Our long-term observations of mussel populations in Tyuva Bay showed, following in line with numerous previous publications (Beukema et al., 2001; Beukema & Dekker, 2014; Wootton & Forester, 2013; Khaitov & Lentsman, 2013; Troost et al., 2022), that these systems are unstable and show multiyear changes in their parameters (abundance, age composition, taxonomic structure). Most expressivelly, even after visual inspection, these changes were evident in the extensive mussel bed located in the upper part of the bay (Fig. ++).

Early researchers (GZU ++++ ) noted two relatively small mussel beds in this part of the area (Fig. ++). Nothing is known about this mussel bed before this observation. However taking into account that these patches were surrounded with so-called "mussel sediment" consisted of shell debris (GZU +++) we may consider that this settlement was more extensive in previous time.

The fate of this mussel bed is unknown up to beginning of 2000s when a powerful mussel bed occupying a much larger than in previous time intertidal and subtidal area was detected (Bufalova +++). This mussel bed was dominated by mussels of 4-5 year old. Thus the population took its beginning at least in the late of 1990-s (approximately 1998) . Dense assemblages of old mussels at intertidal part of the mussel bed were visually traced up to 2010 when numerous dead shells were detected on extensive parts of the mussel bed (Fig. +++). During the next sampling period (2018) the intertidal part of the mussel bed disappeared completely. Mussels could be found only on boulders in this period but soft sediment previously occupied by mussel cover was presented by “mussel sediment”.

The modern and old observations are in good correspondence with the predictions of the conceptual model describing the existence of some cyclic sequence in periods of population flowering changing by periods of perishing (Khaitov Lentsman, ++++, Troost et al., 2022). Such cyclic processes were previously detected on mussel beds in various areas (Khaitov Lentsman, ++++ and references therein). The period of cycles described depends on the mussel life span and ranged between 4 and 9 years (Khaitov Lentsman, ++++ ). In the case of intertidal part of the mussel bed in the Tuva Bay the period seems to be larger (2003-1997 + 2010-2003) = 13 years.

Actually we do not have reliable information on mussel bed dynamics in its subtidal part. However dense assemblages of mussels at monitoring transects were presented in all observation periods no total perishing of mussels was detected. This stability is in a conflict with observations made for subtidal mussel beds in the Dutch Wadden Sea (Troost et al., 2022) longevity of the former is assessed in about 2 years only.

One of the possible reason of the cyclic dynamics of dense population of mussels can be associated with negative impact of old mussels upon recruits (Naumov, 2008; Khaitov & Lentsman, 2016). This negative influence regulates the recruitment, which happens only after crucial decreasing in old mussel’s abundance. In fact we did observe such changes in mussel’s age structure (Fig. 5++). Mussels of 7-12 year old dominated in mussel bed in 2004-2010 were replaced by young mussels, 2-3 years, in 2012, 2018.

However the model of cyclic dynamics predicts that the changes should be a local process: two independent settlements should display no coordination in dynamics (Khaitov & Lentsman, 2016). In fact this was not observed in the Tuva Bay. Both mussel bed (situated in the upper part of the bay) and rocky litoral settlements (situated in the bay mouth), displayed coordinated changes in their age structure (Fig. 5++). Settlements of both these types got to be young dominated in the last observation periods. Thus some factors acting in more extensive spatial sales are to be expected as a driving force in recruitment.