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The Norwegian management of an introduced species: the Arctic red king crab fishery

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ABSTRACT

Introduced into the Barents Sea in the 1960s, the red king crab (*Paralithodes camtschaticus*) has been fished commercially in Norway since 2002. Because it is an introduced species, its management raises a number of concerns. Minimising the threats posed by non-native species that cannot be eradicated is a challenge facing nature management authorities worldwide. High concentrations of crab on fishing grounds in eastern Finnmark in North Norway have interfered with traditional gillnet and longline fisheries, prompting fishermen to demand compensation for lost income. Difficult trade-offs were posed by the dual management objectives, which included (i) preventing the geographical expansion of the crab and (ii) exploiting the resource to provide income to coastal communities. The Norwegian government, with the consent of Parliament, has developed a management regime that addresses both objectives: an open-access fishery west of 26°E to prevent further west- and southward expansion of the crab population, and a regular commercial fishery east of that longitude. This management regime commands wider consideration, owing to its handling of the dilemmas inherent in the management of introduced species.

1. Introduction

The red king crab was transferred from the Russian Far East and released in Kola Bay in the waters of the Soviet Union on several occasions during the 1960s and once during the 1970s [1]. The main purpose of the transfer was to establish a new stock of this valuable resource in the Barents Sea to enhance the food supply in north-western Russia and to increase the economic output of fisheries in the region.

The transfer was not reported to neighbouring countries. However, in negotiations between Norway and the Soviet Union, held in 1976–1977, on practical arrangements for fisheries in a then disputed area of the Barents Sea (The Grey Zone Agreement of 1978), a ban on fishing red king crab in the entire Barents Sea was agreed. Despite the explicit mention of red king crab in the agreement and bycatches of crab in Norwegian waters, the species, new and alien to Norway, attracted no particular attention. By that time, however, it had invaded most of the Kola Peninsula's coastal waters, crossed the Norwegian–Russian border, and become abundant in small inlets close to the border (Fig. 1).

The first known record of the red king crab in Norwegian waters was made in 1977 [2]. It was not until 1992, however, that the crab came to the attention of Norwegian management and research institutions, as a result of the problems it caused in local gillnet fisheries.

In the beginning, the red king crab existed mainly in areas of the Varangerfjord (Fig. 1), but the population gradually expanded farther west, causing problems related to bycatch for fishermen in the expanded area. At the same time, the crab became a significant fish resource in its area of distribution. The fishery increased gradually and, by 2015, it involved more than 500 vessels.

Until recently, the introduction of alien species into new environments was considered a nature management technique [3]. In the Soviet Union, for example, more than 900 different aquatic species were intentionally transferred between ecosystems as the result of a comprehensive, planned governmental policy [4].

The crab population adapted to the Barents Sea ecosystem by establishing an abundant self-reproducing stock. No management measures were applied prior to its establishment in Norwegian waters. Management of the red king crab was an issue considered by the Joint Norway–Russia Fisheries Commission for several years, until it was concluded that, from 2007 onward, each country would manage the crab fisheries separately. After that, Norway managed the red king crab based on its own assessment of management needs [5].

Concerns about the introduction of alien species and their impact on ecosystems have existed for decades [6], but nothing has been done until recently. Changes in the perception of

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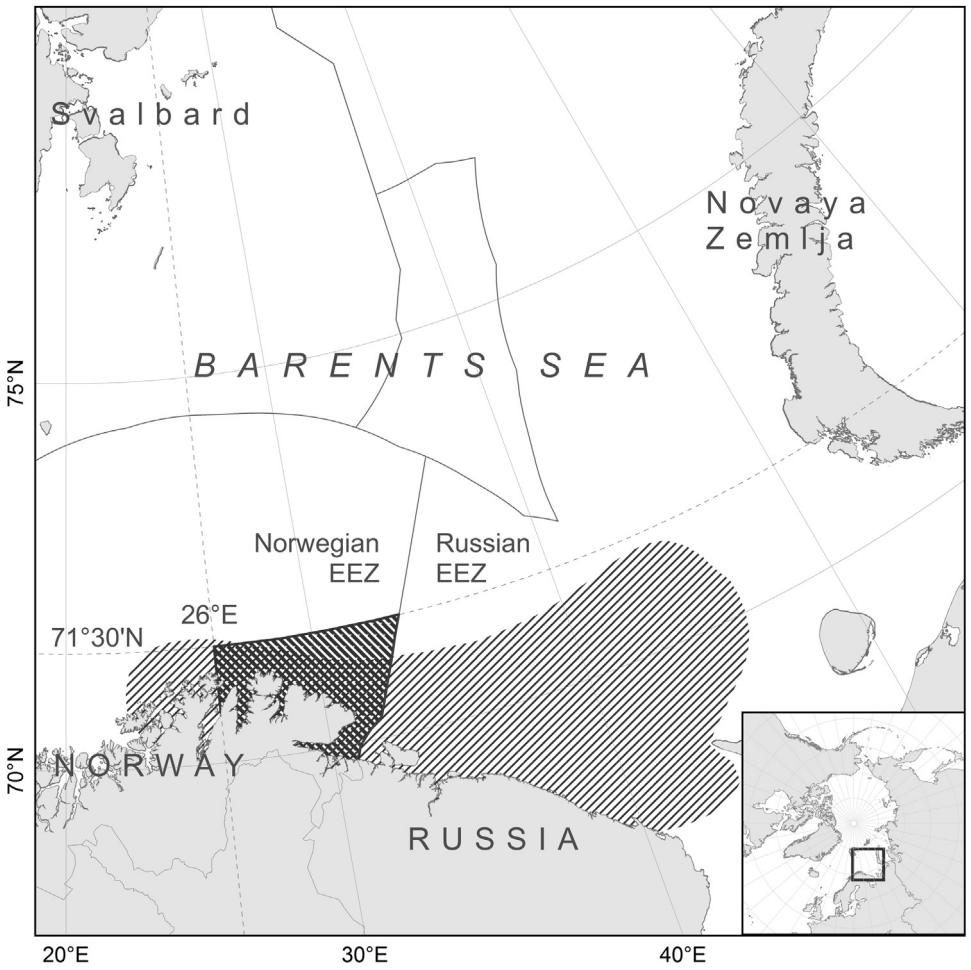

Fig. 1. Map showing the approximate distribution of the red king crab (*Paralithodes camtschaticus*) in the Barents Sea (light shaded), and the area of the quota-regulated area in Norwegian waters (double shaded).

introduced species have recast them as a threat to marine ecosystems [7]. The common policy response mentioned in scientific literature has advocated prevention by limiting vectors, early detection and rapid response (EDRR), and control or eradication [8]. International agreements, to which Norway is a party, require that populations of alien species introduced into local ecosystems be eradicated or, if this is not feasible, be limited to keep populations as low as possible [9]. However, emerging studies question the feasibility of eradication approaches and wonder how introduced species can be realistically managed [10]. Chew et al. [11], for example, suggest that conservationists should assess the impact of non-native species on the ecosystem, rather than focusing on the species' origin outside the ecosystem. Pearce [12] argues that ecosystems are constantly evolving, and non-native species could actually promote that evolution.

Also, the economic advantage of high-value alien species has shifted the perception of such species and their management. For example, the red king crab in the Barents Sea can fetch up to NOK 500/kg in the marketplace. The management regime adopted by the Norwegian government is, therefore, an interesting example of how an introduced species can be managed to benefit the fishing industry and coastal communities, while limiting the population's geographical expansion.

In this paper, the theoretical approach to the dilemma of managing a high-value introduced species will be discussed, in addition to how the management objectives for red king crab have been reconciled in practice. The paper discusses also how past and present management of the red king crab in Norway can lead to a more pragmatic approach to the management of non-native species that cannot be eradicated, for which the costs of keeping the population low are disproportionally high and substantial economic benefits for coastal communities exist.

2. Institutional issues

The 1982 Law of the Sea Convention is the fundamental global agreement for all marine governance. It lays down the ground rules for the jurisdiction, management, and use of the oceans [13]. The Convention provides for sovereign rights of coastal states over the natural resources in waters extending to a distance of 200 nautical miles, and stipulates rights and obligations for the coastal states in the management of living marine resources. Coastal state jurisdiction may extend beyond 200 nautical miles, depending on certain geologic criteria. Crab is a sedentary species and, according to the Convention, management authority over such species follows from its continental-shelf provisions [14].

A number of other international instruments are also relevant. In the development of a substantial body of legal and non-legal agreements on living marine resources and the marine environment over the past two decades, there has been an increasing emphasis on conservation and sustainable use and, therefore, on management of living marine resources [15]. Ecosystem approaches devised by the FAO are an important development, [16] as are other approaches described in academic literature [17] and those based on a precautionary approach to fisheries [18].

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