Abstract: beginning from the early 1990s the Baltic Sea shifted from a cod- to a sprat-dominated system. At the same time the growth of herring and sprat dropped. The decrease in herring growth has been in literature mostly explained by a climatic-induced decrease of its principal preys, since a top-down control by herring on resources was not evidenced. For sprat no comprehensive studies have been performed on this matter. In the Baltic Sea, the clupeids herring and sprat are the principal zooplanktivorous fish. Although the food spectra of Baltic clupeids have been broadly studied, their diel feeding activity, prey selection and predation effect on preys have not been widely investigated. These studies might help understanding the feeding interactions between clupeids and explain the changes in growth that they have experienced. The results would also furnish new insights into the opposite top-down (consumer-regulated) and bottom-up (resource-regulated) processes operating in the Baltic Sea ecosystem and, thus, assist fisheries management decisions.

According to the results of this thesis, clupeids follow a general diel pattern of vertical distribution, being dispersed at surface at night and aggregated deeper in the water column during daytime. The observed pattern is likely in response to food availability and triggered by changes in light intensity. Sprat feed during the whole daytime, whereas herring present two feeding peaks, one at dusk and one at dawn. The difference could be due to different prey preferences. Smaller herring and all size classes of sprat are strictly zooplanktivorous and select common zooplankton species, whereas larger herring are mainly nektobenthic feeders. The shift in herring diet is size- as well as season-dependent probably due to a shift in prey abundance/composition. Food selection of both clupeids is in response to prey size, conspicuousness and reaction time, but also to prey relative abundance. This points to a possible intra- and inter-specific feeding competition between clupeids. The thesis showed in fact that the condition of herring and sprat changed synchronously since the end of the 1980s in all the areas of the Baltic proper and was strongly negatively correlated to total clupeid as well as sprat abundance. The abrupt increase in sprat that begun in the first half of the 1990s affected the biomass and composition of the summer feeding resources common to both clupeids and reduced their amount of ingested preys with negative effects on body condition in fall. Thus, clupeid condition in fall was density-dependent and mediated by feeding competition. Salinity and temperature could co-work with clupeid predation in shaping zooplankton dynamic and, in turn, clupeid condition. Salinity had a direct physiological effect only on sprat condition and merely in the northern part of the study area where salinity is lower. The decrease in sprat growth during 1990s affected negatively the growth of the common guillemot chicks that are fed by parents almost exclusively with sprat during the fledging period. Concerning lower trophic levels, phytoplankton was inversely related to zooplankton biomass, whereas the link phytoplankton/nutrients was not manifest, likely because of the masking effect of eutrophication. The trophic cascade was more evident after the early 1990s owing to the stronger regulation by sprat on zooplankton. In the earlier period zooplankton dynamic was highly variable and likely dependent on additional factors than merely sprat predation. This suggests the existence of two configurations in the Baltic Sea ecosystems, one cod- and one sprat-dominated, in which the ecosystem functions in different ways. The shift occurred suddenly in the early 1990s and has not reversed despite improved conditions for cod stock development. This leaves open the possibility that the two configurations represent alternative stable states.

Keywords: *Sprattus sprattus*, *Clupea harengus*, *Gadus morhua*, *Uria aalge*, zooplankton, nektobenthos, diel vertical migrations, food selectivity, competition, growth, top-down regulation, bottom-up regulation, trophic cascades, alternative ecosystem configurations.

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