Telemetry data of red king crab (Paralithodes camtschaticus) migrations in a north Norwegian fjord

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\textbf{ABSTRACT}

Acoustic telemetry allows for high-resolution, long-term tracking of moving animals. Here, we describe data on the movement patterns of 37 adult red king crab (RKC, Paralithodes camtschaticus) obtained by means of acoustic telemetry. Acoustically tagged RKC were released in Gamvikfjorden (Sørøya, northern Norway) the 24th of May 2016 and tracked until the 1st of November 2016. Individual crabs resided in the fjord for 1–162 days and were recorded 16–11,501 times (mean number of records per crab: 2,851). In total, the data set consist of 105,484 pairs of accurate spatio-temporal coordinates. The acoustic receivers (n = 38) deployed close to the seabed were integrated with temperature sensors that continuously recorded the ambient seawater temperature, resulting in 174,154 water temperature recordings. These novel tracking data can be used to investigate the species’ migratory behaviour, spatio-temporal habitat selection, and the relative role of their environment and their possible food sources. Moreover, the high-resolution seawater temperature dataset may serve independently as input data in physical-oceanographic models of this sub-Arctic sill fjord.

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Specifications Table

| Subject | Ecology and behaviour |
|---------|----------------------|
| Specific subject area | Migratory behaviour |
| Type of data | Tables |
| How data were acquired | Data were acquired using acoustic telemetry, tracking red king crab movements and recording water temperature over a 162-day period. |
| Data format | Triangulated raw data |
| Parameters for data collection | Sex, body size (carapace length and width) and weight of individual crabs. Spatial coordinates and associated time indications describing movements of individual crabs. Seawater temperature (°C). |
| Description of data collection | Acoustic receivers were deployed close to the seabed in a regular grid throughout the study area. Acoustic tags were attached to adult individuals of red king crabs. The movements of the crabs within the study area were tracked over a 5-month period (from the 24th of May until the 1st of November 2016). Temperature sensors attached to the acoustic receivers recorded the seawater temperature continuously. |
| Data source location | Data was collected in Gamvikfjorden, a fjord located on the north-western part of the island Sørøya, northern Norway (70° 47’ N, 23° 16’ E) |
| Data accessibility | Repository name: [Zenodo] Data identification number: [10.5281/zenodo.5823340] Direct URL to data: [https://doi.org/10.5281/zenodo.5823339] |
| Related research article | M. Aune, J.L. Jensen, S.I. Silikavuopio, G.N. Christensen, K.T Nilsen, B. Merkel, P.E. Renaud. Space and habitat utilization of the red king crab (Paralithodes camtschaticus) in a newly invaded fjord in northern Norway. Frontiers in Marine Science, in press [3] |

Value of the Data

• High-resolution data and knowledge of migration patterns and habitat utilization is required in order to facilitate rigorous management and efficient harvesting of the abundant, migratory and commercially attractive red king crab.
• These data will benefit managers, scientists, the fishing industry and hobby fishermen.
• Researchers can use the datasets to develop habitat selection models for this species and test the relative importance of available food sources and environmental constraints.

1. Data Description

Data obtained by 38 acoustic receivers (Table 1) resulted in a position dataset consisting of 105,484 pairs of accurate spatial coordinates and associated time indications, describing the seasonal movements of the 37 tagged red king crabs (RKC) within the study area (summarized in Table 2). In addition, the temperature sensors attached to the acoustic receivers generated 174,154 water temperature recordings. An animation covering the period from the 1st of June until the 1st of September 2016 provides an overview of the RKC movement data (Supplementary Files 1A and 1B). The depth of each acoustic receiver is provided (Table 1). Also, the sex, body weight, carapace length and carapace width of each crab was registered (Table 2). Based on the dates of release and last registration, the residence time of each crab within the study area was calculated. Some crabs left the study area a few hours or days after release, and were
Table 1

Positions of 38 acoustic receivers applied in Gamvikfjorden (Sørøya, northern Norway) to track individuals of the red king crab (*Paralithodes camtschaticus*) in the period 24th of May until the 1st of November 2016. Depth is given in meters. “Synchronization tag?” indicates whether a receiver was equipped with a synchronization tag.

| Receiver ID | Latitude (°N) | Longitude (°E) | Depth (m) | Synchronization tag? |
|-------------|---------------|---------------|-----------|---------------------|
| 96          | 70.77239      | 23.28890      | 18        | No                  |
| 97          | 70.77502      | 23.27484      | 41        | No                  |
| 98          | 70.77659      | 23.28654      | 40        | No                  |
| 99          | 70.77916      | 23.26669      | 33        | No                  |
| 100         | 70.77850      | 23.27750      | 61        | Yes                 |
| 102         | 70.78451      | 23.26340      | 21        | No                  |
| 106         | 70.78819      | 23.27021      | 58        | Yes                 |
| 107         | 70.79092      | 23.28007      | 34        | No                  |
| 108         | 70.79319      | 23.25090      | 24        | Yes                 |
| 109         | 70.79279      | 23.26540      | 53        | No                  |
| 110         | 70.79564      | 23.27854      | 43        | Yes                 |
| 111         | 70.79166      | 23.29560      | 15        | No                  |
| 113         | 70.79679      | 23.23861      | 20        | No                  |
| 114         | 70.79710      | 23.25648      | 53        | No                  |
| 116         | 70.80059      | 23.28368      | 32        | No                  |
| 117         | 70.79597      | 23.29308      | 25        | No                  |
| 118         | 70.79932      | 23.29592      | 15        | No                  |
| 119         | 70.79514      | 23.30916      | 15        | Yes                 |
| 120         | 70.79022      | 23.30830      | 18        | No                  |
| 121         | 70.79156      | 23.32201      | 9         | No                  |
| 122         | 70.80066      | 23.23269      | 17        | No                  |
| 123         | 70.80155      | 23.24809      | 54        | Yes                 |
| 124         | 70.80234      | 23.26207      | 46        | No                  |
| 126         | 70.80479      | 23.29106      | 15        | No                  |
| 127         | 70.80454      | 23.22498      | 15        | No                  |
| 128         | 70.80494      | 23.23842      | 51        | No                  |
| 130         | 70.80696      | 23.26917      | 32        | No                  |
| 131         | 70.80767      | 23.28214      | 27        | No                  |
| 133         | 70.80991      | 23.22168      | 26        | No                  |
| 134         | 70.80908      | 23.23296      | 48        | Yes                 |
| 135         | 70.80949      | 23.24538      | 42        | No                  |
| 137         | 70.81165      | 23.27450      | 36        | No                  |
| 138         | 70.81308      | 23.28618      | 26        | Yes                 |
| 140         | 70.81463      | 23.29688      | 20        | No                  |
| 156         | 70.81378      | 23.23834      | 32        | No                  |
| 157         | 70.81395      | 23.25155      | 42        | No                  |
| 158         | 70.81503      | 23.26493      | 39        | No                  |
| 163         | 70.81366      | 23.22638      | 50        | No                  |

Consequently registered relatively few times (typically <200 times). On the other hand, other crabs resided in the fjord throughout the study period (262 days) and were typically registered several thousand times (Table 2).

2. Experimental Design, Materials and Methods

2.1. Study area

Acoustic telemetry data on the red king crab were collected in Gamvikfjorden, a fjord located on the north-western side of the island Sørøya, northern Norway (Fig. 1). The study area covered an area of ~7 km², and the maximum water depth was ~62 m. The bathymetry of the fjord is characterized by steep slopes on the western side and in the inner parts, flat and sandy areas on the eastern side, and a deep trench along the centre of the fjord.
Table 2
Overview of biological properties of acoustically tagged RKC, and data of their residence time in Gamvikfjorden, northern Norway, in 2016.

| Crab ID | Sex  | Body weight (kg) | Carapace length (cm) | Carapace width (cm) | Release date | Date of last registration | Residence time (days) | Number of registrations |
|---------|------|------------------|----------------------|---------------------|--------------|--------------------------|-----------------------|------------------------|
| R64K-749 Male | 2.6 | 18.5 | 18 | 24.05.2016 | 24.05.2016 | 1 | 16 |
| S256–239 Female | 1.9 | 18 | 16.5 | 24.05.2016 | 24.05.2016 | 1 | 25 |
| S256–241 Female | 1.6 | 17 | 15 | 24.05.2016 | 24.05.2016 | 1 | 17 |
| R64K-748 Male | 3 | 18.5 | 20 | 24.05.2016 | 25.05.2016 | 2 | 52 |
| R64K-766 Male | 1.6 | 15.5 | 15 | 24.05.2016 | 25.05.2016 | 2 | 32 |
| S256–236 Male | 2.9 | 18 | 18 | 24.05.2016 | 25.05.2016 | 2 | 47 |
| S256–237 Male | 2.2 | 17.5 | 17 | 24.05.2016 | 25.05.2016 | 2 | 16 |
| S256–238 Male | 1.3 | 16 | 14 | 24.05.2016 | 25.05.2016 | 2 | 29 |
| R64K-750 Male | 2.1 | 17 | 17 | 24.05.2016 | 25.05.2016 | 3 | 151 |
| R64K-762 Male | 2.9 | 19.5 | 19 | 24.05.2016 | 26.05.2016 | 3 | 86 |
| R64K-768 Female | 1.5 | 16 | 14.5 | 24.05.2016 | 26.05.2016 | 3 | 117 |
| S256–234 Male | 2.9 | 19 | 20 | 24.05.2016 | 26.05.2016 | 3 | 112 |
| R64K-754 Female | 1.2 | 16 | 13 | 24.05.2016 | 30.05.2016 | 7 | 389 |
| S256–235 Male | 3.2 | 20.5 | 19.5 | 24.05.2016 | 01.06.2016 | 9 | 132 |
| S256–243 Male | 1.6 | 16.5 | 14.5 | 24.05.2016 | 02.06.2016 | 10 | 1083 |
| R64K-759 Male | 2.9 | 19 | 18 | 24.05.2016 | 03.06.2016 | 11 | 230 |
| R64K-765 Male | 1.7 | 16 | 15.5 | 24.05.2016 | 13.07.2016 | 51 | 778 |
| S256–240 Female | 1.9 | 18 | 15 | 24.05.2016 | 04.08.2016 | 73 | 1112 |
| S256–233 Male | 2.6 | 17 | 17.5 | 24.05.2016 | 28.08.2016 | 97 | 5368 |
| S256–242 Female | 1.7 | 18 | 15.5 | 24.05.2016 | 21.09.2016 | 121 | 3945 |
| R64K-756 Female | 1.3 | 16 | 14 | 24.05.2016 | 04.10.2016 | 134 | 2092 |
| R64K-746 Male | 1.9 | 16 | 15.5 | 24.05.2016 | 26.10.2016 | 156 | 1869 |
| R64K-757 Female | 1.4 | 16 | 15 | 24.05.2016 | 30.10.2016 | 160 | 10,489 |
| R64K-758 Male | 1.7 | 17 | 16 | 24.05.2016 | 30.10.2016 | 160 | 2026 |
| S256–231 Male | 2.7 | 20 | 19 | 24.05.2016 | 30.10.2016 | 160 | 4633 |
| R64K-747 Male | 3.4 | 19.5 | 20 | 24.05.2016 | 01.11.2016 | 162 | 5034 |
| R64K-751 Female | 1.7 | 18.5 | 14.5 | 24.05.2016 | 01.11.2016 | 162 | 3643 |
| R64K-752 Female | 1.3 | 16 | 13 | 24.05.2016 | 01.11.2016 | 162 | 4430 |
| R64K-753 Female | 1.3 | 16 | 14 | 24.05.2016 | 01.11.2016 | 162 | 4784 |
| R64K-760 Male | 3 | 19.5 | 19.5 | 24.05.2016 | 01.11.2016 | 162 | 9751 |
| R64K-761 Male | 3.5 | 20 | 20 | 24.05.2016 | 01.11.2016 | 162 | 9828 |
| R64K-763 Male | 2.6 | 17 | 17.5 | 24.05.2016 | 01.11.2016 | 162 | 1624 |
| R64K-764 Male | 2.3 | 17 | 17.5 | 24.05.2016 | 01.11.2016 | 162 | 11,501 |
| R64K-767 Male | 1.9 | 15.5 | 15 | 24.05.2016 | 01.11.2016 | 162 | 2678 |
| S256–232 Male | 2.7 | 19 | 18.5 | 24.05.2016 | 01.11.2016 | 162 | 1058 |
| S256–244 Female | 1.4 | 18 | 14 | 24.05.2016 | 01.11.2016 | 162 | 6081 |
| S256–245 Male | 1.8 | 16 | 15 | 24.05.2016 | 01.11.2016 | 162 | 10,226 |

2.2. Tagging, tracking, and positioning

By use of baited square pots, 37 adult individuals of RKC (24 males and 13 females) were caught in Gamvikfjorden on the 24th of May 2016. The crabs were brought on board the research vessel, and an acoustic transmitter was attached to the merus of the fourth pereopod by use of cable ties. A small plastic note with contact information for recaptures were also attached to the tag. The crabs were tagged with either acoustic identification transmitters (n = 22, tag type ATID-MP-13, transmission rate: 240–360 s random interval, diameter: 133 mm, length: 17 mm, mass in air/water: 1.8/1.1 g, lifespan: 36 months, Thelma Biotel AS, Norway; www.thelmabiotel.com) or depth transmitters (n = 15, tag type ADT-MP-13, transmission rate: 240–360 s random interval, diameter: 13 mm, length: 21.5 mm, weight in air/water: 2.0/1.1 g, lifespan: 36 months, Thelma Biotel AS). The body weight (BW) ranged from 1.2 to 3.5 kg (mean mass 2.5 kg ± 0.6 kg for males; and 1.5 kg ± 0.2 kg for females), carapace length (CL) ranged from 15.5 to 20.5 cm (mean length 17.9 cm ± 1.6 cm for males and 16.9 cm ± 1.0 cm for females), and carapace width (CW) ranged
from 13 to 20 cm (mean 17.6 cm ± 1.9 cm for males and 14.5 cm ± 1.0 cm for females) (Table 1). The RKC attains sexual maturation at a CL of ∼110 mm [1], and we therefore assume that all individuals were mature. After tagging, the crabs were released back into the water at the same location where they were captured.

In total, 54 acoustic receivers equipped with temperature sensors (TBR-700, Thelma Biotel AS) were deployed in Gamvikfjorden on the 25th of April until the 1st of November 2016 in order to track the movements of the tagged crabs (Table 2). The precision of the temperature sensors was ±0.1 °C. The receivers were attached to a rope on an anchored buoy and suspended with the antennae facing down 5 m above the sea floor. An extra floater was attached to the rope 1 m above the receiver, to insure a vertical position of the receiver at low tides. The receivers were distributed in the study area according to a grid system that allows triangulation of accurate positions within the study area (as described in Davidsen et al. 2019 [2], positioning performed by Thelma Biotel AS), and 10 synchronisation tags (tag type ART-HP-16, transmission rate: 540–660 s random interval, lifespan: 36 months, Thelma Biotel AS) were used for correction of receiver clocks. Rough weather conditions caused the loss of 16 receivers (many of which were later recovered on nearby beaches), which induced some areas of limited acoustic coverage, particularly in the southern part of the study area.

Ethics Statement

The authors confirm that all experiments comply with the ARRIVE guidelines and were carried out in accordance with the U.K. Animals (Scientific Procedures) Act, 1986 and associated guidelines, EU Directive 2010/63/EU for animal experiments, or the National Institutes of Health guide for the care and use of Laboratory animals (NIH Publications No. 8023, revised 1978).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.
CRediT Author Statement

Magnus Aune: Writing – original draft, Conceptualization, Data curation; Jenny L.A. Jensen: Data curation, Conceptualization, Methodology, Writing – review & editing; Guttorm N. Christensen: Conceptualization, Methodology, Writing – review & editing; Kåre Tormod Nilsen: Conceptualization, Writing – review & editing; Benjamin Merkel: Writing – review & editing; Paul E. Renaud: Writing – review & editing.

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Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi: 10.1016/j.dib.2022.107894.

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