

12 Norway lobster in southern Bay of Biscay, northern Galicia, and Cantabrian Sea

nep.fu.25 and nep.fu.31 – *Nephrops norvegicus* in Division 8.c, Functional Units (FUs) 25 and 31

12.1 *Nephrops norvegicus* in FU 25 (North Galicia)

12.1.1 General

Up to this date, the status of the FU 25 *Nephrops* stock is considered undesirable (ICES, 2016) with extremely low biomass and zero catch advice has been issued since 2017 (ICES, 2017, 2022).

After the identification of the FU 25 *Nephrops* area using hauling data from the SPGFS-WIBTS-Q4 (G2784) survey (1983–2020), from the Discard Programme (observers on board in commercial fishery; 1994–2020) and from the Sentinel fishery observers programme (2017–2020), the area of FU 25 was adjusted, since 2021, including the ICES rectangles 15-16 E0-E1 and 17 E1.

After the WKMSYSPiCT benchmark (ICES, 2021b), FU 25 *Nephrops* stock was upgraded from category 3 (biomass trends-based assessment) to category 2.13 (data rich stock, but with an assessment/forecast that is accepted for trends only and with extremely low biomass with a zero catch advice).

12.1.1.1 Ecosystem aspects

See Stock Annex.

12.1.1.2 Fishery description

Nephrops is caught by the Spanish OTB_DEF_≥55, which is described as the “Northern trawl” fleet in section 2.1.2 of this report. See Stock Annex for more information.

12.1.1.3 Summary of ICES Advice for 2023 and management applicable to 2022 and 2023

ICES advice for 2023

Since 2021 advice for FU 25 is done based on SPiCT outputs (ICES, 2021a). ICES advises that when the MSY approach and precautionary considerations are applied, there should be zero catch in each of the years 2023, 2024 and 2025 for FU 25 *Nephrops* stock.

Management applicable to 2022 and 2023

Since 2011 there is a Spanish regulation that establishes an Individual Transferable Quota system (ITQs) which includes *Nephrops* (ARM/3158/2011, BOE, 2011).

In 2019, a zero TAC was set for *Nephrops* in ICES Division 8.c for 2020, 2021 and 2022.

The advice in 2021 was zero catch for 2022. .

Since 2022, the Total Allowable Catch (TAC) is set by Functional Unit. The TAC for 2022 was zero for FU 25. In 2022, the TAC set was zero for 2023, 2024 and 2025.

Special quotas of 4.3 t in 2017, 2.0 t in 2018, 2019, and 2020 and 1.7 t in 2021 and 2022 were set for *Nephrops* in FU 25 in order to conduct an observers on-board programme (*Nephrops* Sentinel fishery), supervised by the Spanish Oceanographic Institute (IEO) for obtaining a *Nephrops* abundance index and complementary data.

12.1.2 Data

12.1.2.1 Commercial catches and discards

Spanish landings are based on sales notes which are compiled and standardized by IEO. Since 2003, trips data from sales notes are also combined with their respective logbooks. Data are available by statistical rectangle since 2003 and by métier since 2008 (EC, 2008).

Nephrops landings were reported by Spain. The time-series of the commercial landings (Table 12.1.1 and Figure 12.1.1) shows a clear declining trend. From 1975 to 1978, landings were around 600 t. In the period 1979–1993, landings values fluctuated around 400 t. In the period 1993 to 1998, landings decreased by 62%. From 1998 to 2016 (the last year with non-zero *Nephrops* TAC), landings decreased from 103 to 13 t. In 2017, although the annual *Nephrops* TAC was zero, a special quota of 4.3 t was allowed for the FU 25 *Nephrops* Sentinel fishery (special onboard observers' programme in commercial fishing vessels to monitor the status of the stock in this FU). From 2018 to 2020, this special quota was 2 t each year and in 2021 and 2022 the Sentinel quota was 1.7 t per year. Details on the Sentinel fisheries were presented in working documents to WGBIE (Vila *et al.*, 2018; González Herraiz *et al.*, 2019; González Herraiz *et al.*, 2020). Since 2020, the Sentinel fishery was extended to all *Nephrops* areas of the FU in order to provide information representative of the whole FU and to collect spatial data to detect a possible stock area contraction (Figures 12.1.2b-e, 12.1.7).

Information on landings, discards and length distributions was uploaded to InterCatch. *Nephrops* discards were negligible in FU 25 but in 2022 there were 7 tons (80% of the catch). Estimates for 1994, 1997 and 1999 ranged from 0.4 to 2.4% of the catches by weight. However, as the *Nephrops* TAC is zero in this FU, discards were observed in 2018 (179 kg), 2019 (769 kg), 2020 (921 kg), 2021 (819 kg) and 2022 (6906 kg).

VMS information

VMS data since 2009 for the trawl fleet operating in FU 25 in 2009–2018 provided some information about the spatial distribution of *Nephrops* catches in this FU before the zero-TAC was implemented (2009–2016; Figures 12.1.2a-b) and during the zero-TAC years (2017–2022; Figures 12.1.2b-e). These data were collected from the whole trawl fleet (2009–2016 and “no sentinel” in 2017–2022) and for the two vessels engaged in the Sentinel fishery (2017–2022) (Figure 12.1.7). Logbook data were assigned to VMS pings by vessel, fishing day and statistical rectangle. About 22% of the VMS pings could not be identified in logbooks. Only 27% of the 2009–2016 VMS pings revealed the presence of *Nephrops*.

Nephrops presence/absence maps from the sentinel fishery are represented in Figure 12.1.2.b (2017 and 2018) and in Figure 12.1.2.c (2019, 2020 and 2021) and Figure 12.1.2.d (2022), considering all Sentinel surveys hauls (directed and not directed to *Nephrops*). These maps are compared with the maps showing the distribution of the rest of the commercial fishing fleet activity on the same years. Regular commercial fleet catch data are based on fishing days from logbooks since data by haul are only available for trips with observers on board.

Nephrops presence/absence maps by haul from the sentinel fishery in Figure 12.1.2.e (2017–2022) are represented only for the hauls directed to *Nephrops* (observers on board and VMS data). Some of the red points in the Sentinel maps in Figure 12.1.2.c are not represented in Figure 12.1.2.e because they correspond to non-directed hauls in Figure 12.2.c.

The maps for the years 2017, 2018, 2019, 2020, 2021 and 2022 (Figs. 12.1.2b-e) show that the area covered by FU 25 *Nephrops* Sentinel fishery in the first three years was very small, compared with the area of *Nephrops* commercial fishery in the past. It should be noted that this small area has a high occurrence of *Nephrops* (Figure 12.1.2a and Figure 12.1.2b, 2009–2016). Therefore, FU areas with low or no occurrence of *Nephrops* before the zero TAC implementation (Figure 12.1.2a and Figure 12.1.2b, 2009–2016) were not explored by the Sentinel fishery during the first three years (Figures 12.1.2b-d, 2017–2019).

The comparison of the *Nephrops* area in different years estimated with (i) the positions of the *Nephrops* positive hauls from the whole time-series (1977–2022) of the SPGFS-WIBTS-Q4 (G2784) survey and other surveys, (ii) the onboard observers' discard programme in the commercial fishery (1994–2022) and (iii) the Sentinel fisheries (2017–2022), suggests a contraction of the stock area since 1977 by around 71%.

12.1.2.2 Biological sampling

The biological sampling programme and the Sentinel fishery provided since 1982, the *Nephrops* length–frequency distributions (LFDs) by sex of landings and discards, sex ratio, recruitment proxies and mean sizes. The sampling levels in Division 8.c are shown in Table 1.4. SPGFS-WIBTS-Q4 (G2784) survey also provides LFDs by sex and, therefore, mean sizes and sex ratios since 1983.

Annual length compositions for males and females combined, mean size and mean weight in the landings time-series are presented in Table 12.1.2a and Table 12.1.2b for the period 1982–2022. LFDs are presented in Figure 12.1.3a (1982–1999), Figure 12.1.3b (2001–2016) and Figure 12.1.3c (2017–2022).

Mean sizes in landings (Figure 12.1.1) show an increasing trend in the time-series for both sexes. The maximum values were recorded in 2009. Low mean sizes observed in the years 1983–1986, 1991 and 2013 may suggest years with more recruitment (see also Figure 12.1.4b). Mean carapace length in the 2022 FU 25 *Nephrops* Sentinel catch was 44.7 and 42.0 mm CL for males and females, respectively.

Low quantities of males in a *Nephrops* stock could be related to a high fishing pressure since females are protected in burrows during most of the year (Fariña Pérez, 1996). In the worst cases, low quantities of males could affect mating (ICES, 2013), and consequently, recruitment in subsequent years. The percentage of males in landings in FU 25 from the commercial fleet from 1982 to 2016 has its minimum in 1990 and 2013 (blue line in Figure 12.1.4a).

Recruitment proxies estimated from the SPGFS-WIBTS-Q4 (G2784) survey and the fishery show a decreasing trend up to 2008 in the survey and up to 2011 in the fishery (Figure 12.1.4b).

12.1.2.3 Abundance index from survey

Table 12.1.3 and Figures 12.1.5 show two periods in FU 25 *Nephrops* CPUE (kg/haul) time-series and spatial distribution from SPGFS-WIBTS-Q4 (G2784) survey: the first period with high abundances before 1997 and the other with low abundance since then. Figure 12.1.6 show SPGFS-WIBTS-Q4 (G2784) *Nephrops* CPUE in kg/haul for the period 2019–2022. The high abundance index of 2022 (Table 12.1.3 and Figure 12.1.5) is due to one haul of 5 kg (214 individuals) of *Nephrops* of the SPGFS-WIBTS-Q4 (G2784) survey. The catch of that haul is the 94% of the total catch of the survey in FU 25 in 2022. SPGFS-WIBTS-Q4 (G2784) is a bottom trawl survey carried out every year in October to estimate hake recruitment and to collect information on the relative abundance of demersal species (see survey description in section 2.2.1 of this report referred as the Spanish IBTS survey in 3rd quarter). The survey haul positions are the same every year.

12.1.2.4 Commercial catch-effort data

Fishing effort (trips) and LPUE (kg/trip) data are available for the bottom trawl fleet selling in the port of A Coruña from 1975 to 2022 (Table 12.1.4 and Figure 12.1.1). Until 2008, the effort series was from the Northwestern Spanish OTB fleet (see “Northern trawl” in section 2.1.1) selling in A Coruña (SP-CORUTR8c). Since the implementation of the current Data Collection Framework (DCF) sampling program (EC, 2008) in 2009, the Northern trawl was categorized into two different *métiers*: OTB_DEF_>55_0_0 (“baca”, trips targeting demersal fish including *Nephrops*) and OTB_MPD_>55_0_0 (“jurelera”, trips targeting pelagic and demersal fish). Since then, only OTB_DEF_>55_0_0 (SP-LCGOTBDEF) data were used for 8.c *Nephrops* (Castro and Morlán, 2015).

The effort and LPUE time-series (Figure 12.1.1) show general decreasing trends.

In trips catching *Nephrops*, the CPUE (both in kg/haul and kg/hour) in rectangle 15E0 used to be half of the CPUE in rectangles 15E1 and 16E1 (source: logbooks 2006–2016).

In Portugal, CPUE of species with an affinity for temperate waters (in opposition to tropical waters) decreased from 1992 to 2009, especially in the case of long-living species such as *Nephrops* (Teixeira *et al.*, 2014). CPUE time-series of “temperate” species are directly correlated with rain and inversely with temperature (Teixeira *et al.*, 2014). This phenomenon may have occurred and could have affected FU 25 *Nephrops* from 1992 to 2009.

In 2017 the fishing industry presented in WGBIE (Fernández *et al.*, 2017 [WD 10]) FU 25 CPUE indices (kg/hour) for 2015 and 2016 estimated from catches and effort data of two trawl vessels (Table 12.1.5).

An observers’ program (FU 25 Sentinel survey) was authorized during August and September since 2017 in order to obtain a *Nephrops* abundance index (Vila *et al.*, 2018; González Herraiz *et al.*, 2019; González Herraiz, 2020).

In the period 2017–2019 the Sentinel Fishery was carried out in a small area of the FU 25 (Figures 12.1.2b–e). Since 2020, the Sentinel fishery is extended to all *Nephrops* areas of the FU in order to provide information that will be representative of the whole FU and collect spatial data relative to a possible stock area contraction (Figures 12.1.2a–e and Figure 12.1.7). The Sentinel fishery in 2021 and 2022 was carried out only in August. The *Nephrops* Sentinel fishery catch in 2022 was composed of 2163 kg. Data of Sentinel fishery were included in the Spanish data uploaded to InterCatch. The 2017–2022 Sentinel fisheries showed that *Nephrops* no longer occurs in a large part of the area where was previously available (Figures 12.1.7).

Table 12.1.6 shows the *Nephrops* abundance indices (CPUE in kg/hour) estimated for 2017–2022 (in 2017–2019 the area covered was smaller). If we take into account only the small area covered at the beginning of the Sentinels there are CPUE values around 5 kg/hour before 2019 and around 20 kg/hour since 2019. However, this information is not representative of the whole FU 25 (Figure 12.1.2e).

12.1.3 Assessment

2022 advice for FU 25 was zero catch in each of the years 2023, 2024 and 2025, so there is not necessary to carry out the assessment of the stock for 2024. The TAC for 2023 was zero tons. Stakeholder information

The fishing industry presented a WD to WGBIE in 2017 with qualitative and quantitative information about *Nephrops* fishery in FU25 (Fernández *et al.*, 2017). The WG considered that the LPUE data provided could be examined as an abundance index of *Nephrops* in a future benchmark as long as the data collection is continued and the time-series is extended to provide longer

historical information. Nevertheless relevant details on how these data were collected (e.g. area, months of the year, hour, etc.) were not provided to the WG.

In April 2020, WGBIE received a letter from stakeholders (two Spanish fishing producers' organizations, OPP no. 31 and 07) regarding *Nephrops* in ICES Division 8.c. The document analysed market and sales notes data and the fisheries management measures of the recent years regarding *Nephrops* in Division 8.c. This document was discussed in a subgroup meeting during the WG in 2020. Market and sales notes are part of the data used for the ICES assessment of this stock since the first assessment in 1977. Also fisheries management measures have been always taken into account in the assessment process. So, the sources of data and the issues mentioned in the document, together with additional sources of data and any other relevant information relative to the *Nephrops* stocks in 8.c, are taken into account by routine each year to make an integral analysis of the stock status and to elaborate a scientifically sound assessment in the WGBIE.

No further stakeholder information was presented to WGBIE since 2020.

12.1.4 Management considerations

Nephrops is taken mainly as a bycatch in the mixed bottom-trawl fishery (*métier* OTB_DEF≥55).

The overall trend in *Nephrops* landings from the North Galicia (FU 25) is strongly declining. Landings have dramatically decreased since the beginning of the series (1975–2016) representing, in 2016, 11% of the 1975 landings. During the period 2017–2021, the *Nephrops* TAC in division 8c was zero. In 2022 the TAC for FU 25 was zero.

A recovery plan for Southern hake and *Nephrops* stocks in the Cantabrian Sea and Western Iberian Peninsula was established in 2005 (EU, 2005) and repealed in 2019 (EU, 2019).

A Fishing Plan for the Northwest Cantabrian ground was established in 2011 (ARM/3158/2011, BOE, 2011). This new regulation established an Individual Transferable Quota system (ITQs) where *Nephrops* was included.

FU 25 was not included in the multiannual plan for stocks fished in the Western Waters in 2019 (EU, 2019).

An onboard observers' programme in FU 25 supervised by the Spanish Oceanographic Institute (IEO) to obtain a *Nephrops* abundance index ("Sentinel fishery") was carried out from 2017 to 2022 (Vila *et al.*, 2018; González Herraiz *et al.*, 2019; González Herraiz *et al.*, 2020). A special quota allowance for *Nephrops* in FU 25 was set by the EU for this Sentinel fishery (EU, 2022).

12.1.5 References

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12.1.6 Tables and figures

Table 12.1.1. *Nephrops* in FU 25, North Galicia. Catch, landings and discards in tonnes.

Year	Landings	Discards	Catch
1975	743		743
1976	578		578
1977	828		828
1978	706		706
1979	475		475
1980	532		532
1981	318		318
1982	431		431
1983	433		433
1984	515		515
1985	477		477
1986	398		398
1987	412		412
1988	445		445
1989	405		405
1990	335		335
1991	453		453
1992	428		428
1993	274		274
1994	246		246
1995	275		275
1996	209		209
1997	219		219
1998	103		103
1999	124		124
2000	81		81
2001	147		147
2002	143		143
2003	89		89
2004	75		75
2005	63		63
2006	62		62
2007	67		67
2008	39		39
2009	23		23
2010	34		34
2011	46		46
2012	13		13
2013	11		11
2014	10		10
2015	14		14
2016	13		13
2017	2*		2
2018	2*	0	2
2019	2*	1	3
2020	2*	1	3
2021	2*	1	3
2022	2*	7	9

(*) From 2017 to 2022 there was TAC for *Nephrops* Sentinel Fishery (4.3 t in 2017, 2 t each year in 2018-2020 and 1.7 t each year in 2021-2022).

Table 12.1.2a.*Nephrops* in FU 25, North Galicia. Length compositions of landings, mean weight (kg) and mean length (CL, mm) for the period of 1982–2001.

Carapace length (mm)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
15																				
16																				
17																				
18																				
19	1	8			6							5								
20	1	17		16	1				3			34			1			0		
21	7	31	10							1		49	1	0	2				0	
22	10	99	22	8	50	0						32	1	7	5	5		0		
23	41	144	20	68	68	6	4		6	15		15	10	6	6	7	1	1	0	10
24	53	351	150	198	136	38	1		10	20	13	80	10	19	29	16	2	5	2	
25	105	497	163	300	192	191	16		35	71	19	57	60	64	38	18	6	15	7	10
26	142	511	372	326	279	185	42	1	36	204	26	70	118	78	56	53	12	26	9	19
27	275	749	564	575	299	467	17	3	70	360	102	71	179	109	91	49	16	21	5	20
28	303	733	746	799	495	302	208	25	223	1039	332	105	281	214	179	186	47	67	32	79
29	382	762	1092	943	500	366	175	22	208	851	280	134	262	190	225	178	38	91	24	125
30	648	1070	1422	1253	471	506	537	91	332	1428	565	176	335	427	266	441	92	194	85	112
31	611	1006	1205	1215	603	447	505	103	394	1048	586	152	330	373	342	303	65	136	60	129
32	782	1011	1720	1045	780	619	614	267	640	1321	885	308	410	448	404	492	99	197	127	288
33	874	957	1439	817	812	527	908	397	654	947	833	472	471	436	454	387	69	100	95	319
34	906	783	1298	975	886	742	720	437	536	982	1117	533	507	483	520	695	152	300	219	302
35	927	778	1122	797	764	821	746	673	664	884	979	670	564	712	396	543	193	258	218	265
36	991	758	1057	823	682	946	821	446	673	710	811	549	547	483	360	500	139	241	158	243
37	728	611	700	637	695	846	991	665	534	739	925	563	462	465	341	323	192	208	144	285
38	582	668	496	484	601	453	800	816	513	642	658	546	454	462	329	407	178	211	113	238
39	553	514	392	593	341	491	439	467	377	405	529	362	330	317	257	299	123	138	82	192
40	480	439	481	494	416	478	583	513	416	450	518	336	301	511	233	326	203	202	134	212
41	368	349	351	307	329	284	462	547	364	280	366	230	178	240	166	141	101	110	64	115
42	347	286	448	230	251	226	674	404	281	296	387	243	222	302	145	166	106	106	73	150
43	250	194	203	301	283	312	314	449	292	231	297	175	113	220	122	98	81	58	30	103
44	193	124	220	239	108	286	236	301	216	146	215	173	99	117	82	57	65	61	48	98
45	238	126	223	104	102	125	220	255	188	170	138	158	99	143	74	84	82	72	40	68
46	111	87	105	223	64	302	123	225	111	109	138	124	52	74	55	31	35	42	20	35
47	100	56	86	65	80	137	104	168	93	97	104	43	38	56	55	37	41	23	10	22
48	81	44	197	85	31	108	107	175	84	79	35	69	25	30	37	26	31	26	17	24
49	48	23	97	52	42	93	44	97	43	32	45	23	29	12	21	16	16	16	11	18
50	48	17	61	48	25	41	30	77	31	34	31	25	18	16	21	28	28	41	13	18
51	32	16	70	41	17	9	23	53	26	10	16	17	8	8	12	3	5	6	8	16
52	16	6	4	4	20	19	20	44	28	9	33	26	11	6	6	5	9	9	8	10
53	12	9	7	34	8	21	5	44	21	13	14	20	10	6	11	4	4	4	2	15
54	9	6	27	33	8	1	7	28	10	4	5	2	7	4	7	3	3	5	5	4
55	8	6	27	7	4	3	5	14	11	1	12	10	7	3	5	5	3	7	7	7
56	3	3	27	5	0	10	3	10	3	3	2	2	4	2	3	0	2	4	2	5
57	4	1		6	0	7	4	9	6	3	0		5	1	2	1	0	2	3	0
58	1	3	1	0	11	8		5	1	3	0	0	2	1	5	0	1	2	4	1
59	3	2		2	1		10	2	2	1	0	0	1	1	5	0	1	0	0	1
60	2	2	1	1	0	3	2	9	1	0	1		0	1	3	1	1	0	2	1
61	0	2		1	0			4	2				1	1	2	0	0		2	
62	3	2		1	0			2		1	1		0	1	3	0	0	0	0	0
63	1	1		1		1		1	0	0	0		1	1	1	2	0		0	0
64	2	0		3	0	1	2	3	1				0	1	1	0	0		0	0
65	1	0		0	0	1	12	1	0	2	1		0	0	4				0	0
66	0	1		1	0			1					0	0		1	0		0	0
67	1	2		0				1	1	1			0	0	0	1	0		0	0
68	0	1		1			2	0	1				0	0	1	0	0		0	0
69	1	0		1			2	1	1				0		1	0	0		0	0
70	0	1		1				0	0	0					1	0	1		1	
71	1	1		0			2	1	1	0						0	0		0	
72	1	0			1		0					0			0	0	0		0	0
73	0	1		1				1		0			0		0				0	0
74	0	1		0	0			1		0			0	0	1	1	0		0	0
75	0	1		1					0	0			1		1		0		0	0
76	1	1		0									0		1	0	0			
77	0	0		0		1			0				1	0	0		0		0	
78	0	2		1				1		0			0	0	0		0			0
79	0	0		0									0		0					
80	1	0		0				0					0		0		0		0	
81																				
82																				
83																				
84																				
Total number (thousand)	11289	13872	16626	14167	10463	10431	10542	7858	8147	13641	11017	6661	6567	7054	5388	5939	2243	3004	1888	3562
Total weight (tonnes)	431	433	515	477	364	412	445	405	335	453	428	274	246	275	209	219	103	124	81	147
Mean weight (kg)	0.038	0.031	0.031	0.034	0.035	0.039	0.042	0.052	0.041	0.033	0.039	0.041	0.037	0.039	0.039	0.037	0.046	0.041	0.043	0.041
Mean length (CL, mm)	35.5	33.0	34.0	33.9	34.4	35.8	36.8	39.4	36.6	33.9	35.9	36.4	35.3	35.8	35.5	35.3	37.8	36.5	36.9	36.5

Table 12.1.2b. *Nephrops* in FU 25, North Galicia. Length compositions of landings, mean weight (kg) and mean length (CL, mm) for the period 2002–2021. *Nephrops* TAC in FU 25 was zero in the period 2017–2022, but there was a TAC for *Nephrops* Sentinel Fishery, 4.3 t in 2017, 2 t each year in 2018–2020 and 1.7 t each year in 2021–2022. Length distributions from FU 25 *Nephrops* Sentinel fishery used for those years with TAC zero.

Carapace length (mm)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017*	2018*	2019*	2020*	2021*	2022*
15												7									
16																					
17																					
18																					
19																					
20						0		0	0				0								
21		1	0		0	0		0	0				0	0							0
22				1	0	1		0	0				9	0			0				
23	2	0	1	1	1	1		0	0												
24	2	1	2	2	1	1	0	0	0												0
25	2	0	7	5	2	1	1	0	0				9	1	2		0	0			0
26	5	2	7	8	3	5	1	0	0				9	0	1		0	0	0	0	0
27	14	3	12	13	9	4	3	0	2	0			0	1	1	0	0	0	0	0	0
28	30	2	26	25	15	8	4		2	1	5		10	1	3	0	0	0	0	0	0
29	43	5	28	25	18	11	6	0	2	2	3		2	1	2	2	0	0	0	0	0
30	105	14	46	43	25	19	10	1	9	2	5		13	3	18	6	0	0	0	0	0
31	102	26	45	56	39	36	10	1	9	3	7		2	2	11	5	0	0	0	0	2
32	198	36	60	66	55	44	15	1	18	4	8		3	2	14	8	1	0	1	1	0
33	181	51	71	87	69	69	13	3	20	5	8		5	5	25	12	1	0	2	1	0
34	272	66	70	83	62	75	16	4	27	14	5		6	8	26	16	2	1	2	1	0
35	308	85	91	98	85	90	25	6	34	26	11		20	13	47	31	2	1	3	2	0
36	259	110	98	102	88	101	31	7	30	22	9		9	17	26	26	3	2	4	2	1
37	236	123	101	88	87	105	37	10	34	24	13		10	13	22	23	3	3	5	3	1
38	185	147	98	92	80	101	35	11	26	67	9		7	14	22	33	3	3	5	3	1
39	129	130	81	69	67	86	37	11	23	48	3		16	12	12	20	3	2	4	3	1
40	186	129	96	81	64	90	47	13	20	82	20		12	14	16	30	3	2	4	3	2
41	99	81	78	61	59	73	44	13	23	65	9		8	10	11	16	3	2	3	3	2
42	117	79	63	52	49	63	38	12	23	53	9		6	9	12	10	3	3	3	3	2
43	67	65	57	47	44	59	35	13	24	55	3		16	9	10	10	2	2	2	2	3
44	109	52	39	36	32	46	29	16	22	36	8		7	8	10	6	2	2	2	2	6
45	78	46	44	34	30	42	23	15	21	25	7		8	5	6	6	1	1	1	2	3
46	65	57	35	26	26	37	22	12	22	18	3		8	6	5	3	1	1	1	1	9
47	34	42	26	20	18	30	20	15	22	14	2		2	4	5	3	1	1	1	1	7
48	35	37	23	14	17	22	16	10	17	16	1		5	2	3	2	1	1	1	1	2
49	23	27	16	13	11	16	14	9	14	18	4		3	2	3	2	1	1	0	1	2
50	24	27	19	11	14	18	10	8	13	13	1		2	2	2	2	0	0	0	1	4
51	34	20	13	7	9	11	11	7	11	7	3		2	2	2	1	0	0	0	1	5
52	18	16	12	8	8	8	9	7	8	8	1		2	1	2	1	0	1	0	0	3
53	13	11	9	6	7	7	8	8	9	5	3		2	2	2	1	0	0	0	0	3
54	4	9	7	5	4	4	6	6	7	7	1		2	1	1	1	0	0	0	0	6
55	9	6	6	5	4	3	6	6	7	6	3		1	1	1	1	0	0	0	0	3
56	6	5	5	3	9	3	4	4	4	5	1		1	1	1	1	0	0	0	0	3
57	5	7	4	3	4	2	5	4	5	4	1		1	0	0	0	0	0	0	0	3
58	9	4	4	3	2	2	4	4	3	5	1		1	1	0	0	0	0	0	0	1
59	4	5	3	2	1	1	3	3	2	1	0		1	0	0	0	0	0	0	0	2
60	2	2	2	1	1	2	3	3	3	4	0		0	0	0	0	0	0	0	0	0
61	1	1	3	1	1	1	2	2	1	3	3		0		0	0	0	0	0	0	1
62	3	3	2	1	7	1	1	2	1	6	1		1	0	0	0	0	0	0	0	1
63	10	0	2	1	1	1	1	2	1	2	1		0	0	0	0	0	0	0	0	0
64	0	1	2	1	6	0	1	1	0	2	0		0	0	0	0	0	0	0	0	0
65	4	1	2	1	1	0	1	1	1	1	1		0		0	0	0	0	0	0	0
66	1	2	1	1	0	0	1	1	1	1	0		0	0	0	0	0	0	0	0	0
67	2	1	1	1	1	0	1	1	1	0	2		0		0	0	0	0	0	0	1
68	0	1	1	1	0	0	1	1	1	1	2		0	0	0	0	0	0	0	0	0
69	0	2	1	1	0	0	1	1	0	0	0		0		0	0	0	0	0	0	0
70	2	1	1	1	0	0	0	1	0	1	0		0		0	0	0	0	0	0	0
71	0	1	2	0	6	0	0	1	0	0	0		0		0	0	0	0	0	0	0
72	0	1	1	0	6	0	0	1	0	1	0		0		0	0	0	0	0	0	0
73	0	1	1	1	0	0	0	1	0	1	0		0		0	0	0	0	0	0	0
74	1	0	1	0	0	0	0	0	0	1	0		0		0	0	0	0	0	0	0
75	0	1	0	0	0	0	0	0	0	0	0		0		0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0	0	0	0
77		0	0	0	0	0		0	0	0	0				0		0				0
78	0	0	0	0	0	0	0		0	0	0		0				0				0
79			0	0				0	0	0	0						0				0
80	0				0		0	0	0		0										0
81								0	0												
82								0													
83																					
84								0													
Total number (thousand)	3043	1543	1425	1314	1147	1298	612	258	528	686	175	229	175	327	280	38	32	47	37	24	90
Total weight (tonnes)	143	89	75	63	62	67	39	23	34	46	10	11	10	14	13	2	2	2	2	2	7
Mean weight (kg)	0.047	0.058	0.052	0.048	0.054	0.051	0.064	0.089	0.065	0.067	0.057	0.048	0.057	0.043	0.046	0.054	0.063	0.041	0.055	0.071	0.077
Mean length (CL, mm)	37.8	40.6	39.0	37.9	39.6	40	42.2	46.9	42.2	42.6	40.0	41.0	39.9	37.2	38.2	40.1	41.5	39.6	40.5	43.8	47.8

Carapace length (mm)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017*	2018*	2019*	2020*	2021*
15												7								
16																				
17																				
18																				
19								0	0											
20						0		0	0			0								
21	1	0		0		0		0	0			0	0							
22			1	1	0	1		0	1			9	0			0				
23	2	0	1	1	1	1		0	0											
24	2	1	2	2	1	1	0	0	0											
25	2	0	7	5	2	1	1	0	0			9	1	1		0	0	0		
26	5	2	7	8	3	5	1	0	0			9	0	1		0	0	0	0	
27	14	3	12	13	9	4	3	0	2	0		0	1	1	0	0	0	0	0	0
28	30	2	26	25	15	8	4		2	1	5	10	1	3	0	0	0	0	0	
29	43	5	28	25	18	11	6	0	2	2	3	2	1	2	2	0	0	0	0	0
30	105	14	46	43	25	19	10	1	9	2	5	13	3	18	6	0	0	0	0	
31	102	26	45	56	39	36	10	1	9	3	7	2	2	11	5	0	0	0	0	
32	198	36	60	66	55	44	15	1	18	4	8	3	2	14	8	1	0	1	1	0
33	181	51	71	87	69	69	13	3	20	5	8	5	5	25	12	1	0	2	1	0
34	272	66	70	83	62	75	16	4	27	14	5	6	8	26	16	2	1	2	1	0
35	308	85	91	98	85	90	25	6	34	26	11	20	13	47	31	2	1	3	2	0
36	259	110	98	102	88	101	31	7	30	22	9	9	17	26	26	3	2	4	2	1
37	236	123	101	88	87	105	37	10	34	24	13	10	13	22	23	3	3	5	3	1
38	185	147	98	92	80	101	35	11	26	67	9	7	14	22	33	3	3	5	3	1
39	129	130	81	69	67	86	37	11	23	46	3	16	12	12	20	3	2	4	3	1
40	186	129	96	81	64	90	47	13	20	82	20	12	14	16	30	3	2	4	3	2
41	99	81	78	61	59	73	44	13	23	65	9	8	10	11	16	3	2	3	3	2
42	117	79	63	52	49	63	38	12	23	53	9	6	9	12	10	3	3	3	3	2
43	67	65	57	47	44	59	35	13	24	55	3	16	9	10	10	2	2	2	2	2
44	109	52	39	36	32	46	29	16	22	36	8	7	8	10	6	2	2	2	2	2
45	78	46	44	34	30	42	23	15	21	25	7	8	5	6	6	1	1	1	2	2
46	65	57	35	26	26	37	22	12	22	18	3	8	6	5	3	1	1	1	1	2
47	34	42	26	20	18	30	20	15	22	14	2	2	4	5	3	1	1	1	1	1
48	35	37	23	14	17	22	16	10	17	16	1	5	2	3	2	1	1	1	1	1
49	23	27	16	13	11	16	14	9	14	18	4	3	2	3	2	1	1	0	1	1
50	24	27	19	11	14	18	10	8	13	13	1	2	2	2	2	0	0	0	1	1
51	34	20	13	7	9	11	11	7	11	7	3	2	2	2	1	0	0	0	0	1
52	18	16	12	8	8	8	9	7	8	8	1	2	1	2	1	0	1	0	0	0
53	13	11	9	6	7	7	8	8	9	5	3	2	2	2	1	0	0	0	0	0
54	4	9	7	5	4	4	6	6	7	7	1	2	1	1	1	0	0	0	0	0
55	9	6	6	5	4	3	6	6	7	6	3	1	1	1	1	0	0	0	0	0
56	6	5	5	3	9	3	4	4	4	5	1	1	1	1	0	0	0	0	0	0
57	5	7	4	3	4	2	5	4	5	4	1	1	0	0	0	0	0	0	0	0
58	9	4	4	3	2	2	4	4	3	5	1	1	1	0	0	0	0	0	0	0
59	4	5	3	2	1	1	3	3	2	1	0	1	0	0	0	0	0	0	0	0
60	2	2	2	2	1	1	2	3	3	4	0	0	0	0	0	0	0	0	0	0
61	1	1	3	1	1	1	2	2	1	3	3		0	0	0	0	0	0	0	0
62	3	3	2	1	7	1	1	2	1	6	1	1	0	0	0	0	0	0		
63	10	0	2	1	1	1	1	2	1	2	1		0	0	0	0	0	0	0	0
64	0	1	2	1	6	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0
65	4	1	2	1	1	0	1	1	1	1	1		0	0	0	0	0	0	0	0
66	1	2	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
67	2	1	1	1	1	0	1	1	0	2	0		0			0	0	0	0	0
68	0	1	1	1	0	0	1	1	1	2	0		0	0	0	0	0	0	0	0
69	0	2	1	1	0	0	1	1	0	0	0	0	0		0	0	0	0	0	0
70	2	1	1	1	0	0	0	0	1	0	1		0	0	0	0	0	0	0	0
71	0	1	2	0	6	0	0	1	0	0			0	0	0	0	0	0	0	0
72	0	1	1	0	6	0	0	1	0	1	0		0	0	0		0	0		
73	0	1	1	1	0	0	0	1	0	1	0		0	0			0			0
74	1	0	1	0	0	0		0	0	1	0						0			
75	0	1	0	0	0	0		0					0		0	0	0			
76	0	0	0	0	0	0	0	0			0				0					
77	0	0	0	0	0			0					0				0			
78	0	0			0	0		0						0						
79			0	0				0	0								0			
80	0						0	0			0									
81								0	0											
82								0												
83																				
84								0												
Total number (thousand)	3043	1543	1425	1314	1147	1298	612	258	528	686	175	229	175	327	290	38	32	47	37	24
Total weight (tonnes)	143	89	75	63	62	67	39	23	34	46	10	11	10	14	13	2	2	2	2	2
Mean weight (kg)	0.047	0.058	0.052	0.048	0.054	0.051	0.064	0.089	0.065	0.067	0.057	0.048	0.057	0.043	0.046	0.054	0.063	0.041	0.055	0.071
Mean length (CL, mm)	37.8	40.6	39.0	37.9	39.6	40	42.2	46.9	42.2	42.6	40.0	41.0	39.9	37.2	38.2	40.1	41.5	39.6	40.5	43.8

Table 12.1.3. *Nephrops* FU 25, North Galicia. SP-NSGFS Spanish IBTS 4Q trawl survey (G2784). *Nephrops* yield in grammes/haul (1983–2021).

Year	<i>Nephrops</i> yield
1983	127
1984	565
1985	281
1986	353
1987	No survey
1988	453
1989	81
1990	249
1991	1267
1992	468
1993	256
1994	153
1995	494
1996	288
1997	59
1998	74
1999	87
2000	57
2001	90
2002	81
2003	29
2004	57
2005	48
2006	11
2007	10
2008	13
2009	28
2010	45
2011	59
2012	37
2013	96
2014	80
2015	36
2016	81
2017	47
2018	37
2019	49
2020	30
2021	36
2022	149

Table 12.1.4. *Nephrops* FU 25, North Galicia. Landings, fishing effort and LPUE from the fleet selling in A Coruña port (1986–2021).

Year	Landings (t)	Effort (trips)		LPUE (kg/trip)	
		SP-CORUTR8c	SP-LCOTBDEF	SP-CORUTR8c	SP-LCOTBDEF
1986	302	5017		60.1	
1987	356	4266		83.5	
1988	371	5246		70.7	
1989	297	5753		51.7	
1990	199	5710		34.9	
1991	334	5135		65.1	
1992	351	5127		68.5	
1993	229	5829		39.2	
1994	207	5216		39.6	
1995	233	5538		42.0	
1996	182	4911		37.0	
1997	187	4850		38.5	
1998	67	4560		14.7	
1999	121	4023		30.1	
2000	77	3547		21.7	
2001	145	3239		44.8	
2002	115	2333		49.5	
2003	65	1804		35.9	
2004	40	2091		18.9	
2005	32	2063		15.5	
2006	33	1699		19.4	
2007	37	2075		17.8	
2008	21	2128		9.9	
2009	11		1355		8.3
2010	22		1164		18.6
2011	35		906		38.4
2012	10		1460		6.8
2013	8		1582		5.3
2014	8		1869		4.5
2015	13		1358		9.3
2016	11		1589		6.6
2017	2*		1152		0.0
2018	2*		883		0.0
2019	2*		824		0.0
2020	2*		844		0.0
2021	2*		975		0.0
2022	2*		1132		0.0

(*) From 2017 to 2022 there was TAC for *Nephrops* Sentinel Fishery (4.3 t in 2017, 2 t each year in 2018-2020 and 1.7 t each year in 2021-2022).

Table 12.1.5. *Nephrops* FU 25, North Galicia. Cpue (kg/hour) estimated by the fishing industry with data of two fishing vessels (2015 and 2016).

Source	Year	Period	Directed CPUE (kg/hour)	Non-directed CPUE (kg/hour)
Fishing Industry (Fernández <i>et al.</i> , 2017)	2015	Year	6.46	0.18
	2016	Year	10.81	0.27

Table 12.1.6. *Nephrops* FU 25, North Galicia. CPUE (kg/hour) from Sentinel Fisheries (2017–2022). 2017–2019 Sentinels were limited to a small part of the FU.

	Hauls in August at daytime		
	Hauls	Sampled cells	CPUE (kg/hour)
2017	29	9	8.0
2018	41	13	5.0
2019	24	21	9.1
2020	18	24	8.9
2021	37	25	7.7
2022	57	41	5.4
Total	206	55	7.4

*To avoid the effect of daily variations in the catchability of *Nephrops*, which is a consequence of the changes in their behaviour, the hauls that were carried out in more than 50% of the time between dusk and dawn were considered non-directed to *Nephrops*.

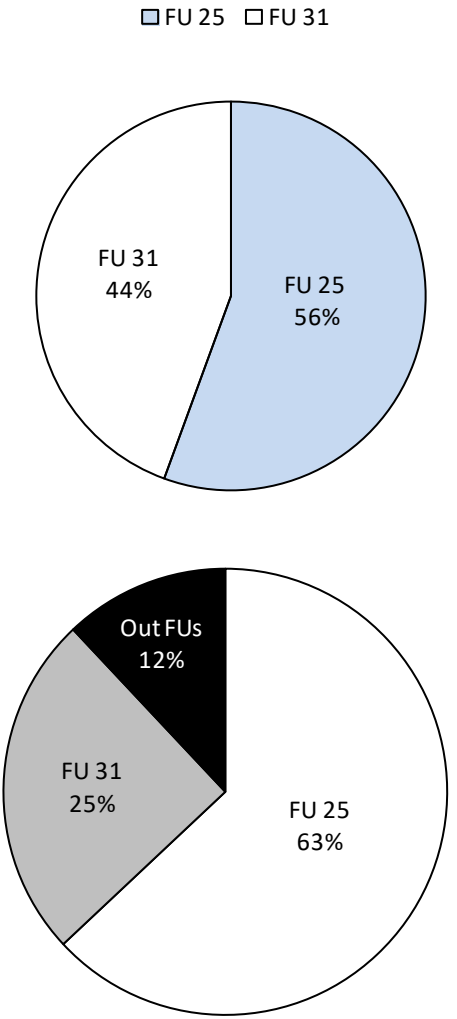


Figure 12.1. ICES Division 8.c *Nephrops* catch by FU (2022).

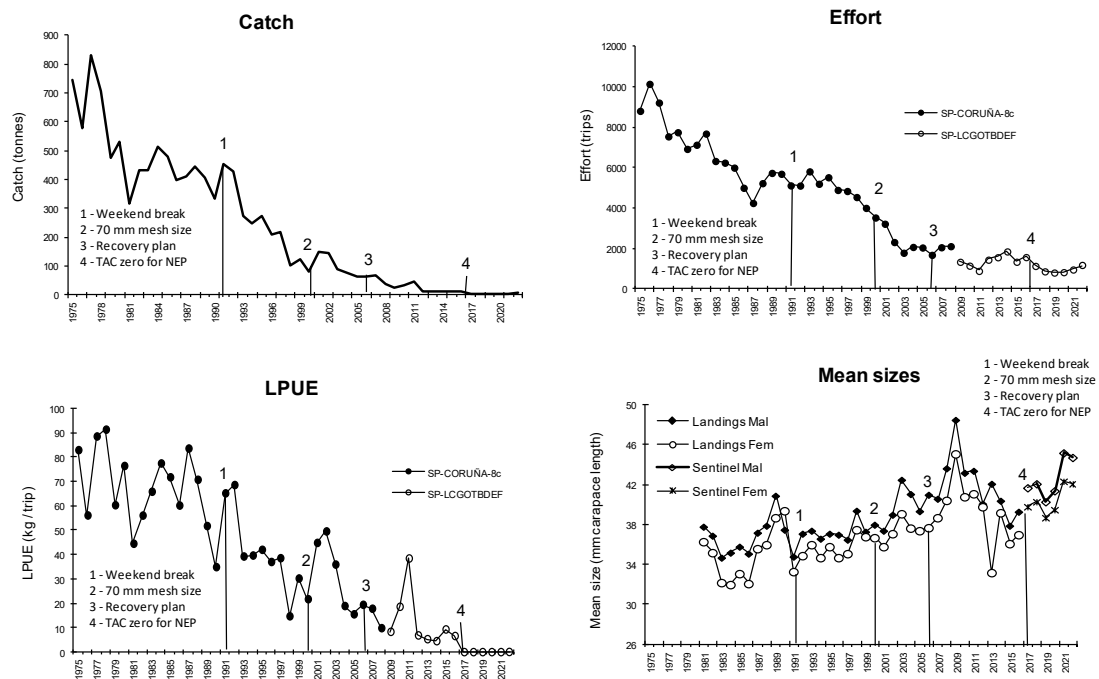


Figure 12.1.1. *Nephrops* FU 25, North Galicia. Long-term trends in landings, effort, LPUE and mean sizes. Catches (in tonnes) and mean sizes from all the selling ports. Effort and LPUE only from the fleet selling in the A Coruña port. *Nephrops* TAC in FUs 25 was zero in the period 2017-2022. Commercial fleet mean sizes information during these years was from the FU 25 *Nephrops* Sentinel fisheries.

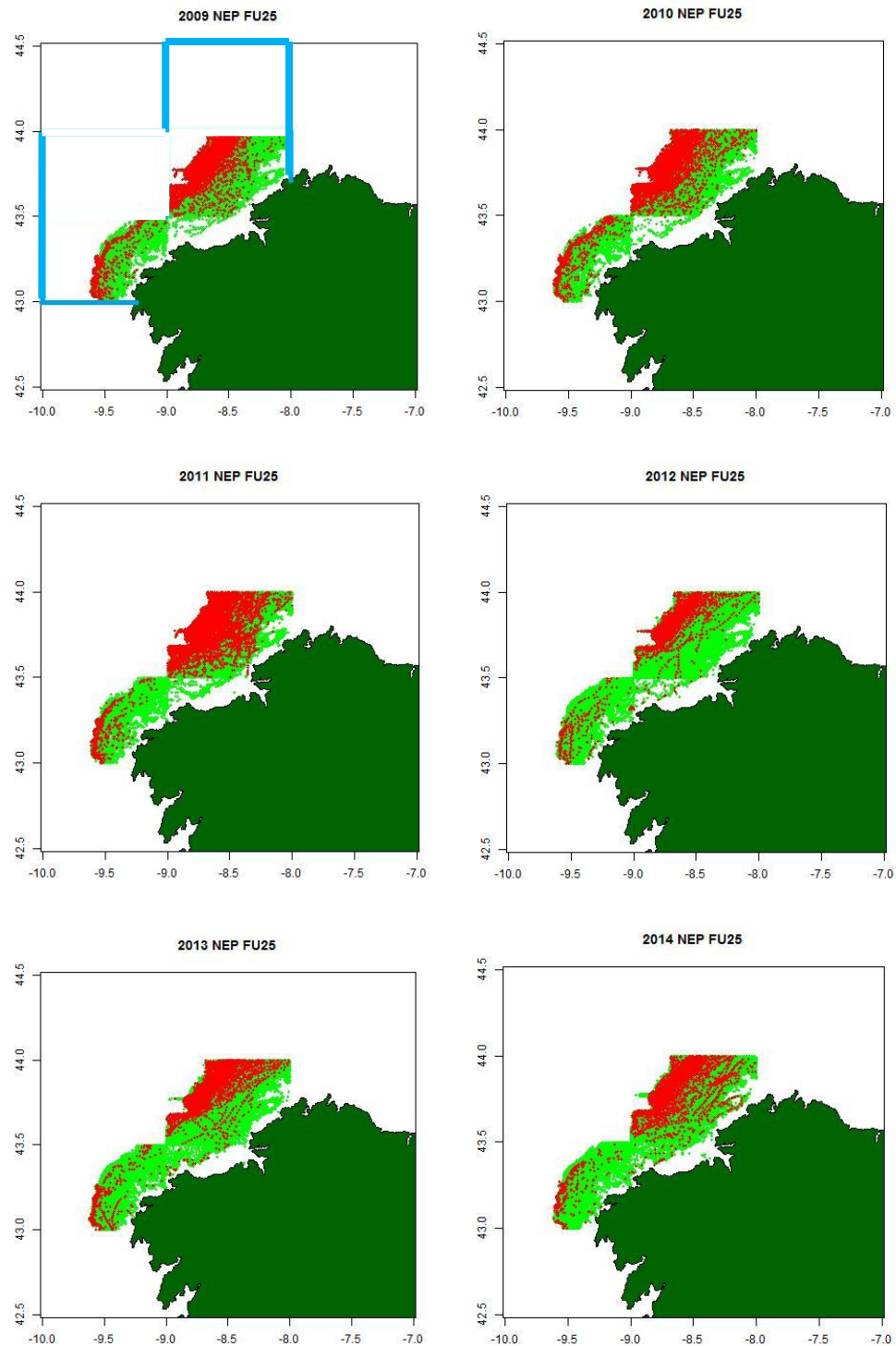


Figure 12.1.2a. *Nephrops* FU 25, North Galicia. *Nephrops* presence/absence distribution from commercial fleet activity (logbooks and VMS data, 2009-2014). Red points: *Nephrops* LPUE > 0 kg/fishing day, green points: *Nephrops* LPUE = 0 kg/fd. Limits of the FU in blue in the 2009 map.

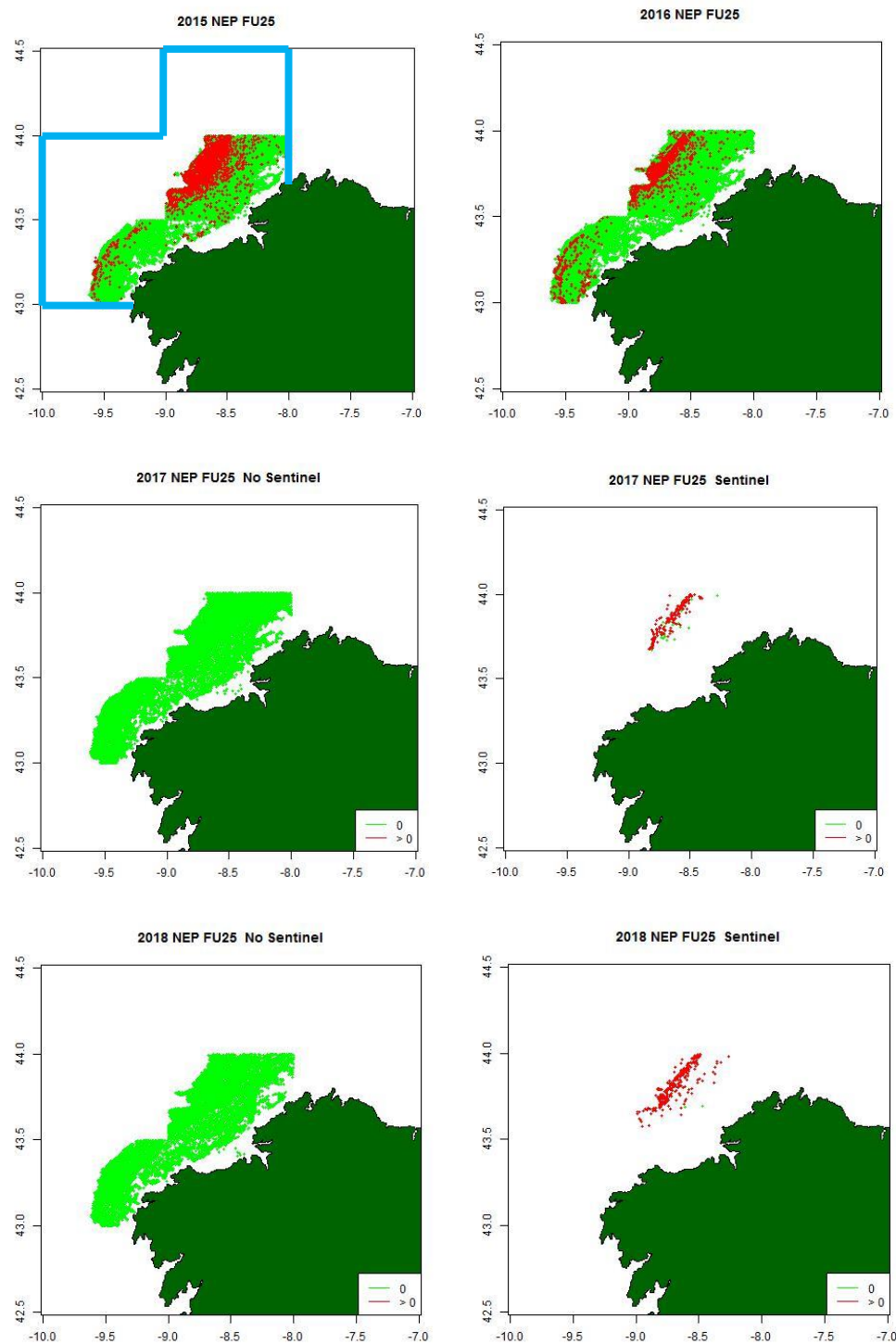


Figure 12.1.2b. *Nephrops* FU 25, North Galicia. *Nephrops* presence/absence distribution from commercial fleet activity (2015, 2016, 2017 and 2018 “no sentinel” maps) and from Sentinel fishery (2017 and 2018 “sentinel”) (logbooks and VMS data). Red points: *Nephrops* LPUE > 0 kg/fishing day, green points: *Nephrops* LPUE = 0 kg/fd. Limits of the FU in blue in the 2015 map.

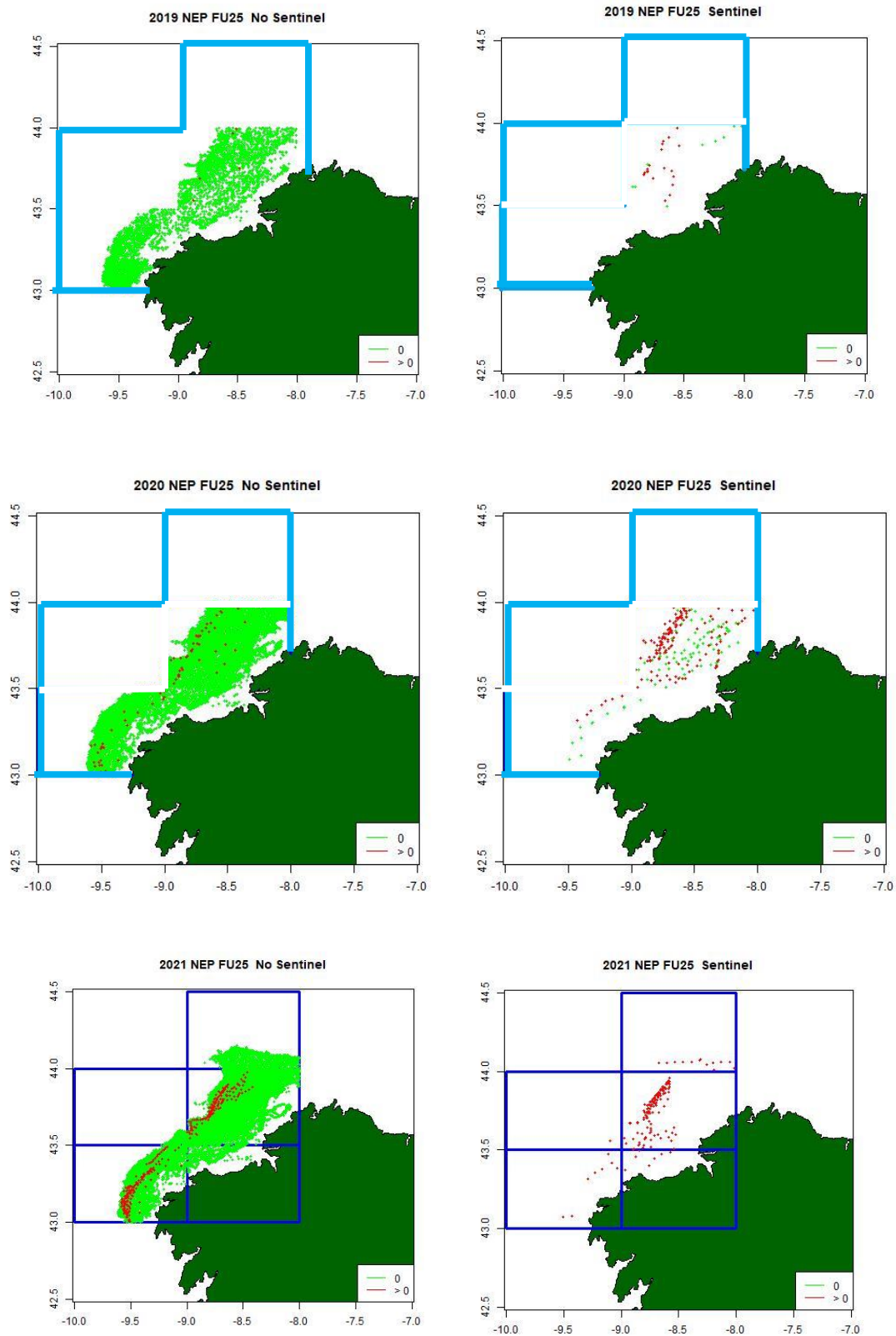


Figure 12.1.2c. *Nephrops* FU 25, North Galicia. *Nephrops* presence/absence distribution from commercial fleet activity ("no sentinel") and from Sentinel fishery ("sentinel") (logbooks and VMS data). Red points: *Nephrops* LPUE > 0 kg/fishing day, green points: *Nephrops* LPUE = 0 kg/fd. Limits of the FU in blue. Since 2020 the sentinel is extended to the whole FU 25 *Nephrops* area.

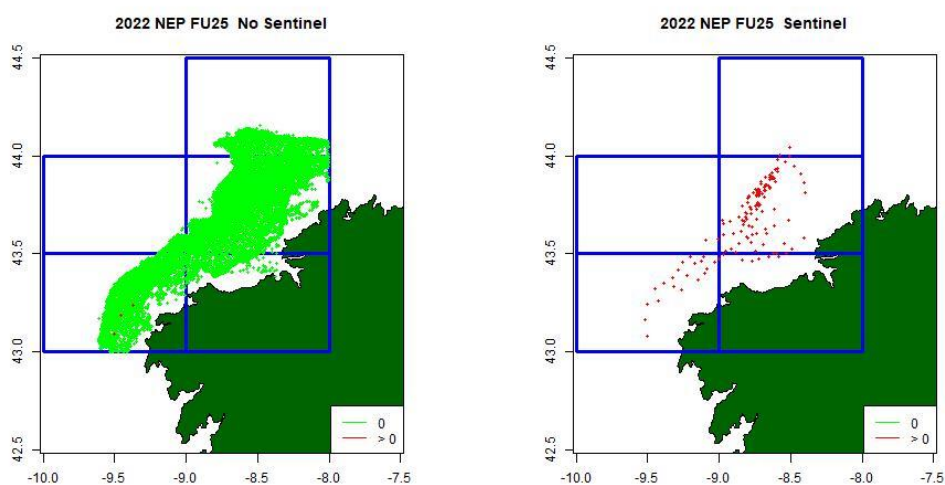


Figure 12.1.2d. *Nephrops* FU 25, North Galicia. *Nephrops* presence/absence distribution from commercial fleet activity ("No sentinel") and from Sentinel fishery ("sentinel") (logbooks and VMS data). Red points: *Nephrops* LPUE > 0 kg/fishing day, green points: *Nephrops* LPUE = 0 kg/fd. Limits of the FU in blue. Since 2020 the sentinel is extended to the whole FU 25 *Nephrops* area.

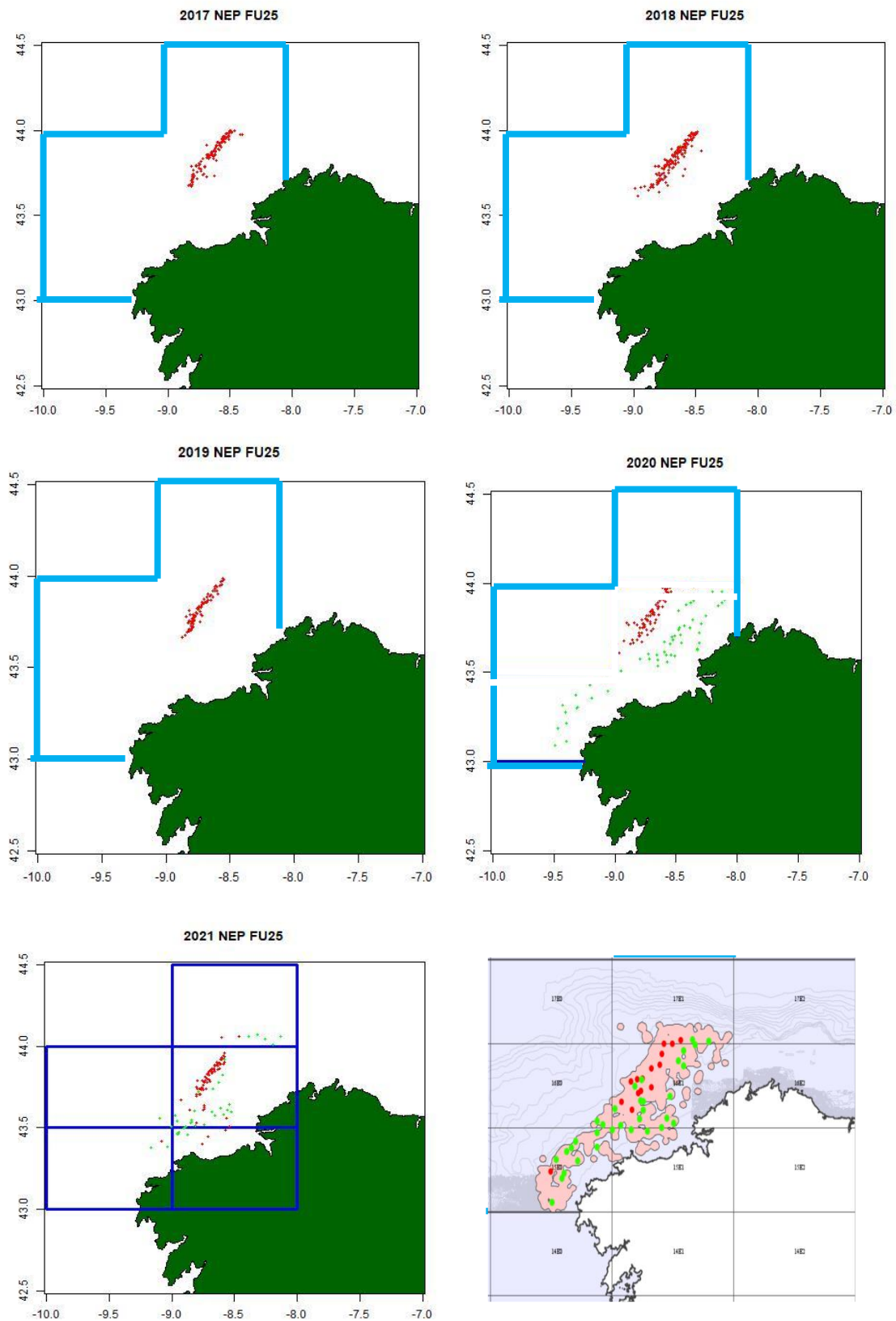


Figure 12.1.2e *Nephrops* FU 25, North Galicia. *Nephrops* presence/absence from Sentinel fishery ("sentinel") (observers on board and VMS data). Only *Nephrops* directed hauls. Red points: *Nephrops* LPUE > 0 kg/haul, green points: *Nephrops* LPUE = 0 kg/haul. Limits of the FU are in blue. Since 2020 the sentinel is extended to the whole FU 25 *Nephrops* area.

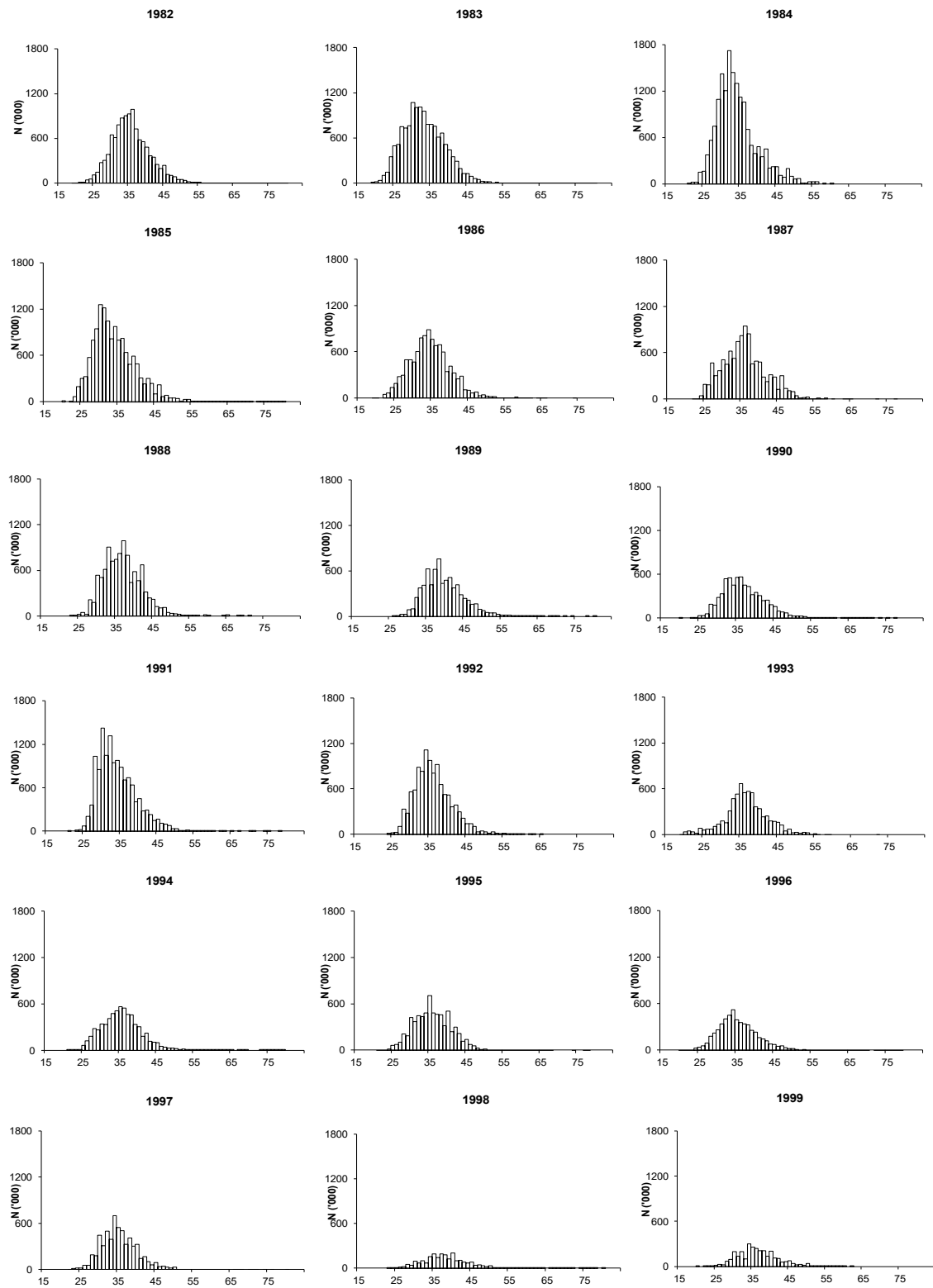


Figure 12.1.3a. *Nephrops* FU 25, North Galicia. Length distributions of landings, 1982–1999. Maximum of y-axis 1800 thousand. Carapace length in mm in the x-axis.

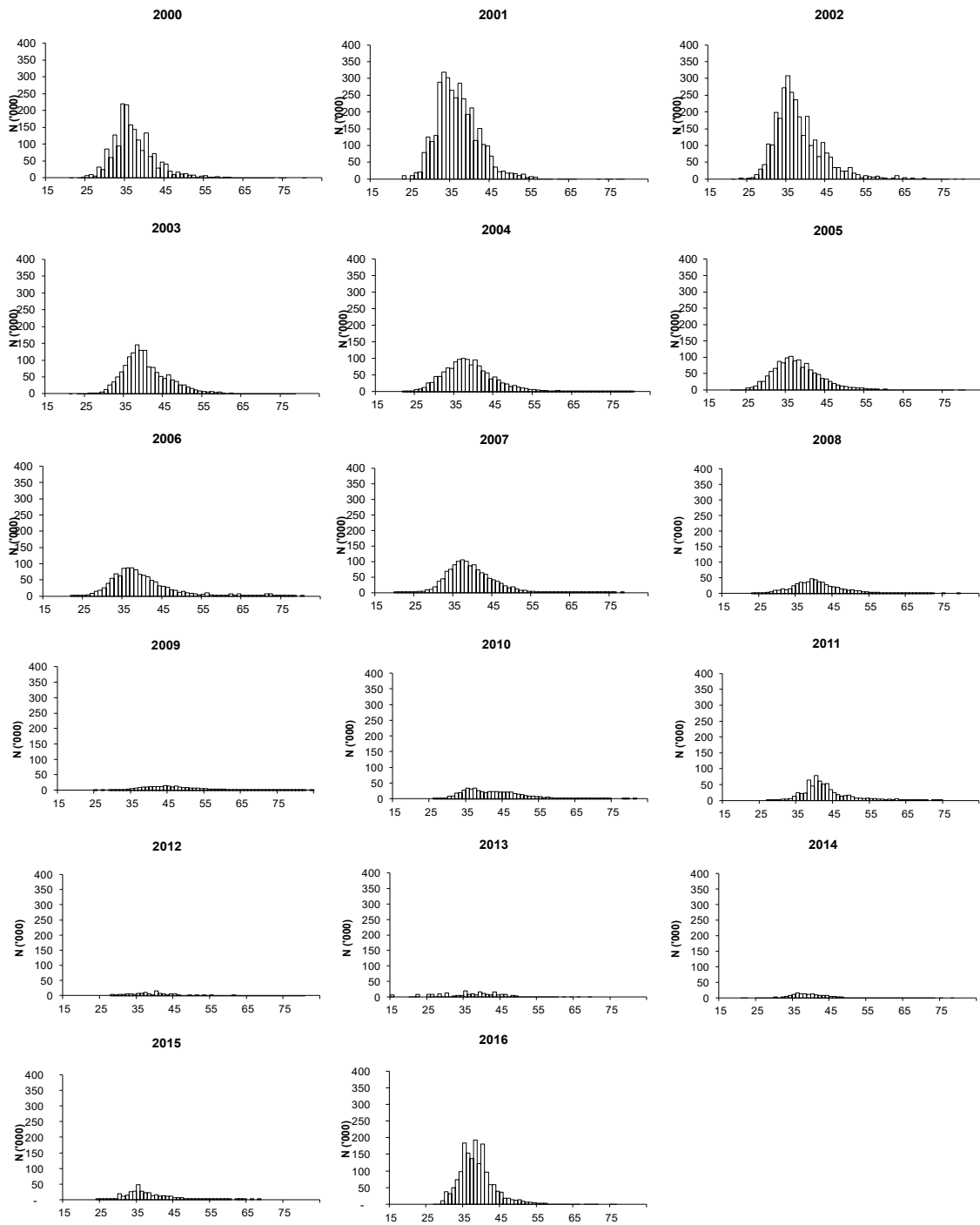


Figure 12.1.3b. *Nephrops* FU 25, North Galicia. Length distributions of landings, 2000–2016. Maximum of y-axis 400 thousand (2000–2016). Carapace length in mm in the x-axis.

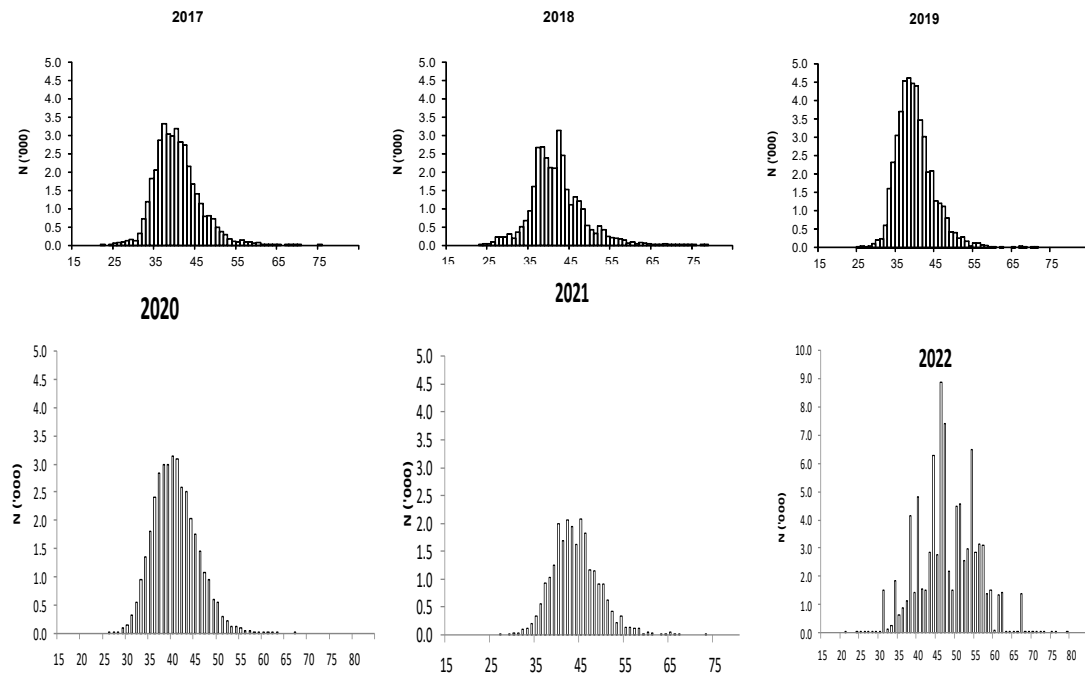


Figure 12.1.3c. *Nephrops* FU 25, North Galicia. TAC in FU 25 was zero for the period 2017–2022. Length distributions of landings for these years were from the *Nephrops* Sentinel fishery in FU 25 (TAC for Sentinels were 4.3 t in 2017, 2 t each year in 2018–2020 and 1.7 t each year in 2021–2022). Maximum of y-axis 5 thousand. 2022 length distribution is from Sentinel fishery and discards. Minimum of y-axis in 2022 10 thousand. Carapace length in mm in the x-axis. The number of measured individuals: 7266 (2017), 8524 (2018), 4633 (2019), 6316 (2020), 3005 (2021) and 7880 (2022).

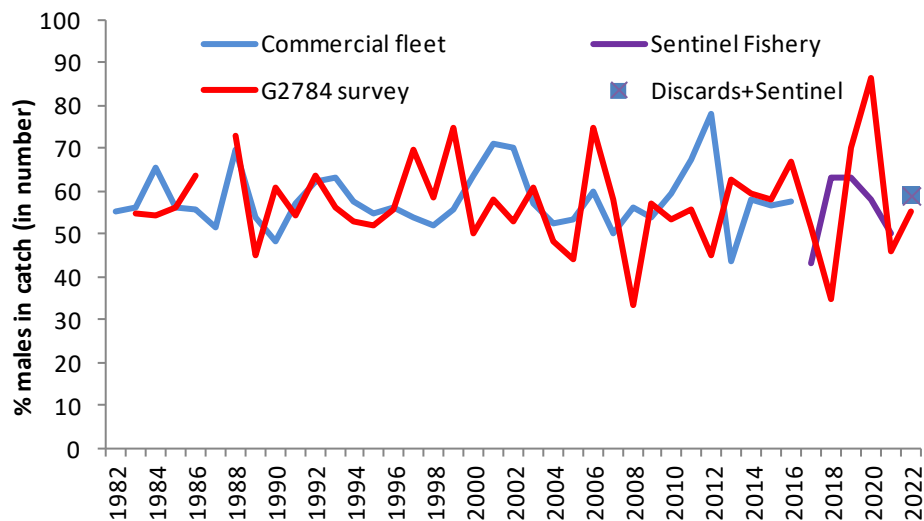


Figure 12.1.4a. *Nephrops* FU 25, North Galicia. Proportion of males in catches for the period 1982–2022. Commercial fleet (1982–2016), Sentinel fishery (2017–2021), SPGFS-WIBTS-Q4 (G2784) survey (1983–2022) and Sentinel+discards (2022).

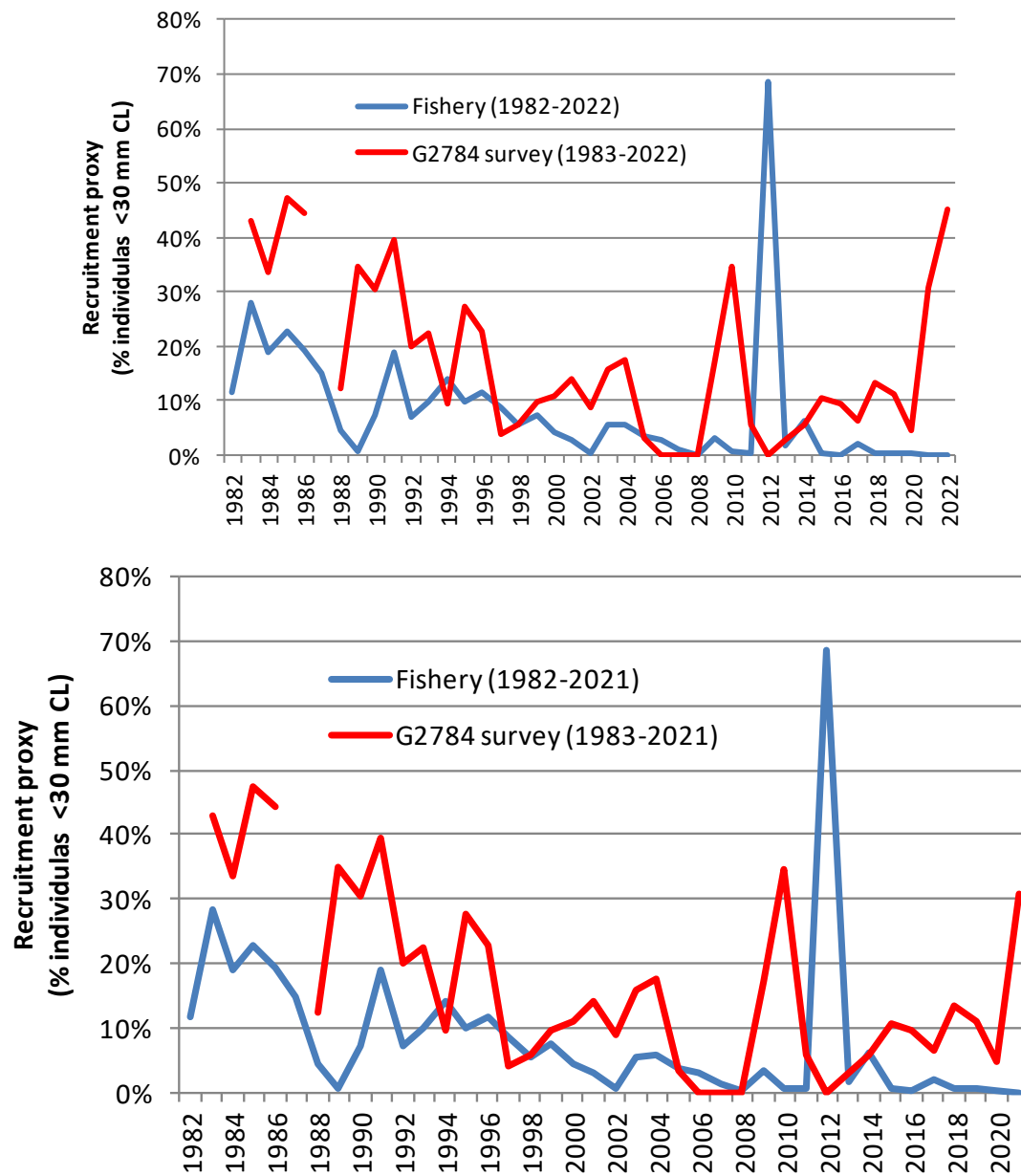


Figure 12.1.4b. *Nephrops* FU 25, North Galicia. Recruitment proxy. Blue line = Commercial fleet (1982–2016) and Sentinel fleet (2017–2021), Sentinel+Discards (2022). Red line = SPGFS-WIBTS-Q4 (G2784) survey (1983–2021)

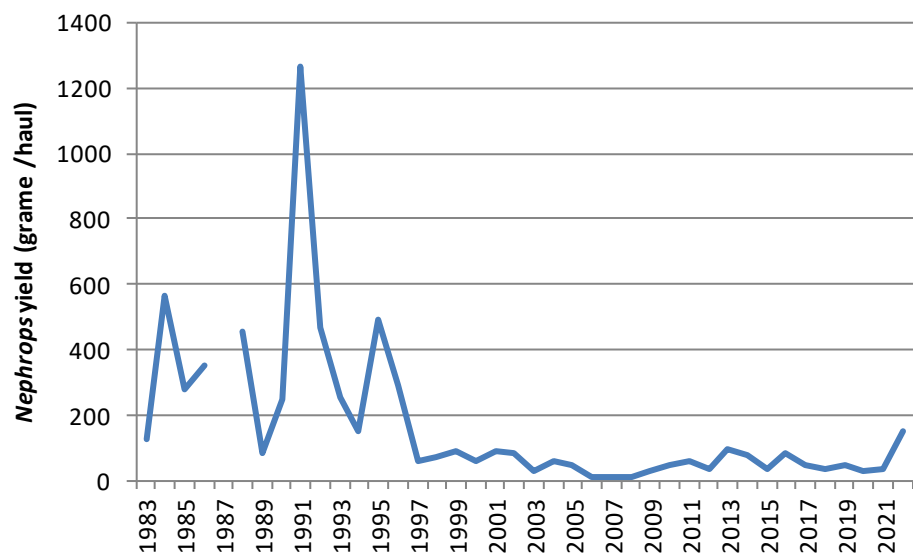
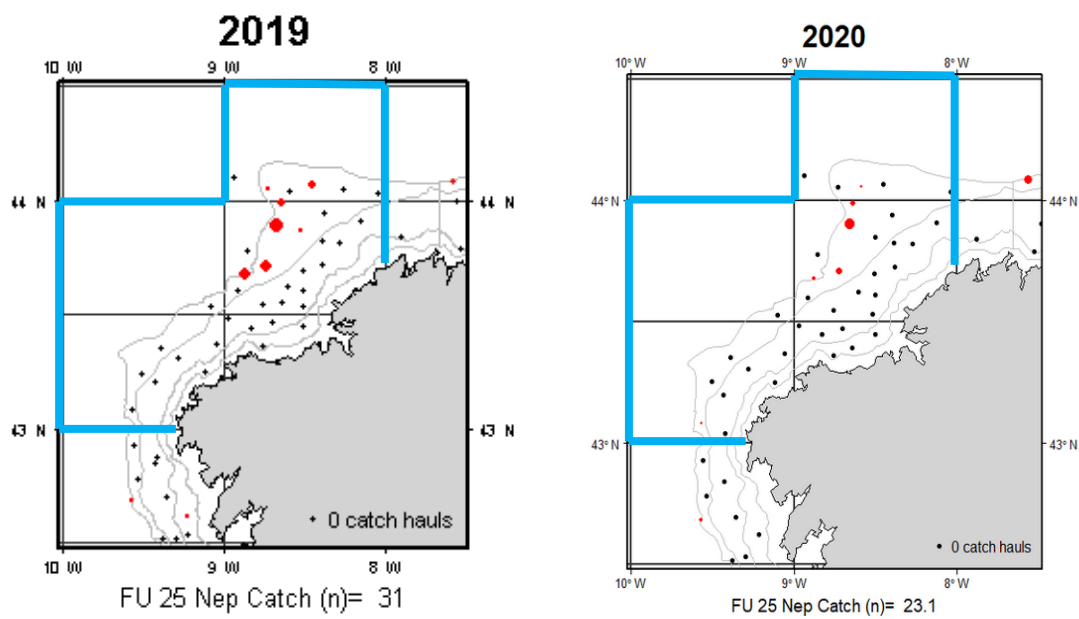


Figure 12.1.5. *Nephrops* FU 25, North Galicia. CPUE (grammes/haul) from SPGFS-WIBTS-Q4 (G2784) survey (1983–2022). No survey was carried out in 1987. Only hauls in the *Nephrops* area have been used.



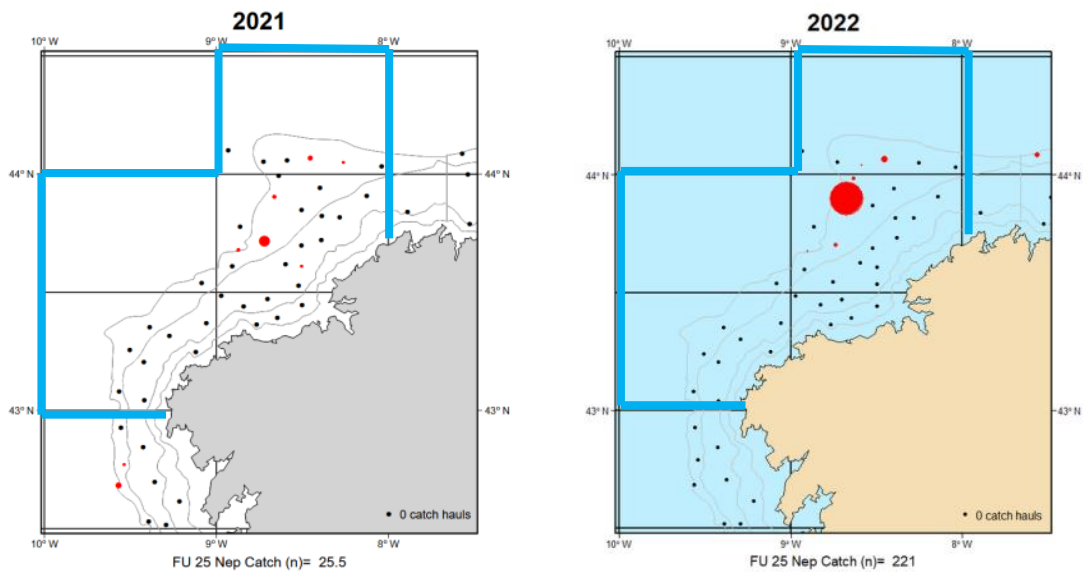


Figure 12.1.6. *Nephrops* FU 25, North Galicia. CPUE (kg/haul) from SPGFS-WIBTS-Q4 (G2784) survey (2019–2022). Black points: zero kg of *Nephrops*/haul. Limits of FU 25 in blue.

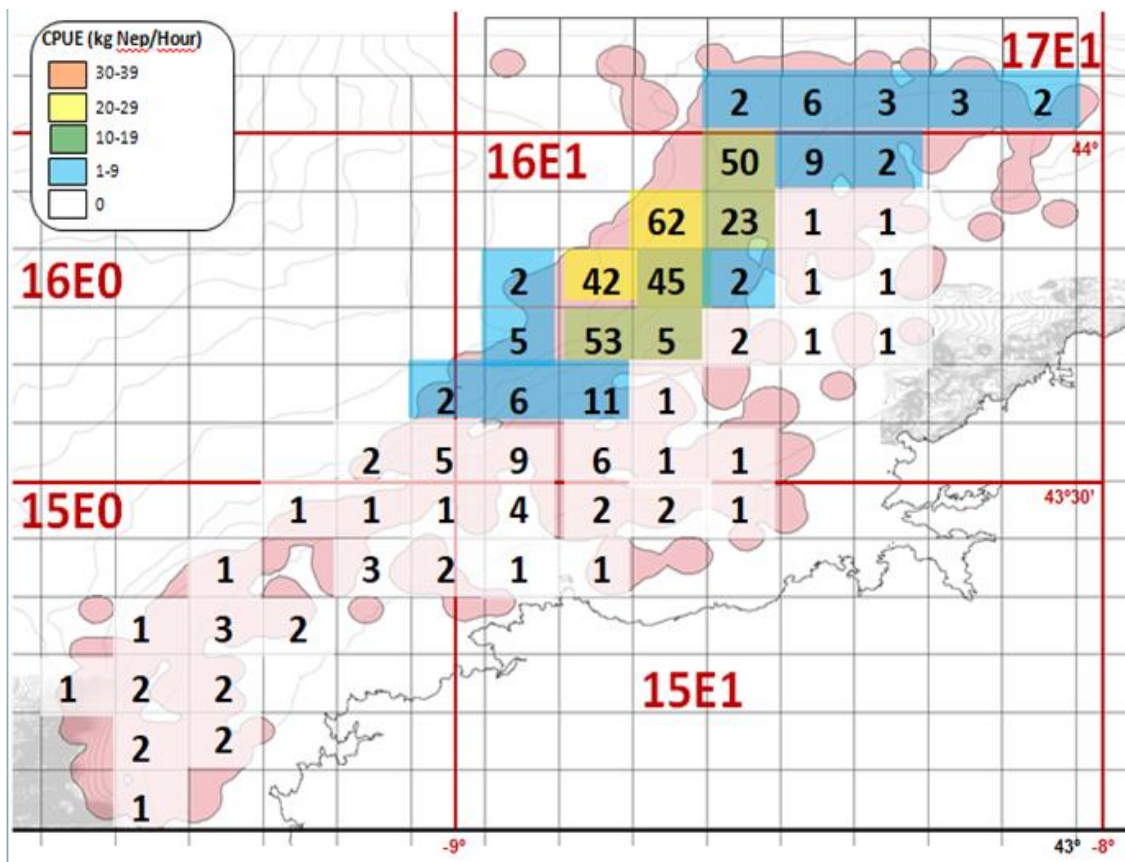


Figure 12.1.7. *Nephrops* FU 25, North Galicia. Sentinel fishery CPUE (kg Nep/Hour) by cell from diurnal hauls with bottom trawl gear done in August (2017–2022). Numbers in the map correspond to the number of hauls that operated in each cell. *Nephrops* TAC for Sentinel fisheries were 4.3 t in 2017, 2 t each year in 2018–2020 and 1.7 t in 2021–2022.

12.2 *Nephrops norvegicus* in FU 31 (Cantabrian Sea)

12.2.1 General

FU 31 *Nephrops* stock is a category 2.12 stock (data rich stock, but with an assessment/forecast that is accepted for trends only and with biomass < MSYB_{trigger}).

After the identification of the FU 31 *Nephrops* area using hauling data from the SPGFS-WIBTS-Q4 (G2784) survey (1983–2020), Discard Programme observers on board in commercial fishery (1994–2020) and the Sentinel fishery observers on board (2017–2020), the FU 31 area was updated in 2022 WG including the ICES rectangles 16–17 E2-E7 and 15 E4–7.

12.2.1.1 Ecosystem aspects

See Stock Annex.

12.2.1.2 Fishery description

FU 31 *Nephrops* is caught by the Spanish OTB_DEF_{≥55}, which is described as the “Northern trawl” fleet in section 2.1.2 of this report. See also Stock Annex for more information.

12.2.1.3 Summary of ICES advice for 2023 and management applicable to 2022 and 2023

ICES advice for 2023

Since 2021 advice for FU 31 is done based on SPiCT outputs (ICES, 2021a). The advice for FU 31 *Nephrops* stock is annual and valid for 2023. ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 17 tonnes.

Management applicable to 2022 and 2023

Since 2011, there is a Spanish regulation that established an Individual Transferable Quota system (ITQs) which includes *Nephrops* (ARM/3158/2011, BOE, 2011).

In 2019, a zero TAC was set for *Nephrops* in ICES Division 8.c for the years 2020, 2021 and 2022.

The advice in 2021 stated that catches in 2022 should be no more than 20 tonnes. Since 2022, the TAC is set by Functional Unit in division 8c. The FU 31 TAC was 20 tons for 2022 and 17 tons for 2023.

A special quota of 0.7 t for 2019, 2020 and 2021 was set for *Nephrops* in FU 31 in order to conduct an observer’s onboard programme (“*Nephrops* Sentinel Fishery”) supervised by the Spanish Oceanographic Institute (IEO) to obtain a *Nephrops* abundance index and complementary data.

12.2.2 Data

12.2.2.1 Commercial catches and discards

Spanish landings are based on sales notes which are compiled and standardized by IEO. Since 2003, trips sales notes are also combined with their respective logbooks. Data are available by statistical rectangle since 2003 and by *métier* since 2008 (EC, 2008). A revision of the 2000–2020 FU 31 *Nephrops* landings and discards was carried out in 2022 based on the definition of the new *Nephrops* assessment area. This identification was made based on the positions of the hauls with *Nephrops* catch from SPGFS-WIBTS-Q4 (G2784) survey (1983–2020), observers on board the

Discard Programme in commercial fishery (1994–2020) and observers on board the Sentinel fishery (2019–2020).

Nephrops landings from FU 31 were reported by Spain (Table 12.2.1 and Figure 12.2.1) and are available for the period 1983–2022. The highest landings were recorded in 1989 and 1990, 177 t and 174 t, respectively. Since 1996, landings have declined sharply to 4 t in 2016, the last year with non-zero *Nephrops* TAC. When the FU 31 included only four statistical rectangles, about 39% of *Nephrops* landings in FU 31 comes from the statistical rectangle 16E7 (Basque Country), 36% from 16E4 (Asturias region), 18% from 16E6 (Cantabrian region) and 8% from 16E5 (logbooks 2003–2016).

In the period 2017–2021, FU 31 *Nephrops* TAC was zero, landings were zero, but 814, 552 and 700 kg of landings were obtained in the 2019, 2020 and 2021 FU 31 Sentinel fishery, respectively (special onboard observers' programme in commercial vessels to monitor the FU stock status), which was granted a special quota. More details were provided to this WG in 2020 (González Herraiz *et al.*, 2020).

Information on landings, discards and length distributions was uploaded to InterCatch. *Nephrops* discards were negligible in FU 31, nevertheless, when the *Nephrops* TAC were zero, estimated discards amounted to 31.4 kg, 7 t, 5.7 t, 9.9 t and 8 t for years 2017, 2018, 2019, 2020 and 2021, respectively. In 2022 the TAC was 20 tons, the landings 7 tons, and discards 0 kg.

VMS information

VMS data from 2009–2018 from FU 31 trawl fleet (Figure 12.2.2a) were used to provide some information about the spatial distribution of *Nephrops* catches in the FU when TAC was higher than zero (2009–2016). Figure 12.2.2a also shows the catch spatial distribution under zero TAC (2017–2018). Figure 12.2.2b shows the presence and absence of *Nephrops* in the Sentinel and non-sentinel fishery (2019–2021). Logbook data were assigned to VMS pings by vessel, fishing day and statistical rectangle. About 28% of the VMS pings could not be identified in logbooks while only 9% of the 2009–2016 VMS pings revealed the presence of *Nephrops*. The CPUE by cells in Sentinel fisheries is shown in Figure 12.2.2d. The occurrence of *Nephrops* in the commercial fishery in 2022 is represented in Figure 12.2.2c.

12.2.2.2 Biological sampling

The biological sampling programme from 1988 to 2016 and the Sentinel fishery in 2019–2021 provided length–frequency distributions (LFDs) by sex of *Nephrops* landings and discards, sex ratio, recruitment proxies and mean sizes. No LFDs was available for FU 31 in 2017 and 2018 because the *Nephrops* TAC was zero. The sampling levels in Division 8.c are shown in Table 1.4. SPGFS-WIBTS-Q4 (G2784) survey also provides LFDs by sex and, therefore, mean sizes and sex ratio since 1983. The number of *Nephrops* individuals from the SPGFS-WIBTS-Q4 (G2784) survey was insufficient in 2017 and 2018 to provide a reliable estimate of mean length.

Mean sizes series show increasing trends until 2009 (Figure 12.2.1), the year where the mean size for males was observed at 55.8 mm CL and 45.9 mm CL for females. Mean sizes decreased in the years 1991, 2002, and 2011 which could suggest years with more recruitment.. Mean size in 2016 was 52.1 mm CL for males and 45.8 mm CL for females. Mean sizes from Sentinel fishery were 45.4, 49.2 and 47.0 mm CL for males and 41.4, 44.1 and 43.0 for females, for the years 2019, 2020 and 2021, respectively. Mean size in 2022 from the commercial fleet were 50.6 mm CL for males and 43.9 mm CL for females.

Low quantities of males in a *Nephrops* stock could be related to a high fishing pressure since ovigerous females are protected in burrows during most of the year (Fariña Pérez, 1996). In worst cases, low quantities of males could affect mating (ICES, 2013), and consequently, recruitment in subsequent years. The minimum percentages of males in FU 31 in the SPGFS-WIBTS-Q4 (G2784)

survey time-series were recorded in 1996 and 2010 (red line in Figure 12.2.2e) and in 1994 in the fishery (blue line).

Recruitment proxies from the SPGFS-WIBTS-Q4 (G2784) survey and the fishery show a decreasing trend up to 2009 in the survey and up to 2016 in the fishery (Figure 12.2.2f).

12.2.2.3 Abundance index from survey

Figures 12.2.3, 12.2.4a-d show two periods in FU 31 *Nephrops* CPUE (kg/haul) time-series and spatial distribution from SPGFS-WIBTS-Q4 (G2784) survey (1983–2021): the first period with high abundance was observed until 1993 and another with low abundance since 1994. A bottom trawl survey is carried out every year in October to estimate hake recruitment and to collect information on the relative abundance of demersal species (see Spanish IBTS survey in 3rd quarter description in section 2.2.1 of this report). The survey hauls positions are the same each year. The survey index has passed from 58 grams/haul in 2021 to 170 grams/haul in 2022.

12.2.2.4 Commercial catch-effort data

The fishing effort and CPUE dataseries include bottom trawl fleets operating in the Cantabrian Sea selling in the harbours of Santander, Gijón and Avilés. In recent years, the information from the different fleets is intermittent. A combined effort series that includes Santander, Avilés and Gijón from 2009 onwards are presented in Figure 12.2.1. In order to standardize the effort units, the unit considered for this series is the trip. All the available effort time-series show decreasing trends from 1983–2016 (Figure 12.2.1). The increase in the use of other gears (HVO and pair trawl) resulted in the reduction of the baca trawl fleet effort. The combined Santander-Gijón-Avilés effort values decreased since 2014 (Figure 12.2.1). The effort in 2022 was 636 trips.

The Santander LPUE series shows fluctuations and a general downward trend (Figure 12.2.1) until 2013 (2.3 kg/fishing days). The combined Santander-Gijón-Avilés LPUE series also shows a decreasing trend. The CPUE in 2016 was 4.3 kg/trip. The LPUE of *Nephrops* was zero during the period with TAC zero (2017–201). The LPUE in 2022 was 7.5 kg/trip, value similar to the values of 2010 and 2011.

In Portugal, CPUE of species with an affinity for temperate waters (in opposition to tropical waters) decreased from 1992 to 2009, especially in long-lived species as *Nephrops* (Teixeira *et al.*, 2014). CPUE time-series of “temperate” species are directly correlated with rain and inversely with temperature (Teixeira *et al.*, 2014). Similar processes could have affected the FU 31 *Nephrops* from 1988 to 2010.

The FU 31 fishing sector requested a Sentinel fishery in that area in order to obtain a *Nephrops* abundance index. ICES delivered a Special Request Advice (ICES, 2019b) establishing the technical requirements and the Sentinel fishery was carried out in July 2019 (González Herraiz *et al.*, 2020). However, in 2020 the Sentinel fishery was delayed to August due to administrative reasons. The *Nephrops* CPUE obtained in this fishery was 19.9, 17.1, 30.0 grammes/kWhour in 2019–2021. The 2020 CPUE was multiplied by a factor of 1.37 in order to compare with the value estimated for the July 2019 CPUE. This ratio was obtained from the CPUE time-series 2006–2016 from logbooks (ICES, 2019b). The high CPUE of 2021 could be related to a less representative fishing hauls distribution in the 2021 Sentinel fishery than in 2019–2020. The *Nephrops* retained catch was 735 kg in 2019 and 552 kg in 2020 and 1478 in 2021. *Nephrops* discards were negligible (79 kg in 2019, 11 kg in 2020 and 45 kg in 2021). Sentinel fishery data were included in the Spanish data uploaded to InterCatch.

12.2.3 Assessment

The SPiCT model (Pedersen and Berg, 2017) was considered suitable for the assessment of the FU 31 *Nephrops* stocks since, unlike other data-limited stocks (DLSs) methods, this method takes into account the history of the fishery and does not use a long list of life-history parameters that usually come with high uncertainty.

12.2.3.1 SPiCT model

The SPiCT model for FU 31 was accepted in the WKMSYSPiCT (ICES, 2021a). In WGBIE 2022 in order to obtain normal distributed catch residuals, the same model configuration of 2021 assessment was used though adding `inp$stdevfacC=c(rep(1,34),4,4,4,4)` to increase uncertainty to the catches of the years with TAC zero (2018–2021). The same code was used in WGBIE 2023. Catch data in 2017 has not been included because it was zero and SPiCT deletes the zero data.

Input data:

- Catches (1983–2022; Table 12.2.1)
- SpGFS-WIBTS-Q4 (G2784) survey index (1983–2022; Table 12.2.2, Figure 12.2.3)

SPiCT settings:

- Euler time-step (years): 1/12
- Medium level of exploitation before the beginning of the time-series
- Fixed shape parameter n to 2
- Intrinsic growth parameter r mean 0.2 and coefficient of variation 0.2
- Priors on the standard deviation of the catches and the F process noise `inp$priors$logsdC=c(log(0.1), 0.2, 1)`
`inp$priors$logsdF=c(log(3), 0.5, 1)`
- High uncertainty for the 1983–1994 catches and for 2018–2021

12.2.3.2 Assessment diagnostics

The SPiCT diagnostics (Figure 12.2.7) and the retrospective plots (Figures 12.2.5 and 12.2.6) did not show major problems, B_t/B_{MSY} and F_t/F_{MSY} Mohn's rho values are inside the range -2 to 2.

12.2.3.3 Assessment results

SpiCT results are presented in Tables 12.2.3 and 12.2.4 and Figure 12.2.7. The stock biomass (B) decreased since 1989, reaching the lowest value in 2011. After 2011, biomass increased until 2016 and has a decreasing trend since then. Biomass has been below $B_{trigger}$ since 2007 and below B_{lim} in the period 2010–2012. Fishing mortality (F) has been below F_{MSY} since 2009.

The biomass at the end of 2022 was 37% of the B_{MSY} and F was 39% of the F_{MSY} (Table 12.2.3).

12.2.3.4 Short-term projections

SpiCT-predicted catch and stock status for 2024 are shown in Table 12.2.5.

12.2.3.5 Biological reference points

No reference points are defined for this stock in terms of absolute values. The SPiCT-estimated values of the ratios F/F_{MSY} and B/B_{MSY} are used to estimate stock status relative to the MSY reference points. The table on the next page presents these relative reference points used in the assessment.

Framework	Reference point	Relative value *	Technical basis	Source
MSY approach	MSY $B_{trigger}$	0.5	Relative value. B_{MSY} proxy is estimated directly from the assessment model and changes when the assessment is updated.	ICES (2021)
	F_{MSY}	1	Relative value. The F_{MSY} proxy is estimated directly from the assessment model and changes when the assessment is updated.	ICES (2021)
Precautionary approach	B_{lim} proxy	$0.3 \times B_{MSY}$	Relative value (equilibrium yield at this biomass is 50% of the MSY proxy).	ICES (2021)
	B_{pa}	Not defined		
	F_{lim}	$1.7 \times F_{MSY}$	Relative value (the F that drives the stock to the proxy of B_{lim}).	ICES (2021)
	F_{pa}	Not defined		

12.2.4 Stakeholders information

In April 2020, WGBIE received a letter from stakeholders (two Spanish fishing producers' organizations, OPP no. 31 and 07) regarding the *Nephrops* fishery in ICES Division 8.c. The document analysed market and sales notes data and the fisheries management measures taken in recent years directed at *Nephrops* in Division 8.c. This document was discussed in a subgroup meeting during the WGBIE in 2020. Market and sales notes are part of the data used for the ICES assessment of this stock since the first assessment in 1997. Also fisheries management measures have been always taken into account in the assessment process. So, the data sources and the issues mentioned in the document, together with additional data and any other relevant information relative to the 8.c *Nephrops* stocks, are taken into account by routine each year to make an integral analysis of the stock status and elaborate a scientifically sound assessment in the WGBIE.

No further stakeholder information was presented to WGBIE since 2020.

12.2.5 Management considerations

Nephrops is taken as bycatch in the mixed bottom-trawl fishery. In 2022 98% of the Spanish *Nephrops* landings are from the bottom trawlers and 2% from nets in FU 31.

The TAC for *Nephrops* in this FU was zero for the period 2017-2021. In 2022 the TAC was 20 t. The overall trend in *Nephrops* catches from the Cantabrian Sea (FU 31) was strongly declining up to 2017. Landings dramatically decreased since the beginning of the series (1983–2016), representing in 2016 less than 2% of the 1989 maximum observed value. Catches have a slight increase since 2017 to 2020 and decreased in 2021 and 2022.

A recovery plan for Southern hake and *Nephrops* stocks in the Cantabrian Sea and Western Iberian Peninsula was established in 2005 (EU, 2005) and repealed in 2019 (EU, 2019).

A Fishing Plan for the Northwest Cantabrian ground was established in 2011 (ARM/3158/2011, BOE, 2011). This new regulation established an Individual Transferable Quota system (ITQs) and includes the *Nephrops*.

FU 31 was not included in the multiannual plan for stocks fished in the Western Waters in 2019 (EU, 2019).

A *Nephrops* Sentinel Fishery in FU 31 supervised by the IEO was carried out in 2019, 2020 and 2021 to obtain a *Nephrops* abundance index (González Herraiz *et al.*, 2020). This fishery followed the technical requirements established by a specific ICES Special Request Advice (ICES, 2019).

12.2.6 References

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12.2.7 Tables and figures

Table 12.2.1. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Landings and discards in tonnes.

Year	Landings	Discards	Catch
1983	63		63
1984	100		128
1985	128		173
1986	127		175
1987	118		159
1988	151		193
1989	177		353
1990	174		347
1991	109		217
1992	94		188
1993	101		188
1994	148		212
1995	94		160
1996	129		129
1997	98		98
1998	72		84
1999	48		48
2000	37		37
2001	27		27
2002	27		27
2003	35		35
2004	29		29
2005	48		48
2006	37		37
2007	43		43
2008	29		29
2009	13		13
2010	9		9
2011	7		7
2012	10		10
2013	10		10
2014	5		5
2015	4		4
2016	4		4
2017	0		0
2018	0	7	7
2019	1*	6	6
2020	1*	10	11
2021	1*	8	9
2022	7	0	7

* *Nephrops* TAC was zero in 8c (FU 25 & FU 31) in the period 2017-2021, but in 2019, 2020 and 2021 there were *Nephrops* Sentinel fisheries in FU 31.

Table 12.2.2. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Yield from the SpGFS-WIBTS-Q4 survey (G2784) for the period 1983–2022.

Year	<i>Nephrops</i> yield (grams/haul)
1983	116
1984	307
1985	341
1986	428
1987	No survey
1988	837
1989	132
1990	240
1991	200
1992	405
1993	295
1994	252
1995	171
1996	199
1997	133
1998	127
1999	111
2000	210
2001	118
2002	83
2003	129
2004	143
2005	93
2006	66
2007	86
2008	59
2009	41
2010	23
2011	72
2012	80
2013	128
2014	133
2015	171
2016	99
2017	54
2018	95
2019	108
2020	99
2021	58
2022	170

Table 12.2.3. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. SPiCT summary results.

Parameter estimates				
Parameter	estimate	cilow	ciupp	log.est
alpha	1.2277	0.4709	3.2007	0.2052
beta	0.1964	0.1188	0.3246	-1.6278
r	0.1798	0.1236	0.2617	-1.7157
rc	0.1798	0.1236	0.2617	-1.7157
rold	0.1798	0.1236	0.2617	-1.7157
m	69.1288	34.2526	139.5161	4.2360
K	1537.6308	733.0175	3225.4463	7.3380
q	0.0020	0.0005	0.0082	-6.2057
sdb	0.2349	0.1219	0.4524	-1.4487
sdf	0.4863	0.3537	0.6687	-0.7209
sdi	0.2884	0.1917	0.4337	-1.2435
sdcc	0.0955	0.0668	0.1365	-2.3487

Stochastic reference points					
Reference points	estimate	cilow	ciupp	log.est	rel.diff.Drp
B _{msys}	639.5263	301.6037	1356.0642	6.4607	-0.2022
F _{msys}	0.0762	0.0503	0.1153	-2.5750	-0.1807
MSY _s	46.9238	20.7602	106.0609	3.8485	-0.4732

MSY B_{trigger} = 319.76 t

B_{lim} = 191.86 t

Estimated states				
	estimate	cilow	ciupp	log.est
B _{2022.92}	234.6187	62.0810	886.6784	5.4580
F _{2022.92}	0.0297	0.0058	0.1518	-3.5166
B _{2022.92} /B _{msy}	0.3669	0.0942	1.4283	-1.0028
F _{2022.92} /F _{msy}	0.3900	0.0808	1.8819	-0.9416

Table 12.2.4. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. SPiCT estimates for B/B_{MSY} and F/F_{MSY} .

	B/B_{MSY}			F/F_{MSY}		
	CI_lower	values	CI_upper	CI_lower	values	CI_upper
1983	0.7462	1.2082	1.9563	0.5449	1.2355	2.8012
1984	0.6396	1.2677	2.5125	0.7251	1.7788	4.3638
1985	0.565	1.3295	3.1283	0.6952	1.8964	5.1735
1986	0.4974	1.4234	4.0735	0.5645	1.6875	5.0448
1987	0.4537	1.4589	4.6915	0.5443	1.7257	5.4716
1988	0.4355	1.5443	5.4762	0.6191	2.1256	7.2986
1989	0.4078	1.5793	6.1162	0.6851	2.5252	9.3076
1990	0.3535	1.5183	6.522	0.6183	2.2961	8.5266
1991	0.3015	1.218	4.9208	0.4876	1.7721	6.4403
1992	0.2803	1.1321	4.572	0.4557	1.6735	6.1458
1993	0.2769	1.1282	4.5975	0.5511	2.1274	8.2119
1994	0.2701	1.221	5.52	0.5468	2.2529	9.2822
1995	0.2325	1.0827	5.0417	0.5324	2.1367	8.5746
1996	0.218	1.0053	4.6353	0.6333	2.713	11.6225
1997	0.1843	0.898	4.3749	0.5162	2.2529	9.8327
1998	0.1563	0.773	3.8229	0.4275	1.842	7.9369
1999	0.137	0.6469	3.0541	0.3431	1.4519	6.1436
2000	0.127	0.5981	2.8164	0.2534	1.0964	4.7433
2001	0.1227	0.5783	2.7251	0.2043	0.893	3.9033
2002	0.1207	0.6049	3.0325	0.2773	1.1446	4.7247
2003	0.1212	0.5555	2.5464	0.3177	1.272	5.092
2004	0.1152	0.496	2.1352	0.3387	1.3965	5.7583
2005	0.1128	0.5342	2.5303	0.4084	1.8155	8.0705
2006	0.0998	0.5014	2.5193	0.4406	1.8882	8.0918
2007	0.0877	0.4218	2.0287	0.4861	2.1942	9.9039
2008	0.0713	0.3556	1.7744	0.2904	1.334	6.1286
2009	0.058	0.2963	1.5136	0.2091	0.8802	3.7063
2010	0.0536	0.243	1.1025	0.1993	0.7497	2.8206
2011	0.0526	0.2088	0.8291	0.1995	0.7248	2.6337
2012	0.0582	0.2183	0.8183	0.1822	0.7416	3.0182
2013	0.0681	0.3188	1.4921	0.0868	0.3874	1.7289
2014	0.0769	0.3794	1.8711	0.0432	0.2032	0.9559
2015	0.0857	0.4679	2.5553	0.0249	0.1206	0.5854
2016	0.091	0.4927	2.6686	0.0179	0.0816	0.373
2017	0.0915	0.4727	2.4432	0.0308	0.134	0.5828
2018	0.0943	0.427	1.9336	0.0627	0.2735	1.1929
2019	0.0961	0.3967	1.6386	0.0826	0.3617	1.5845
2020	0.0956	0.4324	1.9557	0.0968	0.4321	1.9296
2021	0.0947	0.4426	2.0693	0.0928	0.4094	1.8067
2022	0.0932	0.4052	1.7616	0.0808	0.39	1.8819
2023	0.0944	0.3698	1.4479	0.0619	0.39	2.4557
2024	0.0973	0.4061	1.695	0.0491	0.39	3.0976
2025	0.1007	0.4447	1.9635			

Table 12.2.5. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. *Nephrops* SPiCT predicted catch and states for 2024.

	C	B/Bmsy	F/Fmsy	B/Bmsy.lo	B/Bmsy.hi	F/Fmsy.lo	F/Fmsy.hi
1. F=0	0.0	0.46	0.00	0.11	1.96	0.00	0.00
2. F=Fs _q	8.0	0.44	0.39	0.10	1.96	0.05	3.15
3. F=Fmsy	16.5	0.43	0.81	0.09	1.97	0.10	6.57
4. F=Fmsy_C_fractile	12.4	0.44	0.60	0.10	1.97	0.07	4.88

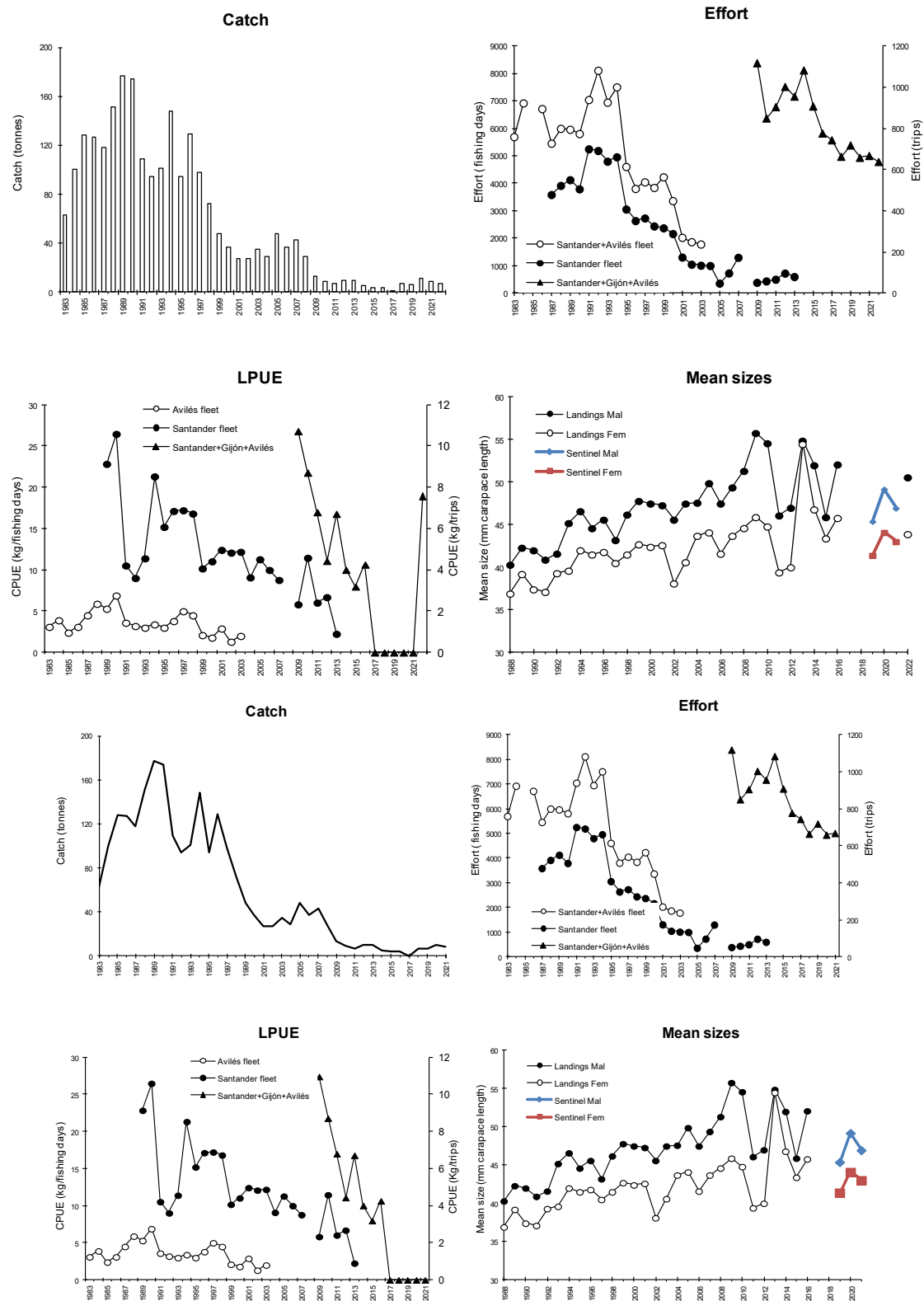


Figure 12.2.1. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Long-term trends in catch, effort, LPUE and mean sizes. Catch and mean sizes of *Nephrops* from the whole FU 31. Effort and LPUE for the “bacas” (métier OTB_DEF≥55) selling in the ports of Santander, Gijón and Avilés. *Nephrops* in 8.c (FUs 25 + 31) had TAC zero in 2017–2021.

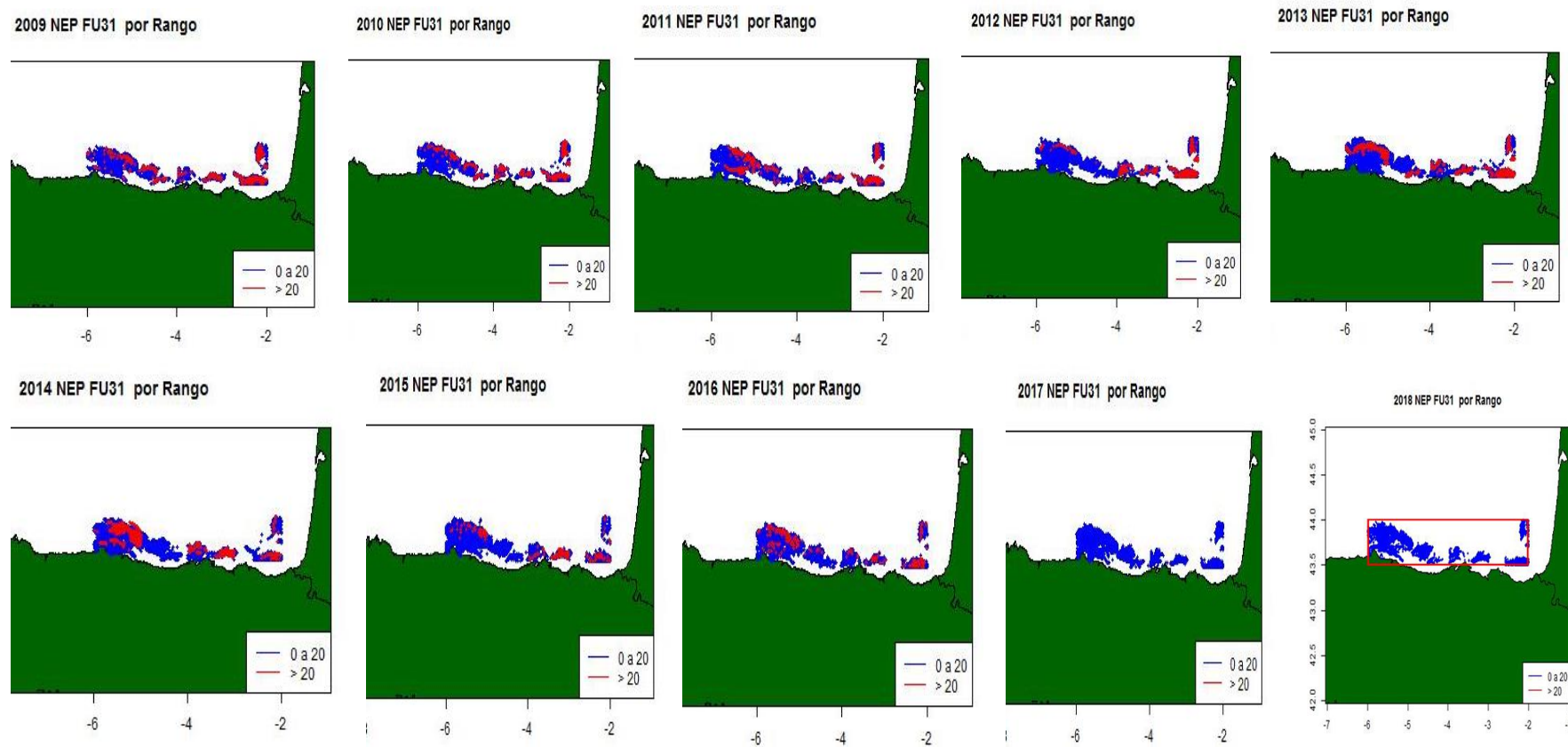


Figure 12.2.2a. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Distribution of FU 31 *Nephrops* LPUE (kg/fishing day) (logbooks and VMS data). FU 31 limits indicated in red in the 2018 map. Red points: *Nephrops* LPUE > 20 kg/fishing day, blue: *Nephrops* LPUE ≤ 20 kg/fd. FU 31 TAC was zero in the period 2017-2021.

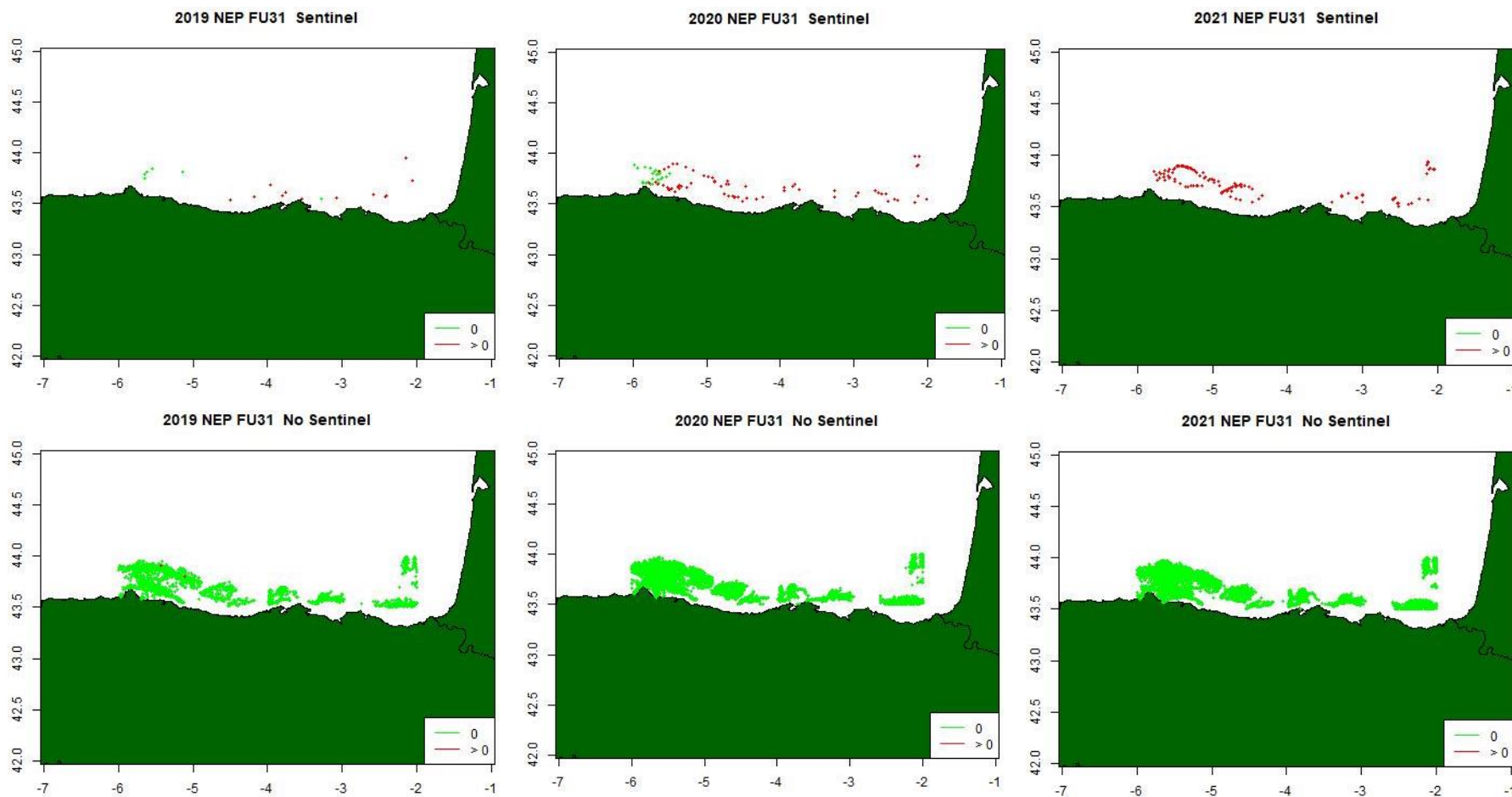


Figure 12.2.2b. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Distribution of FU 31 *Nephrops* LPUE (kg/fishing day) (logbooks and VMS data). FU 31 limits indicated in red in the 2018 map in Figure 12.2.2a. Red points: *Nephrops* LPUE > 0 kg/fishing day, green: *Nephrops* LPUE = 0 kg/fd. FU 31 TAC was zero for the period 2017-2021.

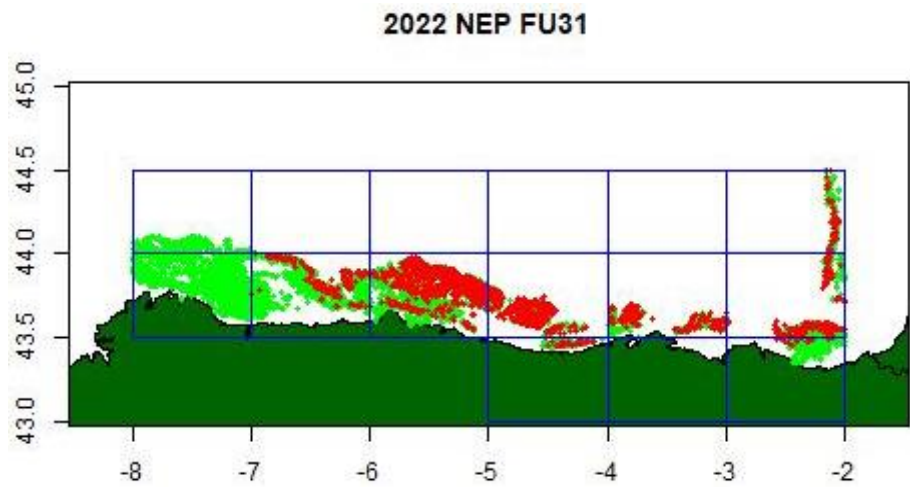


Figure 12.2.2c. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Distribution of FU 31 *Nephrops* LPUE (kg/fishing day) (logbooks and VMS data). Red points: *Nephrops* LPUE > 0 kg/fishing day, green: *Nephrops* LPUE = 0 kg/fishing day.

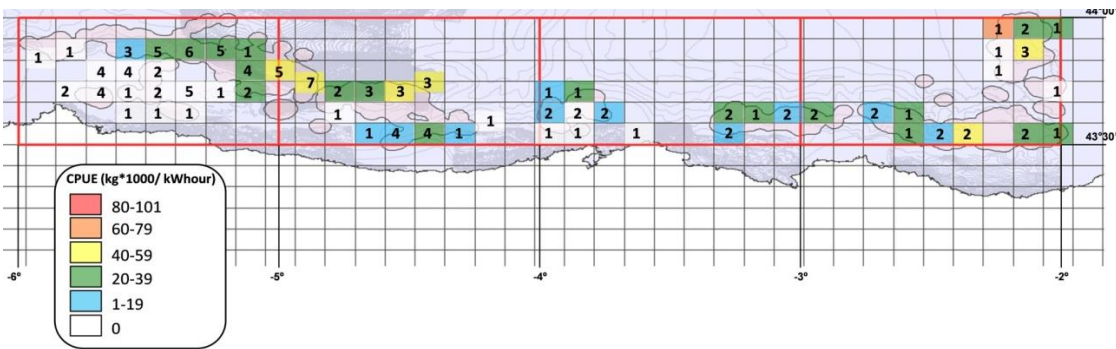


Figure 12.2.2d. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Sentinel Fishery 2019–2021. Numbers in the cells: number of hauls with observed on board carried out in each cell. Colors of the cells: *Nephrops* CPUE in grammes/kWhour. Pink patches: *Nephrops* area.

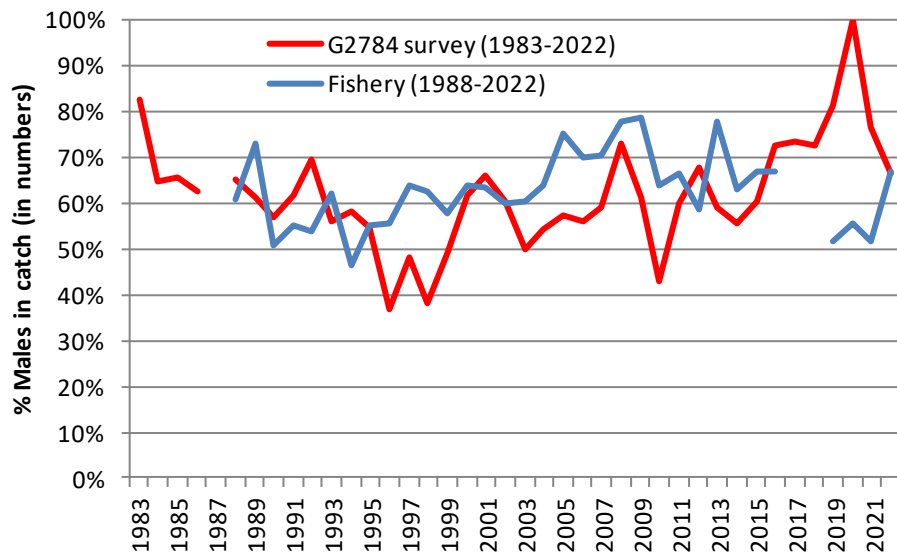


Figure 12.2.2e. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Catches proportion of males (1983–2021) from the SpGFS-WIBTS-Q4 (G2784) survey (red) and from the commercial and Sentinel fishery (blue).

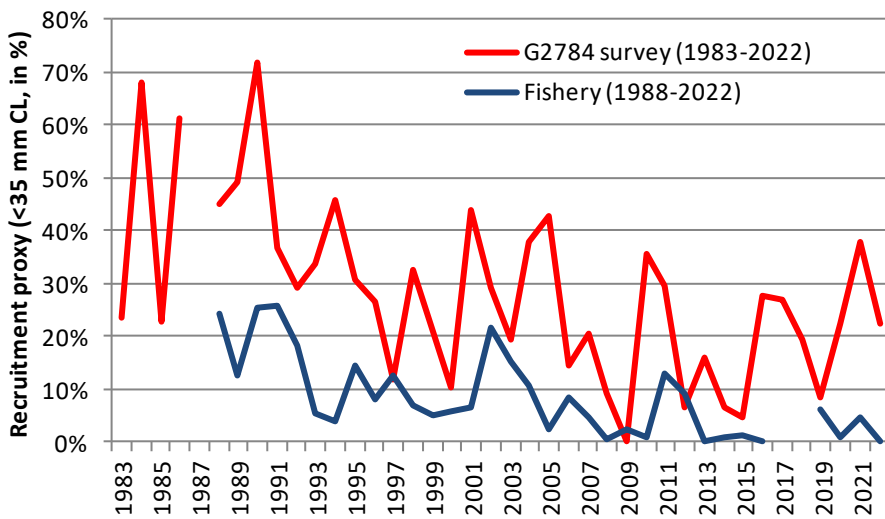


Figure 12.2.2f. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Recruitment proxy. Blue line = Commercial fleet (1988–2016) and Sentinel fleet (2019–2021). Red line = SpGFS-WIBTS-Q4 (G2784) survey (1983–2021).

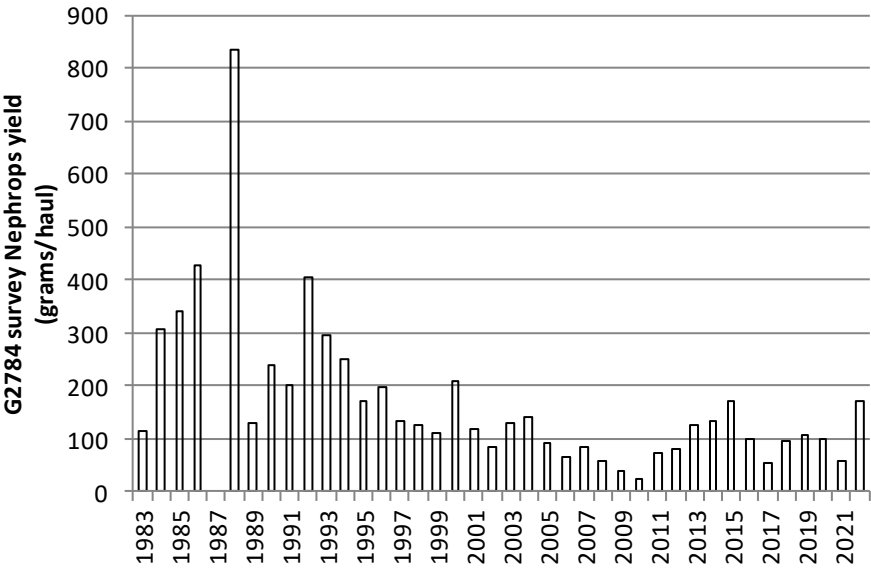


Figure 12.2.3. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. *Nephrops* CPUE (grammes/haul) from SpGFS-WIBTS-Q4 (G2784) survey (1983–2022). No survey was carried out in 1987.

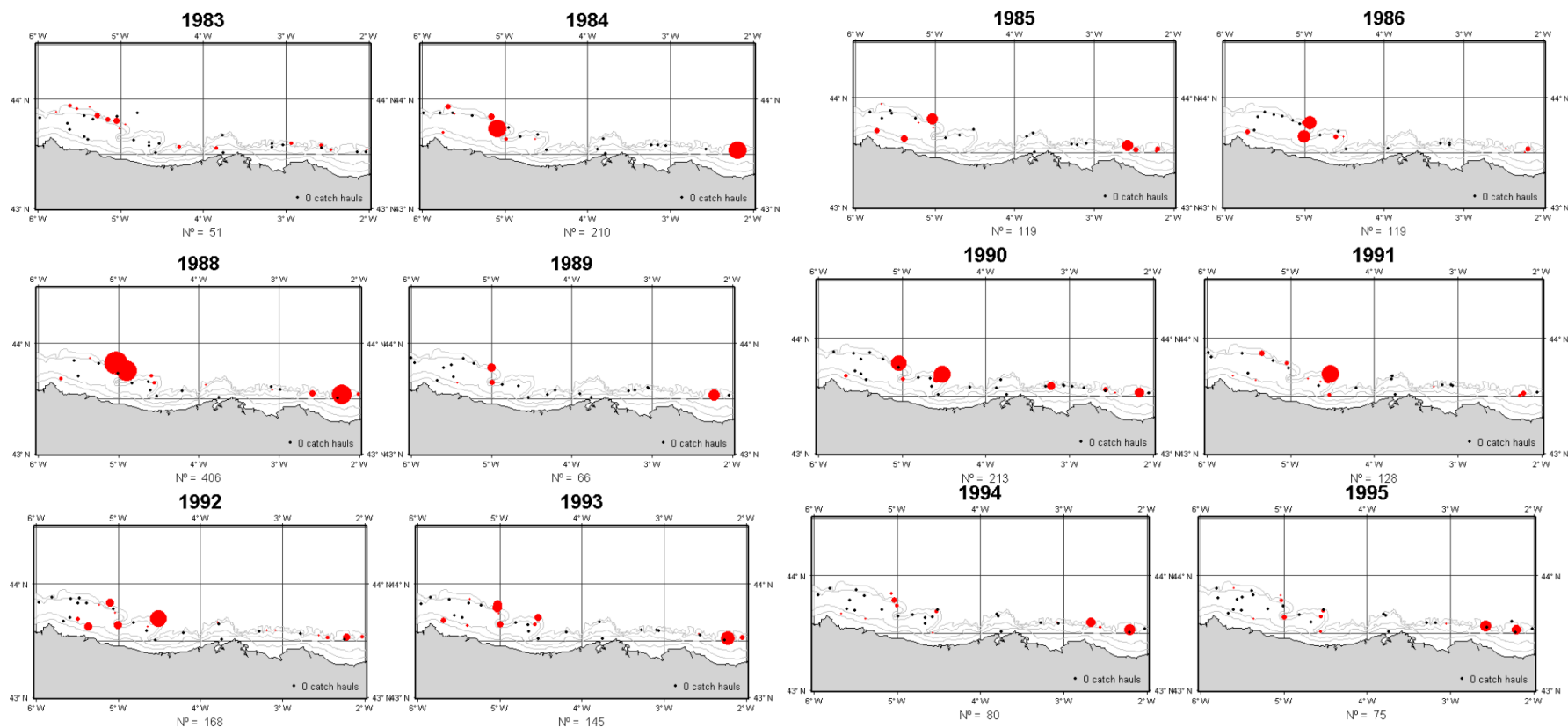


Figure 12.2.4a. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. CPUE (kg/haul) from SpGFS-WIBTS-Q4 (G2784) survey. Black points: zero kg of *Nephrops* by haul. No survey was carried out in 1987. Higher CPUEs period (1983–1995).

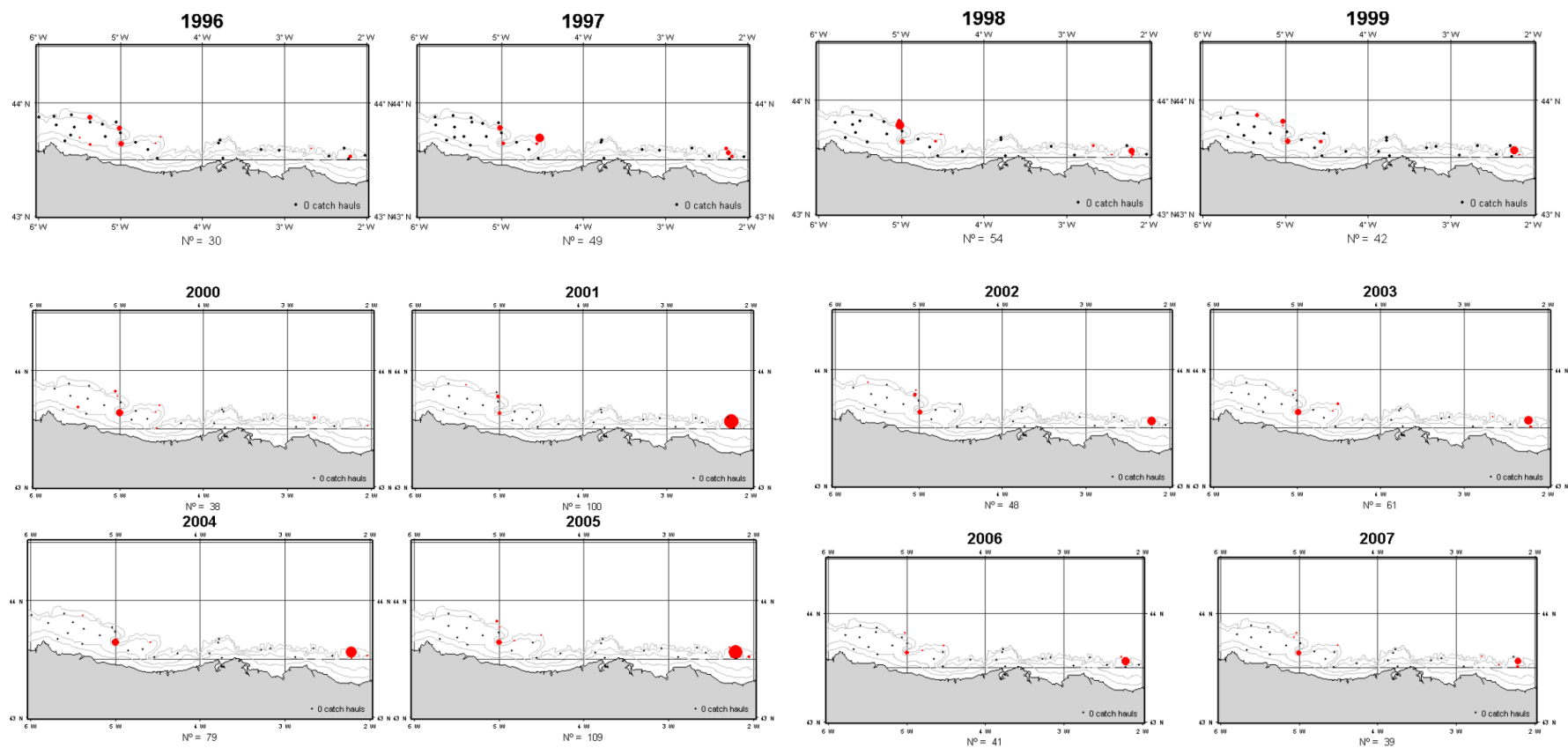


Figure 12.2.4b. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. CPUE (kg/haul) from SpGFS-WIBTS-Q4 (G2784) survey. Black points: zero kg of *Nephrops* by haul. Lower CPUEs, eastern patch prevalence.

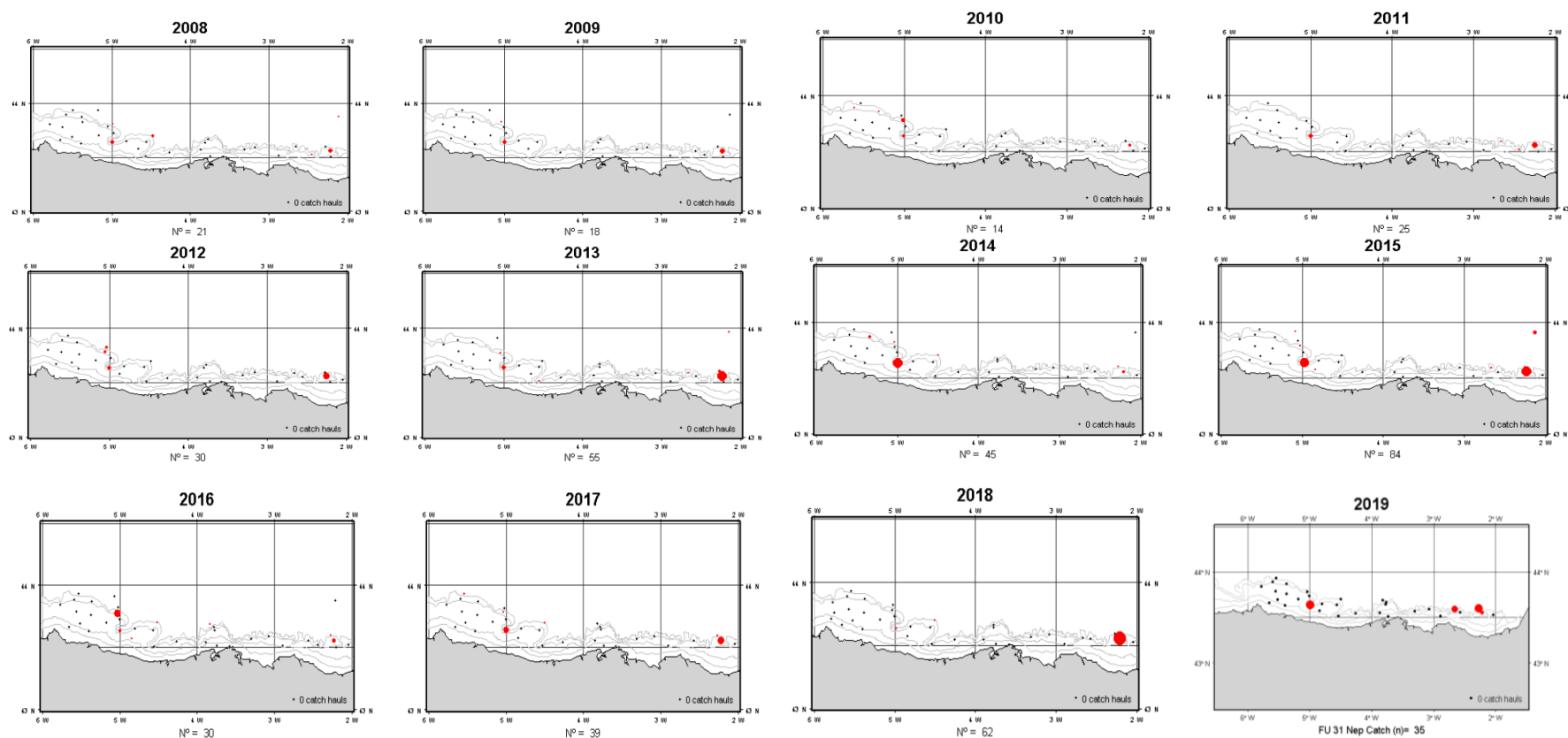


Figure 12.2.4c. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. CPUE (kg/haul) from SpGFS-WIBTS-Q4 (G2784) survey. Black points: zero kg of *Nephrops* by haul. Lower CPUEs.

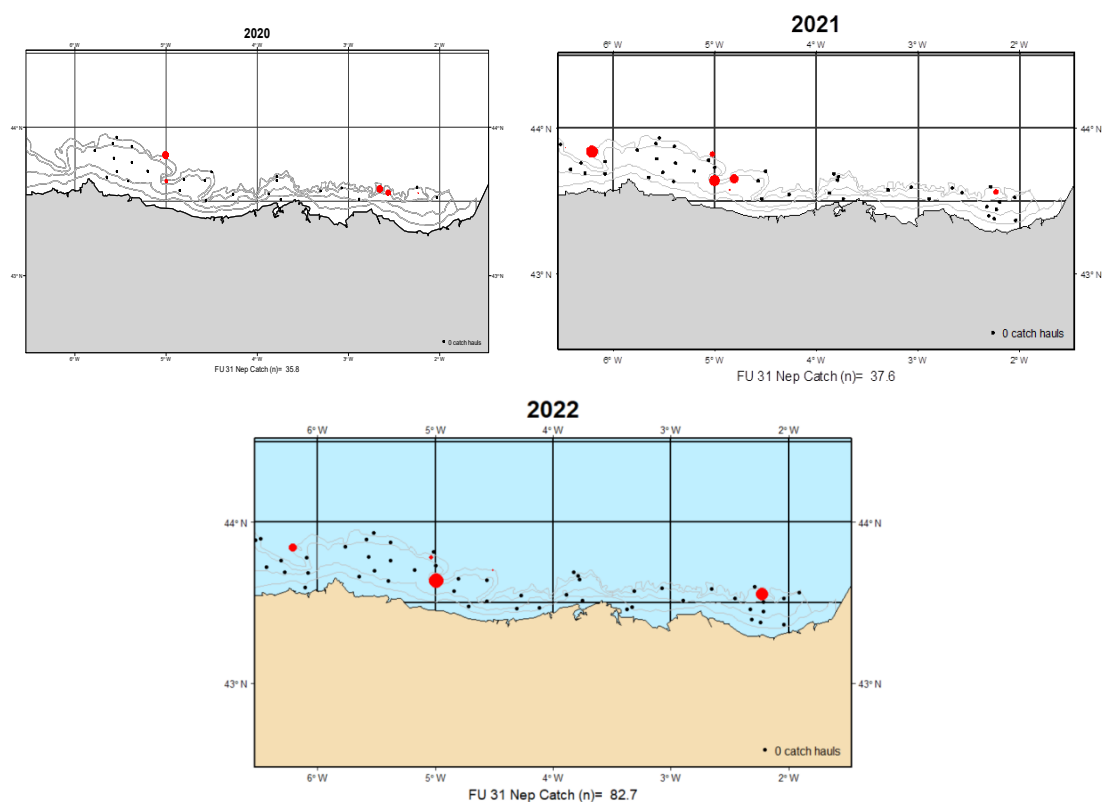


Figure 12.2.4d. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. CPUE (kg/haul) from SpGFS-WIBTS-Q4 (G2784) survey. Black points: zero kg of *Nephrops* by haul. Lower CPUEs.

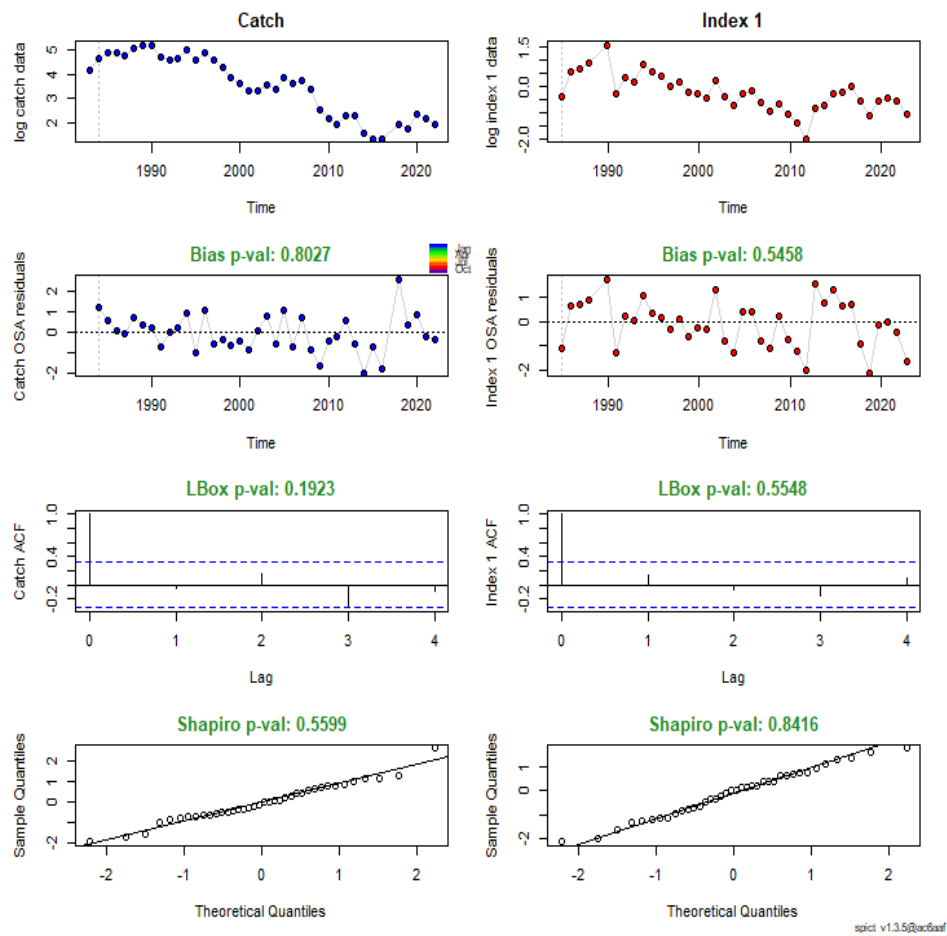


Figure 12.2.5. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. SPiCT diagnostics. Row1: Log of the input datasets. Row 2: OSA residuals with the p-value of a test for bias. Row 3: Empirical autocorrelation of the residuals with tests for significant autocorrelation. Row 4: Tests for normality of the residuals, QQ-plot and Shapiro test.

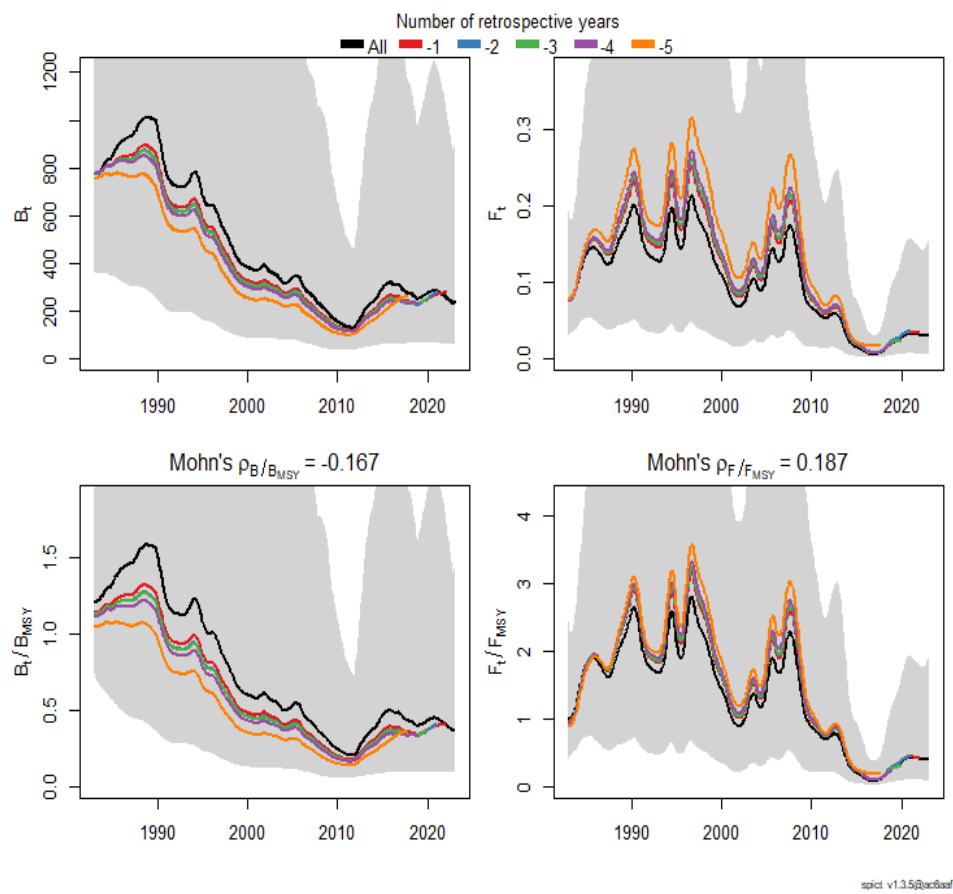


Figure 12.2.6. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Retrospective patterns.

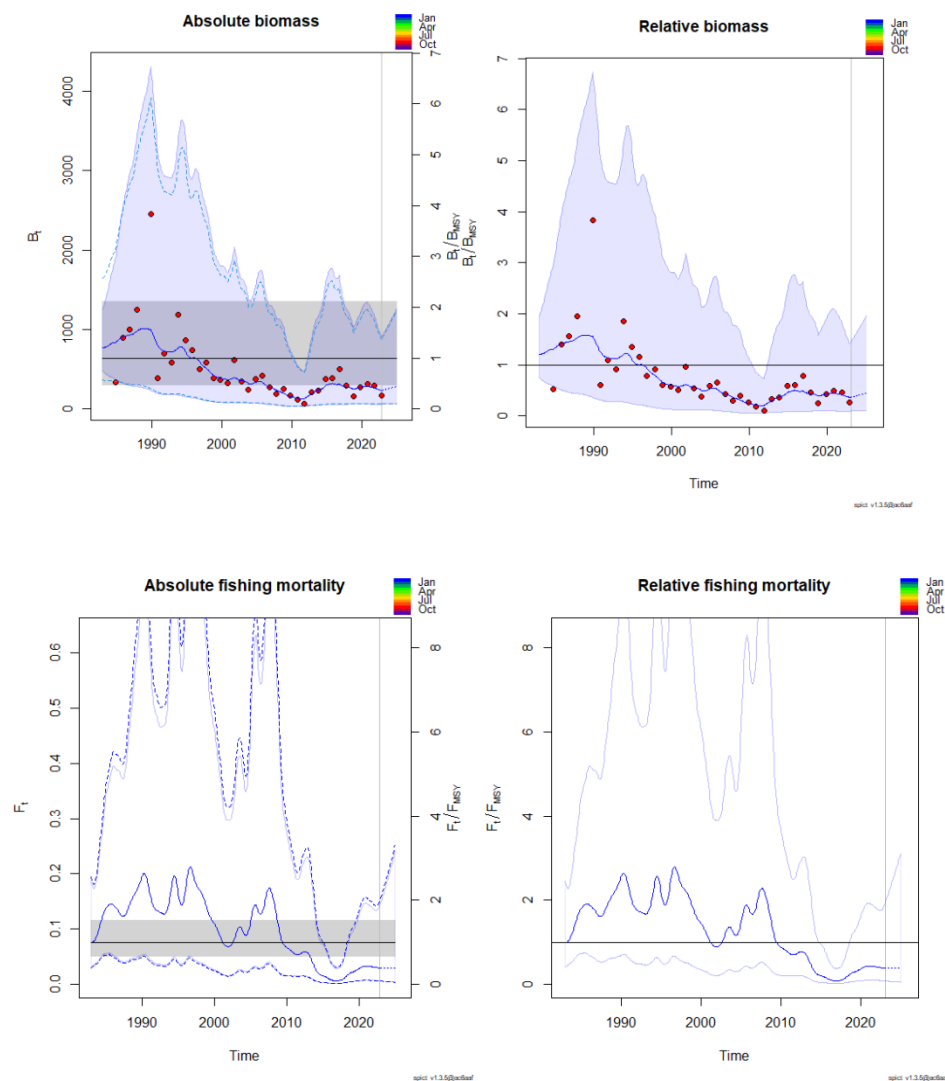


Figure 12.2.7. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Absolute and relative biomass and fishing mortality. Solid (blue) lines indicate median values and shaded areas indicate 95% confidence intervals (CI). Horizontal lines denote fisheries reference points.

12.3 Summary for Division 8.c

Atlantic *Nephrops* landings from the Iberian Peninsula (ICES divisions 8.c and 9.a) have been decreasing by about 93% from 1978 to 2014 (Figure 12.3.1). Separate 8.c and 9.a landings have different magnitudes but present similar trends in the period 1983–1999 (Figure 12.3.2).

Division 8.c includes FU 25 (North Galicia) and FU 31 (southern Bay of Biscay and Cantabrian Sea) and is shown in Figure 1.2. In 2022 FU 25 accounts for 56% of the Spanish *Nephrops* catch in Division 8.c (Table 12.3.1 and Figure 12.1).

The significantly low levels of catches from FU 25 and FU 31 coupled with the decreasing LPUE trends indicate that both stocks are in very poor condition. TAC in Division 8.c was zero catch for the period 2017–2021. For 2022, *Nephrops* in FU 25 has zero TAC and in FU 31 a TAC of 20 t. However, special quotas were authorized for FU 25 since 2017 to 2022 and FU 31 since 2019 to

201 for the Sentinel fishery to collect some data for the estimation of a commercial abundance index.

Low quantities of males in a *Nephrops* stock could be related to high fishing pressure since females are protected in burrows for most of the year (Fariña Pérez, 1996). In worst cases, low quantities of males could affect mating (ICES, 2013) and consequently recruitment in subsequent years. The percentage of males in the Spanish “Demersales” trawl survey (SpGFS-WIBTS-Q4 (G2784)) in Division 8.c from 1983 to 2018 fluctuates around 55%, with the lowest values observed in 1998 and 2004 (Figure 12.3.3).

Increase in mean length could be related to poor recruitment. In Division 8.c, *Nephrops* mean length from SpGFS-WIBTS-Q4 (G2784) showed an increasing trend from 1983 to 2008 (Figures 12.3.4, 12.1.4b and 12.2.3e). Atlantic Iberian Northern *Nephrops* stocks mean length in landings also showed an increasing trend until 2009–2011 (Figures 12.1.1, 12.1.4b, 12.2.2 and 12.2.3e). Both the landings and CPUE decreased in the fisheries. The decreasing F together with an increase in mean size could be related to global processes (e.g. Teixeira *et al.*, 2014) occurring in this division. The resilience of the different stocks to these processes could be related to their different population and/or fishery characteristics (fishing pressure, stock density and size, etc.) and local/punctual events (*Nephrops* larvae mortality, etc.).

12.3.1 References

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12.3.2 Table and figures

Table 12.3.1. *Nephrops* in Division 8.c. Landings and discards (tonnes). *Nephrops* TAC in 8.c was zero for the years 2017–2022.

Year	FU25		FU 31		8c Outside FUs		Total 8c
	Landings	Discards	Landings	Discards	Landings	Discards	
1975	743						743
1976	578						578
1977	828						828
1978	706						706
1979	475						475
1980	532						532
1981	318						318
1982	431						431
1983	433		63				496
1984	515		100				615
1985	477		128				605
1986	398		127				525
1987	412		118				530
1988	445		151				596
1989	405		177				582
1990	335		174				509
1991	453		109				562
1992	428		94				522
1993	274		101				375
1994	246		148				394
1995	275		94				369
1996	209		129				338
1997	219		98				317
1998	103		72				175
1999	124		48				172
2000	81		37				118
2001	147		27				174
2002	143		27				170
2003	89		35		30		154
2004	75		29		10		114
2005	63		48		12		123
2006	62		37		11		110
2007	67		43		2		112
2008	39		29		1		69
2009	23		13		0		36
2010	34		9		5		47
2011	46		7		1		54
2012	13		10		2		25
2013	11		10		4		25
2014	10		5		0		15
2015	14		4		1		19
2016	13		4		3		20
2017*	2*		0		0		2
2018*	2*	0	0	7	0	0	10
2019*	3*	1	1*	6	0	3	12
2020*	2*	1	1*	10	0	0	13
2021*	2*	1	1*	8	0	0	12
2022*	2*	7	7	0	0	0	15

* *Nephrops* TAC was zero in 8c (FU 25 & FU 31) in 2017-2021 and in 2022 for FU 25 but there were *Nephrops* Sentinel Fisheries in FU 25 in 2017-2022 and FU 31 in 2019-2021.

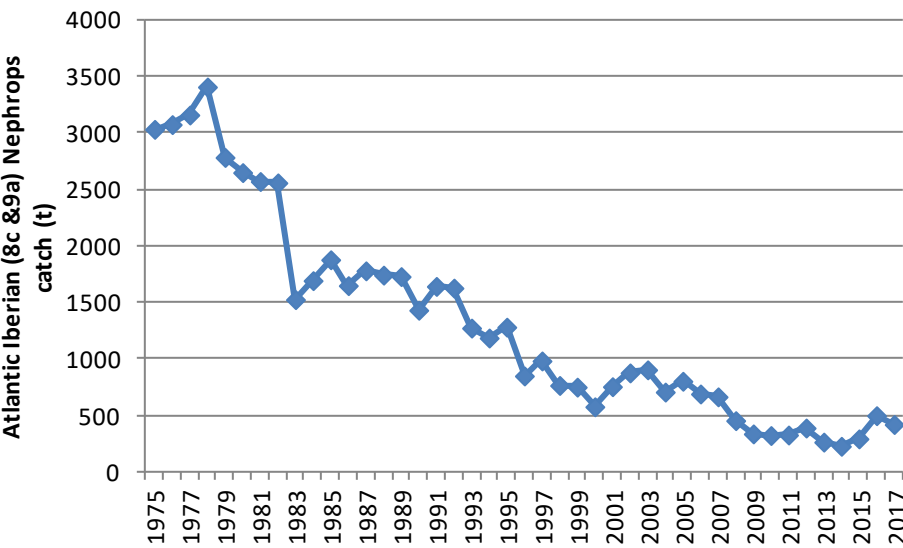


Figure 12.3.1. Atlantic Iberian (8.c+9.a) *Nephrops* landings (t) for the period 1975–2017.

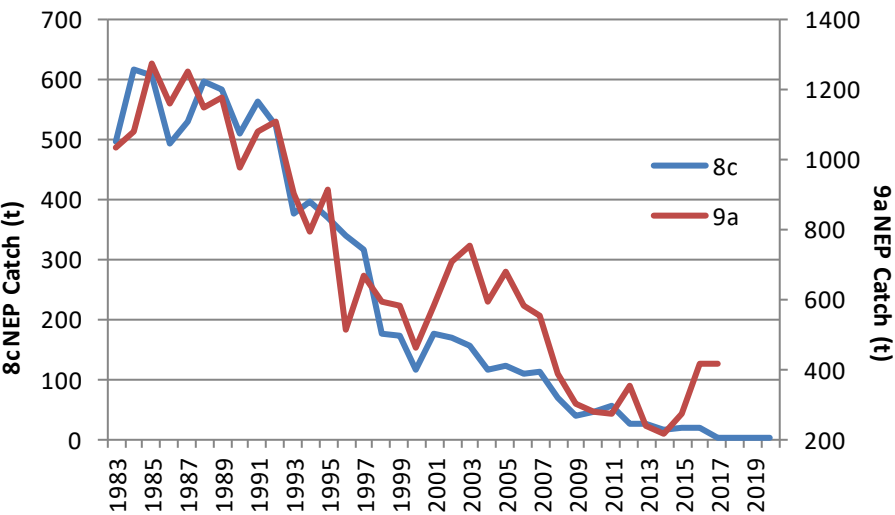


Figure 12.3.2. 8.c and 9.a *Nephrops* landings (t) for the period of 1983–2020.

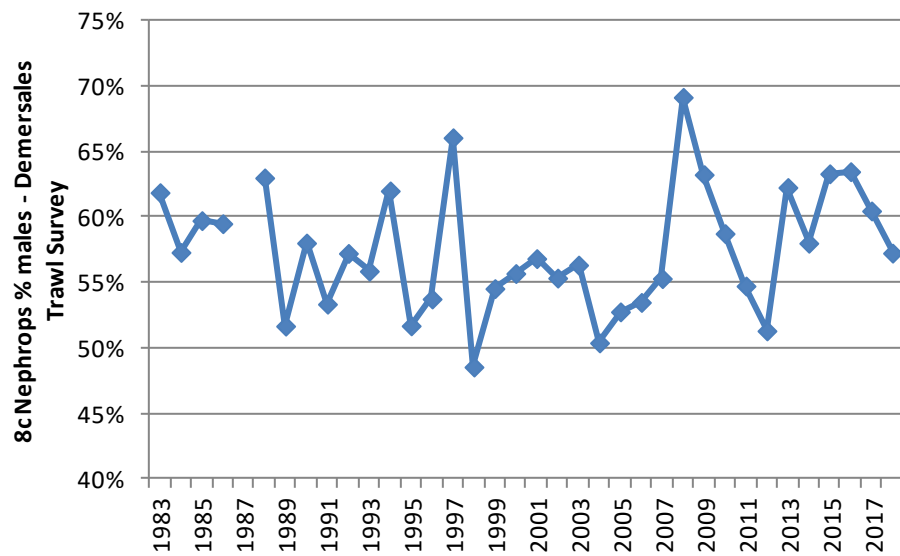


Figure 12.3.3. *Nephrops* in Division 8.c. Percentage of males from the whole Spanish “Demersales” Trawl Survey, SpGFS-WIBTS-Q4 (G2784), for the period of 1983–2018.

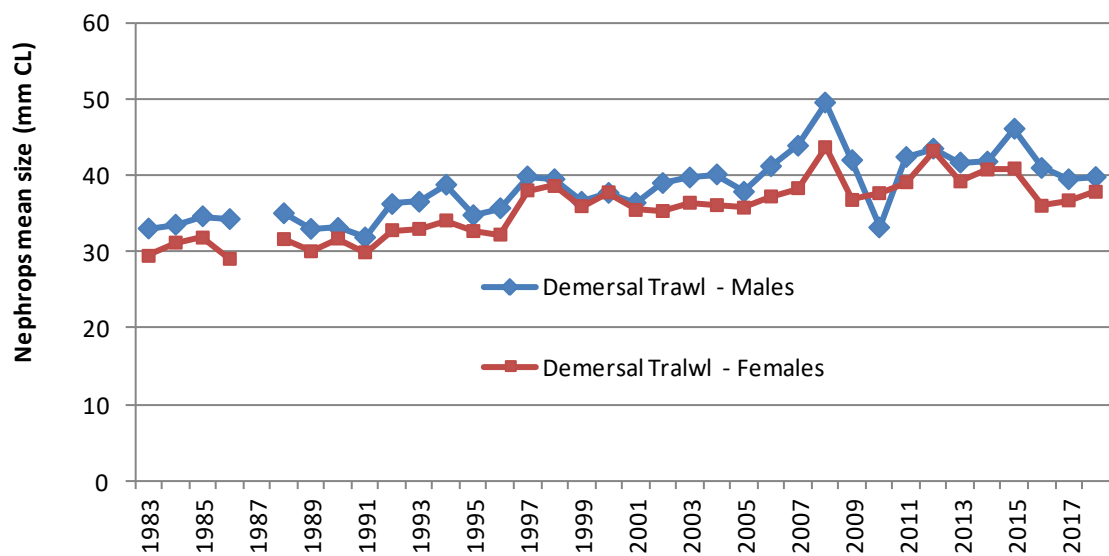


Figure 12.3.4. *Nephrops* in Division 8.c. Mean sizes from the whole Spanish “Demersales” Trawl Survey (SpGFS-WIBTS-Q4 (G2784)) from 1983 to 2018.

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