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ICES CM H:45

Identifying recruitment bottlenecks in the early life history of Western Baltic herring (*Clupea harengus*, L.)

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The inshore waters of Greifswald Bay in the vicinity of the Island of Ruegen, Germany are the major spawning ground of Western Baltic spring spawning (WBSS) herring. The semi-enclosed basin and associated shallow water areas ("Bodden") are subject of major environmental fluctuations and direct anthropogenic impacts. Because the early life history of WBSS herring takes place in inshore retention areas, we assume that stressors and drivers of WBSS herring recruitment are specific to lagoon and estuarine systems (Fig.5) and might differ to some extent from those regulating coastal marine herring stocks.

Summary: Identifying general dynamics and size ranges of larval broodwaves is a valuable baseline for mechanistic research on herring recruitment variability in shallow inshore retention areas. Locating key stone life history stages such as egg survival/ development and larval survival/growth, where most of the pre-recruitment mortality takes place significantly contributes by investigating stressors and drivers of herring recruitment in inshore retention areas.

Objectives: An extended time series on herring recruitment strength basing on larval density and growth indices indicates severe inter-annual fluctuations of WBSS herring recruitment and a general trend of decreasing recruitment strength during the past decade (Fig.2). By searching for mechanisms responsible for recruitment variability and general decrease, we consider it as an essential step to :

Identify the stage(s) and size classes in the early ontogenetic cycle of herring development where major survival/growth bottlenecks are located.

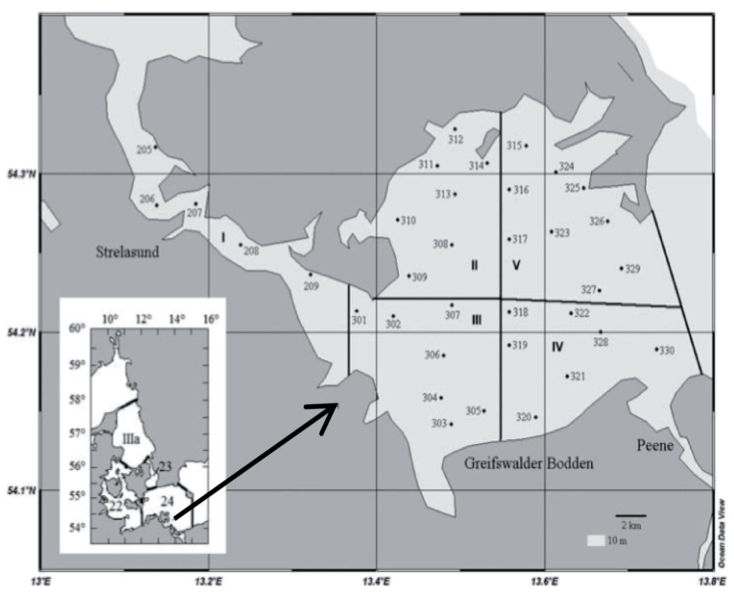

Fig. 1 The annual "Rügen-Herring Larvae Survey" consists of a 36 station grid in Greifswald Bay and the adjacent Strelasund sampled weekly from March to July using a bongo net with mesh sizes of 335-and 780 µm in stepwise, oblique hauls.

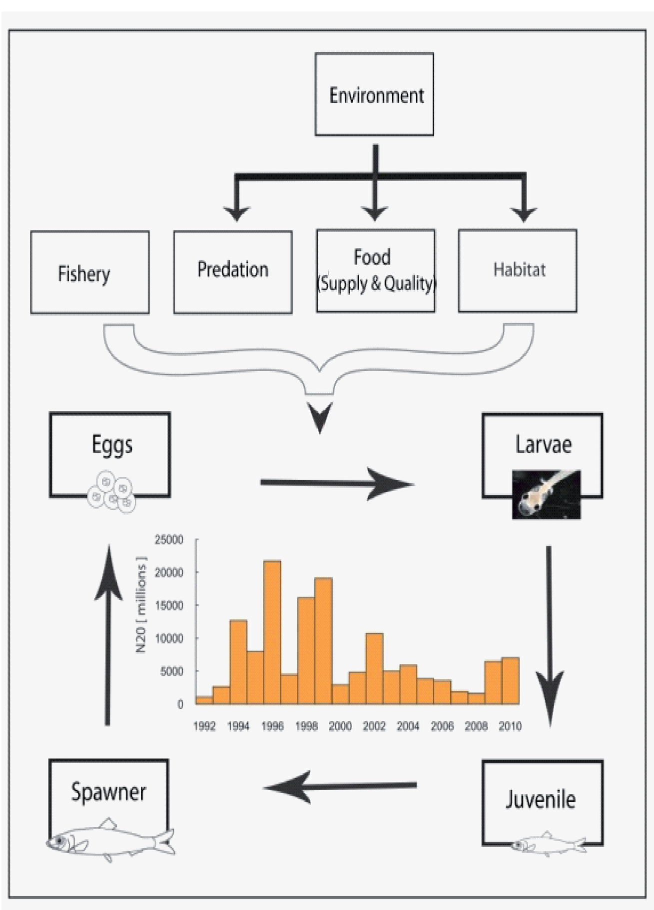

Fig.2 Time series of the annual "N20" recruitmet index (center) and the conceptional model of ongoing research to locate bottlenecks in herring ontogenesis explaining recruitment variability and general decreasing trends.

Along the early life history spend in inshore waters; major bottlenecks can be located in crucial phases of larval development: According to time series-results structuring mechanisms must be effective as early as on the spawning, egg development or hatchling period, before additional factors, such as prey availability become important (please see Poster CM: H 49 for details). The second structuring phase exists throughout the time series, reflected by broodwaves that can be clearly isolated at the size class step from 7 to 9 mm (Fig.3). The annual dynamics of those broodwaves (Fig. 4) provide insight of variability of hatching periods, hatchling densities as well as dimensions of post-hatching mortalities. The actual mechanisms causing broodwave dynamics and larval mortality in Greifswald Bay are subject of ongoing research. An overview of potential recruitment stressors is presented in Fig.5.

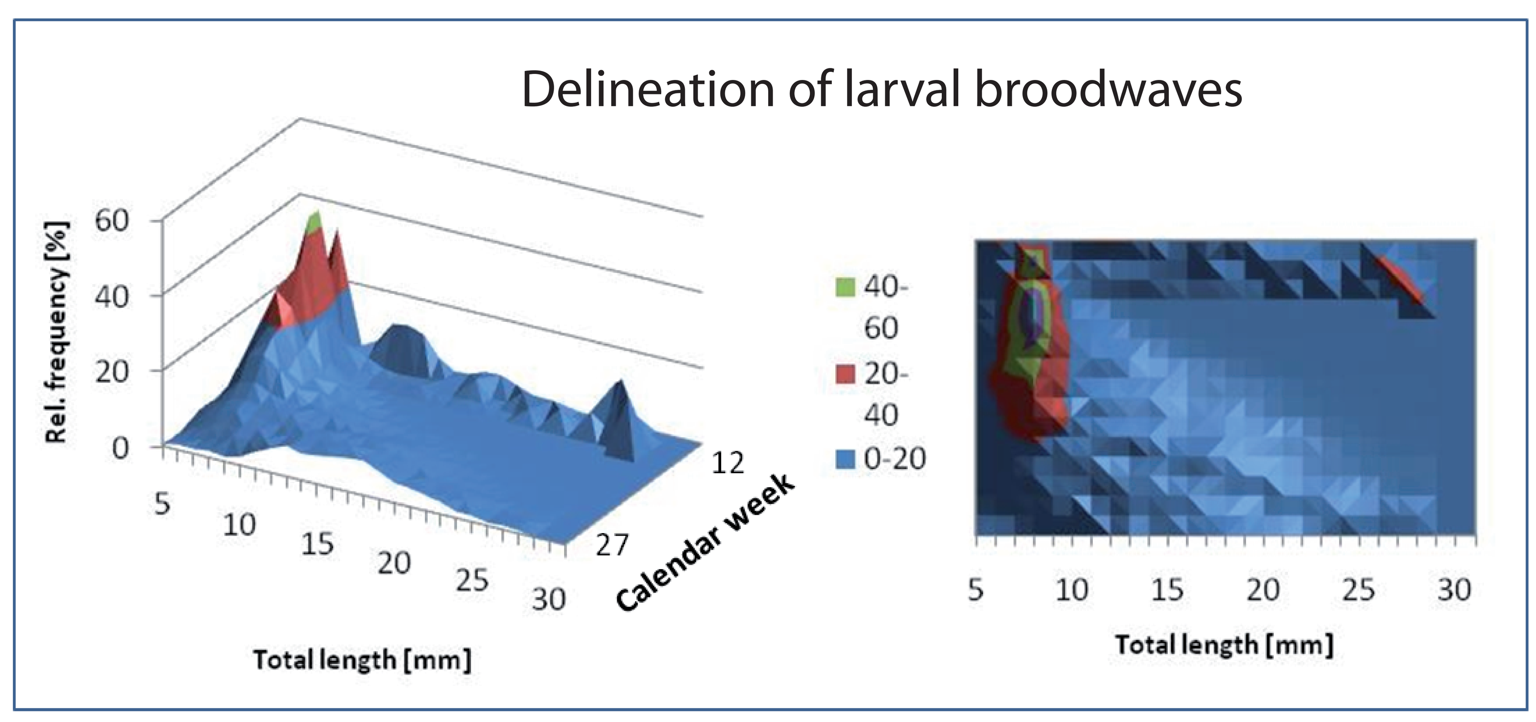

Fig.3 Mean size-class frequency per calendar week from 1992-2011. Early larvae do not occur gradually in the samples but in distinct broodwaves.Throughout the years, these brood waves can be assigned to a size range of 7 to 9 mm larval total length.

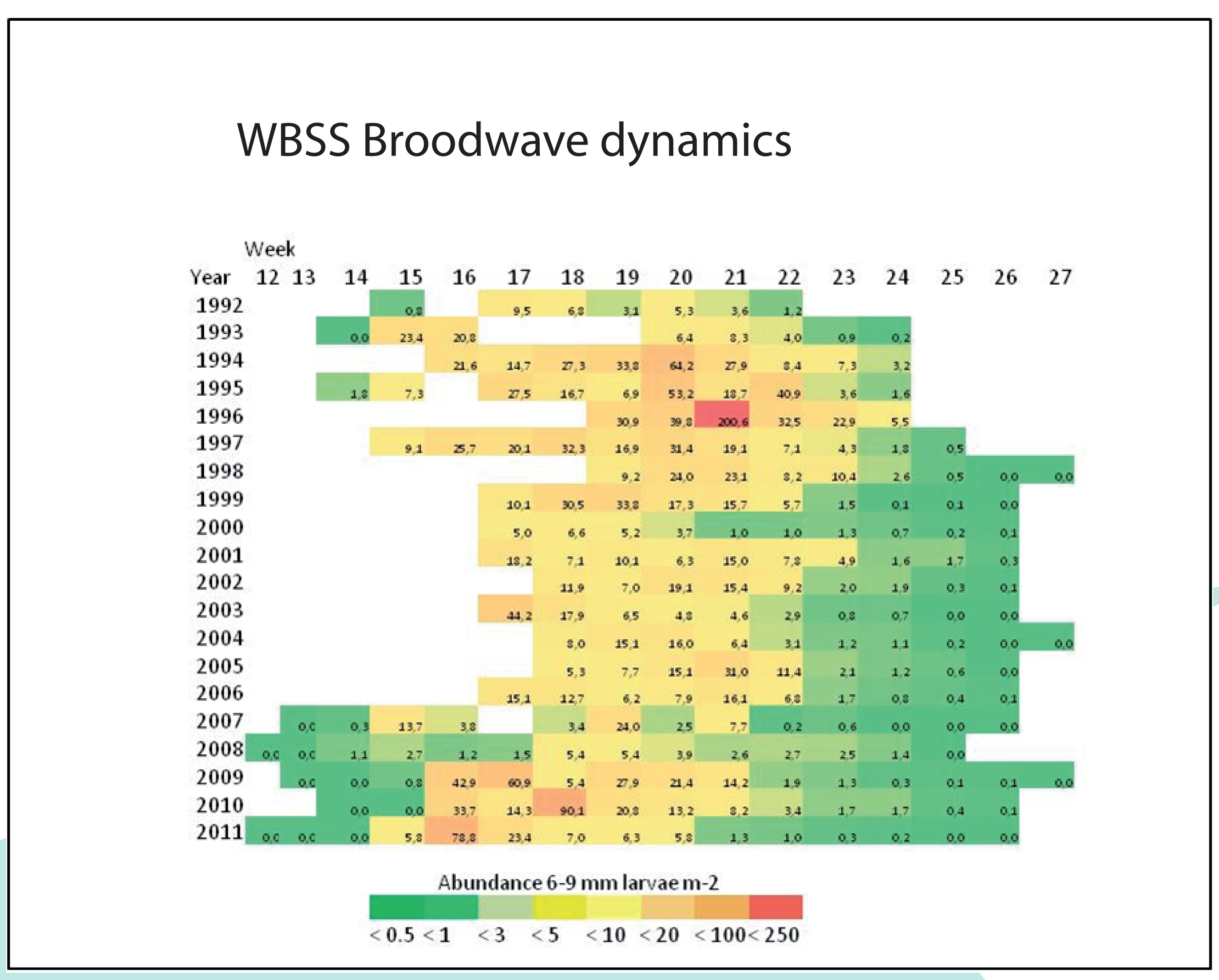

Fig.4 Dynamics of herring broodwaves from 1992-2011. Abundance of early larvae show dinstinct peaks during the reproduction phase along the time series. The occurrence of peaks varies over calendar weeks but abundance and number of broodwave events shows a decreasing trend during recent years.

Conclusions: Monitoring data reveal that ecological recruitment bottlenecks are located in multiple phases in early herring ontogenesis. Therefore it can be concluded that a suit of multiple mechanisms is responsible for WBSS recruitment variability. Further analysis of broodwave dynamics and structuring variables might contribute to the understanding of WBSS herring recruitment variability.

Work in progress:

What are the structuring mechanisms regulating recruitment strength?

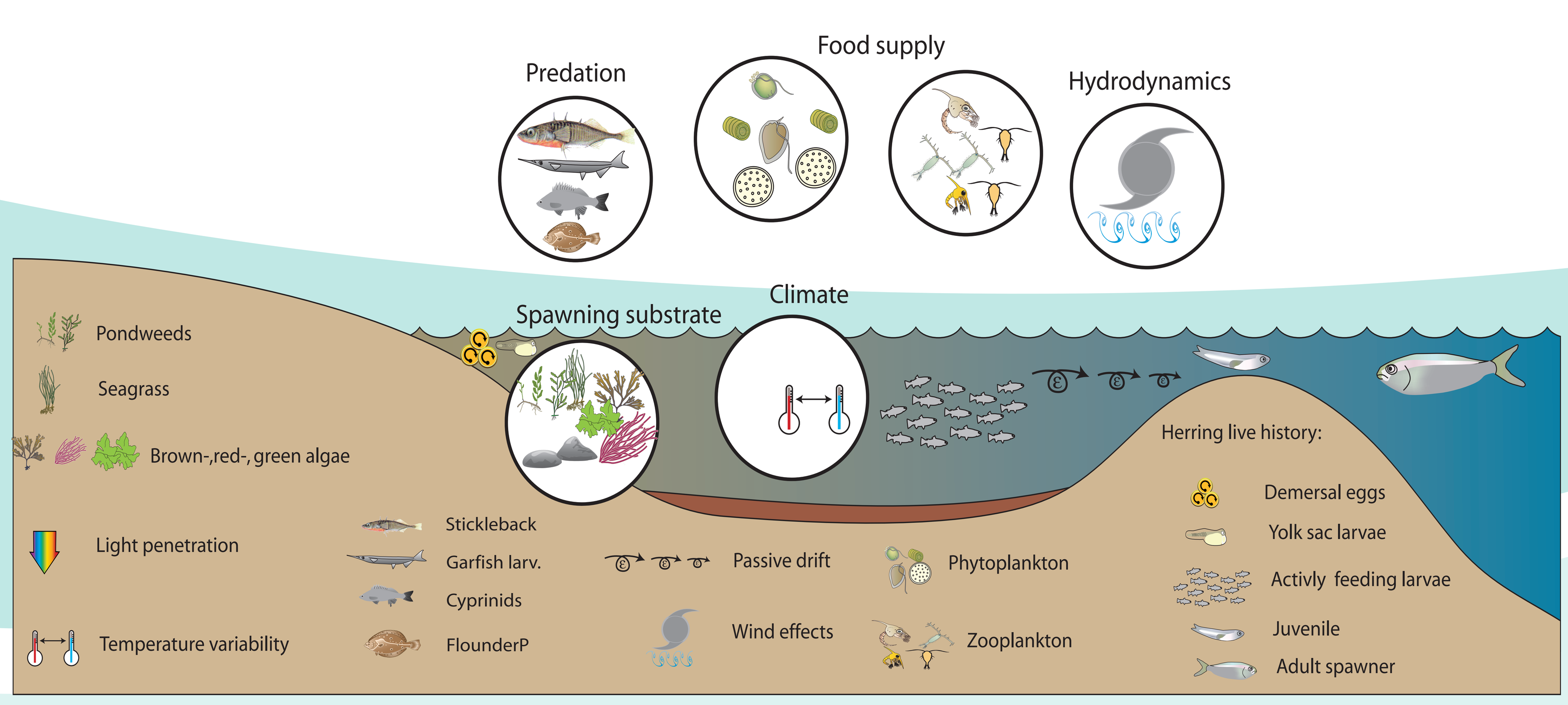

Fig.5 Potential mechanisms structuring herring recruitment in inshore retention areas. Variables, such as predation on spawn and larvae; food supply and-quality, effects of hydrodynamics, climate and spawning substrate dynamics are subject of current research

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