Stock Annex: Norway lobster (*Nephrops norvegicus*) in Division 9.a, functional units 26–27 (Atlantic Iberian waters East, western Galicia, and northern Portugal)

Stock specific documentation of standard assessment procedures used by ICES.

Stock:	Norway lobster
Working Group:	Working Group for the Bay of Biscay and the Iberic waters Ecoregion (WGBIE)
Created:	
Authors:	
Last updated:	May 2016
Last updated by:	Yolanda Vila

A. General

A.1. Stock definition

The *Nephrop*s stock from FU 26 extends along the Atlantic area off the northwestern Spanish coast, south of Cape Finisterre, whereas FU 27 covers the Atlantic area off northern Portugal.

A.2. Fishery

Nephrops is caught in a mixed bottom-trawl fishery, which takes place throughout the year, with the highest *Nephrops* landings in spring and summer. The overall decline of some bottom commercial species in the area has influenced the fishing strategies of the trawl fleets in terms of gear modalities and target species. Targeted species include hake, anglerfish, megrim, horse mackerel, mackerel and a variety of other fish and cephalopods.

The bottom-trawl fleet comprises three main components: baca trawl, high vertical opening trawl (HVO) and pair trawl, each targeting different species. Only the baca trawl catches *Nephrops*. The description of these fisheries was updated and reported in STECF (2003). Trawl vessels can change gear from year to year and, consequently, target species and fishing effort applied vary. The increasing use of pairtrawlers and HVO (fishing for mackerel and horse mackerel) that do not catch *Nephrops*, has reduced fishing effort on the species in recent years.

The Prestige oil spill off the northwest Spanish coast (November 2002) resulted in the adoption of several temporary regulations to minimize the impact on the fisheries, such as spatial and seasonal closure for fishing fleets. The fishery remained partially closed from January to April 2003, causing a reduction in fishing effort.

*Nephrop*s is managed by an annual TAC (applying to the whole of ICES Division 9.a) and technical measures. European Union regulations establish 20 mm carapace length (CL) as a minimum landing size. Few animals are caught under size. Although *Nephrops* represents less than 2% of the total weight landed by the bottom-trawl fishery (Fariña, 1996), the species is a very valuable component of the landings.

A Recovery Plan for southern hake and Atlantic Iberian *Nephrops* stocks was implemented and enforced since 2006 (EC 2166/2005). The aim of the Recovery Plan is to rebuild the stocks within 10 years, with a reduction of 10% in F relative to the previous year and the TAC set accordingly.

A.3. Ecosystem aspects

Nephrops is a burrowing species and occurs on muddy seabed on the continental shelf and upper slope. The distribution of *Nephrops* in this area is limited to depths ranging from 90-500 m. Main patch configurations are evident in shallower waters (80–140 m) in the west coast of Galicia. The distribution of *Nephrops* is more determined by ground type and sea temperature than depth. They are sedentary but they can leave their burrows to look for food and for reproduction purposes.

After reaching sexual maturity, males moult more frequently than females, consequently growing faster. Mating takes place just after the females moult. Eggs are fertilized when they are laid and they attach under the female abdomen. Berried *Nephrops* stay most of the time in their burrows. Larvae are pelagic for one month after hatching, then after metamorphosis the small *Nephrops* settle on the seabed. The emergence patterns of females during the incubation period results in a different exploitation pattern for each sex.

Nephrops are omnivorous but polychetes, crustaceans, molluscs and echinoderms are their favourite preys. There are not reports on *Nephrops*' predators in the area.

B. Data

B.1. Commercial catch

Landings

Landings are reported by Spain and minor quantities by Portugal. The catches are taken by Spanish fleets fishing on the Galicia (FU 26) and North Portugal (FU 27) fishing grounds and by the Portuguese artisanal fleet fishing with traps in FU 27. Prior to 1996 no distinction was made between the two FUs and, therefore, the Spanish landings for that early period are given for the two FUs together. Up to 2010, the Spanish data used were based on Spanish sales notes and Owners Associations data compiled by IEO. Since 2011, the Spanish Authority for Fisheries (Secretaría General de Pesca, SGP) who is also the National Authority for the Data Collection Framework established a new policy and general approach in the provision of official data on catches and fishing effort. So, since 2011 *Nephrops* landings are official landings. Landings data are available since 1975 although landings by sex are only available from 1988 onwards.

Discard

*Nephrop*s discards are negligible in this fishery. Generally, only soft and damaged individuals are discarded (Pérez *et al*., 1996) and the information is obtained via the onboard discard sampling program.

B.2. Biological

Length frequencies by sex of the *Nephrops* landings are collected monthly by the biological sampling program since 1988. The sampling data from the Marín and Vigo

fleets are raised to the total landings by market category and month. Starting from 2009 concurrent sampling is carried out, as required by the new DCR (Reg. EC 1343/2007). With the new sampling strategy, fishing trips of the bottom-trawl métier are sampled at the auction markets of Riveira (FU 26), Marin (FU 26) and Vigo (FU 27) ports, with 3, 4 and 2 sampling events per month, respectively. Information on discards is not taken into account in the estimation of the total catch length distribution due to the low level of discards.

B.3. Surveys

Abundance indices of *Nephrops* only for FU 26 could be derived from the Spanish groundfish survey SP-GFS carried out to collect information on abundance of demersal species. The survey uses a stratified random sampling design with half hour hauls and covers the northwest area of Spain, from Portugal to France, during September/October since 1983 (except 1987). Data for 2003 are not considered reliable. The information is not taken into account due to the low abundance of *Nephrops* in this FU and the surveys are not designed for *Nephrops*.

B.4. Commercial cpue

Fishing effort and LPUE dataseries are available for Marín trawl fleet (SP-MATR) starting from 1990. This fleet accounts for more than 40% of the landings from these FUs. Time-series of fishing effort and LPUE of the bottom-trawl fleets with home ports of Muros (1984–2003), Riveira (1984–2004) and Vigo (1995–2010) are also available.

B.5. Other relevant data

C. Historical Stock Development

The species has been regularly assessed since 1990 (ICES, 1990). The last analytical assessment for this FU was carried out by the WGHMM in 2006 (ICES, 2006). XSA was used with "catch-at age" data generated by slicing length distributions employing the L2AGE program. This procedure, introduced at the 1991 *Nephrops* WG, uses von Bertalanffy growth parameters to determine limits between age classes. The use of slicing to convert length compositions into age composition is controversial, especially for older age groups (3 and older). An assessment with combined sexes was carried out, although the slicing was applied for each sex separately and the resulting catch-at-age matrices by sex added up for the assessment. Prior to 2005 an assessment by sex was carried out but the WG proposed to carry out an assessment for both sexes combined, considering the advantages for management.

The 2006 assessment was calibrated using data from a single commercial LPUE series, where the definition of fishing effort was based on nominal effort. The results were accepted only as indicative of stock trends and not used for projections.

Model used (until 2006): XSA

Software used: Lowestoft VPA Suite (VPA95.exe), Retvpa02.exe

Input data types and characteristics

PARAMETER	VALUE	SOURCE
Discards survival	NA	Not applicable-Few discards (<1% on average)
MALES		

Growth-K	0.150	(Fernandez *et al*., 1986)
Grouth-L(inf)	80	"
Natural mortality-M	0.2	"
Lenght/weight-a	0.00043	(Fariña, 1984)
Lenght/weight-b	3.160	"
FEMALES		
Inmature Growth		
Growth-K	0.160	(ICES, 1994)
Growth-L(inf)	70	"
Natural mortality-M	0.2	"
Size at maturity (mm CL)	26	(Fariña, 1996)
Mature Growth		
Growth-K	0.080	(ICES, 1994)
Grouth-L(inf)	65	"
Natural mortality-M	0.2	"
Lenght/weight-a	0.00043	(Fariña, 1984)
Lenght/weight-b	3.160	"

XSA run:

MALES+FEMALES	2006 WGHMM	
TUNING FLEETS USED	ASSESSMENT YEARS	ASSESSMENT AGES
SP-MATR	1994–2005	2 – 9
First age for normal catchability independent analysis	All ages independent	
First age at which q is considered independent of age	6	
Taper	Tricube over 20 yrs	
F shrinkage (SE for mean F)	1.5	
F Shrinkage	Final 5 yrs	3 oldest ages
Minimum Log SE for terminal population estimates	0.3	
F_{bar} (age)	3 –7	
Recruitment Age	2	

After 2006, no improvements in relation to a methodological assessment were achieved and the WG did not attempt any further analytical assessment for this stock. The time-series of fisheries data are updated every year and LPUE series used to depict the stock trends.

Since 2012, the advice for this stock was based on fishery LPUE and effort trend, according to the ICES data-limited approach (ICES, 2012). This stock is classified in the category 3.1.4. of Data Limited Stocks (DSL): stocks with extremely low biomass.

D. Short-Term Projection

E. Medium-Term Projections

F. Long-Term Projections

G. Biological Reference Points

Proxies of MSY reference points were defined using the methods developed in WKLIFE and WKProxy (ICES, 2015, 2016). $F_{0.1}$, taken as proxy of F_{MSY}, from length–based analysis for the period 1988–2014 was 0.137 for both sexes combined but the value of MSY Bt_{rigger} proxy is not available.

H. Other Issues

I. References

Fariña, A.C., 1984. Informe de la Campaña "Sisargas83". Inf. Tec. Inst. Esp. Oceanogr., no 25.

Fariña, A.C., 1996. Megafauna de la plataforma continental y talud superior de Galicia. Biología de la cigala *Nephrops norvegicus*. Doctoral Thesis. Universidad da Coruña. 297 pp.

Fernández, A., Fariña, A.C. and Penas, E., 1986. Efectos de un cambio de malla en la pesquería de cigala (Nephrops norvegicus L.) de Galicia. Bol. Esp. Oceanogr., 3: 57-74.

ICES, 1990. Report of the Working Group on *Nephrops* stocks. ICES CM 1990/Assess:16

ICES, 1994. Report of the Working Group on *Nephrops* and *Pandalus* stocks. ICES CM 1994/Assess: 12.

ICES, 2006. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim. ICES CM 2006/ACFM:01

Pérez, N., Pereda, P., Uriarte, A., Trujillo, V., Olaso, I. and Lens, S., 1996. Descartes de la flota española en el área del ICES. Datos y Resúm. Inst. Esp. Oceanogr., 2: 142 pp.

ICES, 2012. ICES implementation of advice for Data-limited stocks in 2012. ICES CM 2012/ACOM 68.

ICES, 2015. Report of the Fifth Workshop on the Development of Quantitative Assessment Methodologies based on Life-history Traits, Exploitation Characteristics and other Relevant Parameters for Data-limited Stocks (WKLIFE V), 5–9 October 2015, Lisbon, Portugal. ICES CM 2015/ACOM:56. 157

ICES. 2016. Report of the Workshop to consider MS Y proxies for stocks in ICES category 3 and 4 stocks in Western Waters (WKProxy), 3–6 November 2015, ICES Headquarters, Copenhagen. ICES CM 2015/ACOM:61. 183 pp.