

## ***Interactive comment on “Trawl macrofauna of the Far-Eastern Seas and North Pacific: proportion of commercial species, potential product yield, and price range” by Igor V. Volvenko et al.***

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Dear Editors,

We would like to thank the Anonymous Referee #2 for important comments. We see them in general as recommendations for future extension of our present work. Please find below point-by-point answers to each of the Referee's comments.

Let us start with the question who and how could use the database (species checklist) that we have collected and presented in PANGAEA. First of all, this is a catalogue that can be used by fishermen, fishery managers, officials and policy makers for the de-

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velopment of bioresource management, aquaculture and conservation, assessment of environmental damage caused by anthropogenic impact. Secondly, we have already made the first analysis of this checklist in our review and came up with six practically important conclusions, which were formulated at the end of the manuscript. We gave in it a specific example of publication [1] in which an approximate economic assessment of biological resources of the Sea of Okhotsk was made according to preliminary data. At present this estimate can be refined using our data and extended for other Far Eastern seas (hereinafter, by this term we mean the Sea of Japan, the Sea of Okhotsk, the Bering Sea and the Chukchi Sea.). We could also mention similar economic assessment [2] with the analysis of rationality and efficiency of the use of biological resources of the western part of the Bering Sea. However, unfortunately, it has been published only in Russian and was not translated into English. In the near future, we plan a series of similar publications in English on all Far Eastern seas and the North Pacific Ocean. It will be based on the checklist presented in PANGAEA, combined with the data of scientific trawl surveys and official data on fishing. Anyone interested could do this based on our checklist and catch data from FAO directories (e.g. [3-9]) or from the website of the Russian Federal Fisheries Agency (available at <http://fish.gov.ru/otraslevaya-deyatelnost/ekonomika-otrasli/statistika-i-analitika>) or the Center of Fishery Monitoring and Communications (<http://cfmc.ru>), as well as atlases [10-13] and tabular guides [14-25] on pelagic and bottom macro fauna for each of the Far Eastern sea, that have been published earlier. However, before that we would like to supplement the databases on trawl catches [26-28] with materials from the latest research surveys, including those conducted in 2018. Also, we already mentioned the importance of the checklist published in PANGAEA for assessing environmental damage to marine ecosystems resulting from anthropogenic impacts, including pollution, hydraulic structures, oil and gas production, accidents in tankers or nuclear reactors, etc. In the simplest case, in order to estimate such damage in terms of cost, total destructed biomass should be multiplied by possible product yield and prices for respective species shown in the present study. For more comprehensive assessment,

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the same procedure should be conducted considering the potential offspring of those organisms over a certain period of time, and resulting amounts should be summed up. Environmental and regulatory authorities use such assessments to recover damages.

Comments on the three general concerns of the Referee.

1) The data set indeed covers the period from 1977-2014 and therefore also covers a period with significant environmental changes. It is easy to see which species have been found in which area at which time based on atlases [10-13] and table directories [14-25], as well as on many publications on this topic. Also, there are publications on how abundance and distribution are related to a number of variables, like water temperature or atmospheric indices influencing temperature and currents (e.g. some of the latest publications on these topics on the Sea of Okhotsk [29-31]). The checklist presented in PANGAEA is intended for other purposes – to translate biological (ecologic, biogeographic) assessments into economic assessments.

2) It is clear that the actual catch in a given year would be a useful information to identify trends in exploitation and provide links to open sources of such information. We also note that this information is not available for all species listed in the checklist, but only for the most abundant. Moreover, we plan to analyze all that information in our next publications presenting it in monetary terms using our checklist.

3) The Referee correctly noted that the state of the fish market depends not only on changes in the abundance of one or another species in nature, but also on price dynamics, which in turn depends on many factors and, as a rule, is very variable. We also point out this in our review and name some of these factors. The minimum prices are useful to demonstrate that the value of available biological resources at certain place at one time is no less than a certain amount in dollars. In other words, it shows the minimum value of damage to nature. In the future, we planned to supplement our checklist with maximum and average prices, but not at this stage.

We also share the Referee's concern that several species harvested as one species

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carry the risk of overharvesting the least resilient species of that assemblage (see e.g. [32]). However, it is not easy to cope with that problem. In their official catch reports, fishermen often do not specify, e.g., squids, sharks or gobies by species. Fishermen do not believe that they are obliged to do this, and fishing rules do not prohibit this approach. Total and accurate species identification of catches is possible only in scientific surveys, the data from which we have used to create our checklist published in PANGAEA. Since each comment of the Referee was very relevant and valuable, in our future work, we will try to follow most of his recommendations.

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Best regards,

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