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Renewal of the amateur red king crab fishery in Russian waters of the Barents Sea: Potential benefits and costs

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Abstract

The red king crab (Paralithodes *camtschaticus*) was introduced into the Barents Sea in the 1960s, and the established population of this species has supported commercial Russian fishery since 2004. Licensed recreational fishing for red king crab occurred in 1999–2006. This activity was forbidden after a ban of the red king crab fishery within the 12-mile zone of Russia. In 2021, the amateur red king crab fishery was renewed at several coastal sites of the Barents Sea. An analysis of stock dynamics and fishery statistics indicates that a decline in the crab abundance indices was associated with official, illegal, and amateur fisheries in the coastal Barents Sea. Advantages of recreational crab fishing include the satisfaction of the local population, income from the sale of licenses, and increased tourism potential of the region. Disadvantages are associated with contamination of the nearshore environment, increased illegal fishing, increased mortality of nontarget crabs, and additional costs of control and monitoring.

Introduction

The Barents Sea forms an ecological transition zone between the North Atlantic and the Arctic Ocean. This region is influenced both by warm and saline Atlantic waters in the west, cold Arctic waters in the north, and lower salinity waters from abundant river runoff in the east [1], [2]. Stocks of cod, haddock, saithe, herring, and capelin support large commercial fisheries in the region [3].

Recreational fishing is a popular activity that provides much enjoyment to people who fish. Although several studies suggest that people engage in fishing for a variety of reasons including a vehicle for family cohesion, nature appreciation, personal stress release, and mental relaxation [4], the actual success of catching fish is a primary motivation and source of angling satisfaction [5]. This is especially true for the coastal community of the Murmansk region where the average salary is lower compared to the central regions of Russia. The recreational sector has become increasingly important since 1991, following the collapse of the Soviet Union [6]. Marine recreation fisheries for cod, wolfish, and haddock occur in coastal waters of the Kola Peninsula with a 100 kg daily catch limit per 1 fisherman. These fisheries are open access. In addition to the recreational fisheries for marine fish, recreational fishing for salmon is developed in rivers of the Barents Sea region as well [7]. This fishing is done on a license fee basis.

Despite the high species diversity and productivity of the Barents Sea, there are no native commercially important crab species here. For this reason, adult and juvenile specimens, as well as larvae of the red king crab *Paralithodes camtschaticus,* were transferred from the Sea of Japan and the Sea of Okhotsk into the coastal Barents Sea by Russian scientists [3], [8]. Coordinated Russian-Norwegian studies on red king crab conducted in the 1990–2000s have shown that *P. camtschaticus* formed a self-sustaining population in the Barents Sea [9]. During the establishment of this new population, red king crabs spread both to the west and east of the release sites. Predictably, this large crab species became a popular target for amateur fishermen in the coastal Barents Sea.

In Russian waters, licensed recreational fishing for red king crab occurred in 1999–2006. This fishing was forbidden together with a ban of the commercial red king crab fishery established within the 12-mile zone of the Russian Federation in the Barents Sea. The local fishermen were encouraged by this decision. During the 2010s, many petitions in support of the recreational red king crab fishing were submitted to the Government of the Murmansk Region and the Federal Government. This matter has also been discussed in local media. The fishermen have argued that red king crab has a high abundance at coastal sites and that this invader is "eating everything in the bottom including fish" and this process "affects fish

stocks". Although the last statement is not supported by scientific data [3] the call from the coastal community and angling lobby groups has been heard by the Russian Federal Agency of Fisheries. As a result, on 01 January 2020, the Fishery Rules for the Northern Fishery Basin were amended to allow the recreational red king crab fishery in the Barents Sea.

The aim of this paper is to evaluate whether the decision of reopening the amateur fishery was an appropriate management decision in terms of commercial stock size and landings, shifts in management regime, and socio-economic advantages and disadvantages.

Section snippets

Fishery and management of the Barents Sea red king crab

From 1994–2001, an experimental crab fishery was performed annually in September–December, with identical permitted catches for Russia and Norway. Total allowable catches (TAC) were estimated applying a 25% exploitation rate from the total commercial stock before and a 20% rate after 2000 [8], [10]. From 1994–1998, the total stock of commercial male red king crabs increased from 90,000 to 800,000 crabs. In the next 3 years, this index reached a plateau at ~1,500,000 crabs [11]. A two-fold…

Benefits

Renewal of recreational red king crab fishing was immediately embraced by local anglers and travel firms because it provides them official access to a valuable biological resource. Taking into account that the price of one license is set at 800–1500 rubles, net profit from the sale of 27,000 licenses can vary from 21.6 to 40.5 million rubles or US$288–540 thousand, thus red king crab fishing is considered to be a quite profitable activity for the organizers of this fishery. Assuming that the…

Costs

In contrast to the fishery's benefits, there are a number of problems associated with the recreational red king crab fishery. First, the catch is limited to only legal-sized males and other captured crab must be returned in the sea. Prior to being discarded, undersize and nontarget crabs may be emersed and exposed to ambient air temperatures on deck. In the Barents Sea, recreational crab fishing season starts on August 15 and ends on December 15. During this period, the ambient air temperature…

Conclusion

High abundance indices and positive trends in commercial biomass of red king crab in the open areas of the Barents Sea as well as the call from local coastal communities and fishermen were the reasons for renewal of the recreational fishery for this invasive species in the coastal zone of the Barents Sea. Although fisheries management decisions must allocate possible risks and public discussions are mandatory for fishing activities there has been no academic expertise or risk assessment for the …

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CRediT authorship contribution statement

Alexander G. Dvoretsky: Conceptualization, Methodology, Investigation, Writing – original draft, Project administration. **Vladimir G. Dvoretsky**: Data curation, Investigation, Visualization, Writing – original draft.…

Declaration of Competing Interest

None.…

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> …In Russian waters of the Barents Sea, commercial fishing for P. camtschaticus was opened in 2004 (Dvoretsky and Dvoretsky, 2018). Over the last two decades, the red king crab in the Barents Sea has been intensively studied and new data were obtained for population dynamics and distribution patterns (Dvoretsky and Dvoretsky, 2013a, 2016, 2022a; Matishov et al., 2012; Spiridonov et al., 2020; Strelkova et al., 2021), reproduction and growth (Dvoretsky and Dvoretsky, 2012, 2013a, 2014b, 2015b), feeding and behavior (Sundet and Berenboim, 2008; Pavlova, 2015), symbiotic relationships (Dvoretsky and Dvoretsky, 2011, 2013a, b, 2021a, 2022b), and fishery aspects (Dvoretsky and Dvoretsky, 2015a, 2018, 2022a). Although recent studies have provided information on the fatty acid composition of some red king crab tissues and organs such as hepatopancreas and leg muscles (Dvoretsky et al., 2020, 2021a; Lian et al., 2022), biochemical investigations of the red king crab circulatory system are still nascent not only in the Barents Sea but also in the native area of this crustacean.…

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