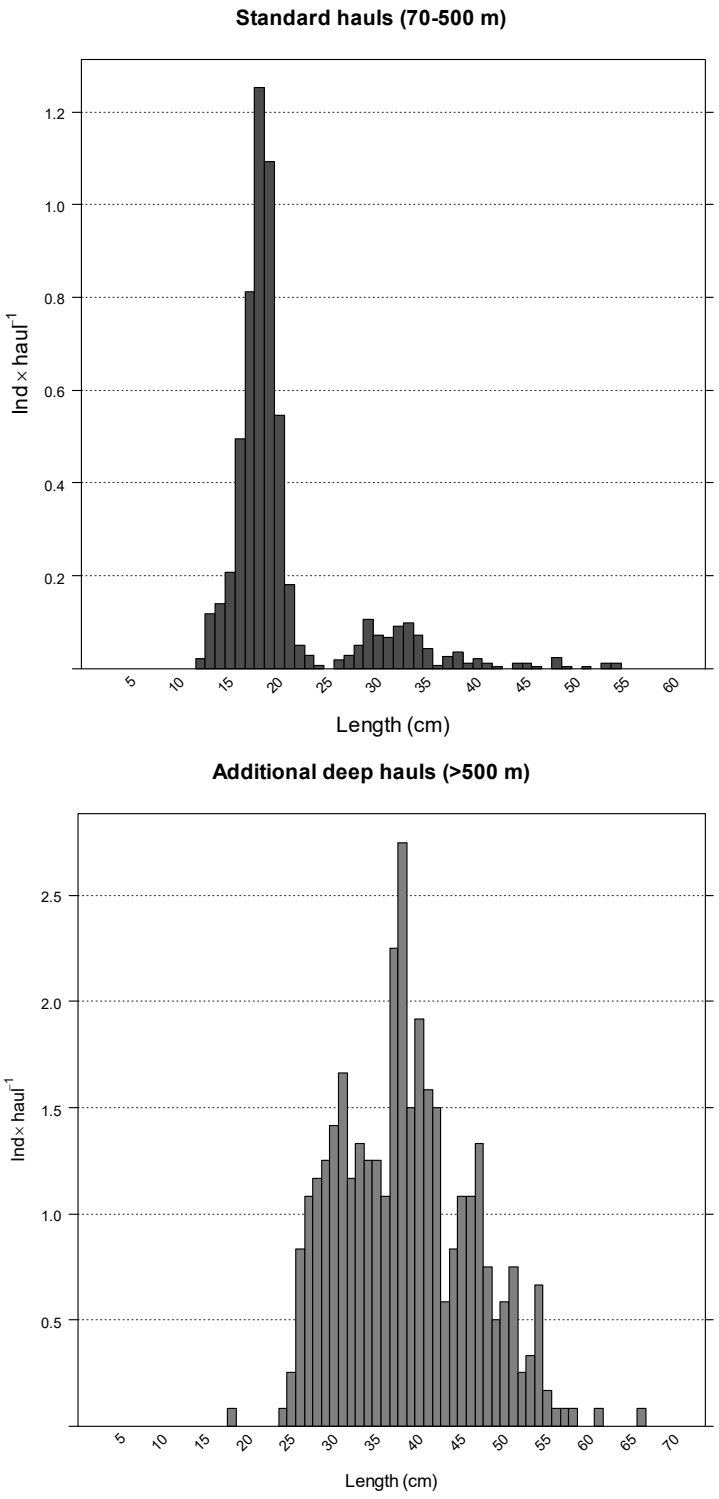

Figure 6 Mean length distributions of *Phycis blennoides* in additional hauls (>500 m) and in the standard hauls (70-500 m) in the North Spanish Shelf survey 2022

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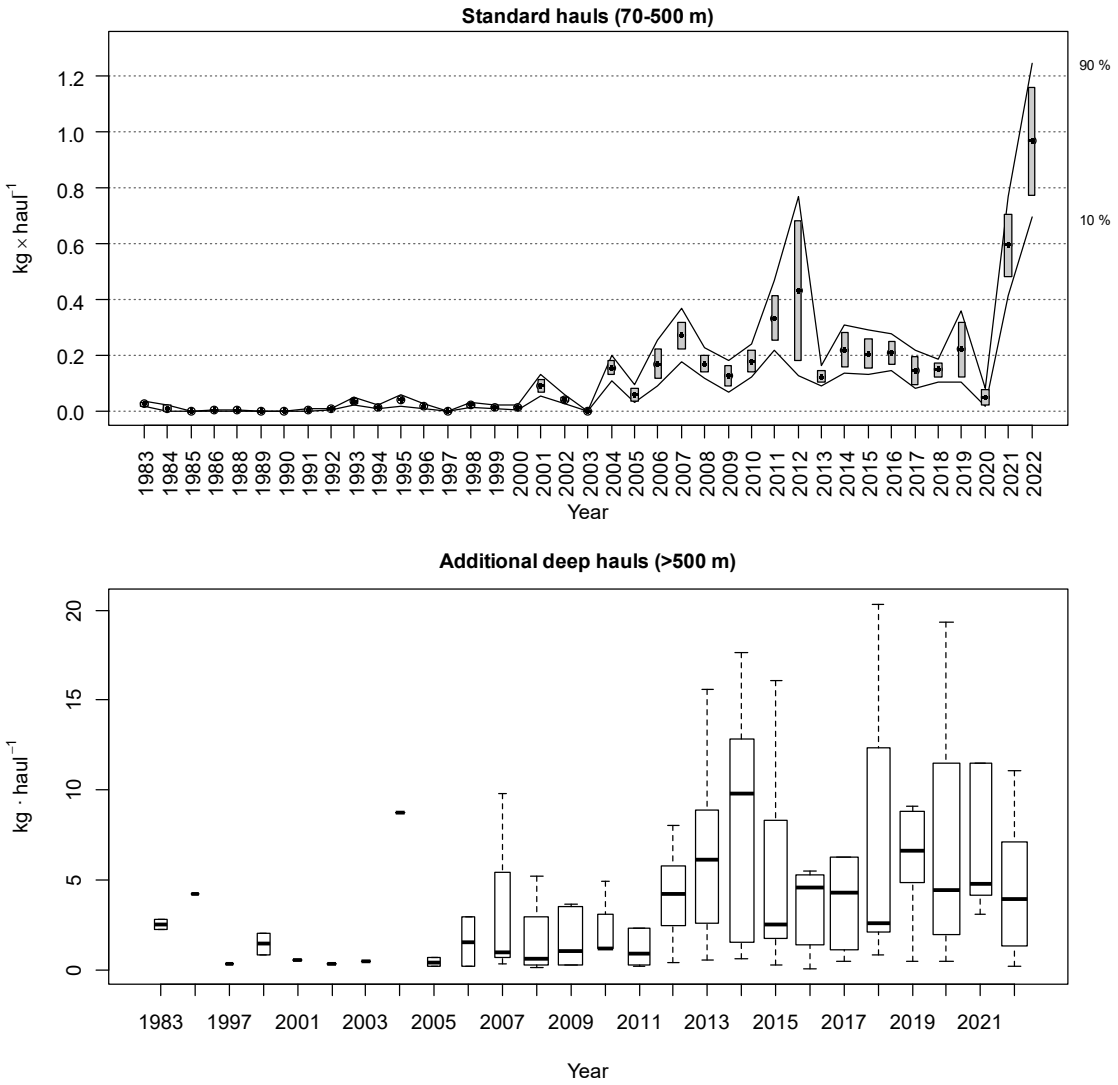

Figure 7 Evolution of *Molva macrophtalma* stratified biomass index in standard hauls and additional deep hauls during the North Spanish shelf bottom trawl survey time series. For the standard hauls boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000). For the additional deep water hauls boxplots represent the median and interquartiles of the biomass catches in the deep hauls performed.

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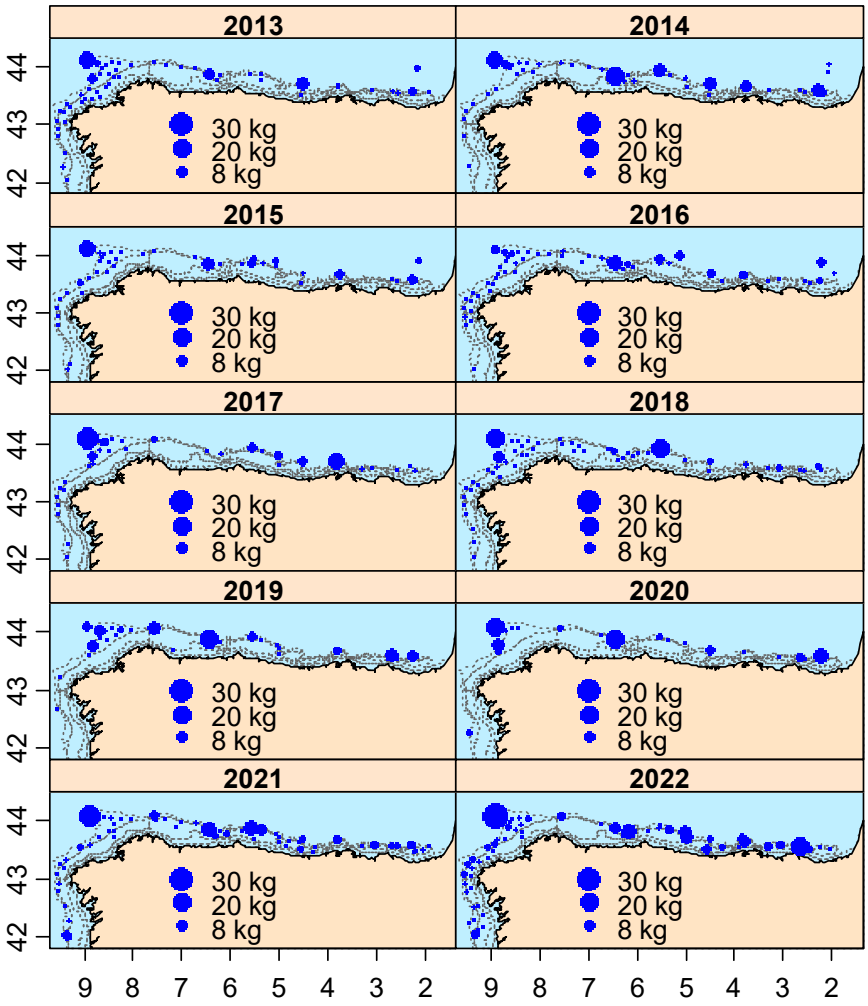

Figure 8 Geographic distribution of *Molva macrophtalma* catches (kg·haul^{-1}) in the Northern Spanish Shelf bottom trawl surveys in the last decade

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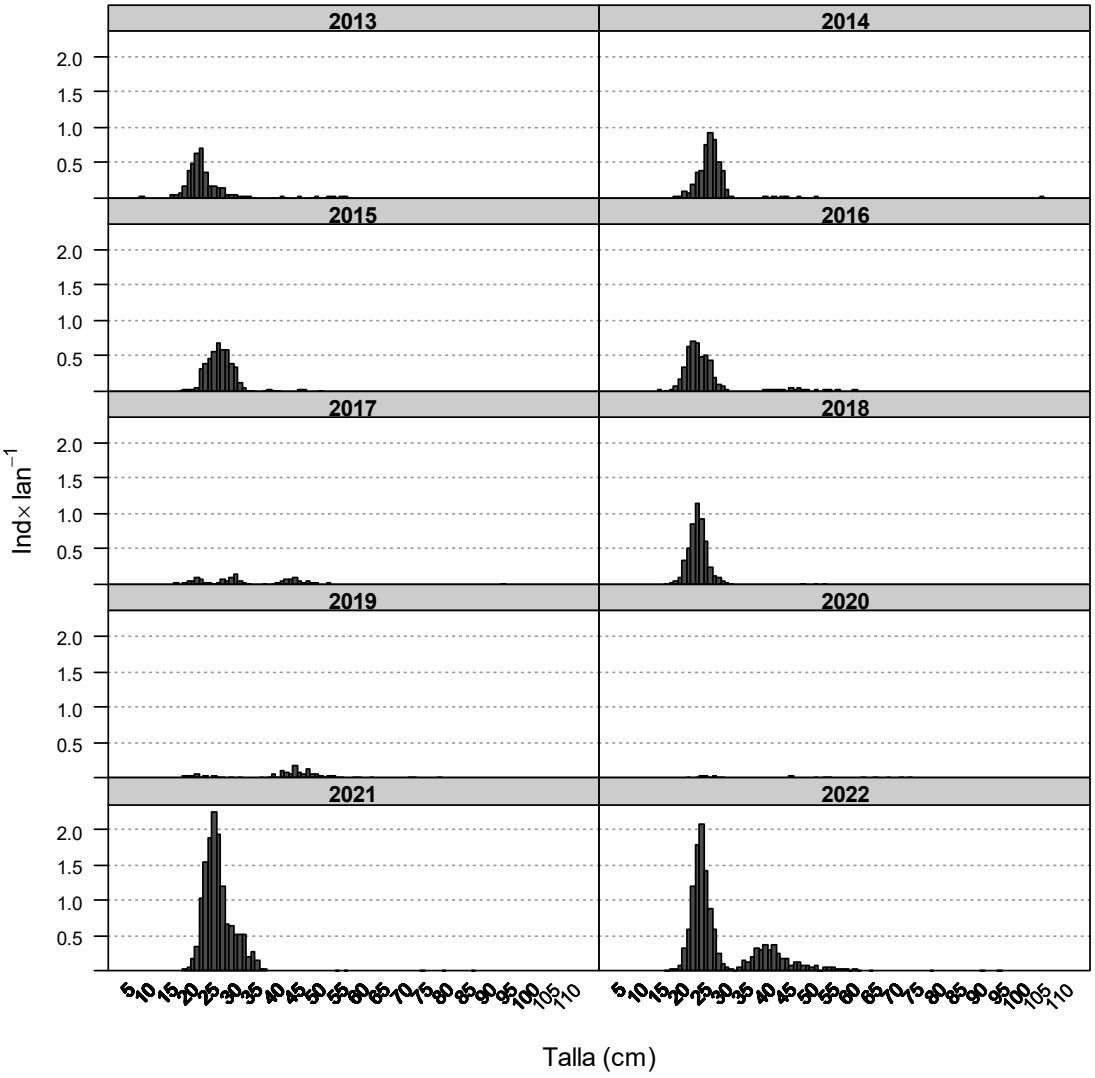

Figure 9 Mean stratified length distributions of *Molva macrophtalma* in Northern Spanish Shelf surveys in the last decade

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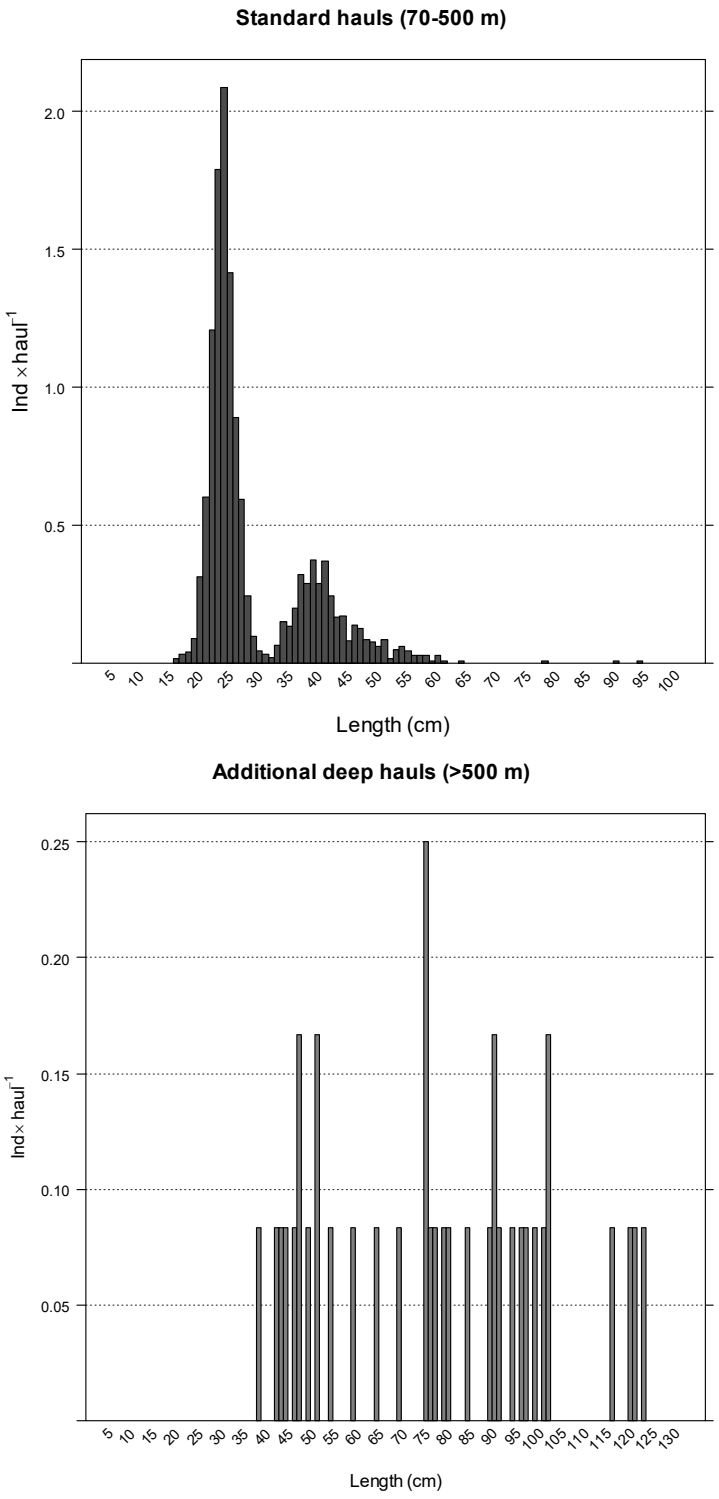

Figure 10 Mean length distributions of *Molva macrophtalma* in additional hauls (>500 m) and in the standard hauls (70-500 m) in the North Spanish Shelf survey 2022

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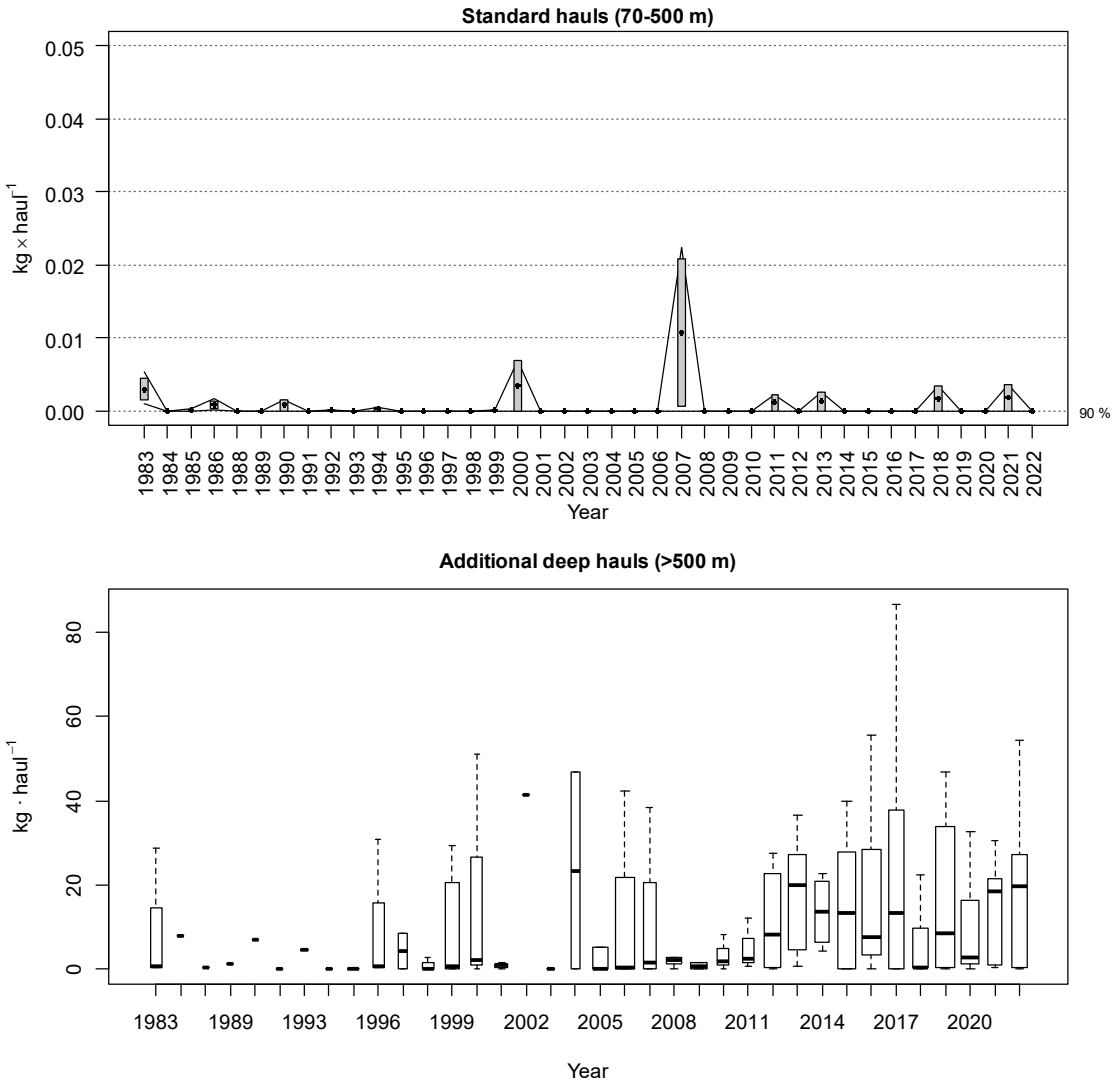

Figure 11 Evolution of *Trachyrincus scabrus* stratified biomass index in standard hauls and additional deep hauls during the North Spanish shelf bottom trawl survey time series. For the standard hauls boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000). For the additional deep water hauls boxplots represent the median and interquartiles of the biomass catches in the deep hauls performed.

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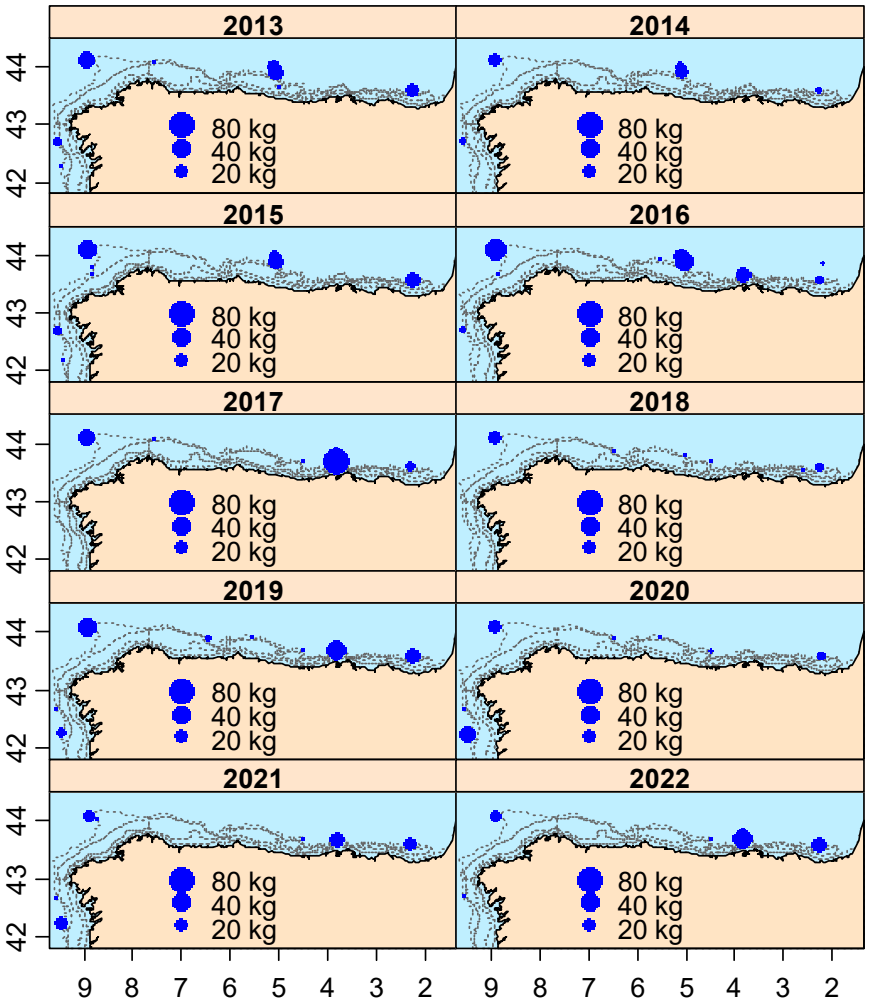

Figure 12 Geographic distribution of *Trachyrincus scabrus* catches (kg·haul^{-1}) in the Northern Spanish Shelf bottom trawl surveys in the last decade

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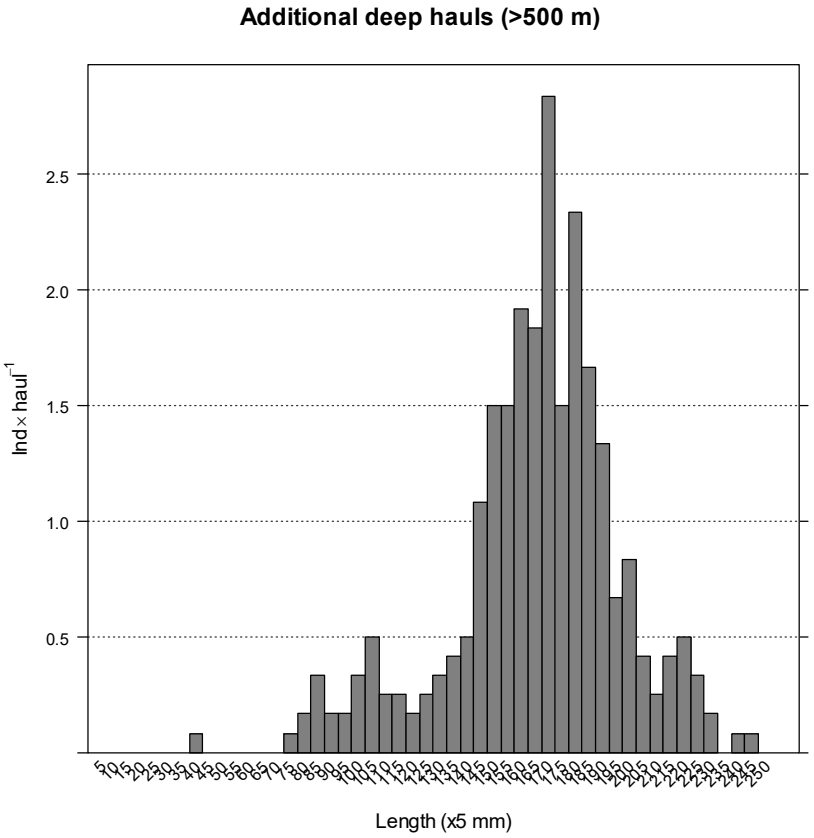

Figure 13 Mean length distributions of *Trachyrincus scabrus* in additional hauls (>500 m) in the North Spanish Shelf survey 2022

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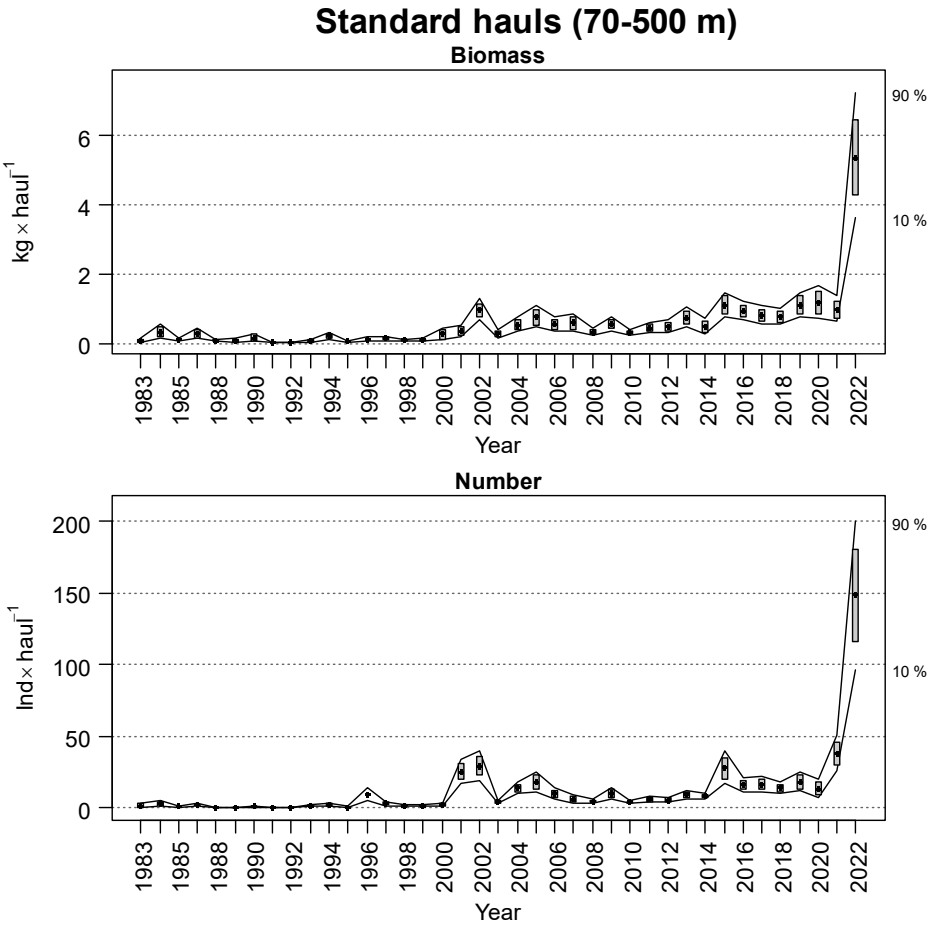

Figure 14 Evolution of *Helicolenus dactylopterus* mean stratified biomass and abundance in Northern Spanish Shelf surveys time series. Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

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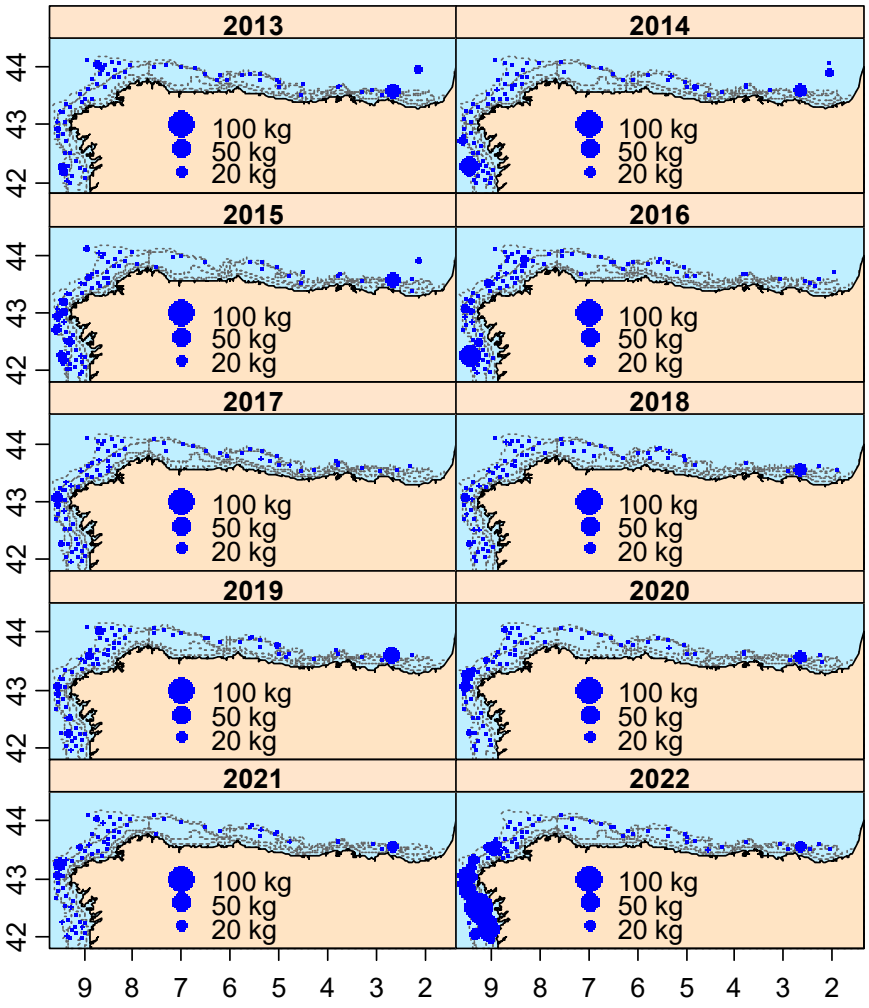

Figure 15 Geographic distribution of *Helicolenus dactylopterus* catches (kg·haul^{-1}) in the Northern Spanish Shelf bottom trawl surveys in the last decade

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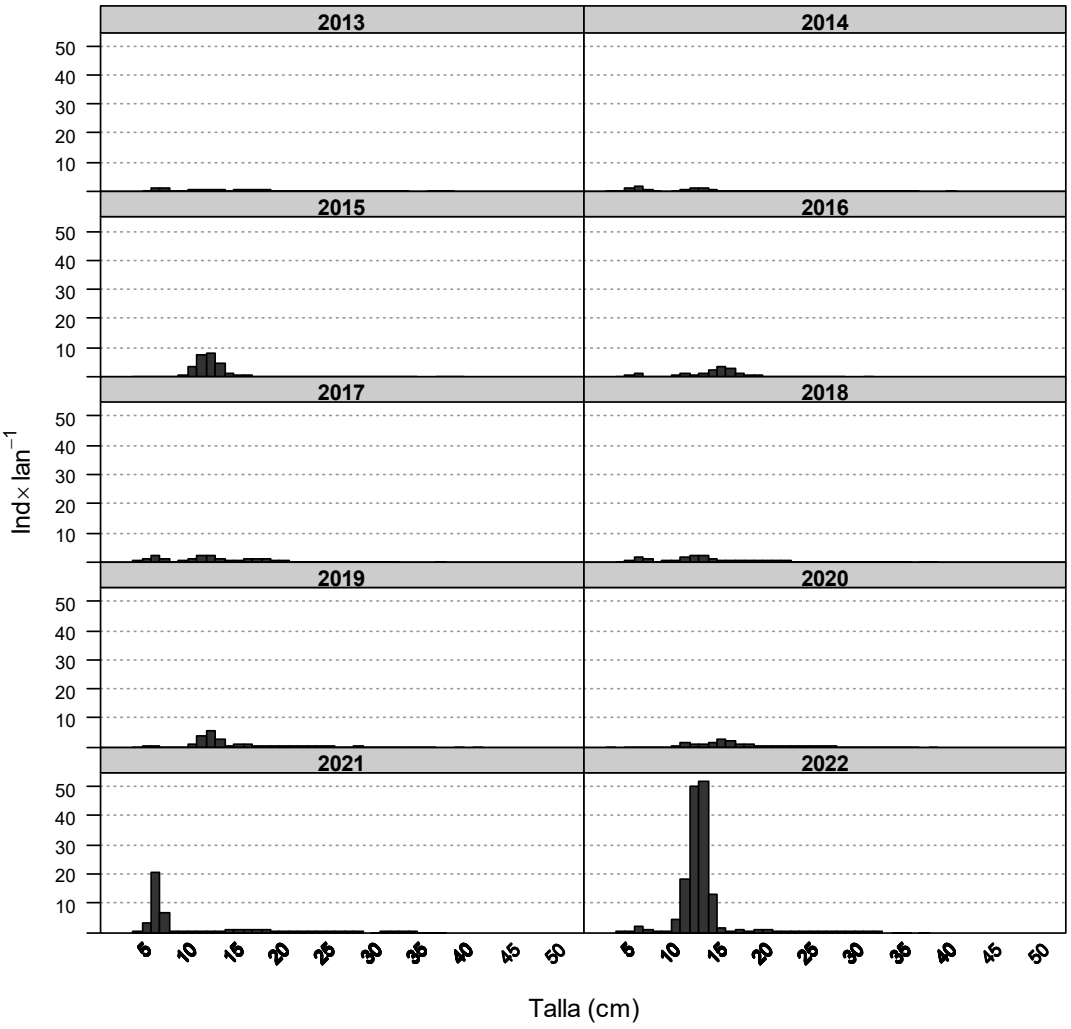

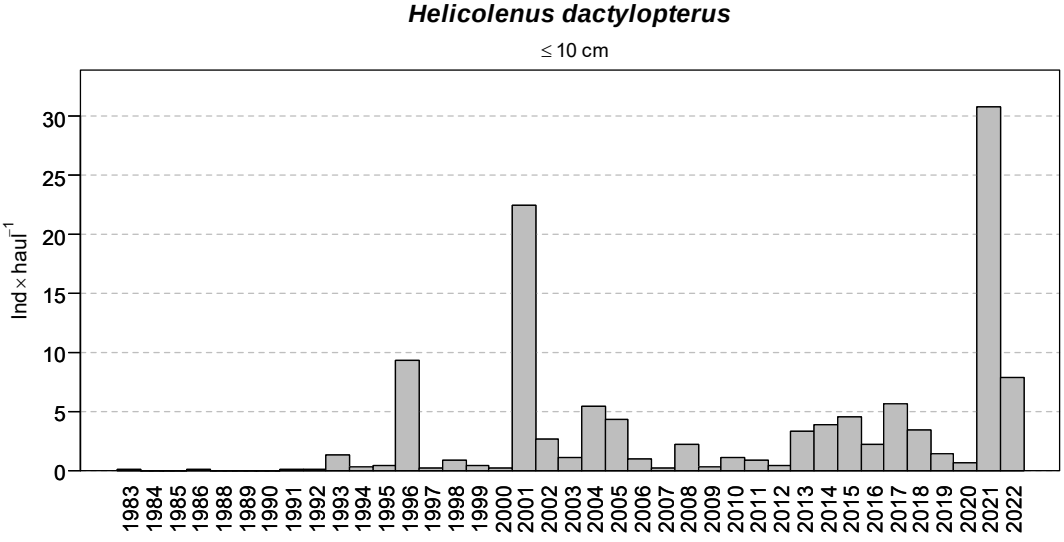

Figure 16 upper plot) Mean stratified length distribution of *Helicolenus dactylopterus* in Northern Spanish Shelf surveys during the last decade
lower plot) *H. dactylopterus* recruitment (< 10 cm) along the north Spanish shelf ground fish survey time series

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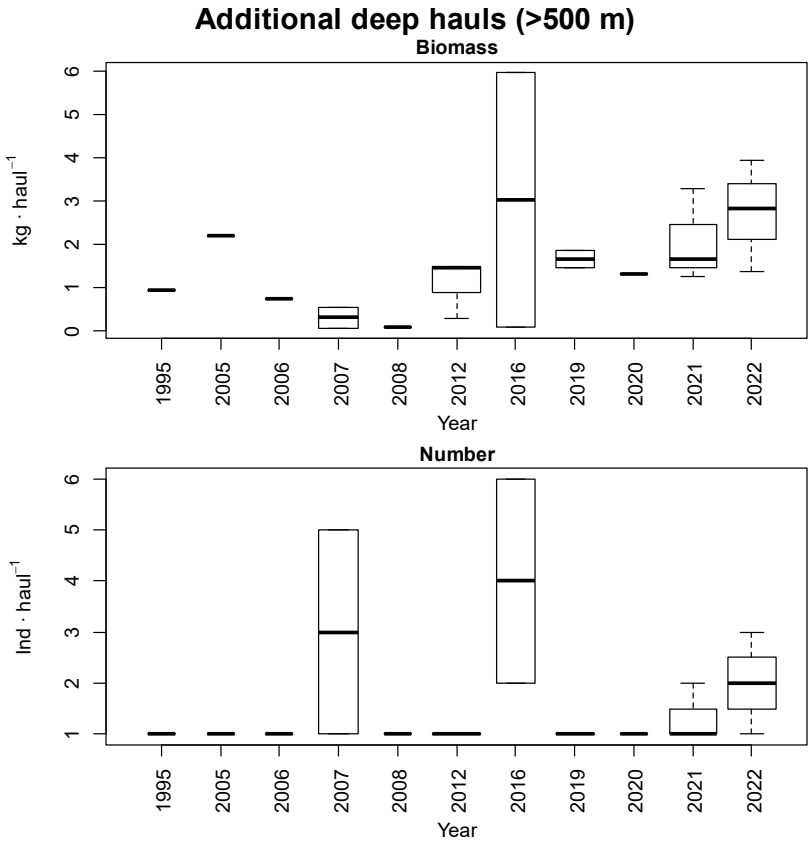

Figure 17 Evolution of *Aphanopus carbo* biomass and abundance in additional deep hauls during the North Spanish shelf bottom trawl survey time series. Boxplots represent the median and interquartiles of the biomass and abundance catches in the deep hauls performed.

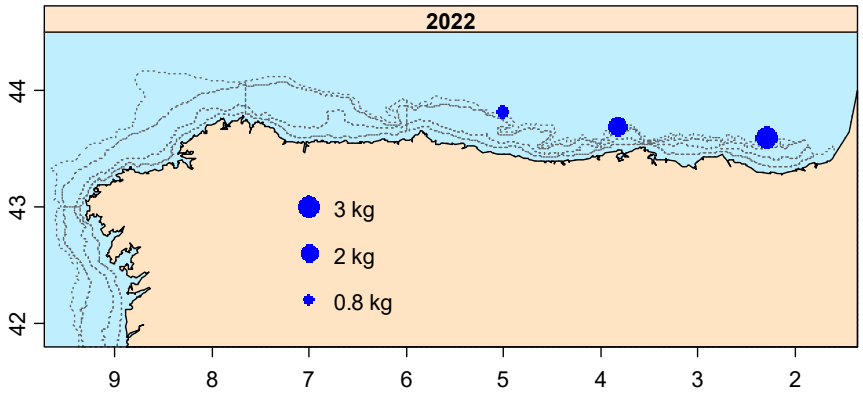

Figure 18 Geographic distribution of *Aphanopus carbo* catches (kg·haul^{-1}) in the Northern Spanish Shelf bottom trawl survey 2022

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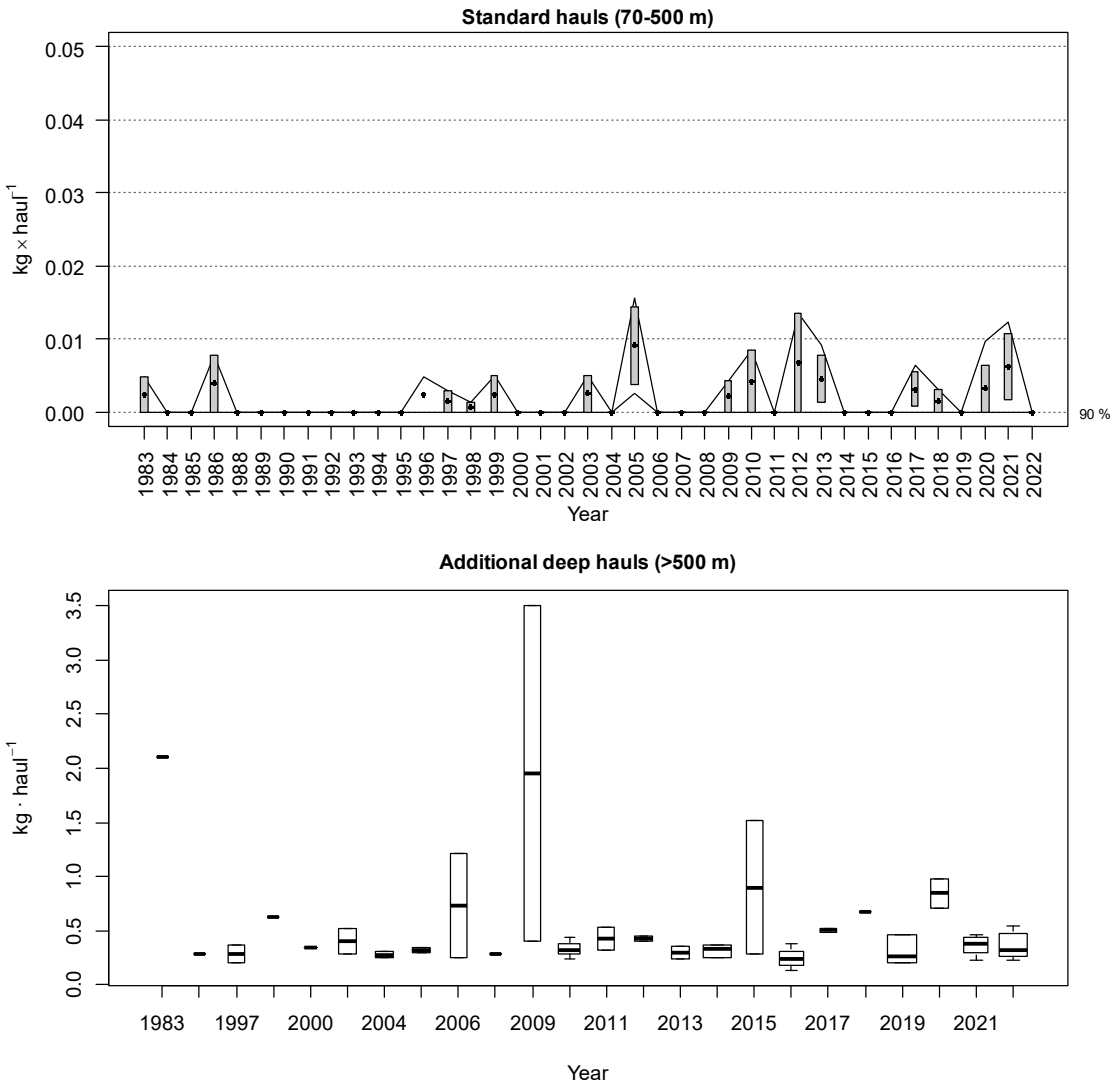

Figure 19 Evolution of *Beryx spp.* stratified biomass index in standard hauls and additional deep hauls during the North Spanish shelf bottom trawl survey time series. For the standard hauls boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000). For the additional deep water hauls boxplots represent the median and interquartiles of the biomass catches in the deep hauls performed.

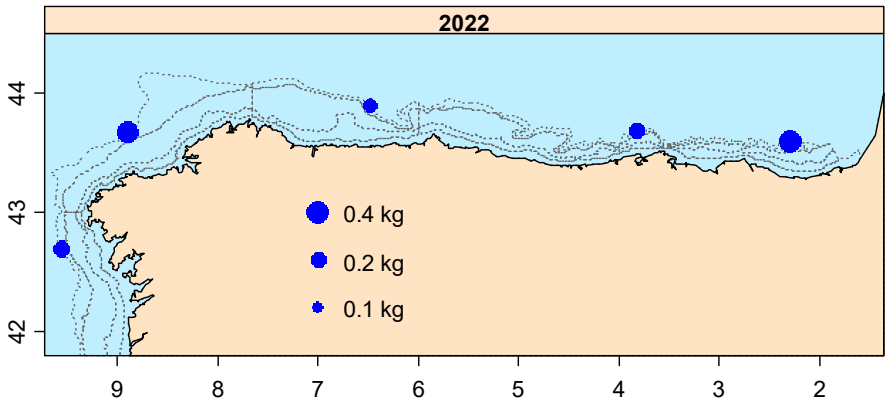

Figure 20 Geographic distribution of *Beryx* spp. catches (kg•haul-1) in the Northern Spanish Shelf bottom trawl survey 2022

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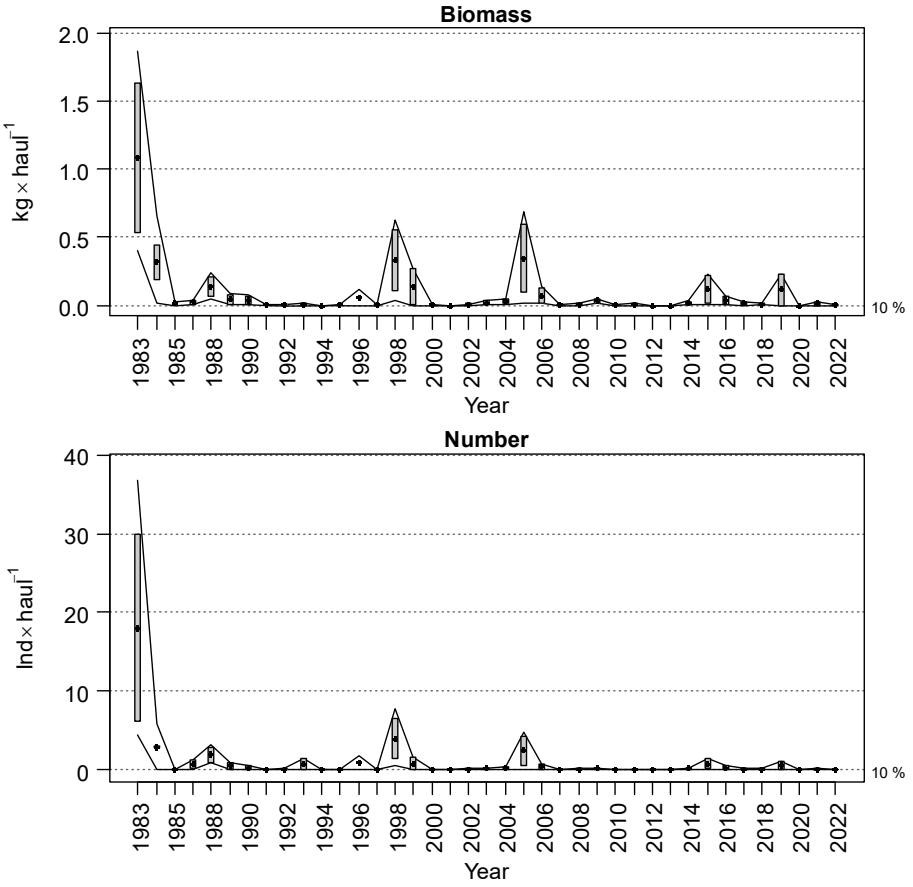

Figure 21 Evolution of *Pagellus bogaraveo* mean stratified biomass and abundance in Northern Spanish Shelf surveys time series. Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

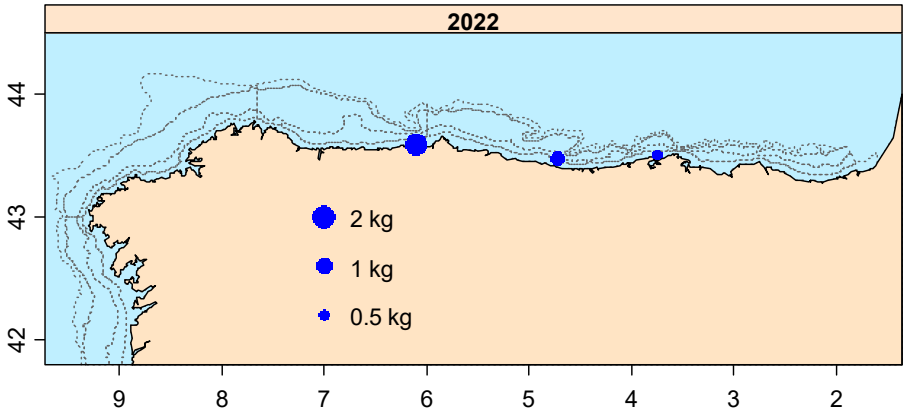

Figure 22 Geographic distribution of *Pagellus bogaraveo* catches (kg·haul^{-1}) in the Northern Spanish Shelf bottom trawl survey 2022

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