Nephrops biomass index estimation from GALNEP26_2021 Survey in FU26 (West Galicia, ICES Division 9a)

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ABSTRACT

Marin Fishing Industry (OPROMAR, Productores de Pesca Fresca del Puerto y la Ría de Marín) promoted a survey onboard a commercial vessel in order to estimate a *Nephrop*s biomass index in FU26 with an observer onboard and the supervision of IEO since 2019. GALNEP26_2021 survey was conducted from 19th to 28th July 2021, following a systematic sampling over a 5x5 nm grid. Area survey was established on the base on the VMS analysis together the bottoms trawl logbooks in the 2009-2017 period. Additionally, sediment composition (EDMOnet) was taken account and gravel and rocky bottoms were eliminated in the area delimited by VMS. Survey was carried out by a unique commercial vessel (27.9 m Length, 109.17 TRB, 430 hp & 70 mm mesh size). The main objectives of GALNEP26_2021 survey were to estimate: the *Nephrops* abundance index, the discard rate and the size composition for both sexes in this FU. *Nephrops* total catches were 78 kg, representing lower than 1% of the total retained catch. Discard rate was very low and it was considered negligible. Survey index was 0.95 Kg/h with 95% confident of 1.31. Hauls positive in *Nephrop*s were 18 of a total of 41 hauls carried out during the survey. Spatial analysis of the survey index shows *Nephrops* is concentrated in a small area on the Northwest half within the historical area distribution in FU26 although low *Nephrops* catches were obtained in the shallower and deeper part of the south of the area. The mean length was 35.0 mm CL for females and 41.9 mm CL for males. Sex-ratio was estimated in almost 50%.

1. INTRODUCTION

The *Nephrop*s stock from FU 26 extends along the Atlantic area off the northwestern Spanish coast, south of Cape Finisterre (Statistical rectangles 13-14 E0-E1) (Figura 1). This FU is assessed jointly FU 27 (North of Portugal) because prior to 1997 no distinction was made between these two FUs, and therefore they are considered together. FU26 is exploited by the Spanish fleet while FU27 is exploited in a minor proportion by the Spanish trawlers and the artisanal Portuguese fleet (creels). Landings in FU26 and FU27 have shown a progressive declining trend in the time series, from more than 800 t up to lower than 4 t in last year (ICES, 2022). Commercial LPUE also shows a decreasing trend indicating a very low biomass level.

Marín Fishing Industry (OPROMAR: Asociación de Productores de Pesca Fresca del Puerto y la Ría de Marín) together with DATAFISH company, requested the collaboration of IEO (Spanish Oceanographic Institute) to carry out a survey onboard a commercial vessel in order to estimate a *Nephrops* biomass index in FU26 in 2019. This is the third GALNEP26 survey.

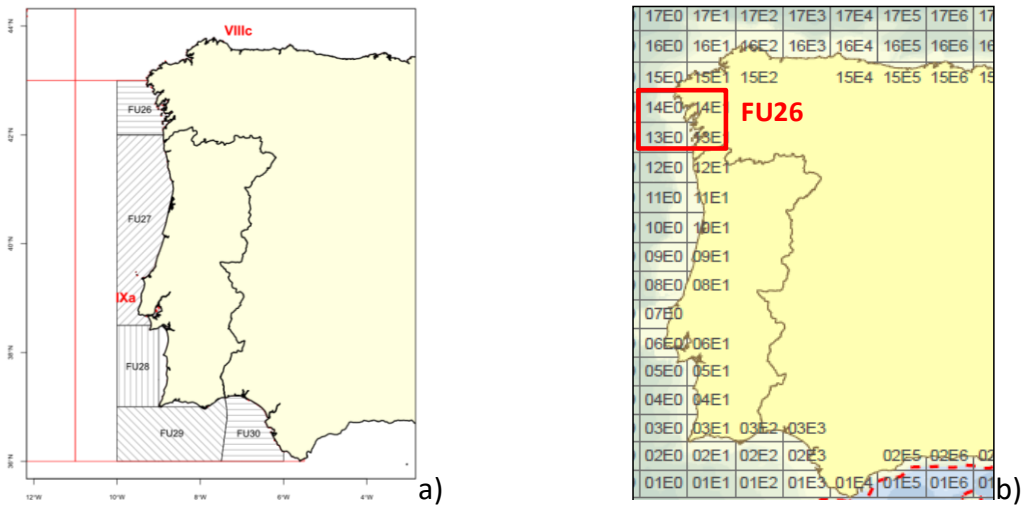


Figura 1. ICES Division 9a and Functional Units included in this division (a). FU 26 ICES statistical rectangles in red square (b).

2. OBJECTIVES

- To obtain a *Nephrops* biomass index in FU26 (West Galicia)
- To obtain the *Nephrops* discard rate
- To obtain the size composition by sex and proportion of males and females

3. METHODOLOGY

Survey area was established on the base on VMS (Vessels Monitoring Systems) and bottom trawl logbook analysis in the 2017-2019 period. Sediment composition was also used in order to eliminate rocky and gravel zones where it is not suitable to built burrows *Nephrops*. Figure 2 shows the area resulting and used in the GALNEP26 survey time series. It is covers 3 373 Km^2.

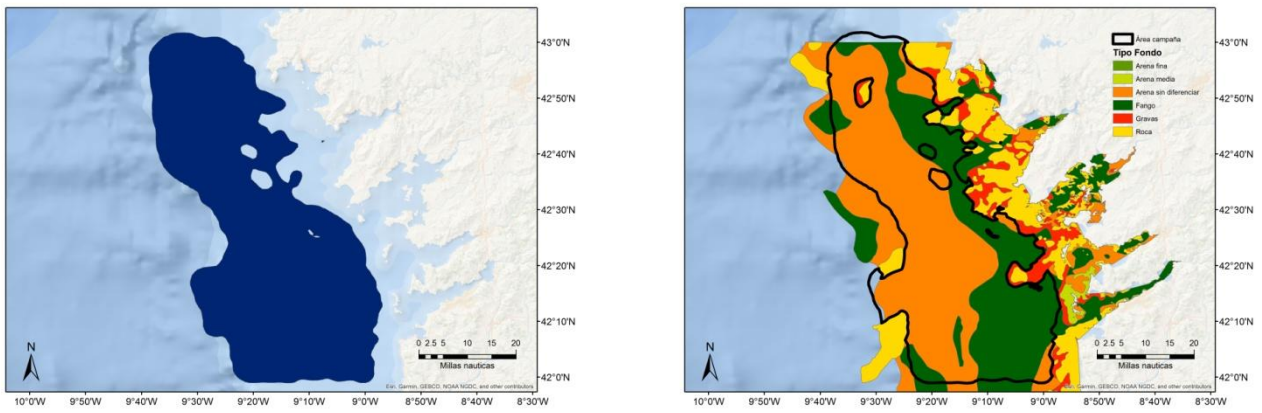


Figura 2. *Nephrops* area established from VMS and logbooks analysis (a). Sediment types and final *Nephrops* area, excluding rocks and gravels parts (b).

Survey design follows a systematic sampling, overlapping a 5x5 nm grid on the established *Nephrops* historical area distribution. A total of 43 hauls were planned (Figure 3). GANEP26_2021 survey was conducted from 19th to 28th July 2022, onboard "Ría de Marín" from the Marin port. Table 1 shows number of trips and number of hauls carried out during the survey. Hauls targeted to *Nephrops* were carried out during the day to avoid the diary effect of the *Nephrops* catchability (Aguzzi et al., 2003). Hauls depth ranged between 109 m to 473 m. Hauls take 2 hours but the effort unit used to calculate the index was one hour. Some hauls no planned were carried out but they did not taken into account for the estimation of the index.

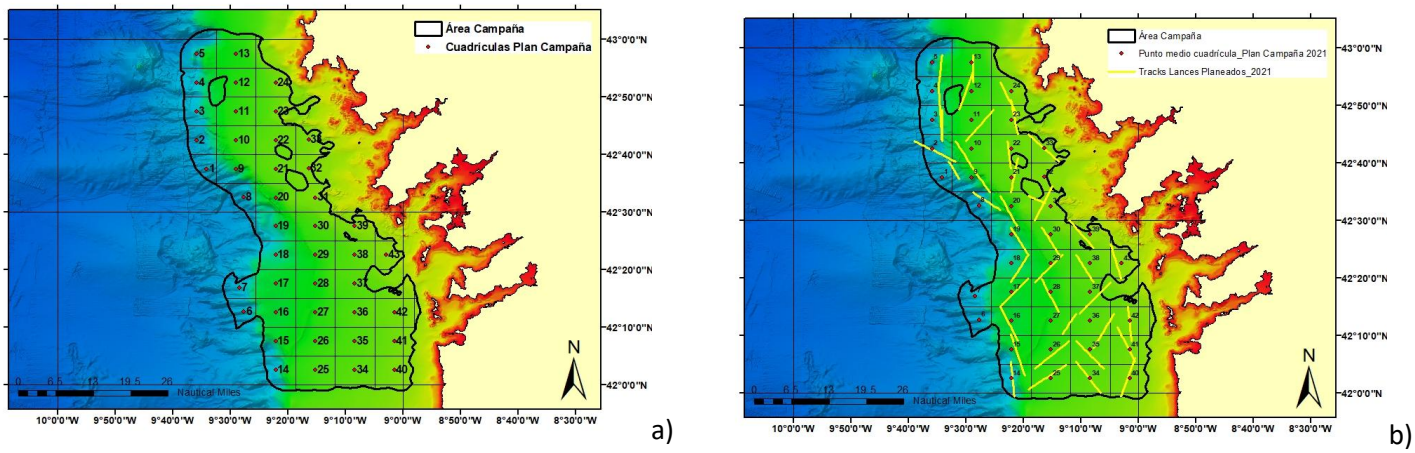


Figure 3. Survey area and planned hauls following a systematic sampling on a 5x5 grid (a). Tacks of planned hauls conducted during the survey.

Table 1. Hauls conducted during the survey by trip (planned and non planned).

TRIPS	FISHING DAYS	HAULS			
		NO PLANEADOS	PLANEADOS	NULOS	TOTAL
NEP2621001	1	0	5	0	5
NEP2621002	1	1	5	0	6
NEP2621003	1	1	5	0	6
NEP2621004	1	1	5	0	6
NEP2621005	1	1	4	0	5
NEP2621006	1	1	5	0	6
NEP2621007	1	1	5	0	6
NEP2621008	1	5	7	0	12
TOTAL	**8**	**8**	**11**	**41**	**0**	**52**

4. RESULTS

Total catch obtained from the 41 hauls carried out in the survey were 11 765 Kg with 14% corresponding to discards (573 Kg). The specific composition in the retained and discarded fraction is shown in Figure 4. The main species caught were hake (*Merluccius merluccius*) representing 32.73% of the total catch, followed to horse mackerel (*Scomber scombrus*) with 27.24% and four spot megrim (*Lepidorhombus boscii*) with 10.22%. The blue whiting (*Micromessitius poutassou*), small-spotted catshark (*Scyliorhinus canicula*) and hake are the most representative species in the discarded fraction, representing 27.12%, 18.18% and 13.81%, respectively.

In relation to the targeted specie, a total of 78 Kg of *Nephrops* were caught, representing less than 1% in the retained fraction (0.76%). *Nephrops* discard was considered negligible representing only 0.05% (0.77Kg). *Nephrops* was only caught in 18 hauls of 41 planned hauls.

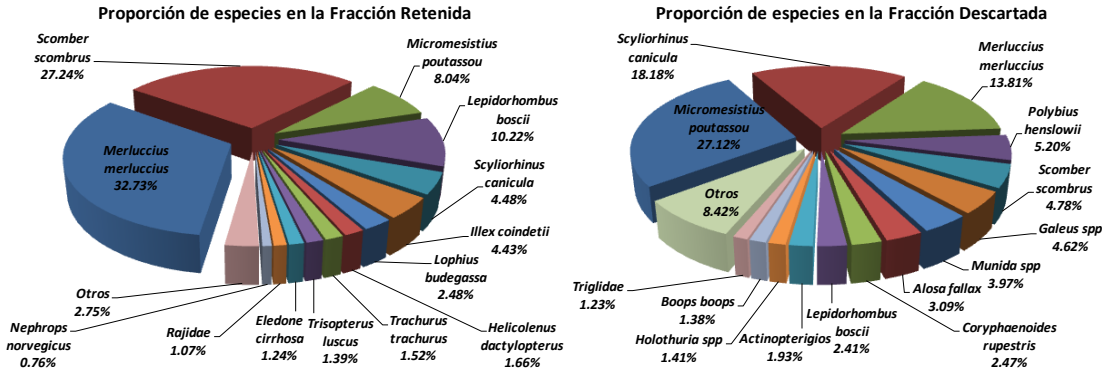


Figure 4. Specific composition in the retained and discarded fraction of the planned hauls during the survey.

Table 2 shows the *Nephrops* catch by haul and the proportion in the total catch of the haul, ranging to 21% and 0.1%. The specific composition of the retained fraction in hauls with more than 1% *Nephrops* caught is shown in Figure 5. The main species caught were blue whiting (8%-44%), broadtile shortfin squid *Illex coindettii* (14%-34%), four spot megrim (13%-15%) and blackbelly rosefish *Helycolenus dactylopterus* (12%-26%). The proportion of *Nephrops* is very low in cell 1 (2%) and 8 (3%) while hake (14%-71%), anglerfhish *Lophius budegasa* (16% in cell 1) or blue whiting (59% in cell 1). *Nephrops* discards was recorded only in 4 hauls with values lower than 1Kg in the case of the cell 3 (0.69 Kg; 12 individuals) and very low values in cell 13 (0.02 Kg; 1 individual), cell 22 (0.04 Kg; 2 individuals) y cell 24 (0.04 Kg; 2 individuals) (Table 2).

Table 2. Weight and number of individuals of *Nephrops* in retained and discarded fraction as well as the proportion of *Nephrops* in the catch in weight by haul.

GRIDNº	Trip Code	Haul Code	Retained weight (Kg)	Discarded weight (Kg)	Prpportion in Catch (%)	Retained individuals (Nº indv.)	Discarded Individuals (Nº indv.)
1	NEP2621005	3	4.24	0.00	3.55	66	0
2	NEP2621005	4	20.00	0.00	20.83	347	0
3	NEP2621008	11	0.00	0.69	0.29	0	12
4	NEP2621008	10	24.00	0.00	14.81	384	0
5	NEP2621008	9	24.00	0.00	20.17	342	0
8	NEP2621005	2	4.08	0.00	2.16	60	0
10	NEP2621005	5	0.10	0.00	0.05	4	0
13	NEP2621008	3	0.00	0.02	0.02	0	1
17	NEP2621003	3	0.05	0.00	0.01	1	0
18	NEP2621004	3	0.06	0.00	0.02	1	0
19	NEP2621004	2	0.04	0.00	0.01	3	0
20	NEP2621006	3	0.02	0.00	0.00	1	0
22	NEP2621007	5	0.00	0.04	0.01	0	2
24	NEP2621008	4	0.00	0.02	0.01	0	1
36	NEP2621002	6	0.26	0.00	0.16	2	0
39	NEP2621006	6	0.15	0.00	0.05	7	0
40	NEP2621001	4	0.22	0.00	0.06	1	0
41	NEP2621001	5	0.04	0.00	0.01	1	0

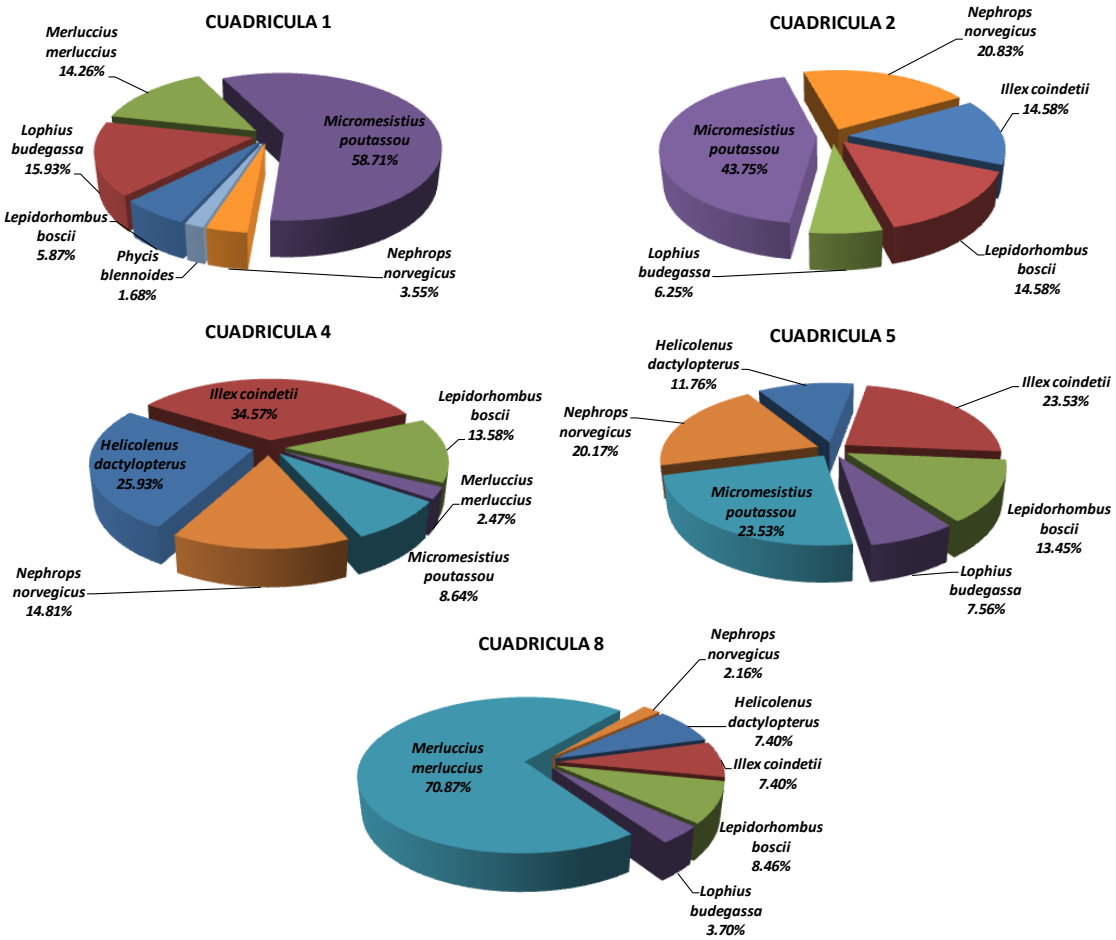
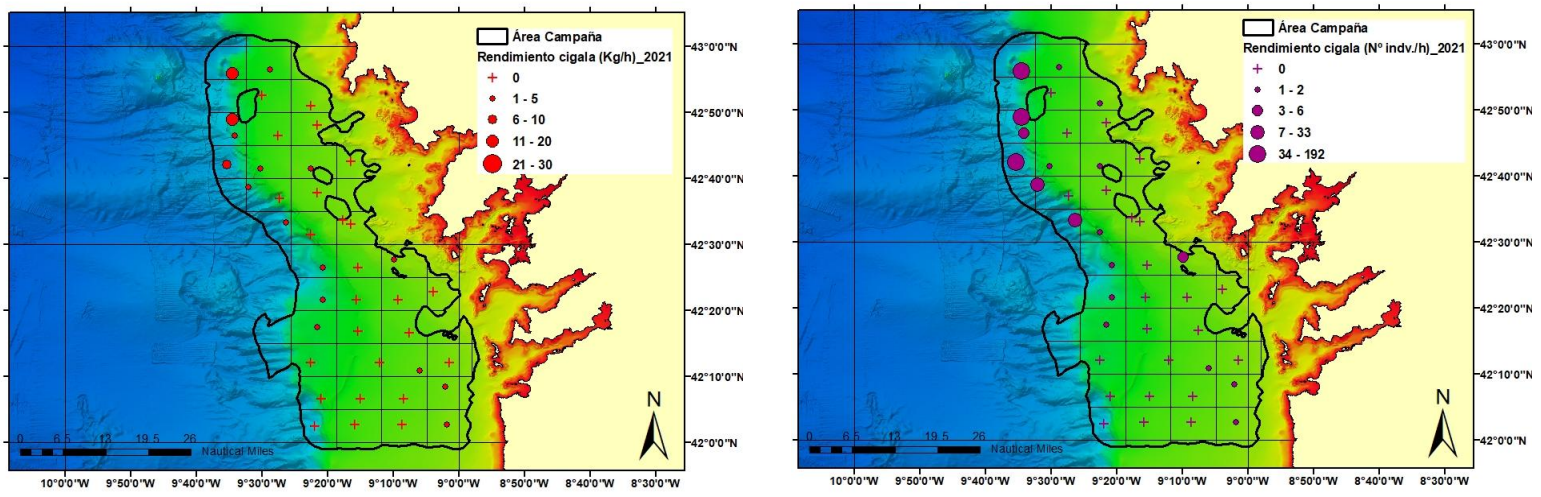


Figura 5. Specific composition in the retained fraction of the planned hauls with *Nephrops* catch representing more than 1% of the total haul.

The *Nephrops* survey index spatial distribution, expressed as weight and number by haul is shown in Figure 6. The survey index in weight ranged between 0 Kg/h and 12 Kg/h, while the index in number ranged between 0 Indv./h and 192 Indv./h (Table 3). The biomass index obtained for the total area was 0.95 Kg/h and 15.07 Indv./h with 95% confidence interval of 1.31 y 20.61, respectively (Table 3).

Tabla 3. Survey index in weight and number by haul with positive *Nephrops* catch.

Grid Nº	Trip Code	Haul Code	CPUE	
			Kg/h	Nº Indv./h
1	NEP2621005	3	2.12	33.00
2	NEP2621005	4	10.00	173.50
3	NEP2621008	11	0.34	6.00
4	NEP2621008	10	12.00	192.00
5	NEP2621008	9	12.00	171.00
8	NEP2621005	2	2.04	30.00
10	NEP2621005	5	0.05	2.00
13	NEP2621008	3	0.01	0.50
17	NEP2621003	3	0.02	0.50
18	NEP2621004	3	0.03	0.50
19	NEP2621004	2	0.02	1.50
20	NEP2621006	3	0.01	0.50
22	NEP2621007	5	0.02	1.00
24	NEP2621008	4	0.01	0.50
36	NEP2621002	6	0.13	1.00
39	NEP2621006	6	0.07	3.50
40	NEP2621001	4	0.11	0.49
41	NEP2621001	5	0.02	0.48
CPUE mean			**0.95**	**15.07**
IC (95%)			**1.31**	**20.61**



a) b)

Figura 6. Spatial distribution of survey index by haul, expressed as Kg/h (a) y Nº Indv./h (b). + symbol represents zero *Nephrops* catch in the haul.

The *Nephrops* length distribution for both sexes is shown in Figure 7. A total of 1236 individuals (501 females and 735 males) were caught in the whole planned hauls carried out and a total of 423 individuals were sampling (175 females and 248 males). The number of individuals by sex was raised to one hour of sweeps. The sex-ratio showed a higher proportion of males than females (59% and 41%, respectively).

The mean sizes for females ranged between 22 and 60 mm of carapace length (CL) while males achieved higher sizes (23-79 mm CL). The mean size for females and males was 35.0 mm ± 8.1 and 41.9 mm ± 13.3, respectively. The mean size for discarded *Nephrops* was similar in the case of the females and slightly lower in the case of the males (Table 5).

Tabla 5. *Nephrops* mean size and size range (mm carapace length) in the retained and discarded fraction.

	RETAINED		DISCARDED	
	Females	**Males**	**Females**	**Males**
Mean Size	35.0	41.9	36.7	38.4
s.d.	8.1	13.3	3.6	8.7
Minimum Size	22	23	31	27
Maximun Size	60	79	41	54
TOTAL Nº Indv./h	**248**	**362**	**3**	5

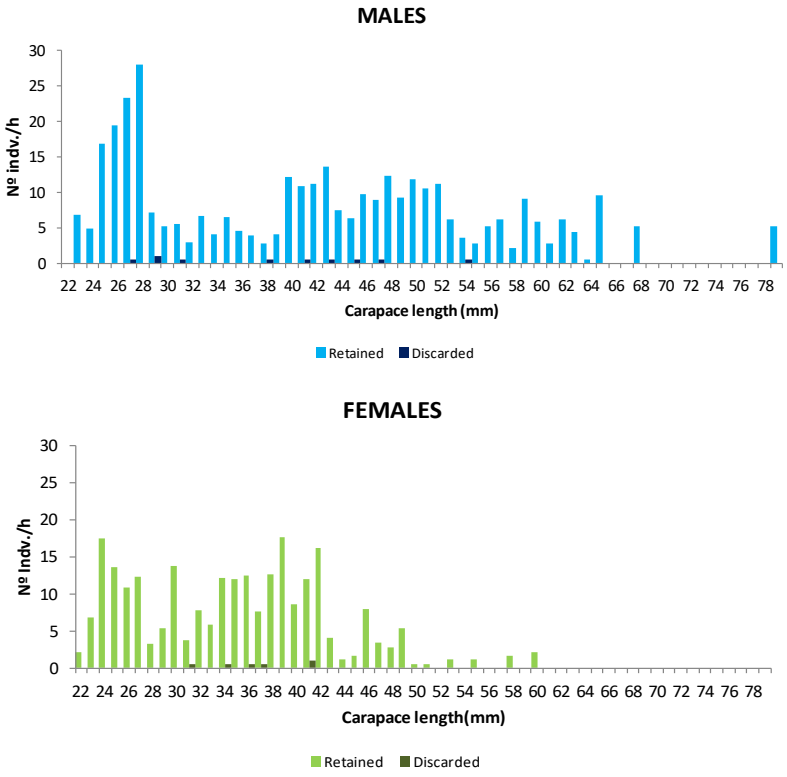


Figura 7. *Nephrops* length frequency distribution for both sexes.

5. GALNEP26 survey time series analysis

Table 6 and Figure 8 show survey index obtained in the GALNEP26 survey time series. *Nephrops* biomass decreased 48% in 2021 in relation to 2020. However, unlike previous years, the *Nephrops* spatial distribution has spread to the South of the survey area although *Nephrops* catches were very low.

The percentage of hauls positive in *Nephrops* was higher in 2021 in relation to the previous years (44% in 2021 againts 18% in 2019 and 2020). Nevertheless, the *Nephrops* abundance continue being low in FU26.

Table 6. Survey index, expressed as biomass and abundance , for the GALNEP26 time series and the 95% confidence interval.

Year	CPUE			
	Kg/h	IC (95%)	Nº Ind./h	IC (95%)
2019	0.74	0.58	11.4	1.07
2020	1.82	1.86	30.18	29.6
2021	0.95	1.31	15.07	20.61

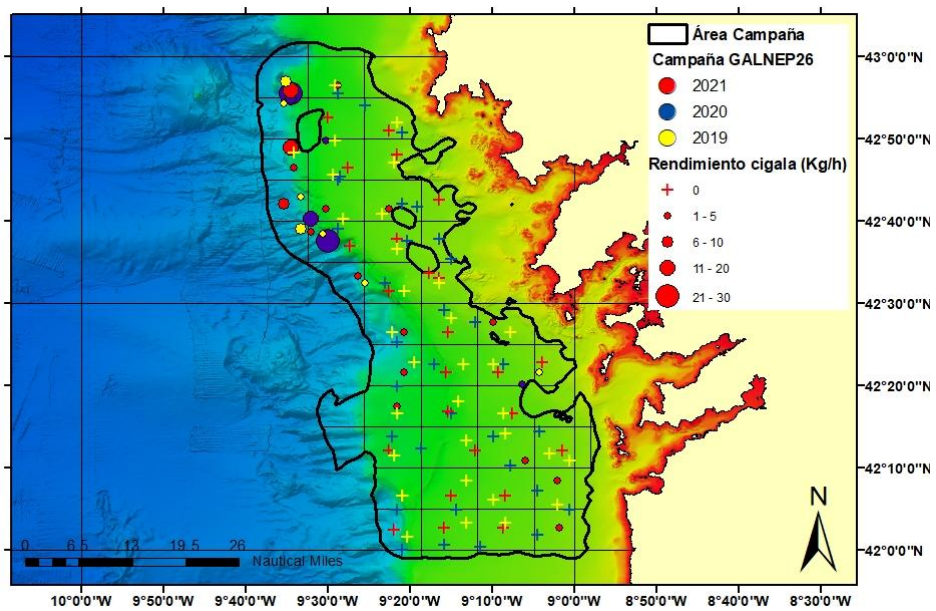


Figura 8. *Nephrops* biomass index (Kg/h) obtained in the GALNEP26 time series ((2019-2021). + symbol represents zero Nephrops in hauls.

6. REFERENCES

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