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WORKING GROUP FOR THE BAY OF BISCAY AND THE IBERIAN WATERS ECOREGION (WGBIE)

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Section contents

12   Norway lobster in Division 8.c

Nephrops norvegicus – nep.fu.25, nep.fu.31

Functional Unit 25 (southern Bay of Biscay and northern Galicia)
Functional Unit 31 (southern Bay of Biscay and Cantabrian Sea)

The ICES Division 8.c includes two Nephrops Functional Units (FUs): FU 25, North Galicia and FU 31, Cantabrian Sea (Figure 1.2). FU 25 contributes with 63% to the Spanish Nephrops landings from 8.c, FU 31 with 25% and the other rectangles of 8.c with the remaining 12% of landings (logbooks 2003–2016) (Figure 12.1).

12.1   FU 25 (North Galicia) *Nephrops*

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 was issued (ICES, 2017) in recent years.

After the identification of the FU 25 *Nephrops* area using hauling data from the SPGFS-WIBTS-Q4 (G2784) survey (1983–2020), discards from the onboard sampling programme (1994–2020) and the Sentinel fishery onboard sampling programme (2017–2020), it was proposed to include the statistical rectangles 16E0 and 17E1 in FU 25. *Nephrops* from those rectangles belongs to the same system as that of FU 25 and their catches are higher than in rectangle 15E1 which is part of FU 25.

After the WKMSYSPiCT benchmark (ICES, 2021b), FU 25 *Nephrops* stock was upgraded from category 3 (assessment based on trends) to 2 (production model) assessment (ICES, 2021a).

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 2021 and management applicable to 2020 and 2021

ICES advice for 2021

The advice for this *Nephrops* stock is triennial and valid for 2020, 2021, and 2022.

ICES advises that when the precautionary approach is applied, there should be zero catch in each of the years 2020, 2021 and 2022.

To protect the stock in this FU, ICES advises that the management area should be consistent with the assessment area. Therefore, management should be implemented at the Functional Unit level.

Management applicable to 2020 and 2021

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

In 2016, a zero TAC was set for *Nephrops* in ICES Division 8.c for 2017, 2018 and 2019. In 2019, this measure was advised again for the years 2020, 2021 and 2022.

Special quotas of 4.3 t in 2017, 2.0 t in 2018, 2019, and 2020 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. It should be noted that 88% of *Nephrops* landings are from the statistical rectangle 16E1, 10% from 15E0 and 2% from 15E1 (source: logbooks 2003–2016).

From 2017 to 2020, although the annual *Nephrops* TAC was zero, a special quota of 2 t each year 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). Details on the Sentinel fisheries were presented in working documents (WDs) to WGBIE (Vila *et al.*, 2018; González Herraiz *et al.*, 2019; González Herraiz *et al.*, 2020). In 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 12.1.2c-d, 12.1.7, 12.1.8).

Information on landings, discards and length distributions was uploaded to InterCatch. *Nephrops* discards are negligible in FU 25. 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), and 2020 (921 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) and during the years when the zero-TAC was implemented (2017–2020). These data were collected from a trawl fleet and for two vessels engaged in the Sentinel fishery (Figures 12.1.2a through 12.12c, and 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*.

Sentinel cpue maps are represented in Figure 12.1.2.b (2017 and 2018) and Figure 12.1.2.c (2019 and 2020), in kg/fishing day, considering all sentinel surveys hauls (directed and not directed to *Nephrops*). These maps are used and compared with the maps showing the distribution of the rest of the commercial fishing fleet activity. 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.

Sentinel maps in Figure 12.1.2.d (2017–2020) are represented in kg/haul only for the hauls directed to *Nephrops*, which were used for the Sentinel *Nephrops* cpue estimates. Some of the red points of the 2019 Sentinel map in Figure 12.1.2.c are not represented in Figure 12.1.2.d because they correspond to non-directed hauls.

The maps for the years 2017, 2018, 2019 and 2020 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* 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 (Figure 12.1.2b through Figure 12.1.2d, 2017–2019).

The comparison of the *Nephrops* area estimated with the position of the hauls with *Nephrops* catches from the whole time-series (1983–2020) of SPGFS-WIBTS-Q4 (G2784) survey plus discard programme and Sentinel fisheries with the area estimated only with 2017-2020 data suggests a contraction of the stock area since 1983 to 2020 by around 63% (Figure 12.1.8).

12.1.2.2 Biological sampling

The biological sampling programme and the Sentinel fishery provided since 1982 length–frequency distributions (LFDs) by sex of *Nephrops* 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 1982–2020. LFDs for 1982–2019 is presented in Figure 12.1.3a, Figure 12.1.3b and Figure 12.1.3c.

Mean sizes in landings (Figure 12.1.1) show an increasing trend in the time-series for both sexes. The maximum value was recorded in 2009. Low mean sizes observed in the years 1983–1986, 1991 and 2013 may suggest recruitment failure. Mean carapace length in males was 41.4 and 39.5 mm CL for females from the 2020 FU 25 *Nephrops* Sentinel survey catch (landings and discards).

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 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 (red 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

Figures 12.1.5 and 12.1.6a-d show two periods in FU 25 *Nephrops* cpue (kg/haul) time-series and spatial distribution from SPGFS-WIBTS-Q4 (G2784) survey (1983–2020): the first period with high abundances before 1997 and the other with low abundance since then. Moreover, Figures 12.1.6c-d could indicate a very small increase in cpue in the statistical rectangles 16E1 (inside FU 25) and 17E1 (outside FU 25) since 2008. This 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 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 and LPUE data are available for the bottom-trawl fleet selling in the port of A Coruña from 1975 to 2020 (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 (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 with cpue indices estimated from catches and effort data of two trawl vessels based in the A Coruña port for the years 2015 and 2016 in FU 25 (Table 12.1.5) was presented to WGBIE in 2017 as a WD (Fernández *et al.*, 2017).

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

In 2020, the Sentinel fishery was 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 12.1.2c-e and Figure 12.1.7). Sentinel fishery *Nephrops* catch in 2020 was composed of 2122 kg of retained catch and 12 kg of discards. Data of Sentinel fishery were included in the Spanish data uploaded to InterCatch. 2020 Sentinel fishery showed that *Nephrops* no longer occur in a large part of the area where these were previously available (Figure 12.1.7 and Figure 12.1.8).

Table 12.1.6 shows the *Nephrops* abundance indices (cpue) estimated for the years of 2017, 2018, 2019, and 2020 from the original area of the Sentinel fishery. However, this information is not representative of the whole FU 25 (Figure 12.1.2e).

12.1.3 Assessment

According to the ICES data-limited approach (ICES, 2015), this stock was considered as category 3.1.4—a stock with extremely low biomass and zero catch advice (ICES, 2019). The assessment of FU 25 is triennial. After the WKMSYSPiCT benchmark (ICES, 2021c), FU 25 was upgraded to category 2 (ICES, 2021a).

The SPiCT model (Pedersen and Berg, 2017) was considered suitable for the assessment of the FU 25 *Nephrops* stocks since, unlike other data-limited stocks (DLSs) methods, this model 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.

12.1.3.1 SPiCT model

The SPiCT model (Pedersen and Berg, 2017) was implemented for assessment and accepted in the WKMSYSPiCT benchmark (ICES, 2021b) with data until 2019. The same model revised with the 2020 data were used in this WG (ICES, 2021c).

Input data:

- Catches (1975–2020) (Table 12.1.1)
- SPGFS-WIBTS-Q4 (G2784) survey index (1983–2020) (Table 12.1.3, Figure 12.1.5)

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 CV of the catches and the F process noise
- High uncertainty for the 2017–2020 catches (period with TAC zero)

12.1.3.2 Assessment diagnostics

The SPiCT diagnostics and retrospective plots did not show major problems in this year's assessment (Figures 12.1.9 and 12.1.10).

12.1.3.3 Assessment results

SPiCT results are presented in Table 12.1.7, Table 12.1.8, and Figure 12.1.11. The stock biomass (B) decreases from 1975 to 2007 and has had a very slight increase since then. Except in 1975 and 1976, biomass has been below the B_{MSY}. Fishing mortality (F) has been above F_{MSY} until 2012.

The biomass at the end of 2020 was 10% of the B_{MSY} and the fishing mortality was 17% of the F_{MSY} (Table 12.1.7).

12.1.3.4 Short-term projections

SPiCT predicted catch and stock status for 2022 specific scenarios are shown in Table 12.1.9.

12.1.3.5 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 below presents these relative reference points accepted by WKMSYSPiCT and used in the assessment to provide advice.

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 (2021b)
	F_{MSY}	1	Relative value. The F_{MSY} proxy is estimated directly from the assessment model and changes when the assessment is updated.	ICES (2021b)
Precautionary approach	$B_{lim\ proxy}$	$0.3 \times B_{MSY}$	Relative value (equilibrium yield at this biomass is 50% of the MSY proxy).	ICES (2021b)
	B_{pa}	Not defined		

Framework	Reference point	Relative value *	Technical basis	Source
	F_{lim}	$1.7 \times F_{MSY}$	Relative value (the F that drives the stock to the proxy of B_{lim}).	ICES (2021b)
	F_{pa}	Not defined		

12.1.4 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. Details on how these data were collected (e.g. area, season) was 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 in relation with 8.c *Nephrops*. This document was discussed in a subgroup meeting during the WG in 2020. 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 8.c *Nephrops* stocks, are taken into account each year to make an integral analysis of the stock status and to elaborate a scientifically sound assessment.

No further information was presented to WGBIE in 2021.

12.1.5 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 years 2017, 2018, 2019, and 2020, the *Nephrops* TAC was zero.

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.

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

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12.1.7 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	364		364
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	32		32
2011	46		46
2012	9		9
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

(*) *Nephrops* TAC was zero in 8c (FU 25 & FU 31) in 2017, 2018, 2019 and 2020, but there was *Nephrops* Sentinel Fishery in FU 25.

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
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	1					0	1	1	0		0	0
67	1	2		0				1	1				0	0	1	0	0		0	
68	0	1		1			2	0	1				0	0	1	0	0			
69	1	0		1			2	1	1				0		1		0			
70	0	1		1				0	0	0				1	0	1	1			
71	1	1		0			2		1	0					0	0	0			
72	1	0			1		0					0			0	0	0		0	0
73	0	1		1					1				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	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	
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 2002–2020. * *Nephrops* TAC in 8.c (FUs 25 and 31) was zero in the years 2017, 2018, 2019 and 2020. Length distributions from FU 25 *Nephrops* Sentinel fishery used for those years.

Carapace length (mm)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017*	2018*	2019*	2020*
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	0		9	0				0		
23	2	0	1	1	1	1			0	0								0	
24	2	1	2	2	1	1	0	0	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			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
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
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
33	181	51	71	87	69	69	13	3	20	5	8	5	5	25	12	1	0	2	1
34	272	66	70	83	62	75	16	4	27	14	5	6	8	26	16	2	1	2	1
35	308	85	91	98	85	90	25	6	34	26	11	20	13	47	31	2	1	3	2
36	259	110	98	102	88	101	31	7	30	22	9	9	17	26	26	3	2	4	2
37	236	123	101	88	87	105	37	10	34	24	13	10	13	22	23	3	3	5	3
38	185	147	98	92	80	101	35	11	26	67	9	7	14	22	33	3	3	5	3
39	129	130	81	69	67	86	37	11	23	48	3	16	12	12	20	3	2	4	3
40	186	129	96	81	64	90	47	13	20	82	20	12	14	16	30	3	2	4	3
41	99	81	78	61	59	73	44	13	23	65	9	8	10	11	16	3	2	3	3
42	117	79	63	52	49	63	38	12	23	53	9	6	9	12	10	3	3	3	3
43	67	65	57	47	44	59	35	13	24	55	3	16	9	10	10	2	2	2	2
44	109	52	39	36	32	46	29	16	22	36	8	7	8	10	6	2	2	2	2
45	78	46	44	34	30	42	23	15	21	25	7	8	5	6	6	1	1	1	2
46	65	57	35	26	26	37	22	12	22	18	3	8	6	5	3	1	1	1	1
47	34	42	26	20	18	30	20	15	22	14	2	2	4	5	3	1	1	1	1
48	35	37	23	14	17	22	16	10	17	16	1	5	2	3	2	1	1	1	1
49	23	27	16	13	11	16	14	9	14	18	4	3	2	3	2	1	1	0	1
50	24	27	19	11	14	18	10	8	13	13	1	2	2	2	2	0	0	0	1
51	34	20	13	7	9	11	11	7	11	7	3	2	2	2	1	0	0	0	0
52	18	16	12	8	8	8	9	7	8	8	1	2	1	2	1	0	1	0	0
53	13	11	9	6	7	7	8	8	9	5	3	2	2	2	1	0	0	0	0
54	4	9	7	5	4	4	6	6	7	7	1	2	1	1	1	0	0	0	0
55	9	6	6	5	4	3	6	6	7	6	3	1	1	1	1	0	0	0	0
56	6	5	5	3	9	3	4	4	4	5	1	1	1	1	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
58	9	4	4	3	2	2	4	4	3	5	1	1	1	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
60	2	2	2	2	1	1	2	3	3	4	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
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
64	0	1	2	1	6	0	1	1	0	2	0	0		0	0	0	0		
65	4	1	2	1	1	0	1	1	1	1	1			0	0	0	0	0	
66	1	2	1	1	0	0	1	1	1	1		0	0	0	0	0	0		
67	2	1	1	1	1	0	1	1	0	2				0		0	0	0	0
68	0	1	1	1	0	0	1	1	1	2	0			0	0	0	0	0	
69	0	2	1	1	0	0	1	1	0	0	0		0		0	0	0		
70	2	1	1	1	0	0	0	1	0	1	0			0			0	0	
71	0	1	2	6	0	0	0	1	0					0			0	0	
72	0	1	1	0	6	0	0	1	0	1				0	0				
73	0	1	1	1	0	0	0	1	0	1	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	0	0
76	0	0	0	0	0	0	0					0		0	0				
77		0	0	0								0						0	
78	0	0	0		0	0		0	0			0		0			0		
79		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
Total weight (tonnes)	143	89	75	63	62	67	39	23	34	46	10	11	10	14	13	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
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

Table 12.1.3. *Nephrops* **FU 25, North Galicia. SP-NSGFS Spanish IBTS 4Q trawl survey (G2784).** *Nephrops* **yield in gramme/haul (1983–2020).**

Year	Nephrops yield
1983	127
1984	565
1985	281
1986	353
1987	
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

Table 12.1.4. *Nephrops* **FU 25, North Galicia. Landings, fishing effort and LPUE from the fleet selling in A Coruña port (1986–2020).**

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

* *Nephrops* TAC in 8c (FU 25 and FU 31) was zero in 2017, 2018, 2019 and 2020, but there was Nephrops Sentir fishery in FU 25.

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 *et al.*, 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 for the years of 2017, 2018, 2019 and 2020 in the original area of the Sentinel fishery.**

Source	Year	Period	*Nephrops* directed hauls			
			cpue (kg/hour)	s.d.	CV	n
Observers on board Sentinel survey	2017	Aug-Sep	7.2	3.1	43%	54
	2018	Aug-Sep	5.1	3.0	59%	66
	2019	Aug-Sep	16.2	11.1	69%	22
	2020	Aug-Sep	16.6	11.7	70%	24

*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*.

Table 12.1.7. *Nephrops* FU 25, North Galicia. SPiCT summary results.

Parameter estimates

Parameter	estimate	cilow	ciupp	log.est
alpha	2.8277	0.8191	9.7616	1.0395
beta	0.4439	0.2510	0.7850	-0.8122
r	0.1795	0.1243	0.2594	-1.7174
rc	0.1795	0.1243	0.2594	-1.7174
rold	0.1795	0.1243	0.2594	-1.7174
m	405.5033	209.9941	783.0360	6.0051
K	9034.2754	4567.2685	17870.2287	9.1088
q	0.0010	0.0005	0.0019	-6.9312
sdb	0.2037	0.0746	0.5563	-1.5913
sdf	0.3982	0.2695	0.5882	-0.9209
sdi	0.5759	0.4082	0.8125	-0.5518
sdc	0.1767	0.1278	0.2445	-1.7330

Stochastic reference points

Reference points	estimate	cilow	ciupp	log.est	rel.diff.Drp
Bmsys	3945.1177	1930.3088	8062.9346	8.2802	-0.1450
Fmsys	0.0794	0.0524	0.1204	-2.5330	-0.1303
MSYs	307.4125	135.5493	697.1816	5.7282	-0.3191

$B_{trigger}$ 1973 t B_{lim} 1184 t

Estimated states

	estimate	cilow	ciupp	log.est
B_2020.92	379.2235	165.3588	869.6875	5.9381
F_2020.92	0.0136	0.0028	0.0649	-4.3006
B_2020.92/Bmsy	0.0961	0.0341	0.2706	-2.3421
F_2020.92/Fmsy	0.1707	0.0370	0.7879	-1.7676

Table 12.1.8. *Nephrops* FU 25, North Galicia. SPiCT estimates for B/B$_{MSY}$ and F/F$_{MSY}$.

	B/Bmsy ll	est	ul F/Fmsy	ll	est	ul
1975	0.70	1.15	1.87	0.96	2.16	4.87
1976	0.57	1.03	1.85	0.98	2.00	4.09
1977	0.50	0.99	1.95	1.11	2.26	4.62
1978	0.42	0.91	1.97	1.29	2.66	5.51
1979	0.36	0.79	1.73	1.09	2.29	4.81
1980	0.32	0.73	1.64	1.05	2.22	4.68
1981	0.29	0.66	1.49	0.91	1.93	4.09
1982	0.28	0.64	1.44	0.90	1.87	3.89
1983	0.27	0.63	1.45	1.09	2.19	4.39
1984	0.26	0.61	1.44	1.24	2.40	4.64
1985	0.24	0.63	1.60	1.32	2.54	4.87
1986	0.23	0.58	1.50	1.21	2.35	4.55
1987	0.21	0.56	1.49	1.17	2.29	4.48
1988	0.20	0.55	1.49	1.28	2.50	4.90
1989	0.19	0.51	1.41	1.37	2.68	5.24
1990	0.17	0.45	1.18	1.28	2.50	4.89
1991	0.16	0.46	1.34	1.33	2.68	5.37
1992	0.14	0.46	1.55	1.39	3.03	6.65
1993	0.11	0.41	1.50	1.10	2.61	6.18
1994	0.10	0.37	1.29	0.94	2.27	5.48
1995	0.09	0.34	1.25	1.00	2.47	6.11
1996	0.08	0.30	1.21	0.99	2.58	6.69
1997	0.07	0.25	0.94	1.17	2.88	7.10
1998	0.06	0.18	0.58	1.11	2.49	5.61
1999	0.05	0.16	0.47	1.11	2.31	4.81
2000	0.05	0.14	0.40	1.11	2.23	4.50
2001	0.05	0.14	0.37	1.33	2.62	5.15
2002	0.04	0.13	0.38	1.87	3.74	7.45
2003	0.03	0.10	0.29	1.79	3.57	7.15
2004	0.03	0.08	0.22	1.63	3.19	6.22
2005	0.03	0.07	0.19	1.61	3.10	5.98
2006	0.02	0.06	0.16	1.71	3.28	6.29
2007	0.02	0.05	0.13	1.96	3.82	7.43
2008	0.02	0.05	0.12	1.62	3.27	6.58
2009	0.02	0.05	0.12	0.96	1.97	4.01
2010	0.02	0.05	0.16	0.78	1.63	3.41
2011	0.02	0.07	0.25	0.80	1.88	4.43
2012	0.02	0.07	0.26	0.40	1.03	2.63
2013	0.02	0.07	0.25	0.21	0.54	1.40
2014	0.02	0.08	0.30	0.16	0.43	1.12
2015	0.02	0.09	0.34	0.17	0.44	1.14
2016	0.02	0.09	0.35	0.18	0.46	1.17
2017	0.03	0.09	0.32	0.12	0.34	0.94
2018	0.03	0.09	0.26	0.07	0.24	0.78
2019	0.03	0.09	0.24	0.05	0.20	0.71
2020	0.03	0.09	0.25	0.04	0.18	0.71
2021	0.03	0.10	0.28	0.04	0.17	0.80
2022	0.04	0.11	0.34	0.03	0.17	0.96
2023	0.04	0.13	0.42	0.03	0.17	1.14

Table 12.1.9. *Nephrops* **FU 25, North Galicia. SPiCT predicted catch and stock status for 2022.**

```
                       C  B/Bmsy F/Fmsy  B/Bmsy.lo B/Bmsy.hi F/Fmsy.lo F/Fmsy.hi
1. F=0               0.0   0.13   0.00      0.04      0.42      0.00      0.00
2. F=Fsq             6.4   0.13   0.17      0.04      0.42      0.03      1.14
3. F=Fmsy            0.0   0.13   0.00      0.04      0.42      0.00      0.00
4. F=Fmsy_C_fractile 0.0   0.13   0.00      0.04      0.42      0.00      0.00
```
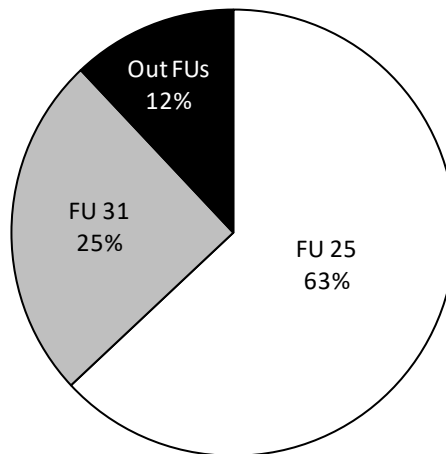

Figure 12.1. ICES Division 8.c *Nephrops* landings (in tonnes) by FU (2003–2016). *Nephrops* TAC in 8.c was zero for the years 2017, 2018, 2019 and 2020.
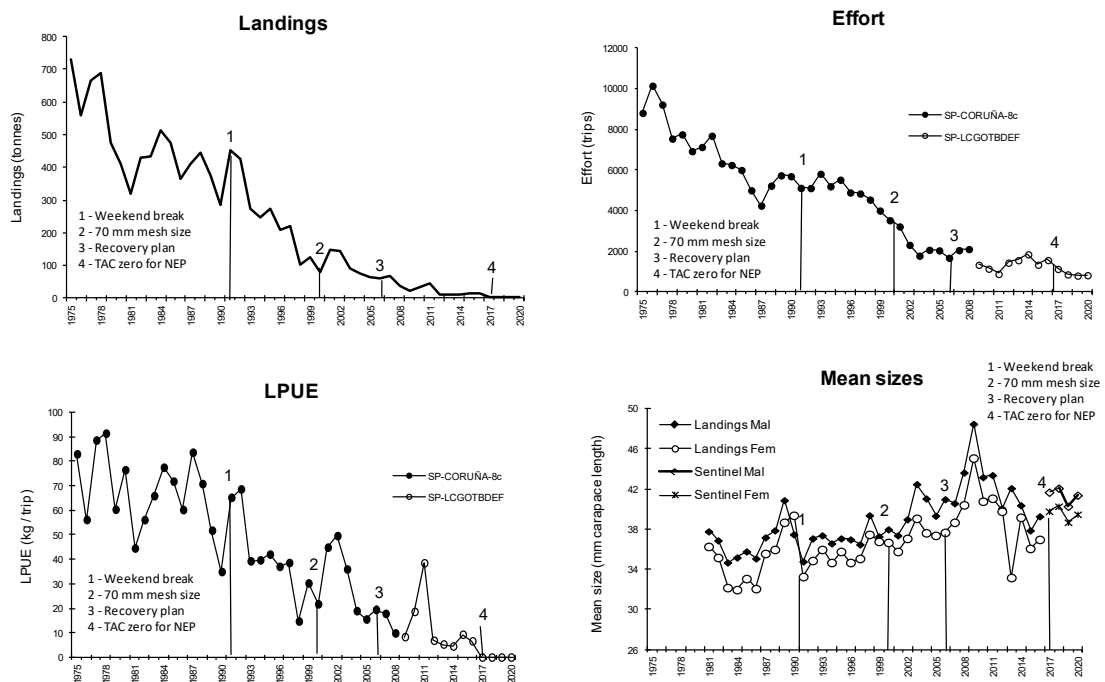
Figure 12.1.1. *Nephrops* FU 25, North Galicia. Long-term trends in landings, effort, LPUE and mean sizes. Landings (in tonnes) and mean sizes from the FU. Effort and LPUE from the fleet selling in the A Coruña port. *Nephrops* TAC in 8.c (FUs 25 and 31) was zero for the years 2017, 2018, 2019 and 2020. Mean sizes information during these years were from the FU 25 *Nephrops* Sentinel fisheries.
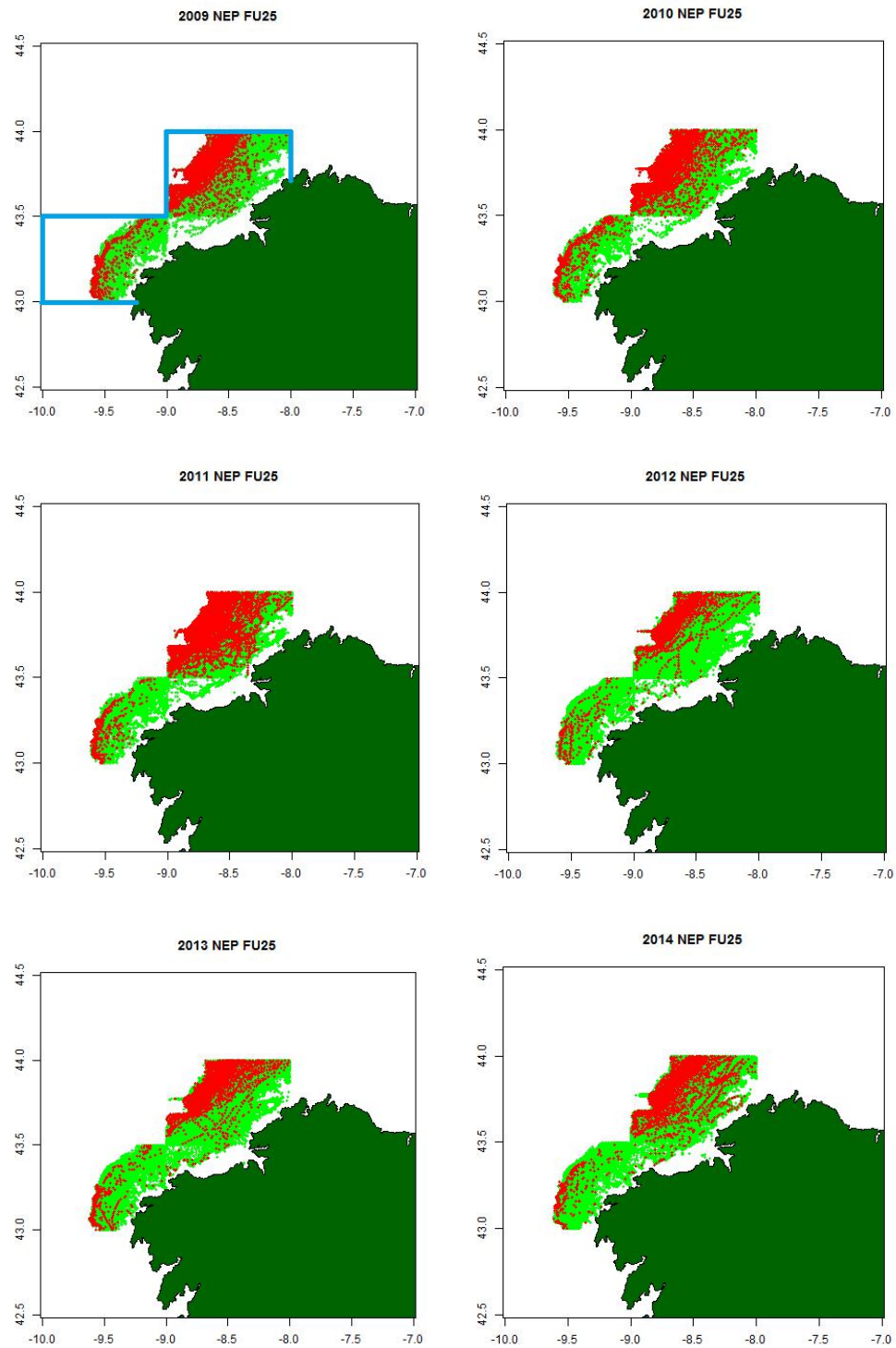
Figure 12.1.2a. *Nephrops* **FU 25, North Galicia. LPUE (kg/fishing day) distribution from commercial fleet activity. Red points:** *Nephrops* **LPUE > 0 kg/fd, green points:** *Nephrops* **LPUE = 0 kg/fd. Limits of the FU in blue in the 2009 map.**
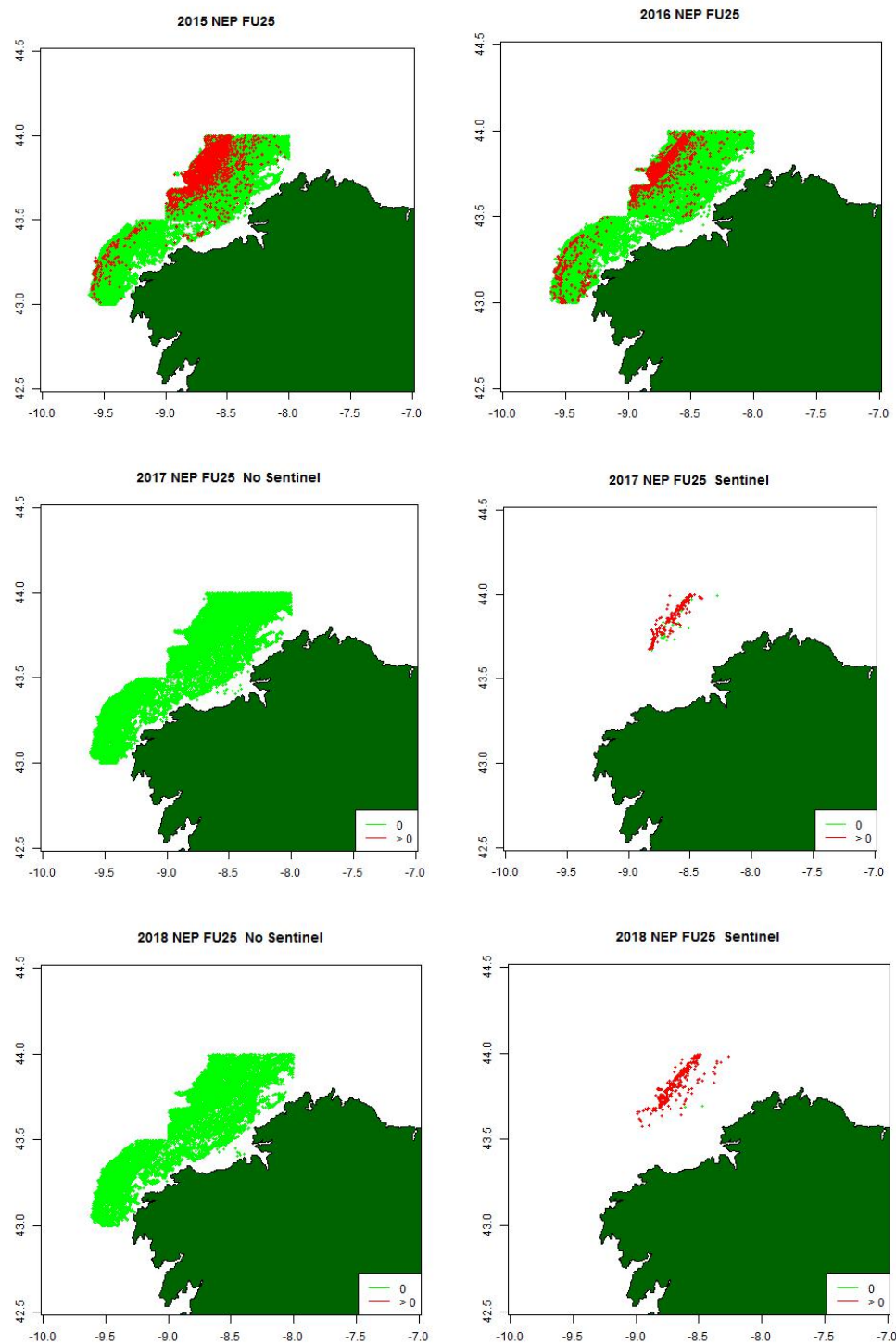
Figure 12.1.2b. *Nephrops* **FU 25, North Galicia. LPUE (kg/fishing day) distribution from commercial fleet activity (2015, 2016, 2017 and 2018 "no sentinel" maps) and from Sentinel fishery (2017 and 2018 "sentinel"). Red points: Nephrops LPUE > 0 kg/fd, green points: Nephrops LPUE = 0 kg/fd. Limits of the FU in blue in the 2009 map in Figure 12.1.2a.**
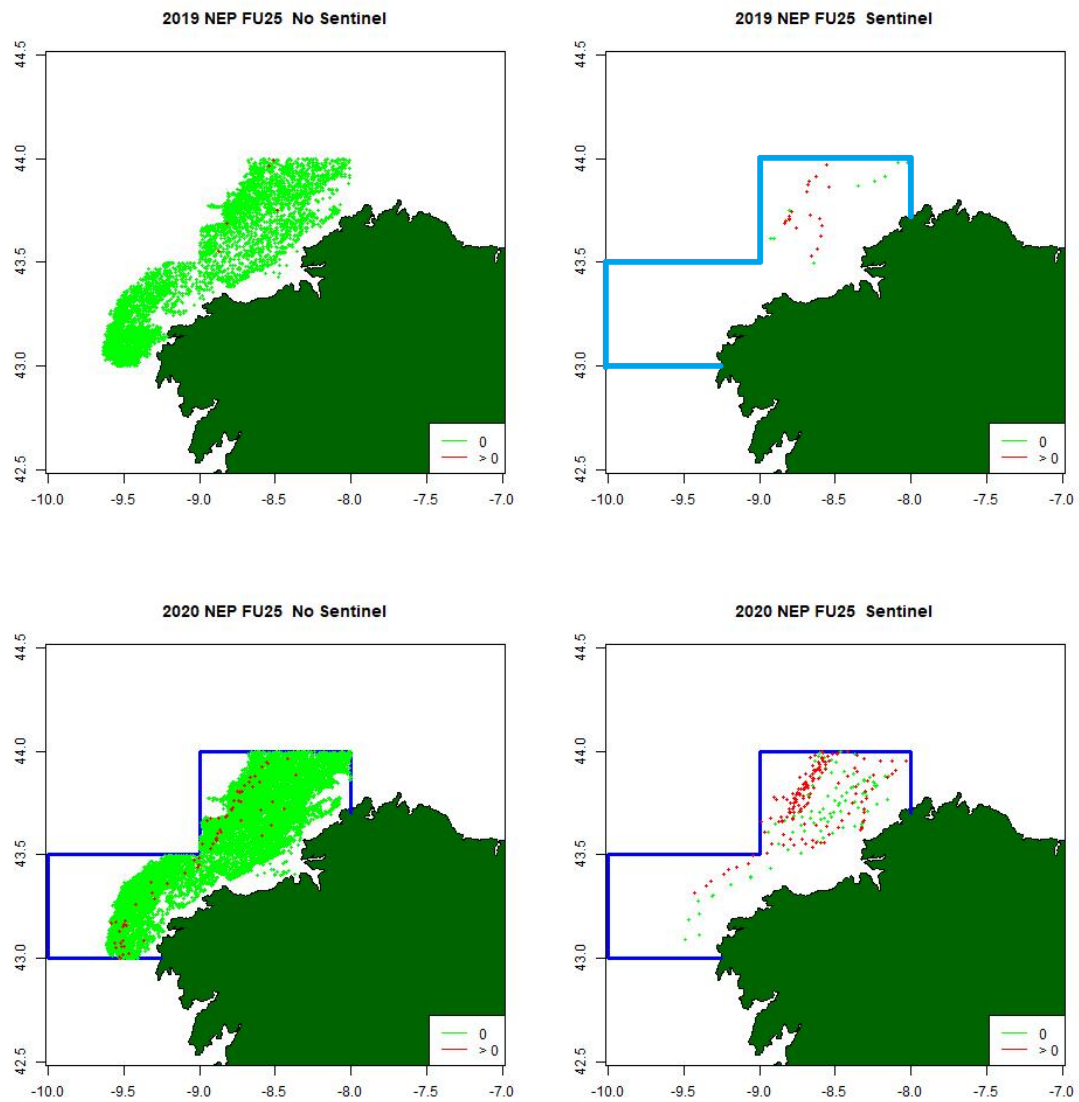
Figure 12.1.2c. *Nephrops* **FU 25, North Galicia. LPUE (kg/fishing day) distribution from commercial fleet activity ("no sentinel") and from Sentinel fishery ("sentinel"). Red points:** *Nephrops* **LPUE > 0 kg/fd, green points:** *Nephrops* **LPUE = 0 kg/fd. Limits of the FU in blue. In 2020, the sentinel was extended to the whole previous FU 25** *Nephrops* **area.**
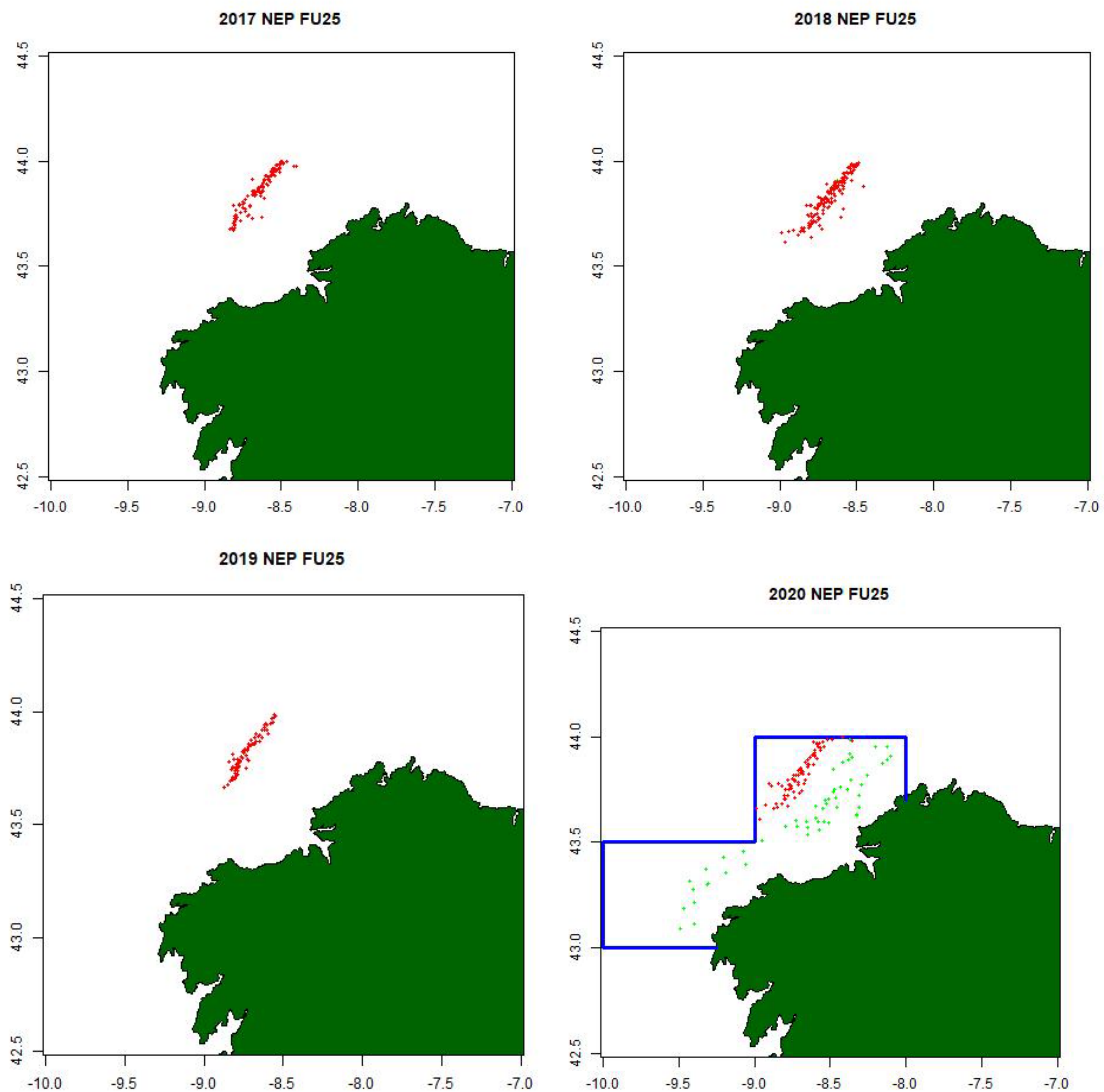
Figure 12.1.2d *Nephrops* **FU 25, North Galicia. LPUE (kg/haul) distribution from Sentinel fishery ("sentinel"). Only** *Nephrops* **directed hauls. Red points:** *Nephrops* **LPUE > 0 kg/haul, green points:** *Nephrops* **LPUE = 0 kg/haul. Limits of the FU are in blue. In 2020, the sentinel was extended to the whole previous FU 25** *Nephrops* **area.**
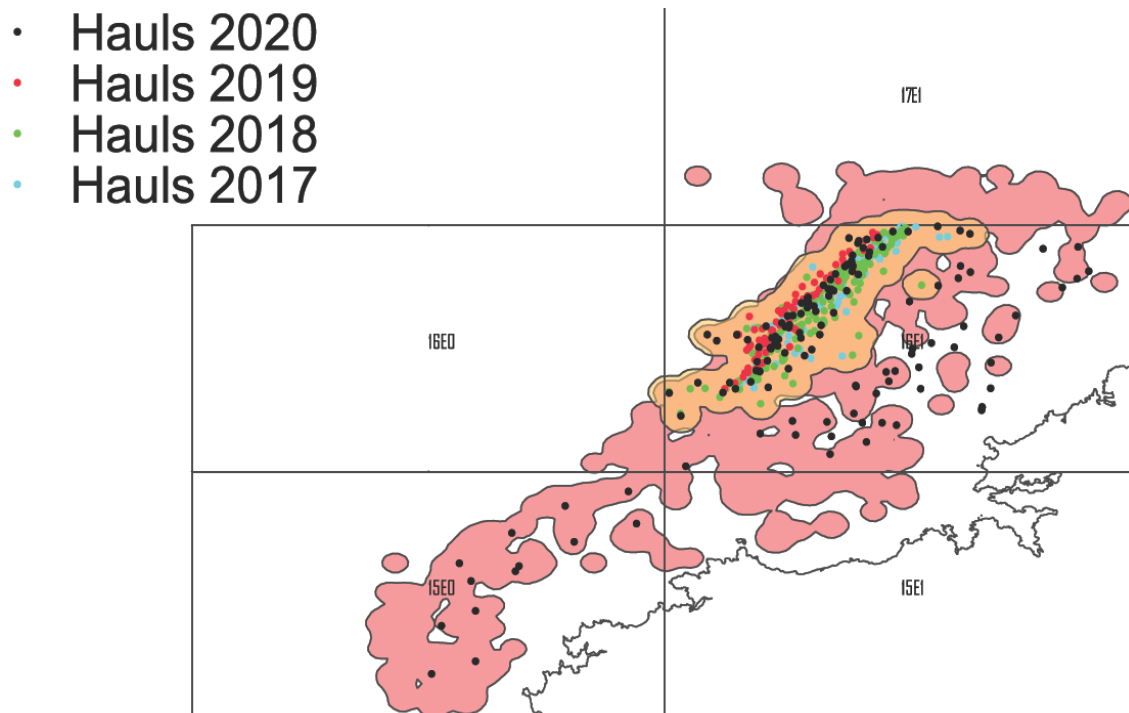
Figure 12.1.2e. *Nephrops* **FU 25, North Galicia. Sentinel effort (hauls) distribution in 2017–2020. In pink FU 25** *Nephrops* **assessment area, in yellow 2017–2019 Sentinel area. Only hauls directed to** *Nephrops***.**
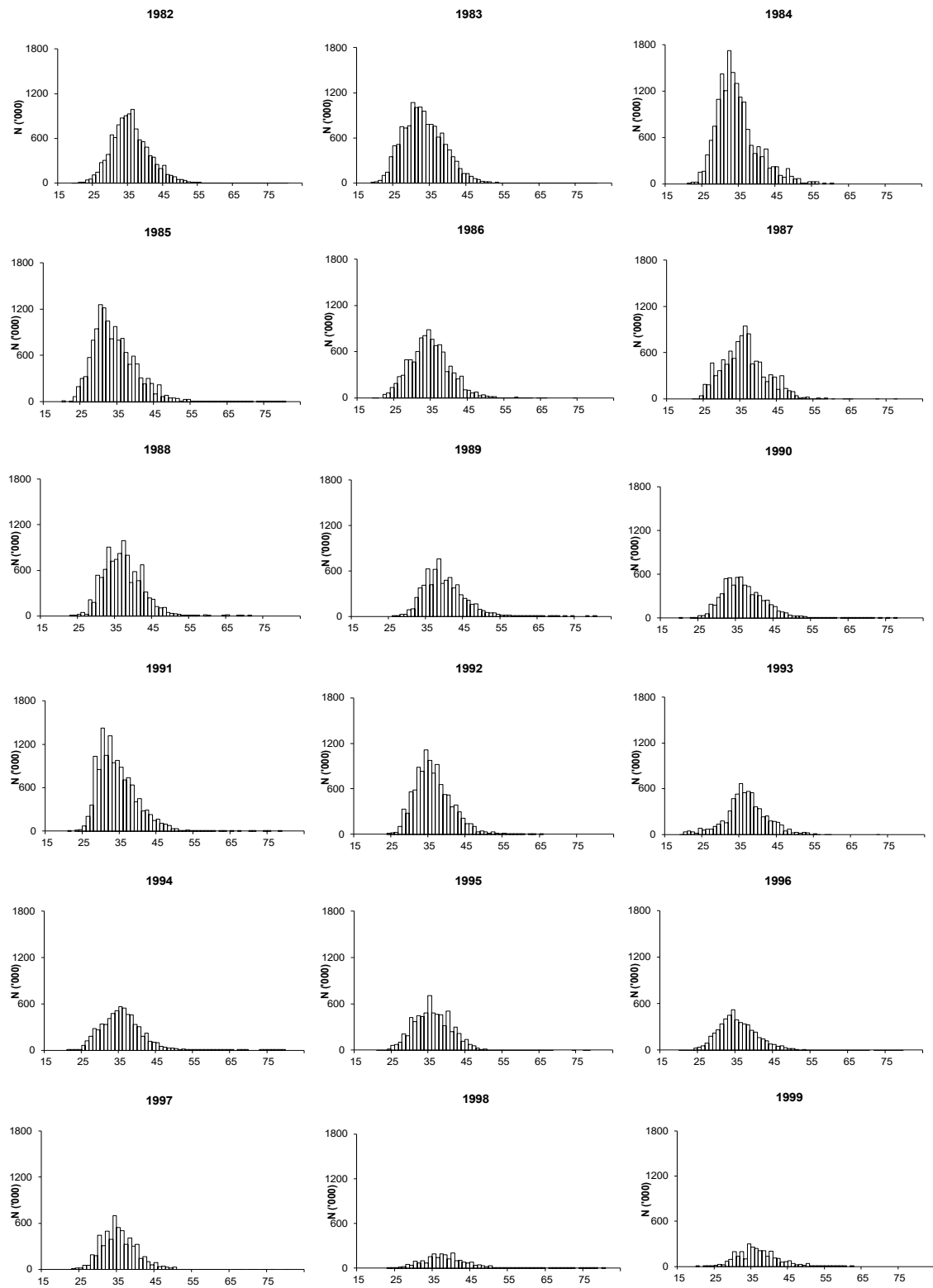
Figure 12.1.3a. *Nephrops* **FU 25, North Galicia. Length distributions of landings, 1982–1999. Maximum of y-axis 1800 thousand. Carapace length in mm in the x-axis.**
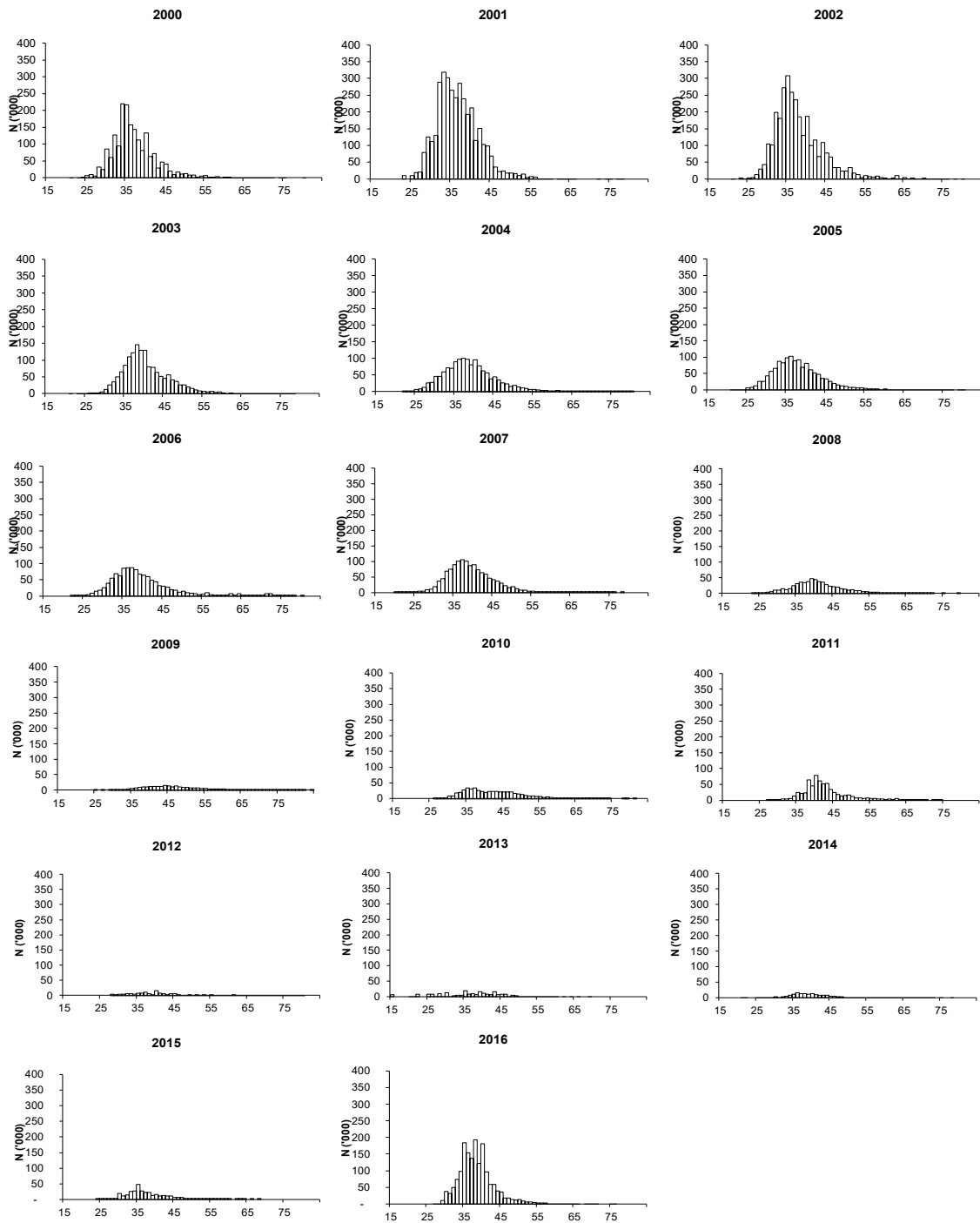
Figure 12.1.3b. *Nephrops* **FU 25, North Galicia. Length distributions of landings, 2000–2016. Maximum of y-axis 400 thousand (2001–2016). Carapace length in mm in the x-axis.**
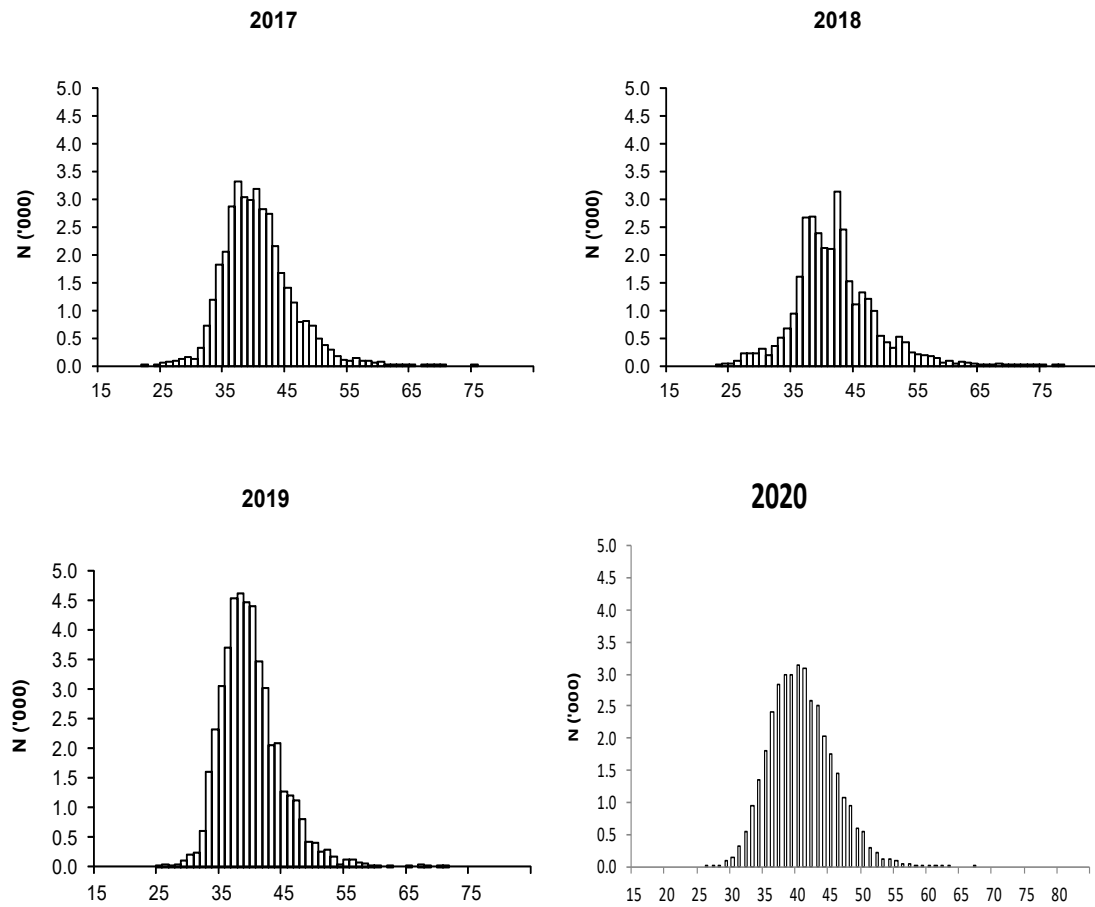
2017

2018

2019

2020

Figure 12.1.3c. *Nephrops* FU 25, North Galicia. TAC in 8.c (FU 25 and FU 31) was zero for the years 2017, 2018. 2019 and 2020. Length distributions of landings for these years were from the *Nephrops* Sentinel fishery. Maximum of y-axis 5 thousand. Carapace length in mm in the x-axis. The number of measured individuals: 7266 (2017), 8524 (2018), 4633 (2019), and 6316 (2020).
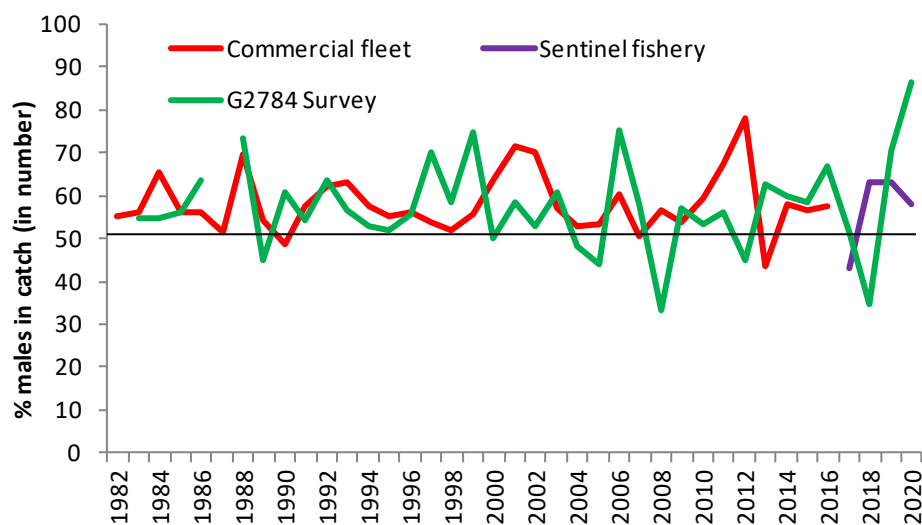
Figure 12.1.4a. *Nephrops* FU 25, North Galicia. Proportion of males in catches for the period 1982–2020. Commercial fleet (1982–2016), Sentinel fishery (2017–2020) and SPGFS-WIBTS-Q4 (G2784) survey (1983–2020).
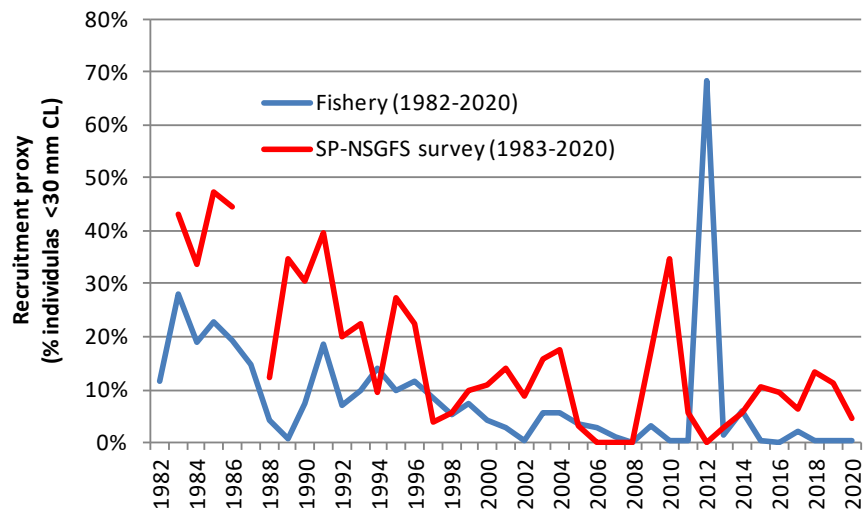
Figure 12.1.4b. *Nephrops* **FU 25, North Galicia. Recruitment proxy. Blue line = Commercial fleet (1982–2016) and Sentinel fleet (2017–2020). Red line = SPGFS-WIBTS-Q4 (G2784) survey (1983–2020)**
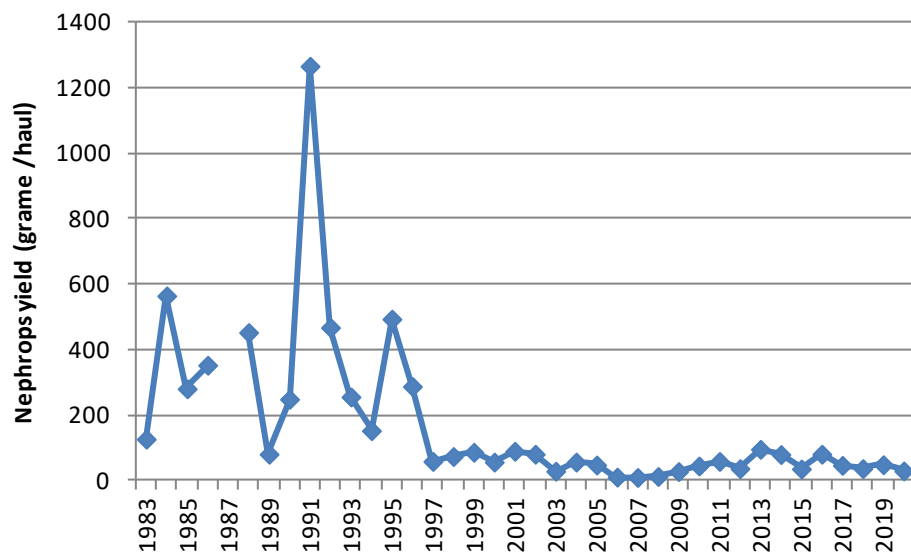
Figure 12.1.5. *Nephrops* **FU 25, North Galicia. Cpue (gramme/hour) from SPGFS-WIBTS-Q4 (G2784) survey (1983–2020). No survey was carried out in 1987. Only hauls in the** *Nephrops* **area have been used.**
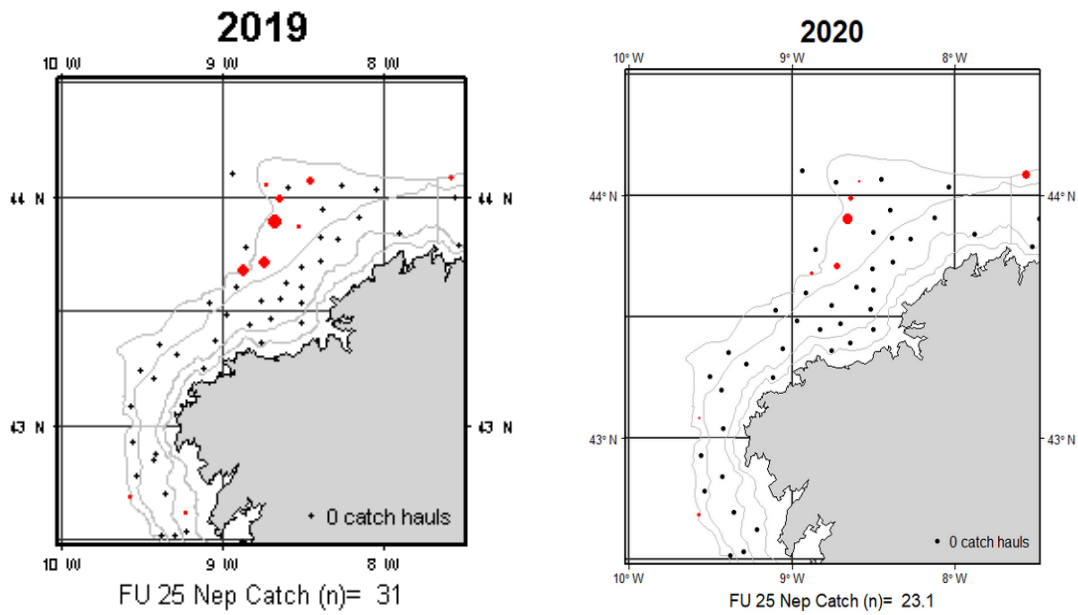
Figure 12.1.6d. *Nephrops* FU 25, North Galicia. Cpue (kg/haul) from SPGFS-WIBTS-Q4 (G2784) survey. Black points: zero kg of *Nephrops*/haul. Limits of FU 25 in blue in the 2009 map in Figure 12.1.6c.
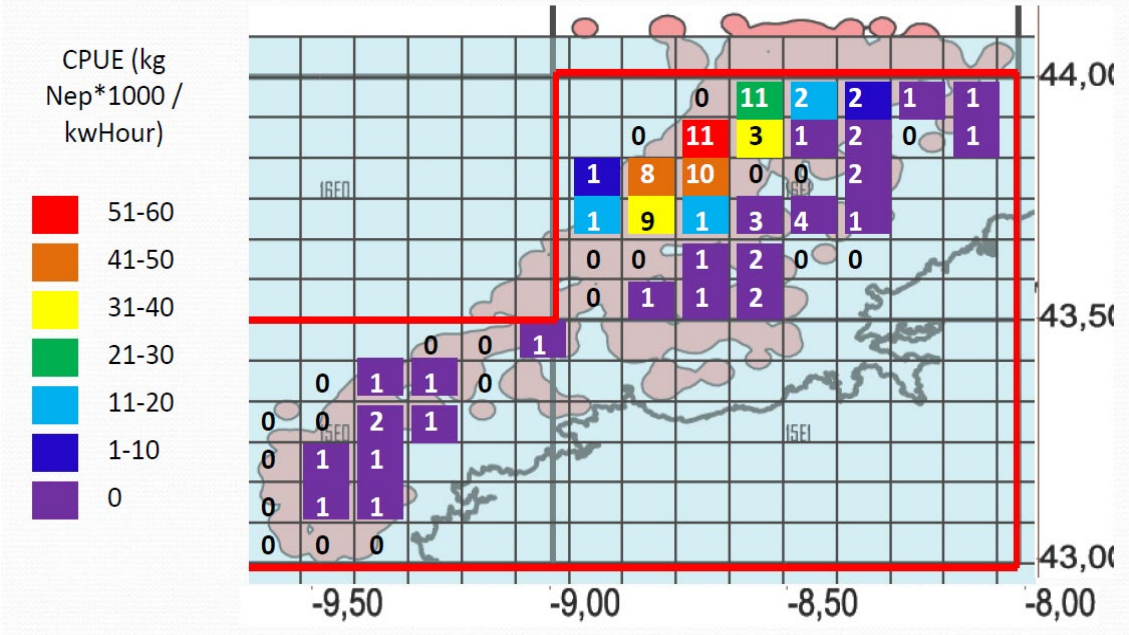
Figure 12.1.7. *Nephrops* FU 25, North Galicia. Cpue (kg*1000/kwHour) from the 2020 Sentinel fishery. Numbers in the map correspond to the number of hauls that were fished in each sampling cell. FU 25 limits in red.
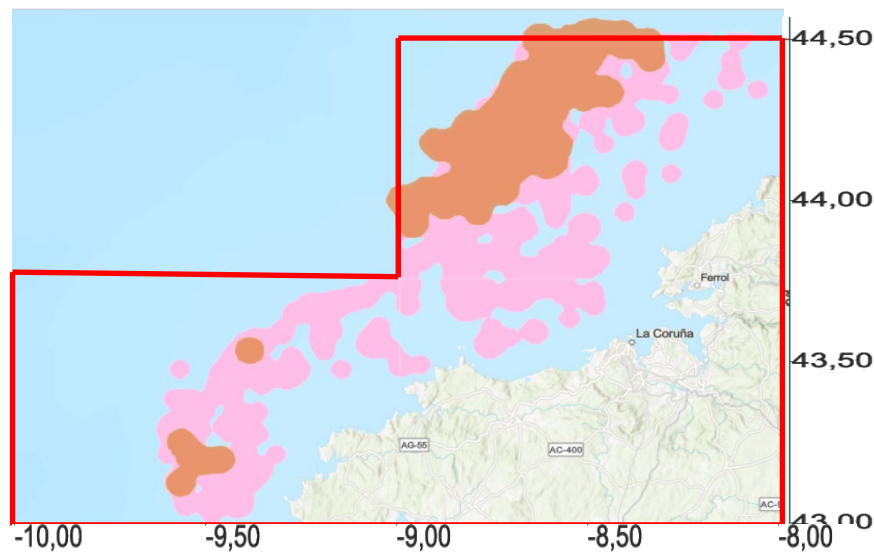
Figure 12.1.8. *Nephrops* FU 25, North Galicia. Limits of FU 25 in red. Pink area (3710 km²) calculated with the positions of the hauls with *Nephrops* catches from SPGFS-WIBTS-Q4 (G2784) survey (1983–2020), Discarding programme (1994–2020) and Sentinel fishery (2017–2020). Brown area (1354 km2) was calculated from the same data sources but only with 2017–2020 data incorporated.
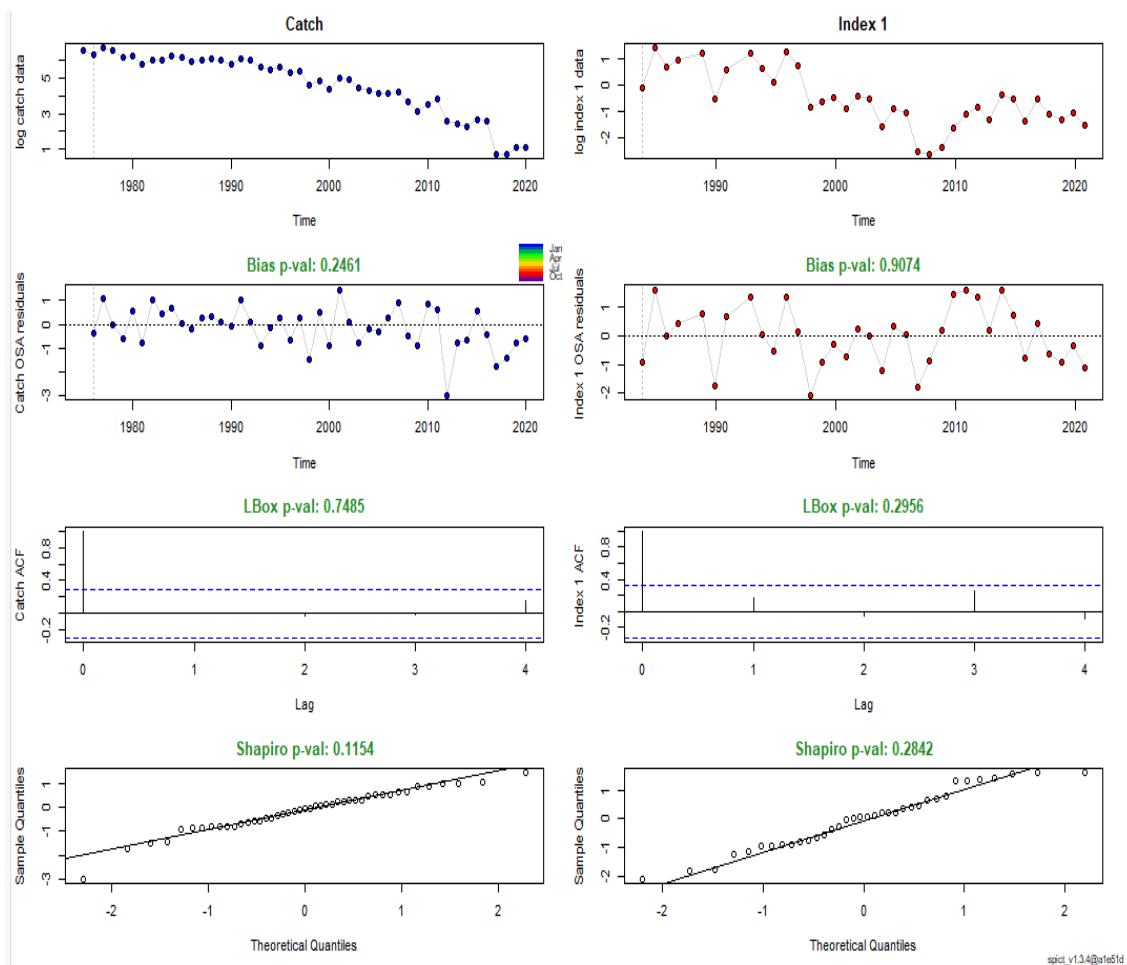
Figure 12.1.9. *Nephrops* FU 25, North Galicia. SPiCT diagnostics.
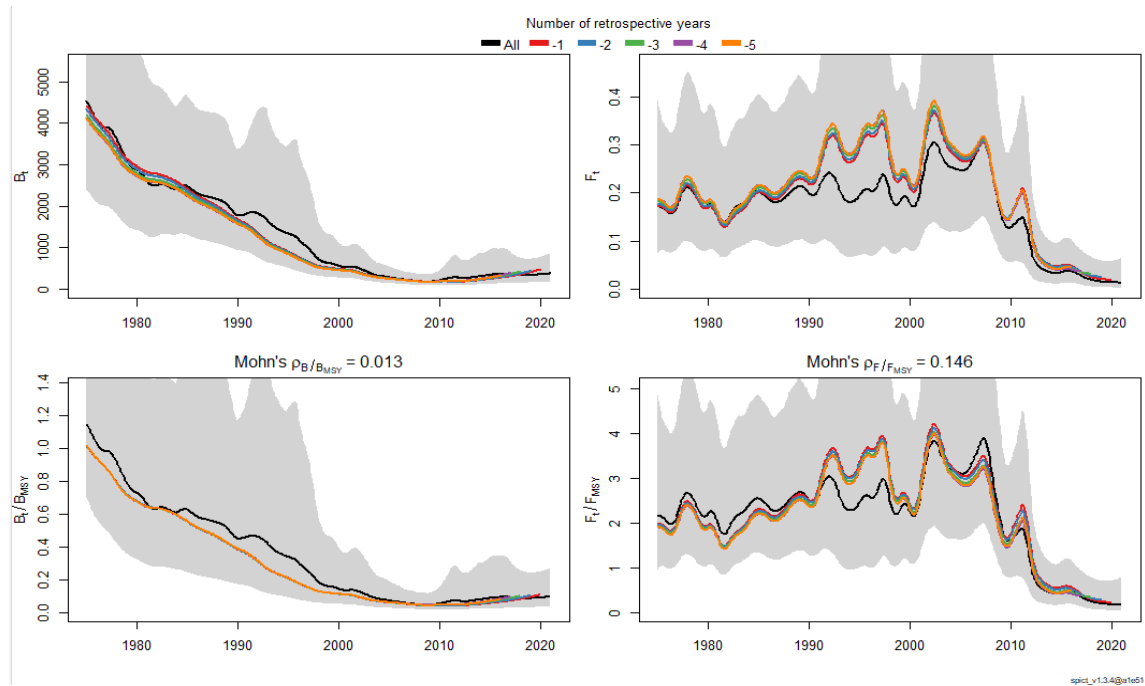
Figure 12.1.10. *Nephrops* FU 25, North Galicia. Retrospective patterns.
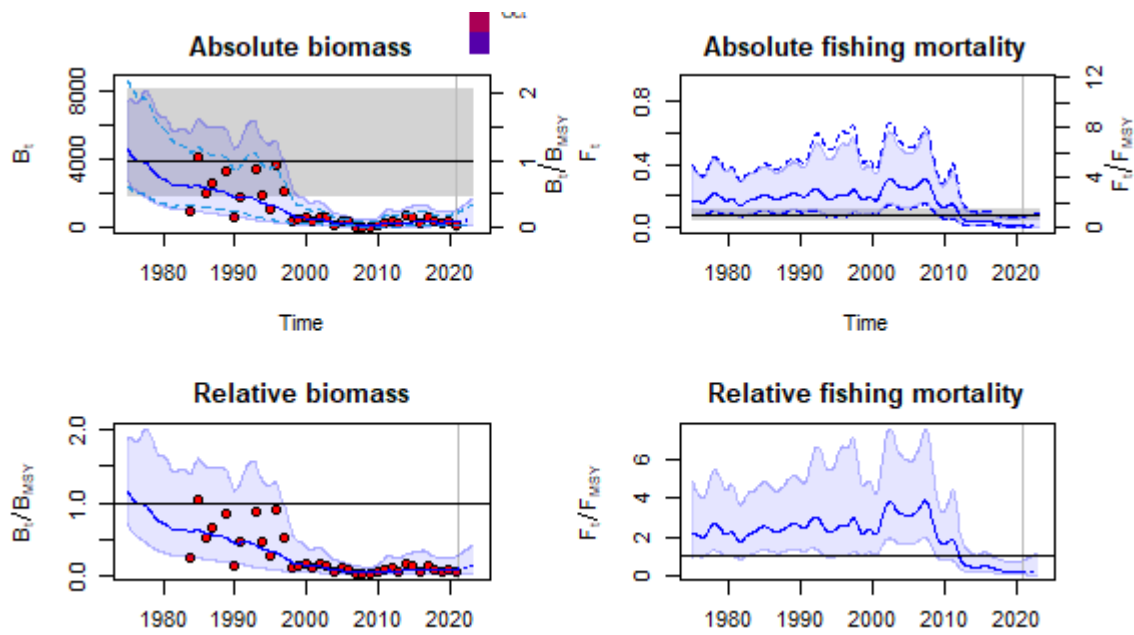
Figure 12.1.11. *Nephrops* FU 25, North Galicia. Absolute and relative biomass and fishing mortality.

12.2 FU 31 (southern Bay of Biscay and Cantabrian Sea) Nephrops

12.2.1 General

Up to this date, the status of the FU 31 *Nephrops* stock was considered undesirable (ICES, 2016) with extremely low biomass and zero-catch advice (ICES, 2017).

After the WKMSYSPiCT benchmark (ICES, 2021), FU 31 *Nephrops* stock was upgraded from a category 3 (based on trends) to a category 2 (production model) assessment.

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 2021 and management applicable to 2020 and 2021

ICES advice for 2021
The advice for this *Nephrops* stock is triennial and valid for 2020, 2021 and 2022.

ICES advises that when the precautionary approach is applied, there should be zero catch in each of the years 2020, 2021, and 2022.

To protect the stock in this FU, ICES advises that the management area should be consistent with the assessment area. Therefore, management should be implemented at the FU level.

Management applicable to 2020 and 2021
Since 2011, there is a Spanish regulation that established an Individual Transferable Quota system (ITQs) which includes *Nephrops* (ARM/3158/2011, BOE, 2011).

In 2016, a zero TAC was set for *Nephrops* in ICES Division 8.c for the years 2017, 2018 and 2019. In 2019, this measure was advised again for the years 2020, 2021 and 2022.

A special quota of 0.7 t for 2019 and 2020 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 2003–2009 FU 31 *Nephrops* landings was made in 2019 based on logbooks data.

Nephrops landings from FU 31 were reported by Spain (Table 12.2.1 and Figure 12.2.1) and are available for the period 1983–2020. The highest landings were recorded in 1989 and 1990, 177 t and 174 t, respectively. Since 1996, landings have declined sharply to 3 t in 2016, the last year with non-zero *Nephrops* TAC. 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).

For the years 2017, 2018, 2019, and 2020, *Nephrops* TAC was set at zero, landings were zero, but 814 and 552 kg of landings were obtained in the 2019 and 2020 FU 31 Sentinel fishery, respectively (special on-board 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, since the *Nephrops* TAC is zero, estimated discards amounted to 31.4 kg, 3.4 t, 5.7 t and 9.9 t for years 2017, 2018, 2019 and 2020, respectively.

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). 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 occurrence *of Nephrops* in the Sentinel fishery area in 2019 and 2020 are represented in Figure 12.2.2.b.

The comparison of the *Nephrops* area estimated with the position of the hauls with *Nephrops* catches from the whole time-series (1983–2020) of SPGFS-WIBTS-Q4 (G2784) survey, discarding programme and Sentinel fisheries with the area estimated only with 2017–2020 data could suggest a contraction of the stock area since 1983 to 2020 by around 19% (Figure 12.2.5).

12.2.2.2 Biological sampling
The biological sampling programme from 1988 to 2016 and the Sentinel fishery in 2019 and 2020 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 FLDs 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, 2011, and 2015. The decline of mean sizes could be related to 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 and 49.2 mm CL for males and 41.4 and 44.1 for females, for the years 2019 and 2020, respectively.

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 (blue line in Figure 12.2.2c).

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 12.2.2d).

12.2.2.3 Abundance index from survey

Figure 12.2.3 and Figures 12.2.4a through 12.24c show two periods in FU 31 *Nephrops* cpue (kg/haul) time-series and spatial distribution from SPGFS-WIBTS-Q4 (G2784) survey (1983–2020): 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 survey description in section 2.2.1 of this report as Spanish IBTS survey in 3rd quarter). The survey hauls positions are the same each year.

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 2020 was 659 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. For the years 2017, 2018, 2019, and 2020 *Nephrops* TAC was zero in 8.c (FU 25 and FU 31).

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 22.6 kg * 1000/kWhour in 2019 and 15.6 kg * 1000/kWhour in 2020 (the 2020 cpue was multiplied by a factor of 1.37 in order to compare with the value estimated for the July 2019 cpue). The *Nephrops* retained catch was 735 kg in 2019 and 552 kg in 2020. *Nephrops* discards were negligible (79 kg in 2019 and 11 kg in 2020). Sentinel fishery data were included in the Spanish data uploaded to InterCatch.

12.2.3 Assessment

According to the ICES data-limited approach (ICES, 2015), this stock was considered as category 3.1.4—a stock with extremely low biomass and zero catch advice (ICES, 2019a). The assessment of FU 31 is triennial After the WKMSYSPiCT benchmark (ICES, 2021b), FU 31 was upgraded from a category 3 to 2 stock (ICES, 2021a).

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 was accepted in the WKMSYSPiCT (ICES, 2021b) with data until 2019. The same model was updated by adding the 2020 data and was used in this WG (ICES, 2021c).

Input data:

- Catches (1983–2020) (Table 12.2.1)
- SPGFS-WIBTS-Q4 (G2784) survey index (1983–2020) (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 CV of the catches and the F process noise
- High uncertainty for the 1983–1994 catches

12.2.3.2 Assessment diagnostics

The SPiCT diagnostics and retrospective plots did not show major problems during the assessment (Figures 12.2.6 and 12.2.7).

12.2.3.3 Assessment results

SPiCT results are presented in Tables 12.2.3 and 12.2.4 and Figure 12.2.8. The stock biomass (B) decreased from 1983 to 2000 and has been stable since then. Since 1990, biomass has been below the B_{MSY}. Fishing mortality (F) has been above F_{MSY} until 2008.

The biomass at the end of 2020 was 44% of the B_{MSY} and F was 44% of the F_{MSY} (Table 12.2.4).

12.2.3.4 Short-term projections

SPiCT-predicted catch and stock status for 2022 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 that were 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 (2021b)
	F_{MSY}	1	Relative value. The F_{MSY} proxy is estimated directly from the assessment model and changes when the assessment is updated.	ICES (2021b)
Precautionary approach	$B_{lim\ proxy}$	$0.3 \times B_{MSY}$	Relative value (equilibrium yield at this biomass is 50% of the MSY proxy).	ICES (2021b)
	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 (2021b)
	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 *Nephrops* in ICES Division 8.c. The document analysed market and sales notes data and the fisheries management measures of the recent years in relation with Division 8.c *Nephrops*. This document was discussed in a subgroup meeting during the WGBIE in 2020. 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 each year to make an integral analysis of the stock status and elaborate a scientifically sound assessment.

No further information was presented to WGBIE in 2021.

12.2.5   Management considerations

Nephrops is taken as bycatch in the mixed bottom-trawl fishery. In FU 31, the bulk of the Spanish *Nephrops* landings are from the bottom-trawlers, 7% from crustacean pots (FPO_CRU) and 1% from other pots or traps (FPO_FIF) (logbooks 2008–2016).

The overall trend in *Nephrops* landings from the Cantabrian Sea (FU 31) is strongly declining. Landings have dramatically decreased since the beginning of the series (1983–2016), representing in 2016 less than 2% of the 1989 maximum value observed. The TAC for *Nephrops* was zero for the years 2017, 2018, 2019 and 2020.

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*.

A *Nephrops* Sentinel Fishery in FU 31 supervised by the IEO was carried out in 2019 and 2020 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, 2019b).

Spain requested a Sentinel fishery for *Nephrops* in FU 31 for 2019, similar to those carried out in FU 25 in 2017 and 2018. An ICES Special Request Advice on a Sentinel fishery for *Nephrops* in FU 31 for 2019 was released in March 2019. ICES advised that, if a UWTV survey cannot be

conducted, the collection of sentinel fishery cpue data would require no more than 0.7 t (ICES, 2019b). FU 31 Sentinel fishery had been conducted in 2019 and 2020.

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
	Trawl	Other gears		
1983	63			63
1984	100			100
1985	128			128
1986	127			127
1987	118			118
1988	151			151
1989	177			177
1990	174			174
1991	105	4		109
1992	92	2		94
1993	95	6		101
1994	146	2		148
1995	90	4		94
1996	120	9		129
1997	97	1		98
1998	69	3		72
1999	46	2		48
2000	33	1		34
2001	26	1		27
2002	25	1		26
2003	34	1		35
2004	29	0		29
2005	48	0		48
2006	37	0		37
2007	32	0		32
2008	19	1		20
2009	9	1		10
2010	8	0		9
2011	7	0		7
2012	10	0		10
2013	10	0		10
2014	4	0		4
2015	3	0		3
2016	3	0		3
2017	0	0		0
2018	0	0	3	3
2019	1*	0	6	6
2020	1*	0	10	10

* Nephrops TAC was zero in 8c (FU 25 & FU 31) in 2017, 2018, 2019 and 2020, but in 2019 and 2020 there was *Nephrops* Sentinel fishery in FU 31.

Table 12.2.2. *Nephrops* **in FU 31, southern Bay of Biscay and Cantabrian Sea. Yield from the SP-NSGFS Spanish IBTS 4Q trawl survey (G2784) for the period 1983–2020.**

Year	Nephrops yield (gram/haul)
1983	97
1984	247
1985	319
1986	371
1987	No survey
1988	729
1989	105
1990	217
1991	178
1992	311
1993	245
1994	99
1995	124
1996	43
1997	104
1998	70
1999	82
2000	84
2001	107
2002	81
2003	108
2004	130
2005	86
2006	60
2007	79
2008	47
2009	39
2010	22
2011	65
2012	74
2013	103
2014	118
2015	176
2016	59
2017	50
2018	79
2019	55
2020	77

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	1.4050	0.5651	3.4932	0.3400
beta	0.1861	0.1139	0.3041	-1.6813
r	0.1825	0.1250	0.2665	-1.7011
rc	0.1825	0.1250	0.2665	-1.7011
rold	0.1825	0.1250	0.2665	-1.7011
m	76.6562	38.3967	153.0382	4.3393
K	1680.2627	801.0101	3524.6528	7.4267
q	0.0018	0.0006	0.0050	-6.3301
sdb	0.2296	0.1218	0.4328	-1.4715
sdf	0.5113	0.3767	0.6941	-0.6707
sdi	0.3226	0.2181	0.4771	-1.1314
sdc	0.0952	0.0657	0.1379	-2.3521

Stochastic reference points

Reference points	estimate	cilow	ciupp	log.est	rel.diff.Drp
Bmsys	706.9167	329.8336	1515.1011	6.5609	-0.1884
Fmsys	0.0781	0.0520	0.1173	-2.5498	-0.1684
MSYs	53.4554	23.9666	119.2278	3.9788	-0.4340

$B_{trigger}$ 353 t B_{lim} 212 t

Estimated states

	estimate	cilow	ciupp	log.est
B_2020.92	311.2351	108.4439	893.2477	5.7405
F_2020.92	0.0345	0.0106	0.1120	-3.3672
B_2020.92/Bmsy	0.4403	0.1442	1.3444	-0.8204
F_2020.92/Fmsy	0.4416	0.1370	1.4237	-0.8174

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/Bmsy ll	est	ul	F/Fmsy ll	est	ul
1983	0.7705	1.2063	1.8887	0.3535	0.8711	2.1466
1984	0.6892	1.2822	2.3857	0.501	1.1237	2.5203
1985	0.64	1.3576	2.8796	0.6751	1.5668	3.6366
1986	0.5879	1.4428	3.5409	0.6686	1.6403	4.0241
1987	0.5444	1.4754	3.9982	0.5599	1.4533	3.7724
1988	0.5211	1.5328	4.5084	0.579	1.5684	4.2483
1989	0.4844	1.5369	4.8759	0.6818	1.9516	5.5863
1990	0.4253	1.4563	4.9871	0.7905	2.3601	7.0459
1991	0.3586	1.1739	3.8429	0.6816	2.0359	6.0815
1992	0.3277	1.0669	3.474	0.562	1.6499	4.8442
1993	0.3145	1.0136	3.2664	0.5664	1.6444	4.7737
1994	0.3018	1.0099	3.3798	0.822	2.3914	6.9573
1995	0.2518	0.8241	2.6969	0.8664	2.5029	7.2306
1996	0.2284	0.6922	2.0982	1.0396	2.8514	7.8208
1997	0.1847	0.5662	1.7357	1.3896	3.8466	10.648
1998	0.1493	0.4471	1.3385	1.129	3.1926	9.0283
1999	0.1351	0.4528	1.5177	0.7774	2.3543	7.1292
2000	0.1294	0.4331	1.4496	0.5201	1.6155	5.0178
2001	0.1324	0.4501	1.5301	0.3812	1.1895	3.7115
2002	0.1402	0.475	1.6095	0.3038	0.9512	2.9785
2003	0.1511	0.5278	1.8442	0.3494	1.096	3.4384
2004	0.1525	0.5217	1.7844	0.3327	1.0481	3.3018
2005	0.1563	0.565	2.0426	0.3786	1.2251	3.9646
2006	0.1438	0.5497	2.1017	0.4313	1.4585	4.9319
2007	0.1262	0.4631	1.6986	0.4073	1.3533	4.4968
2008	0.1091	0.3914	1.4037	0.3598	1.1912	3.9436
2009	0.0953	0.3323	1.1587	0.2206	0.7089	2.2785
2010	0.0884	0.2826	0.9035	0.1937	0.5938	1.8204
2011	0.0848	0.2554	0.7693	0.1827	0.5405	1.5987
2012	0.0905	0.2667	0.7859	0.1809	0.5331	1.571
2013	0.1089	0.3706	1.262	0.1826	0.566	1.7544
2014	0.1187	0.4204	1.4888	0.0762	0.2466	0.7982
2015	0.1293	0.4885	1.8455	0.0377	0.1269	0.4266
2016	0.1345	0.5175	1.9904	0.0208	0.0723	0.2514
2017	0.1331	0.4887	1.7942	0.0161	0.0531	0.175
2018	0.1314	0.4129	1.2979	0.0286	0.0882	0.2722
2019	0.1342	0.4083	1.2419	0.0644	0.1908	0.5647
2020	0.1415	0.4403	1.3702	0.1139	0.3411	1.0218
2021	0.1443	0.4435	1.3633	0.1322	0.4416	1.4747
2022	0.1461	0.4834	1.5995	0.0921	0.4416	2.1182
2023	0.149	0.5253	1.8521	0.0687	0.4416	2.8391

Table 12.2.5. *Nephrops* **in FU 31, southern Bay of Biscay and Cantabrian Sea.** *Nephrops* **SPiCT predicted catch and states for 2022.**

	C	B/Bmsy	F/Fmsy	B/Bmsy.lo	B/Bmsy.hi	F/Fmsy.lo	F/Fmsy.hi
1. F=0	0.0	0.54	0.00	0.16	1.87	0.00	0.00
2. F=Fsq	12.2	0.53	0.44	0.15	1.85	0.07	2.84
3. F=Fmsy	26.3	0.50	0.97	0.14	1.84	0.15	6.22
4. F=Fmsy_C_fractile	20.2	0.51	0.74	0.14	1.84	0.11	4.73

Catch

Effort
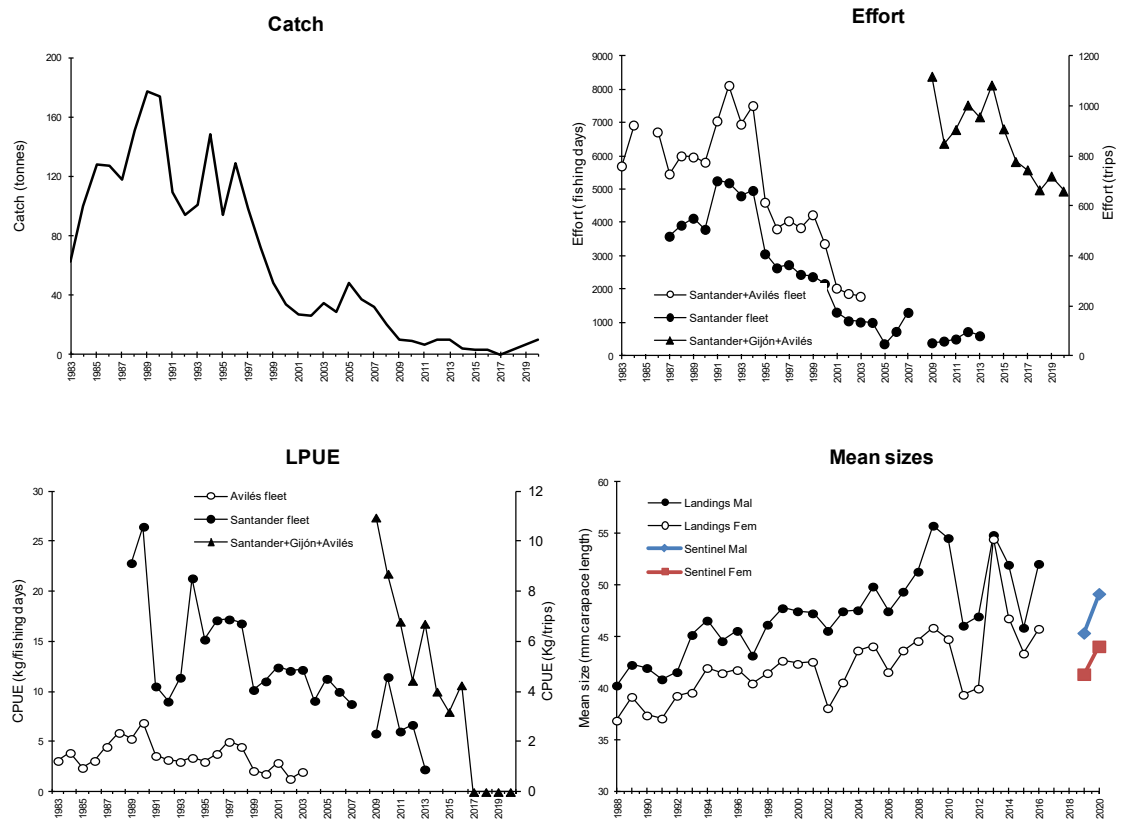
LPUE

Mean sizes

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 and 31) had TAC zero in 2017, 2018, 2019, and 2020.
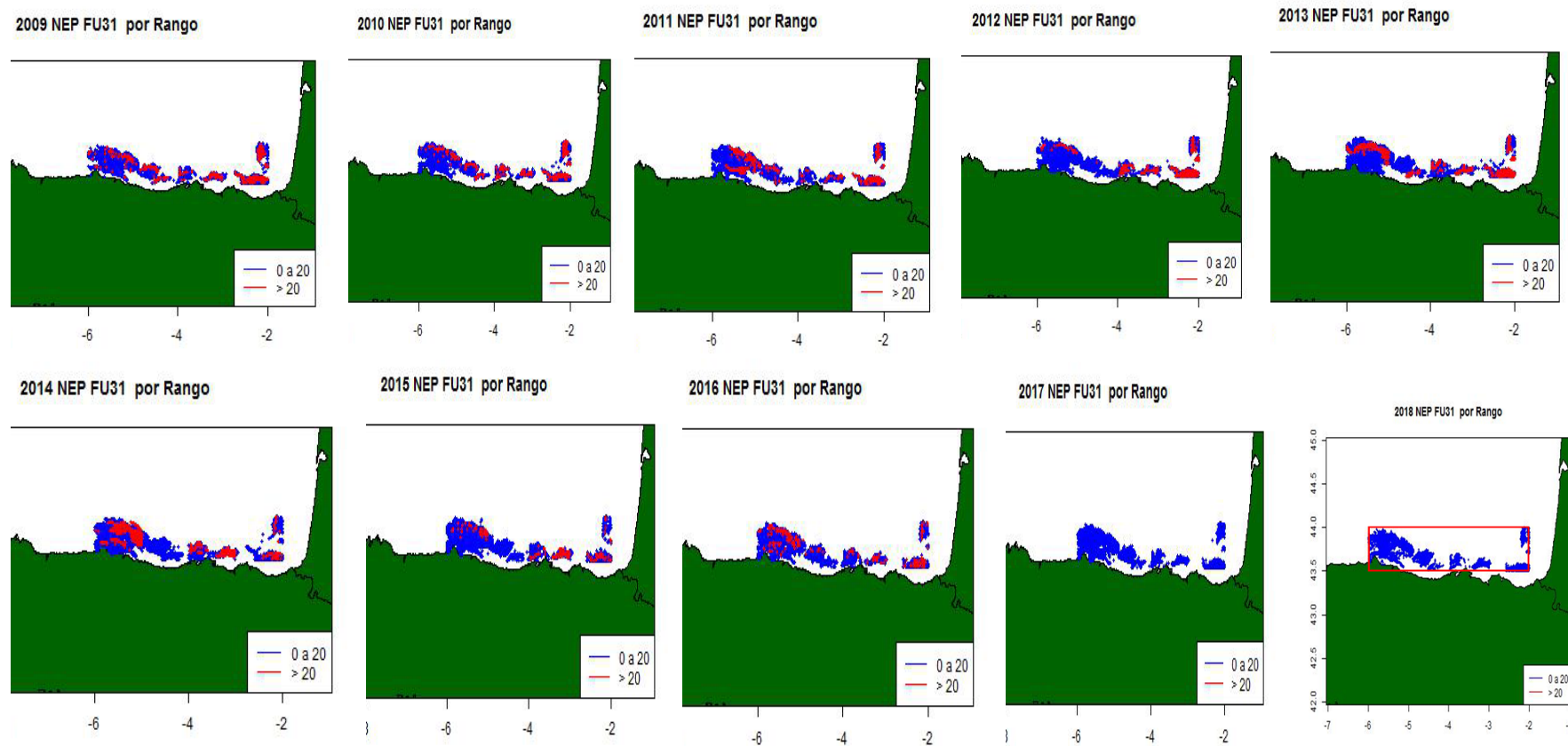
Figure 12.2.2a. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Distribution of FU 31 *Nephrops* LPUE (kg/fishing day). FU 31 limits indicated in red in the 2018 map. Red points: *Nephrops* LPUE > 20 kg/fd, blue: *Nephrops* LPUE ≤20 kg/fd. *Nephrops* TAC in 8.c (FUs 25 and 31) was zero for the years 2017, 2018 and 2019.
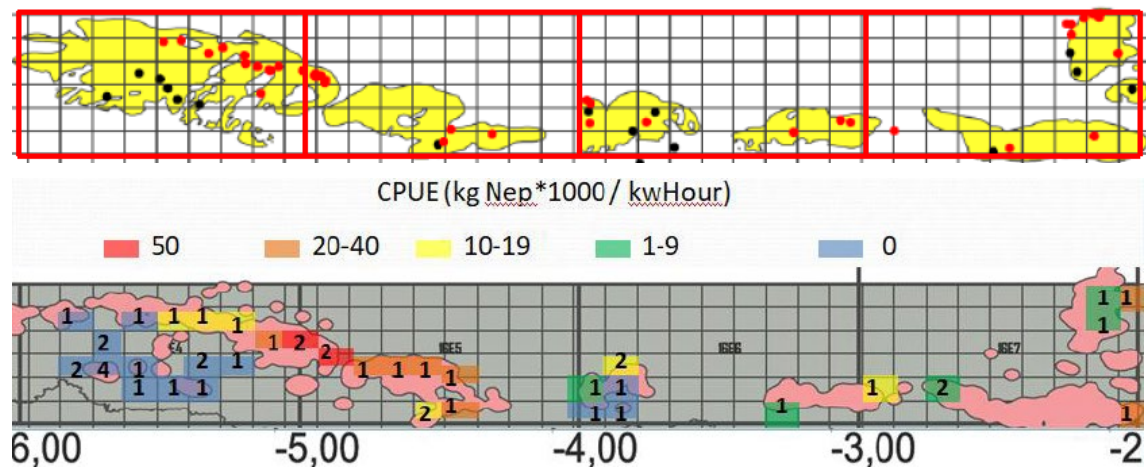
Figure 12.2.2b. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Sentinel Fishery. Top: 2019 Sentinel effort distribution (hauls VMS points). Red points: hauls with *Nephrops* catch. Black points: hauls without *Nephrops* catch. Yellow patches estimated with daily data (logbooks). Bottom: 2020 Sentinel cpue (*Nephrops* kg*1000/kwHour) represented by colours and effort in number of hauls conducted in each sampling cell). Pink patches mapped with haul data (survey and observers on board).
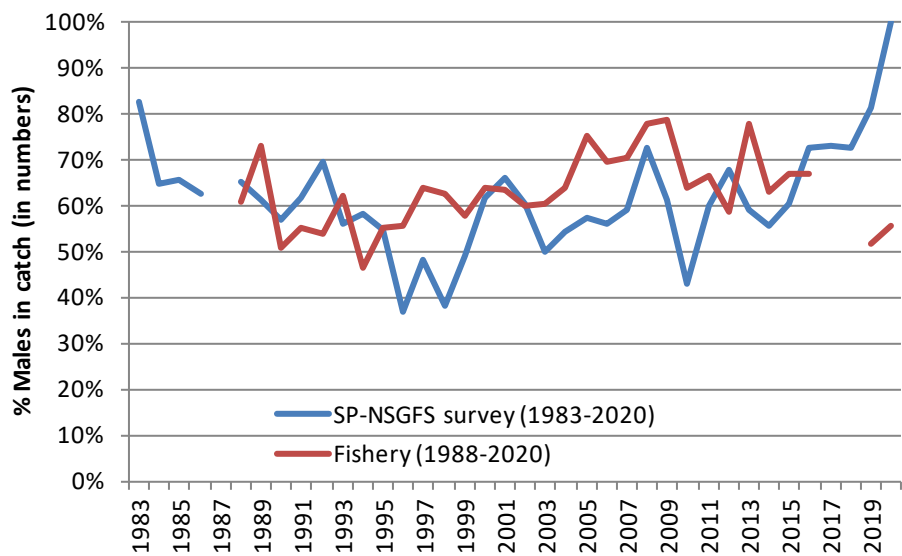
Figure 12.2.2c.*Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Catches proportion of males (1983–2020) from the SPGFS-WIBTS-Q4 (G2784) survey.
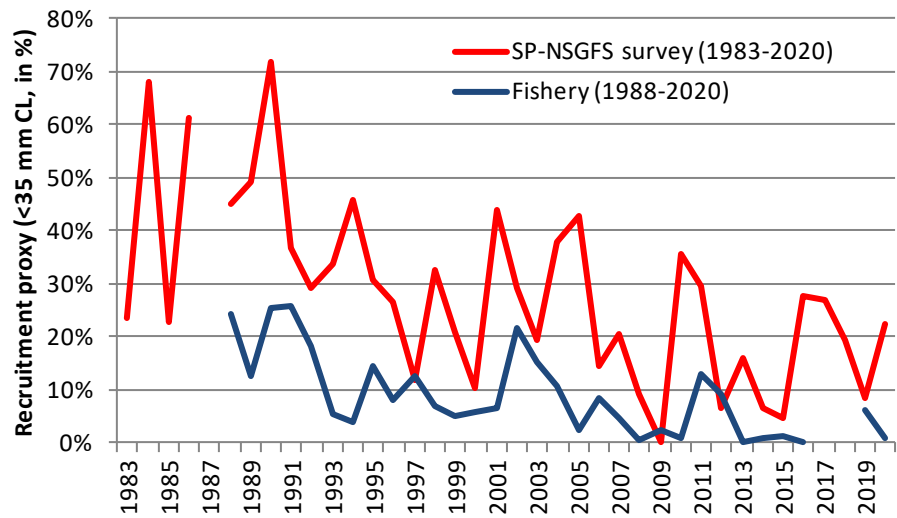
Figure 12.2.2d. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Recruitment proxy. Blue line = Commercial fleet (1988–2016) and Sentinel fleet (2019–2020). Red line = SP-NSGFS or SPGFS-WIBTS-Q4 (G2784) survey (1983–2020).
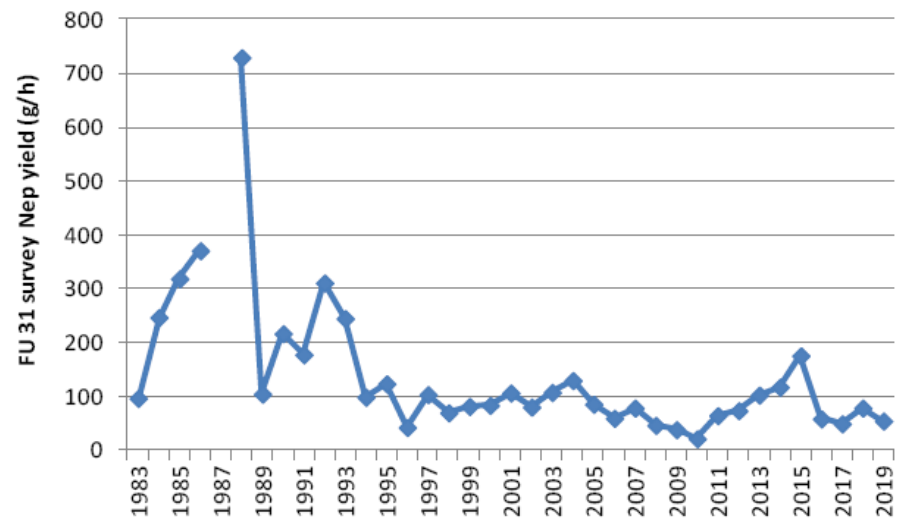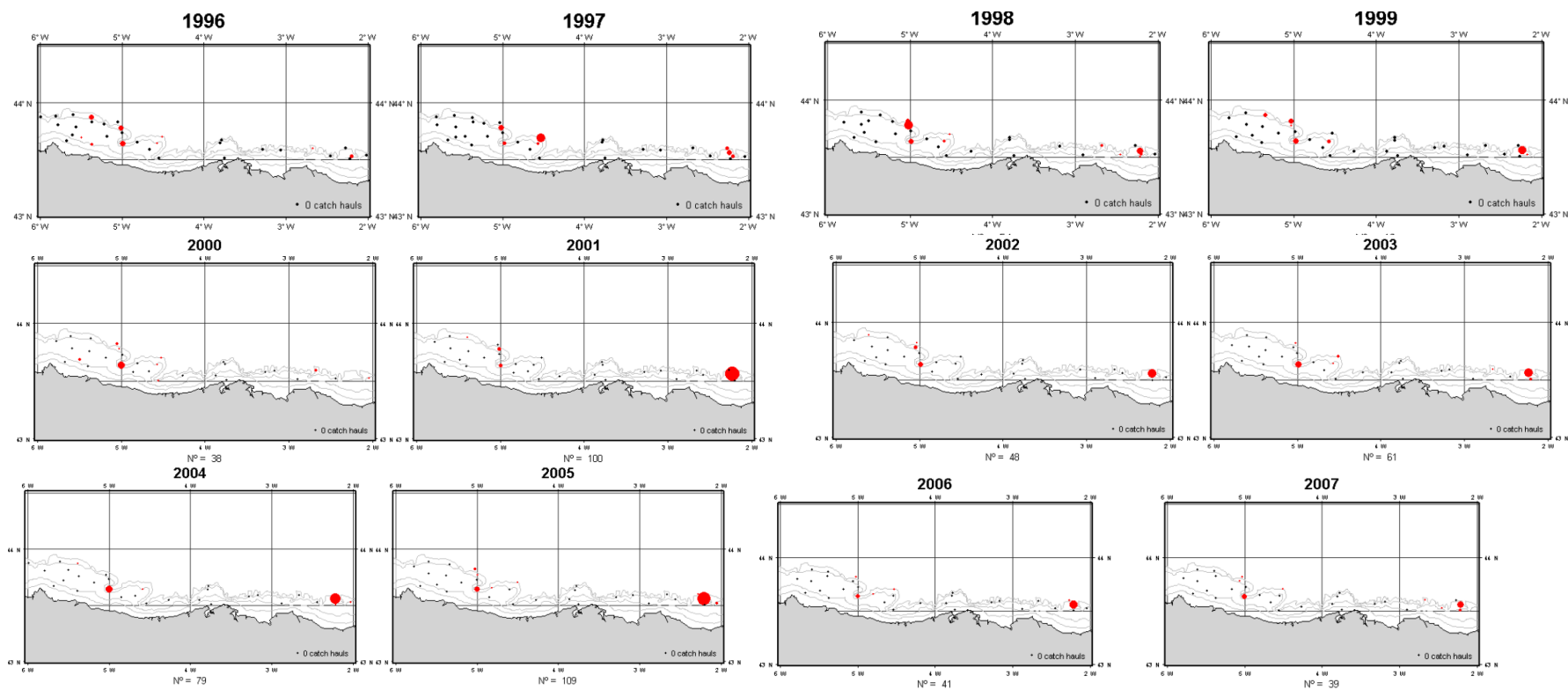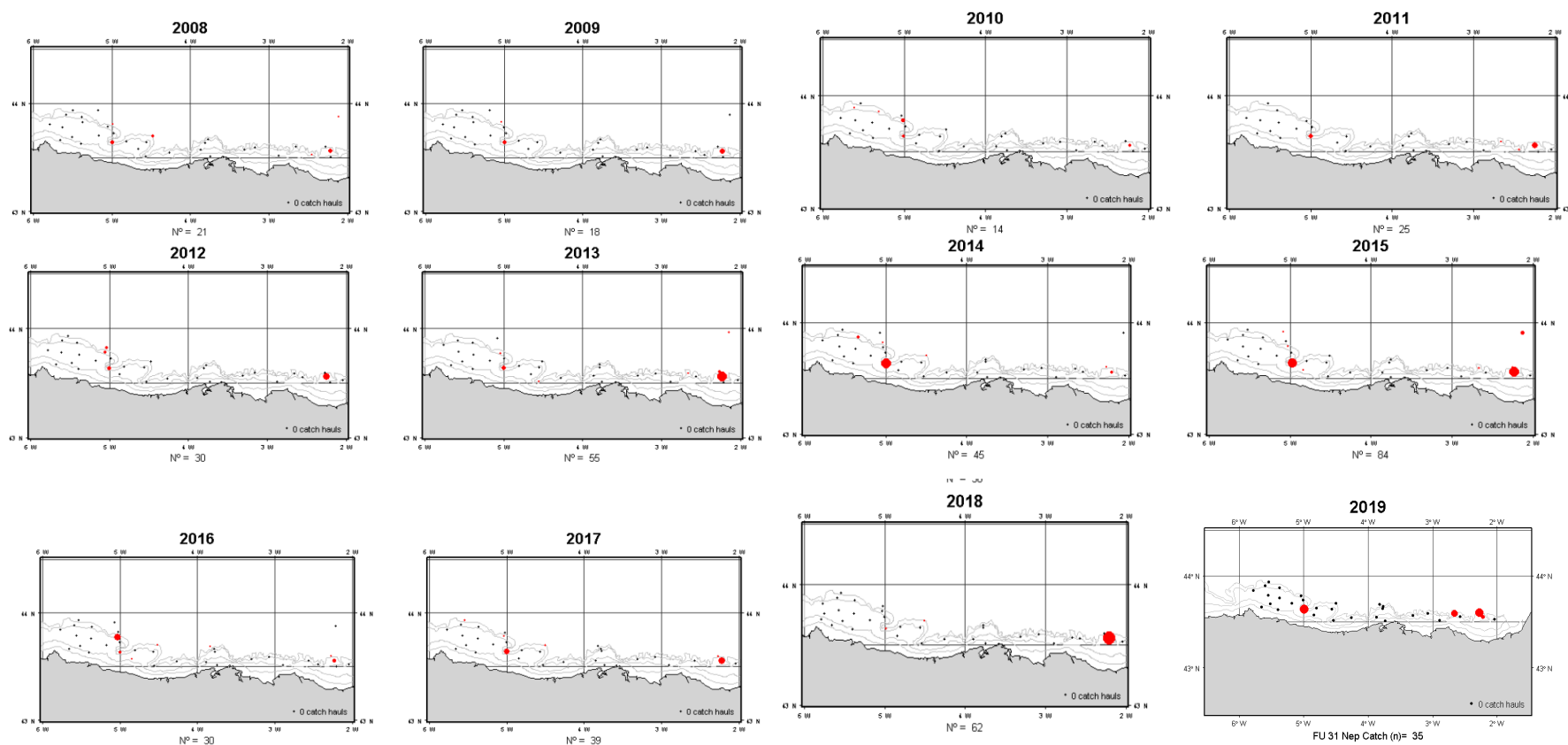

Figure 12.2.3. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. *Nephrops* cpue (gramme/haul) from SPGFS-WIBTS-Q4 (G2784) survey (1983–2020). No survey was carried out in 1987.
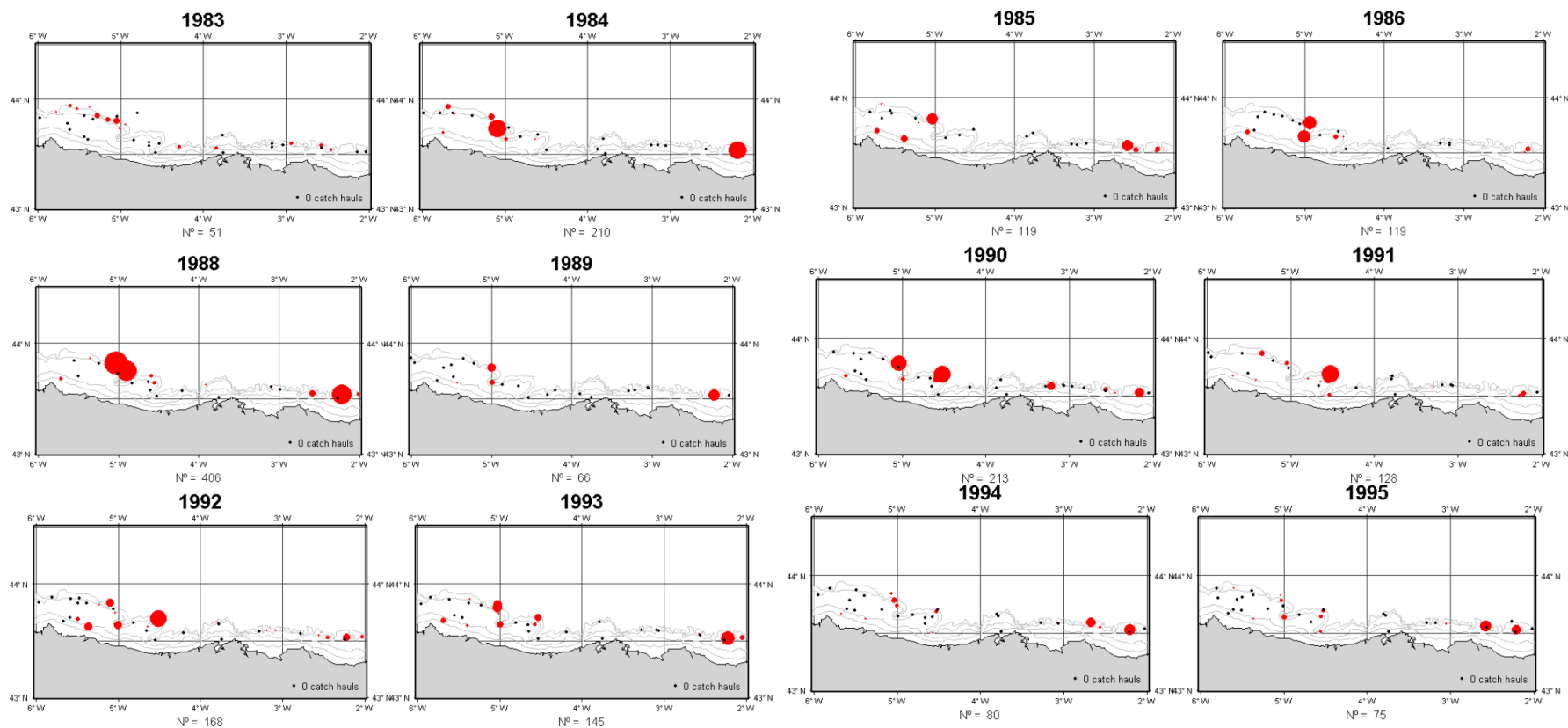
Figure 12.2.4a. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Cpue (kg/haul) from SPGFS-WIBTS-Q4 (G2784) survey. Black points: zero kg of *Nephrops* by haul. No survey was carried out in 1987. Higher cpues period (1983–1995).

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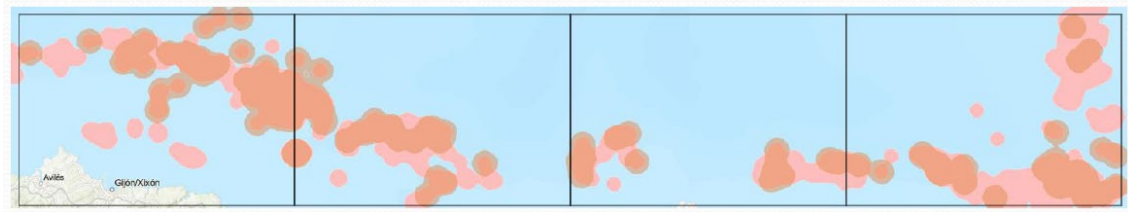
Figure 12.2.4c. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Cpue (kg/haul) from SPGFS-WIBTS-Q4 (G2784) survey. Black points: zero kg of *Nephrops* by haul. Lower cpues.

Figure 12.2.5. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. *Nephrops* area. Pink area (3783 km2) calculated with the positions of the hauls with *Nephrops* catches from SPGFS-WIBTS-Q4 (G2784) survey (1983–2020), discarding programme (1994–2020) and Sentinel Fishery (2019–2020). Brown area (3077 km²) was calculated from the same data sources but only with 2017–2020 data.
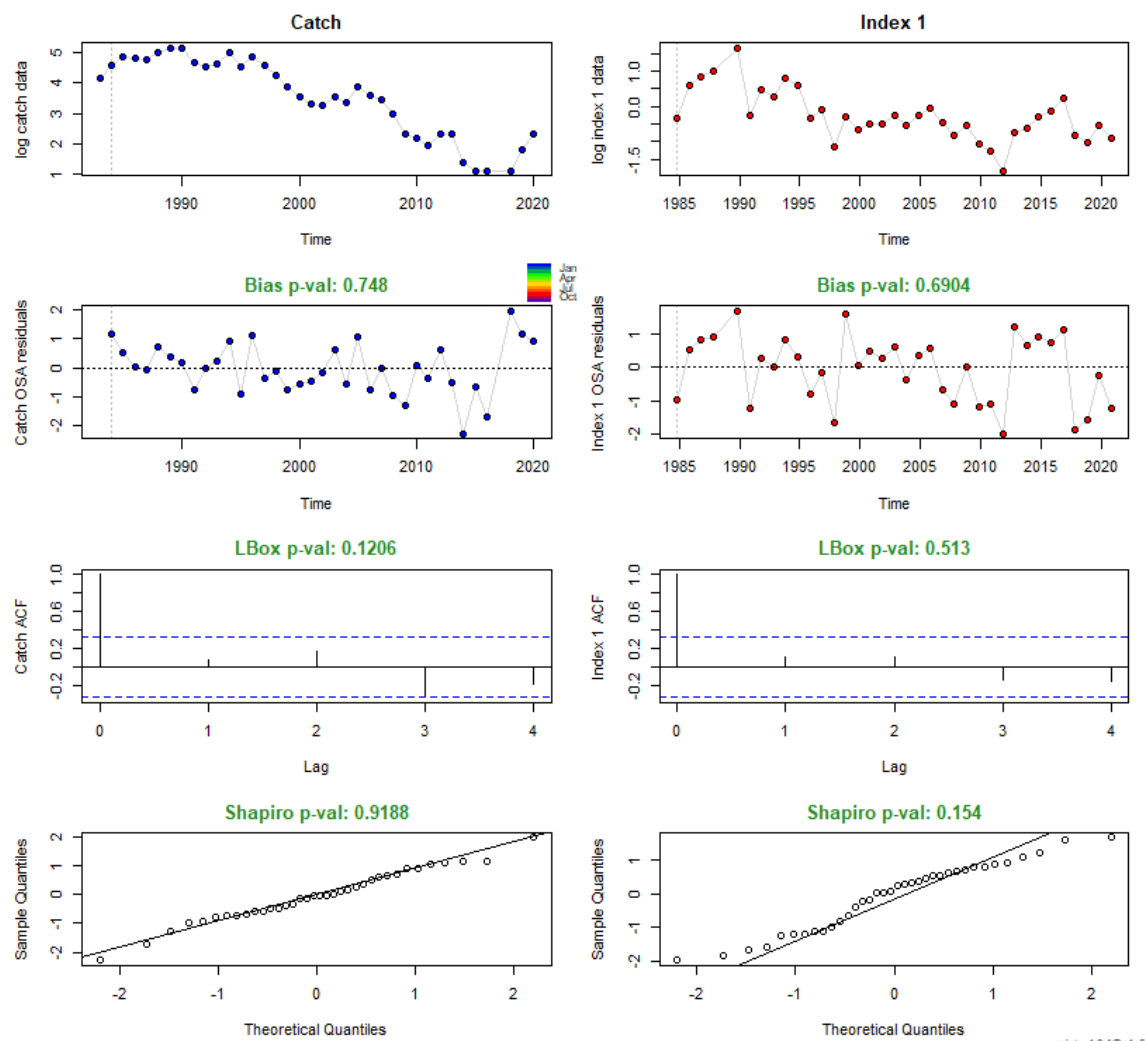

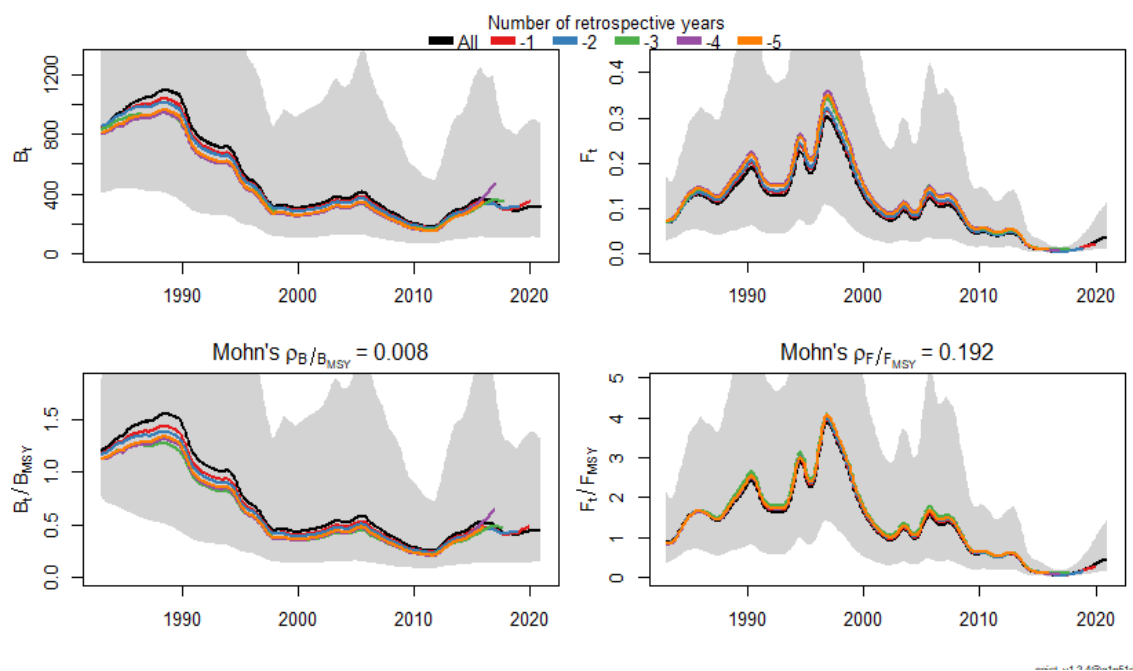**Figure 12.1.6.** *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. SPiCT diagnostics.

Figure 12.1.7. *Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Retrospective patterns.
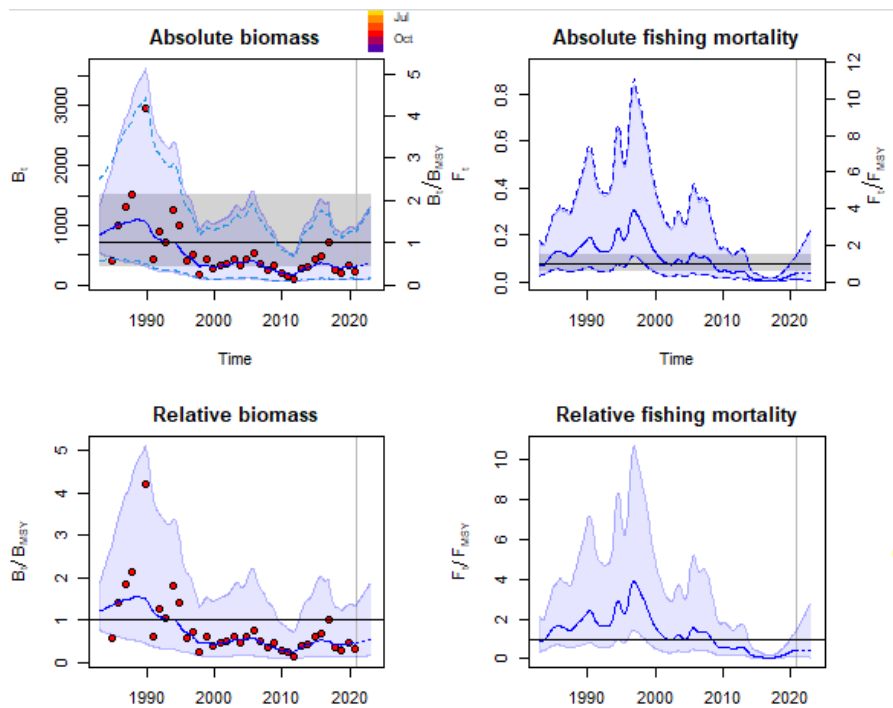

Figure 12.1.8.*Nephrops* in FU 31, southern Bay of Biscay and Cantabrian Sea. Absolute and relative biomass and fishing mortality.

12.3   Summary for Division 8.c

Atlantic *Nephrops* landings from the Iberian Peninsula (ICES divisions 8.c and 9.a) have been decreasing at about 93% from 1978 to 2014 (Figure 12.3.1). Separate 8.c and 9.a landings have different magnitude but offer similar evolution information except for the period of 2002–2007, 2016, and 2017 (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. FU 25 provides about 63% of the Spanish *Nephrops* landings, FU 31 the 25% and 12% for the other rectangles in 8.c (logbooks 2003–2016) (Table 12.3.1 and Figure 12.1).

The significantly low levels of landings from FU 25, FU 31 and rectangles outside these FUs 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 years of 2017, 2018, 2019 and 2020. However, special quotas were authorized for FU 25 since 2017 and FU 31 since 2019 in order 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 a high fishing pressure since ovigerous 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).

Decreases in mean length could be related to recruitment. In Division 8.c, *Nephrops* mean length from SPGFS-WIBTS-Q4 (G2784) showed an increasing trend from 1983 to 2008 (Figure 12.3.4). Atlantic Iberian Northern *Nephrops* stocks mean length showed an increasing trend until 2009–2011 (Figures 12.1.1 and 12.2.1). 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, 2018, 2019, and 2020.

Year	FU25 Landings	FU25 Discards	FU 31 Landings	FU 31 Discards	8c Outside FUs Landings	8c Outside FUs Discards	Total 8c
1975	731						731
1976	559						559
1977	667						667
1978	690						690
1979	475						475
1980	412						412
1981	318						318
1982	431						431
1983	433		63				496
1984	515		100				615
1985	477		128				605
1986	364		127				491
1987	412		118				530
1988	445		151				596
1989	376		177				553
1990	285		174				459
1991	453		109				562
1992	428		94				522
1993	274		101				375
1994	245		148				393
1995	273		94				367
1996	209		129				338
1997	219		98				317
1998	103		72				175
1999	124		48				172
2000	81		34				115
2001	147		27				174
2002	143		26				169
2003	89		35		30		154
2004	75		29		10		114
2005	63		48		12		123
2006	62		37		11		110
2007	67		32		13		112
2008	39		20		10		69
2009	21		10		5		36
2010	34		9		5		47
2011	44		7		3		54
2012	10		10		5		25
2013	11		10		4		25
2014	9		4		2		15
2015	14		3		2		19
2016	13		3		4		20
2017*	2*		0		0		2
2018*	2*	0	0	3	0	4	10
2019*	2*	1	1*	6	0	3	12
2020*	2*	1	1*	10	0	0	13

* *Nephrops* TAC was zero in 8c (FU 25 & FU 31) in 2017, 2018, 2019 and 2020, but there were *Nephrops* Sentinel Fisheries in FU 25 and FU 31.
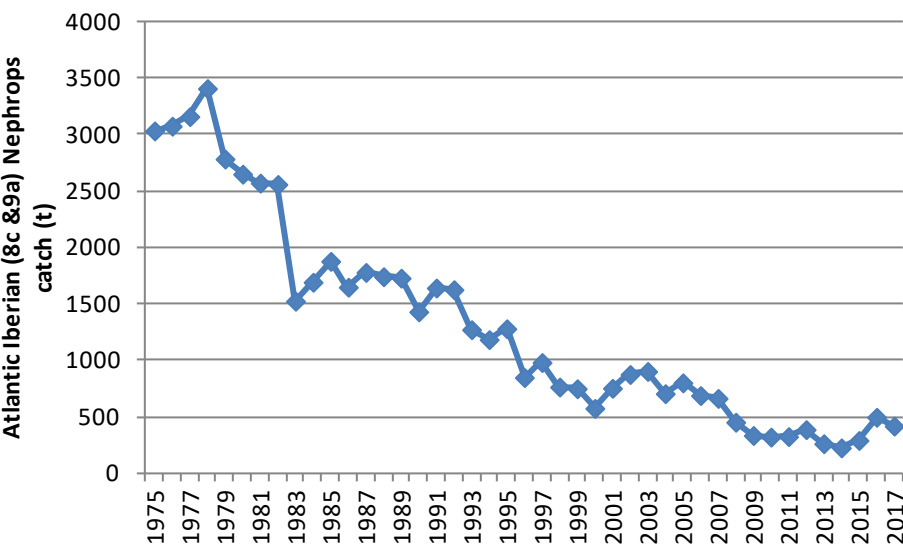
Figure 12.3.1. Atlantic Iberian (8.c+9.a) *Nephrops* landings (t) for the period 1975–2017.
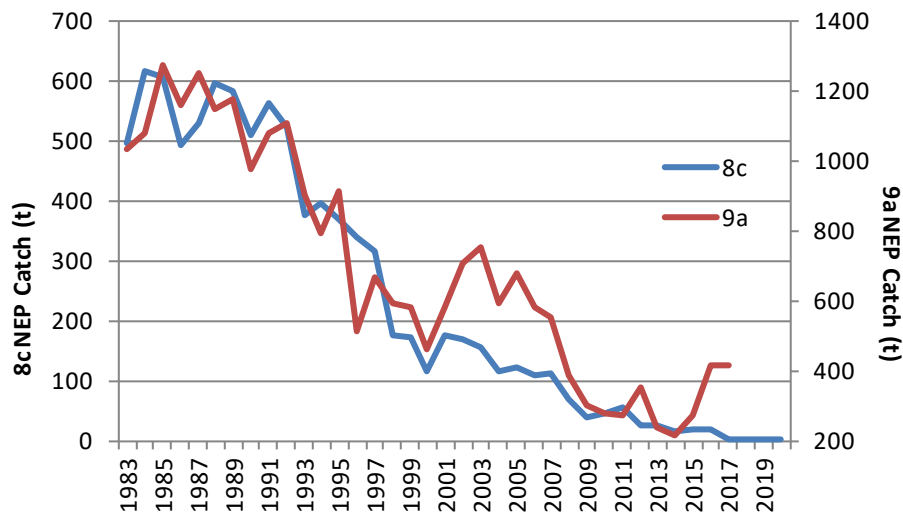

Figure 12.3.2. 8.c and 9.a *Nephrops* landings (t) for the period of 1983–2020.
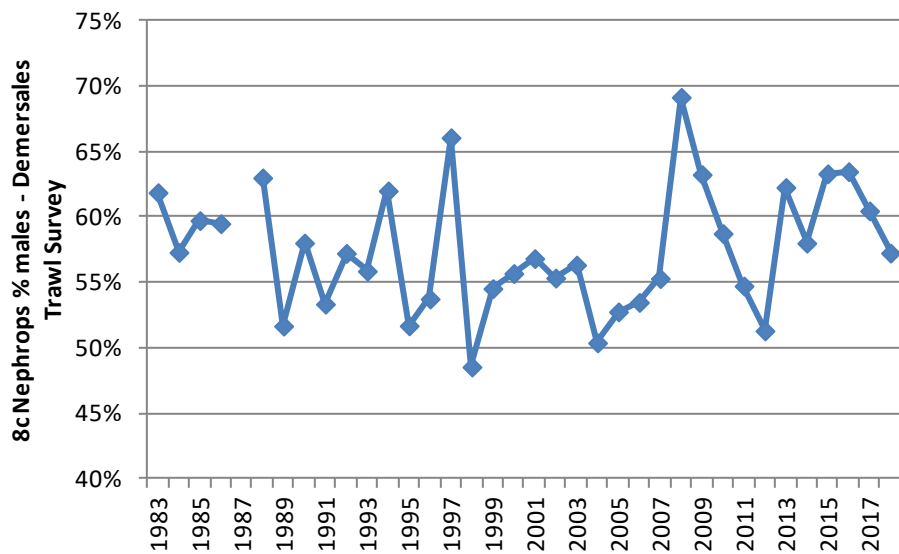
Figure 12.3.3. *Nephrops* in Division 8.c. Percentage of males from the whole Spanish "Demersales" Trawl Survey, SPGFS-WIBTS-Q4 (G2784), for the period of 1983–2018.
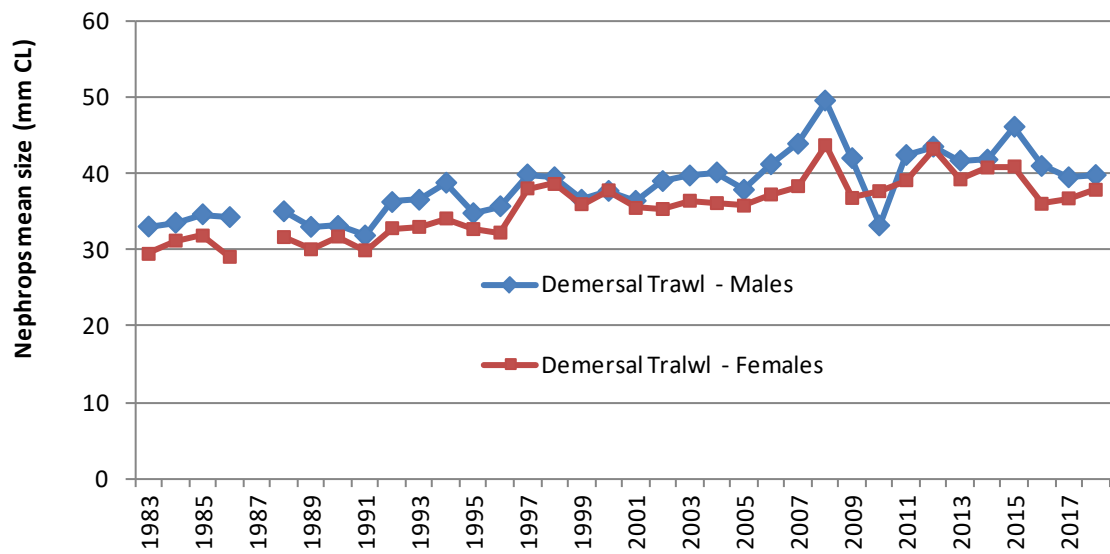

Figure 12.3.4. *Nephrops* in Division 8.c. Mean sizes from the whole Spanish "Demersales" Trawl Survey (SP-NSGFS) from 1983 to 2018.