The Ayan-Shantar population of the red king crab (Paralithodes camtschaticus) abundance dynamic

CHERNIENKO Igor and CHERNIENKO Emiliya

The Pacific branch of VNIRO, Vladivostok, Russia. E-mail: igor.chernienko@tinro.vniro.ru

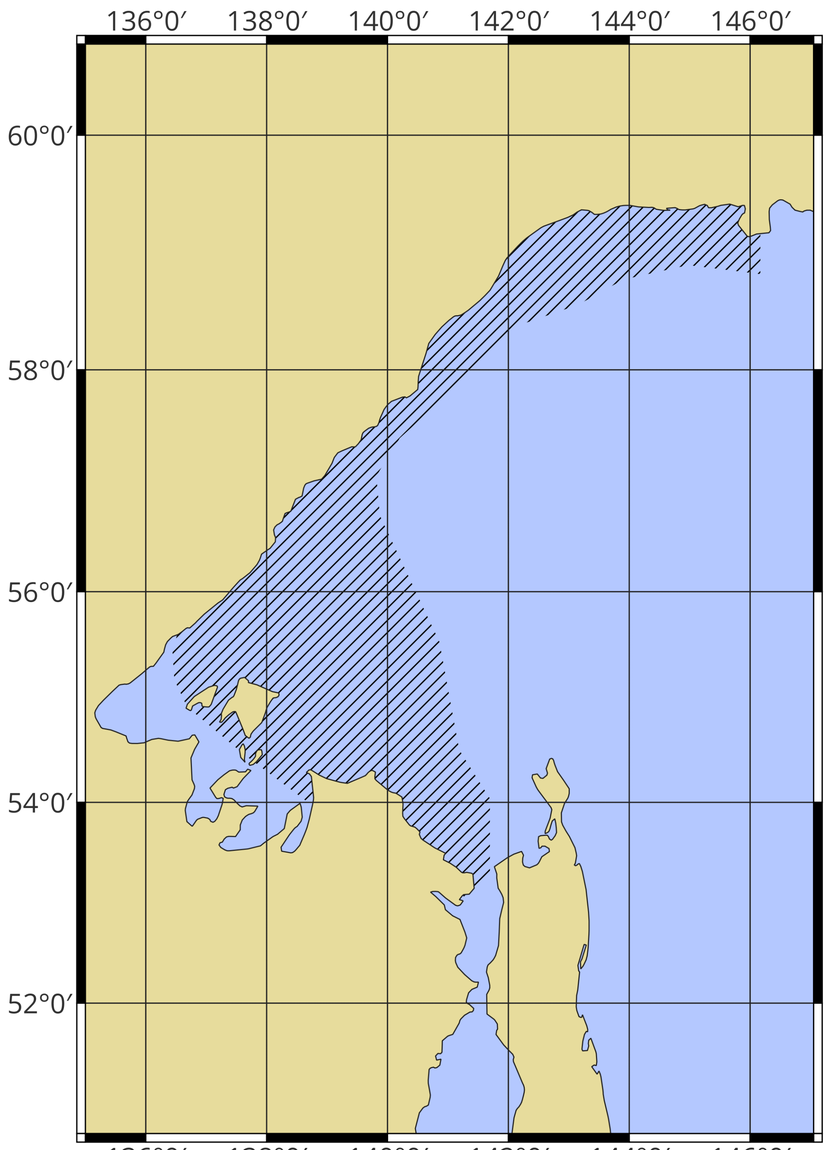

Fig.1 The Ayan-Shantar red king crab population area

The Ayan-Shantar population of the red king crab inhabits the northwestern part of the Sea of Okhotsk. This population is unique in a number of its ecological and biological characteristics. It is characterized by slow growth rates. The maximum size of a male was 202 mm in carapace width, while females barely exceed 100 mm. However, some females carry external eggs on their pleopods already upon reaching 50 mm in carapace width. Males reach sexual maturity at approximately the same size. These features are adaptations to the harsh hydrological regime of their habitat area.

The harsh hydrological conditions and low fecundity of females on one hand, and the lack of data on female abundance and juvenile survival on the other, necessitate close attention to the reproduction processes in this population. The entire population is divided into several aggregations, interconnected by migrations and larval dispersal. The population as a whole is relatively isolated from others. It has been shown that Kamchatka crab aggregations west of 147° East longitude can be considered distinct and self-reproducing. Thus, an assessment of this population's abundance can be performed using mathematical models.

Data on the Ayano-Shantar population are characterized by heterogeneity and discontinuous series. Furthermore, commercial fishery statistics are available.

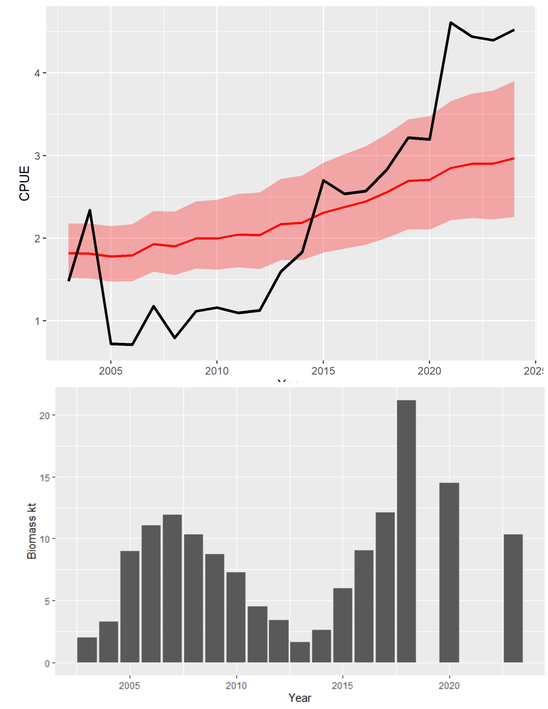

Fig.2 The indicies

For modeling, a hybrid finite-difference delay-difference Deriso-Schnute model with a sigma-point Kalman filter was used. Two abundance indices were utilized. The first was estimates of fishery biomass performed from data of survey trap catches using the area-swept method. The second was standardized catches per vessel-day. The Brody coefficient required for the model was derived from the Ford-Walford equation, which was itself derived from the Bertalanffy weight equation.

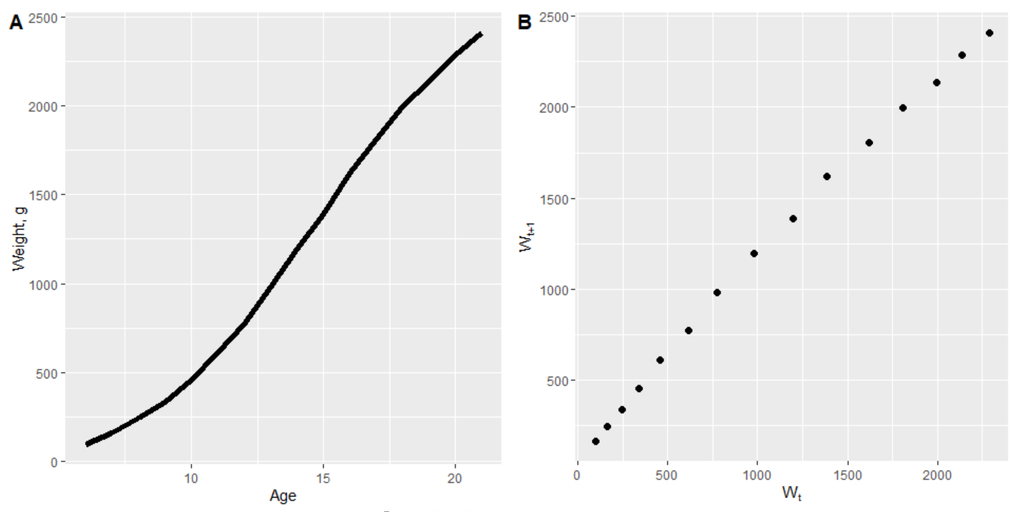

Fig.3 Grow process

As can be seen from the figure, the model follows the CPUE index. In our opinion, this indicates that the survey index is noisy. The modeling showed that from 2003-2014 the stock was stable, from 2014-2018 its growth was observed, and since 2020 the stock has been at a consistently high level, with a tendency to increase.

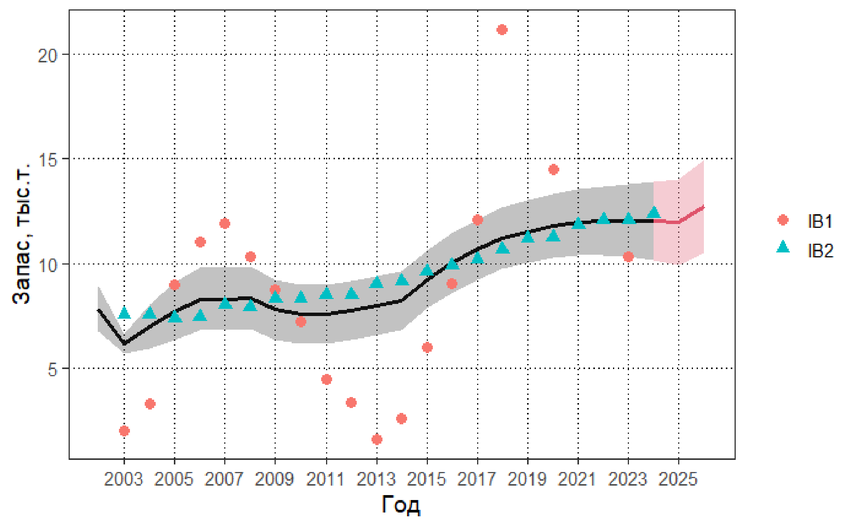

Fig.4 The abundance dynamic estimation