DEPM Surveys of Horse Mackerel (*Trachurus trachurus*) from the Atlantic Iberia-southern stock (ICES 9a)
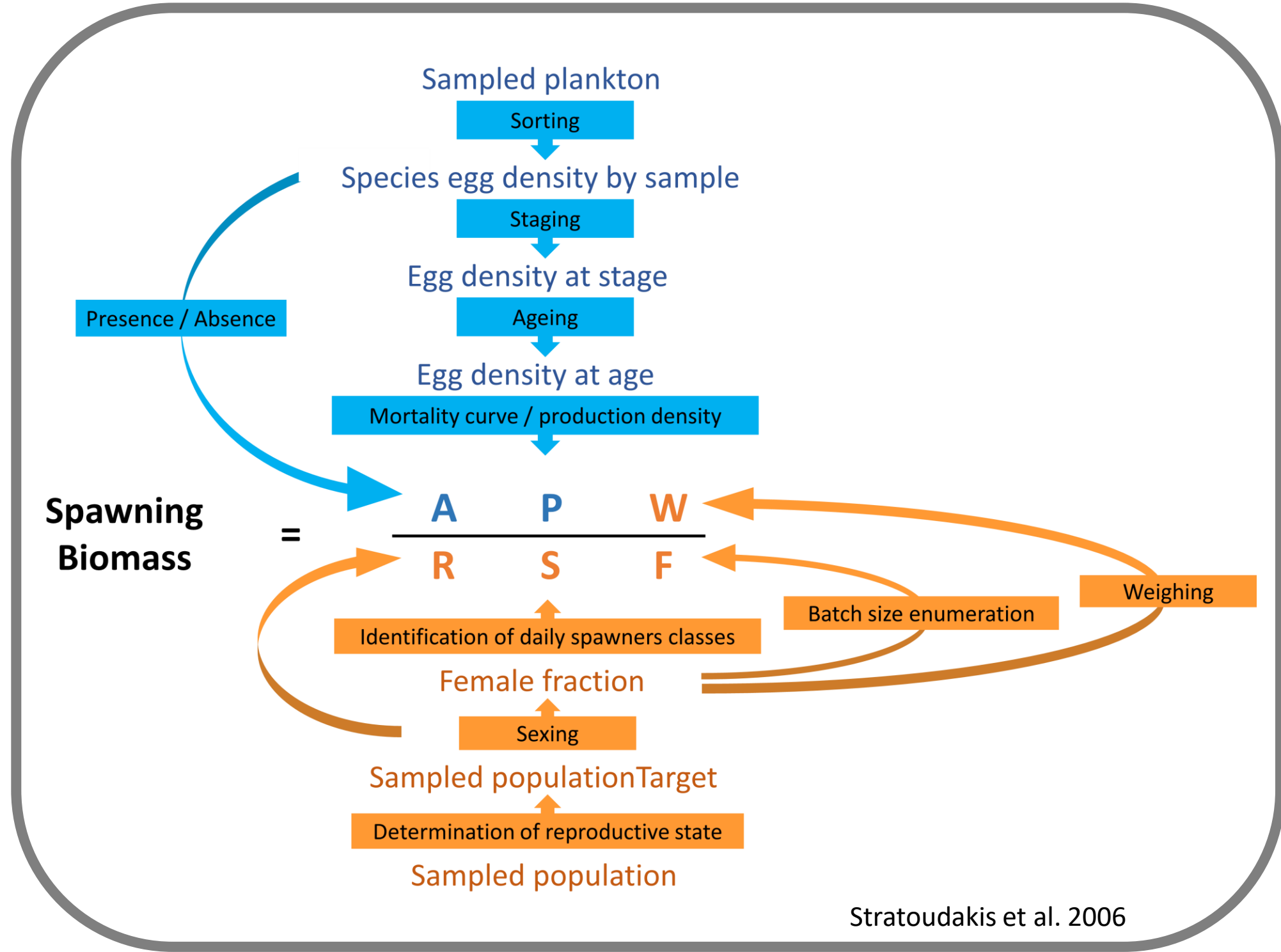
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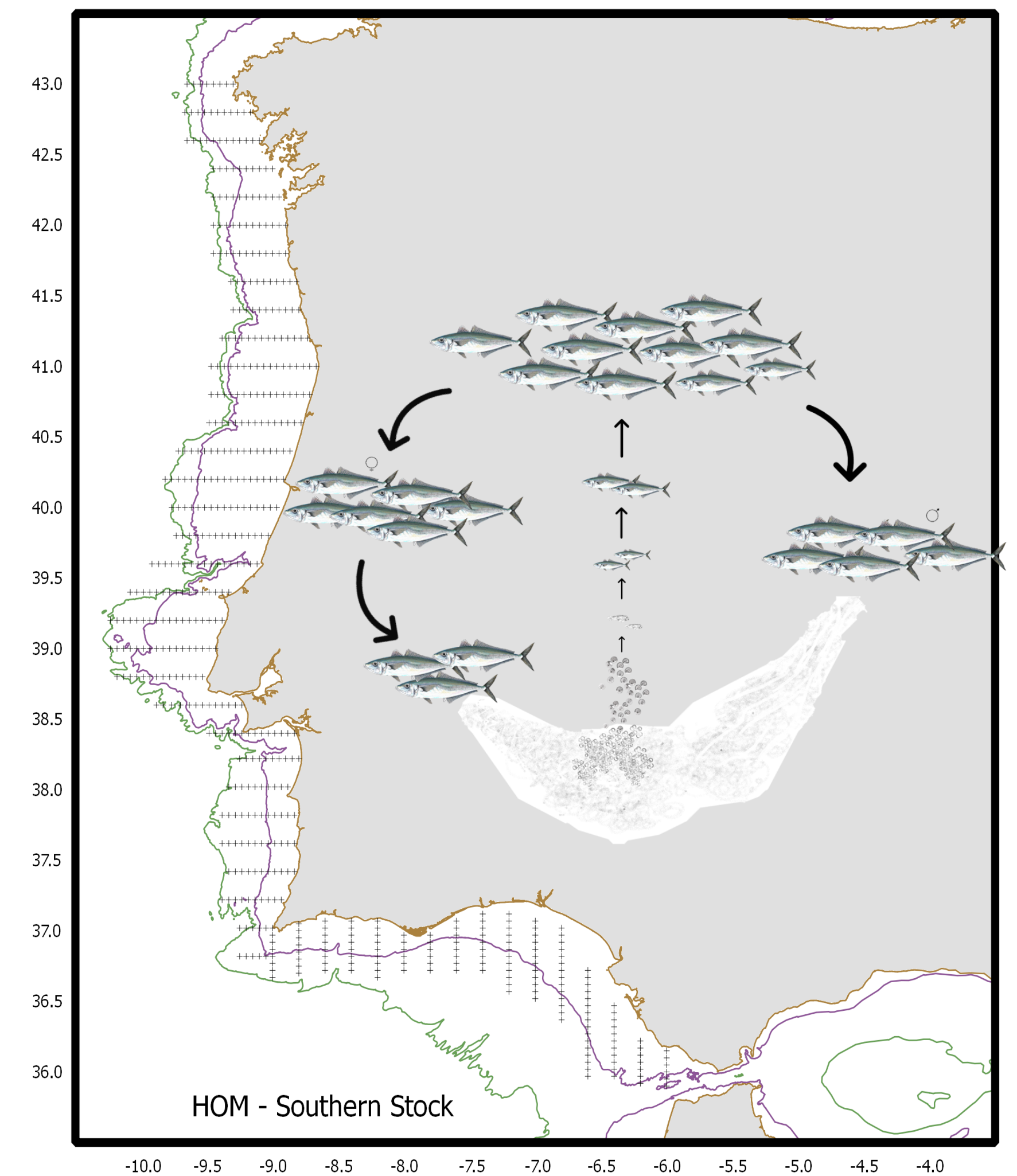[2] Aristotle University, Thessaloniki, Greece

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Daily Egg Production Method

Sampled plankton — Sorting
Species egg density by sample — Staging
Egg density at stage — Ageing
Egg density at age
Mortality curve / production density
Presence / Absence

Spawning Biomass = A P W / R S F — Weighing

Identification of daily spawners classes — Batch size enumeration
Female fraction — Sexing
Sampled population Target
Determination of reproductive state
Sampled population

Stratoudakis et al. 2006

Trachurus trachurus Southern Stock ICES 9a

HOM - Southern Stock

Background

- HOM DEPM application started in 2007 specifically dedicated to the southern horse-mackerel stock, but it also provides information for the AEPM international effort directed at the mackerel western stock. DEPM approach was considered for the species in the region as new investigations indicated HOM to exhibit indeterminate fecundity, a key requisite for the method.
- Since DEPM adoption several developments have been achieved to better adjust the methodology to the species and monitoring area:
  - Grid of plankton stations was altered to permit higher spatial resolution (implying a change in sampler from Bongo to an adapted HOM – Pairovet)
  - Egg identification was detailed to prevent misidentification with other *Trachurus spp.*
  - Egg incubation experiments were conducted to establish a model of stage (age) development with temperature
  - The ichthyoanalyses routines/scripts developed for PIL were adapted for HOM.
  - The degeneration of the POFs in the female ovaries was described in more detail and a combined histomorphological and biometric method started being used to infer POFs age for the estimation of the spawning fraction (S)
  - Applied research was carried out to adapt to HOM a semi-automated method for the estimation in laboratory of batch fecundity (F)
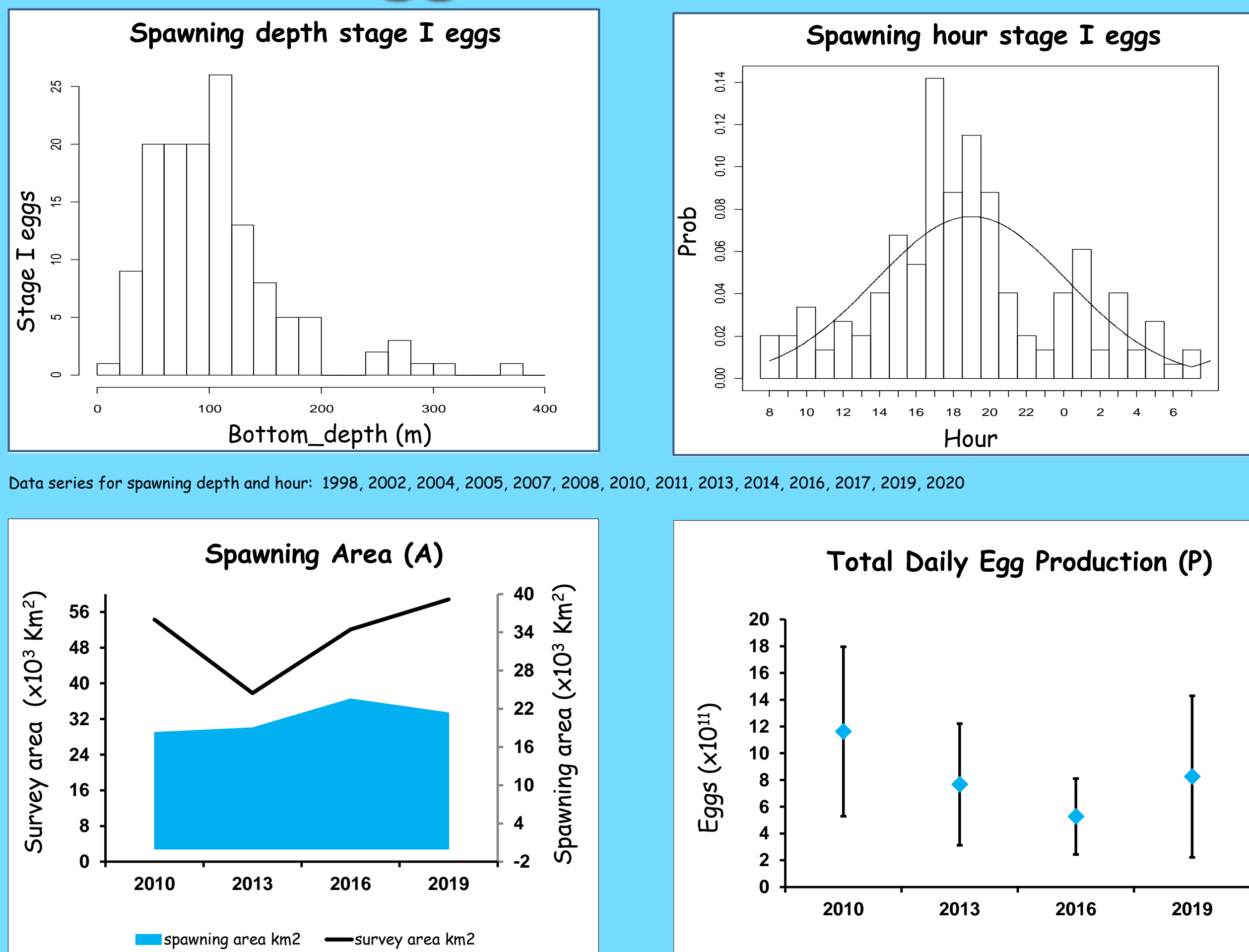
SURVEY SERIES SUMMARY

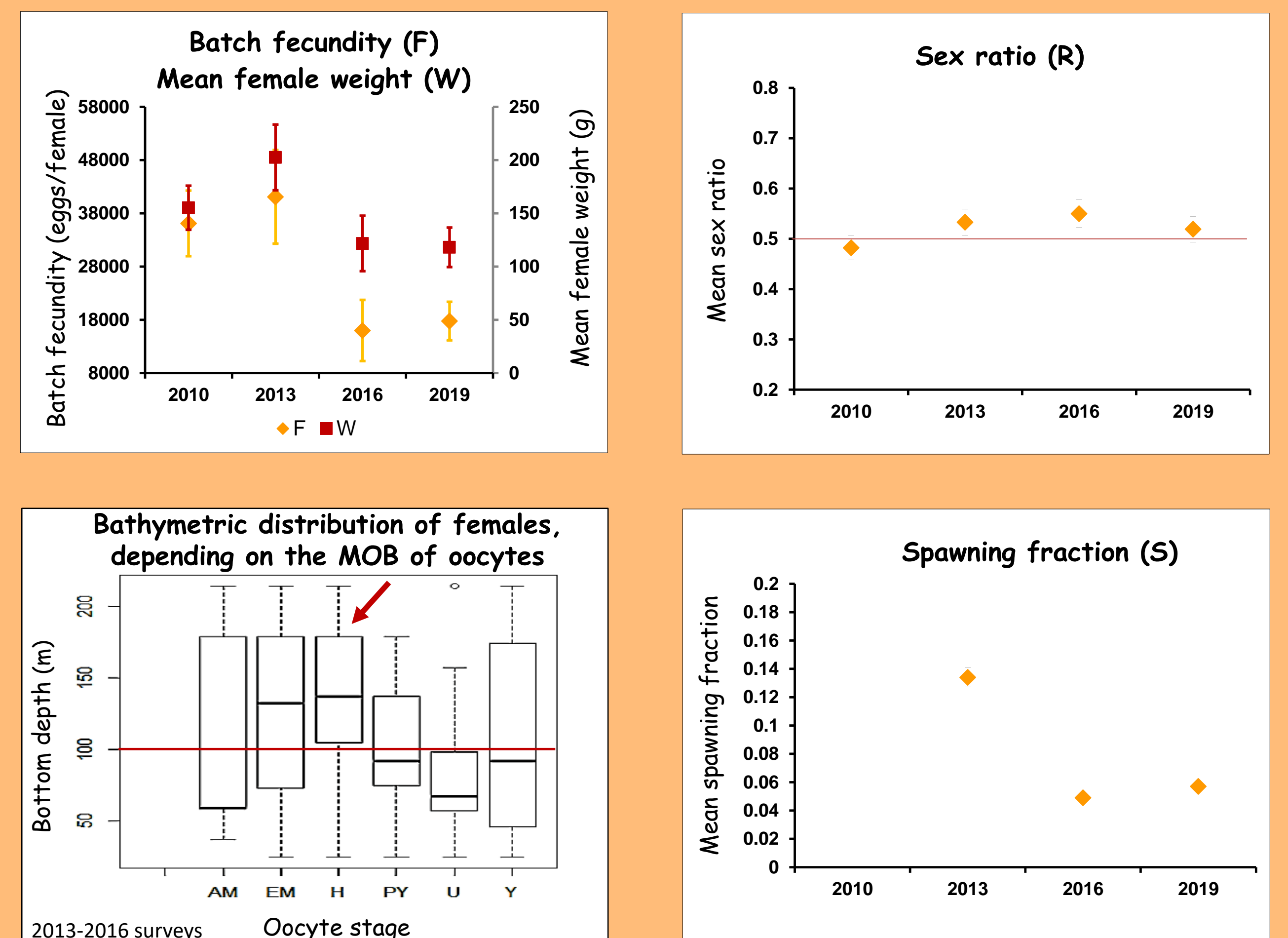| Survey	Period	Nb CalVET samples (nb with HOM eggs)	HOM eggs Tot (max eggs m^{-2})	Nb fishing hauls (% with HOM)	Total fish sampled
DEPM10	30 Jan - 3 Mar	414 (102)	1191 (2063)	57 (33 RV* + 24 CV*) (75%)	3169
DEPM13	10 - 19 Feb	222 (94)	2768 (816)	14 (14 CV*) (100%)	1057
DEPM16	11 Mar – 1 May	393 (51)	453 (900)	73 (52 RV* + 21 CV*) (31%)	2451
DEPM19	25 jan – 25 Feb	531 (94)	1700 (1735)	71 (56 RV* + 15 CV*) (38%)	2215

* RV – Research Vessel; CV – Commercial Vessel

Egg Parameters

Spawning depth stage I eggs
Spawning hour stage I eggs
Spawning Area (A)
Total Daily Egg Production (P)

Data series for spawning depth and hour: 1998, 2002, 2004, 2005, 2007, 2008, 2010, 2011, 2013, 2014, 2016, 2017, 2019, 2020

- Egg Production estimation using Ichthyoanalysis routines
- Spawning location mostly in midshelf over 60-120m depth
- Spawning hour (stage I eggs last 6h aprox) mostly around 18-20h
- Surveys and spawning area similar between years (2013, survey gap in Cadiz however zone with no spawning HOM)
- Egg Production - eggs/m2/day, variable (22.4-63.6); higher in 2010, lower in 2016

Adult Parameters

Batch fecundity (F) Mean female weight (W)
Sex ratio (R)
Bathymetric distribution of females, depending on the MOB of oocytes
Spawning fraction (S)

2013-2016 surveys

- Inter-annual variability of the adult reproductive parameters
- Possible influence of the demographic structure of the population, of the timing of the survey in relation to reproductive season, of sampling issues (fishing gear, ontogenetic changes in geographic/bathymetric distribution of the fish and trawling spatial coverage) and/or environmental factors affecting fish condition.
- Imminent spawning females (with Hydrated Oocytes – H) distributed mostly deeper than the 100m.

Spawning Stock Biomass

SSB (thousand tons)
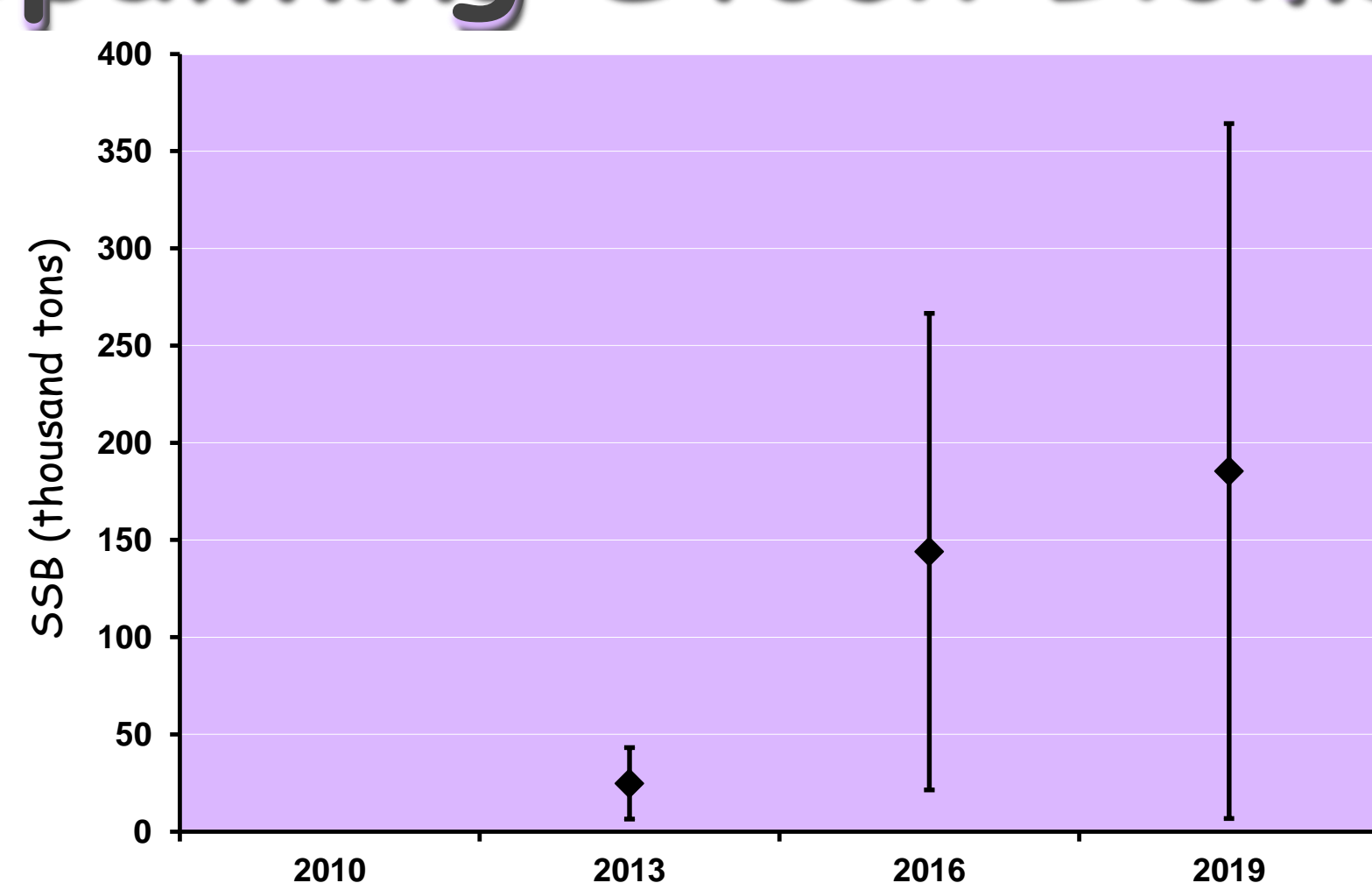
Work in progress:

- ❖ Egg mortality estimation using aggregated data series and temperature as covariate
- ❖ Investigate potential geographical/ecological data stratification
- ❖ Detail HOM spawning behaviour in relation to fish geographical and bathymetric distribution and ecological forcing affecting reproduction
- ❖ Confirm HOM daily spawning pattern and synchronicity
- ❖ Improve the estimation of adult reproductive parameters, especially spawning fraction (S) based on the POFs method and/or alternative methodologies
- ❖ Investigate the influence of the individual characteristics on the reproductive parameters