

Results of satellite tagging of the Caspian seal (*Pusa caspica*) in the northeastern part of the Caspian Sea in November, 2019

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The Caspian seal is an endemic species of Caspian Sea. Being the final link in the trophic chain, the species plays a unique role in the Caspian ecosystem, lives in the entire sea area and can be considered as an indicator of its state. Analysis of the movements of the Caspian seal in different seasons based on satellite telemetry data can help to study the response of this important species to changing environmental conditions. This paper presents the results of satellite tagging of the Caspian seal (4 males and 5 females), conducted in November 2019 on shalygas in the north-eastern part of the Caspian Sea.

The **goal** of this research was to analyze the features of the movement of the Caspian seal in different seasons of the year using satellite tagging data.

Methodology. Satellite tagging was performed on November 8, 2019. Satellite radio tags "Pulsar" (CJSC "ES-PASS") were used for tagging. Data processing was performed using software ArcGIS 10.8 and STATISTICA 12. The data from November 2019 to March 2020, when most of the tags continued to operate simultaneously, were used for processing. To compare individuals with each other and compare the parameters of movement between months, the speed index was used (the average monthly values for each animal divided by the average speed among all individuals).

Information about transmitters and tagged individuals

No of transmitter	Age	Date of last signal	Number of working days	Number of locations after filtering	Length of track, km	Average speed, km/h
Males						
196479	4+	07.05.20	181	612	9654	1,68
196480	4+	06.04.20	150	1090	9565	1,51
196483	4+	22.03.20	135	529	6665	1,24
196484	3+	10.11.19	2	24	40	0,18
Females						
196478	5+	11.03.20	124	927	5494	1,07
196481	0+	09.03.20	122	828	5250	0,95
196482	0+	31.03.20	144	1066	6483	0,99
196485	1+	07.01.20	60	229	2947	1,62
196486	0+	07.02.20	91	356	3645	0,95



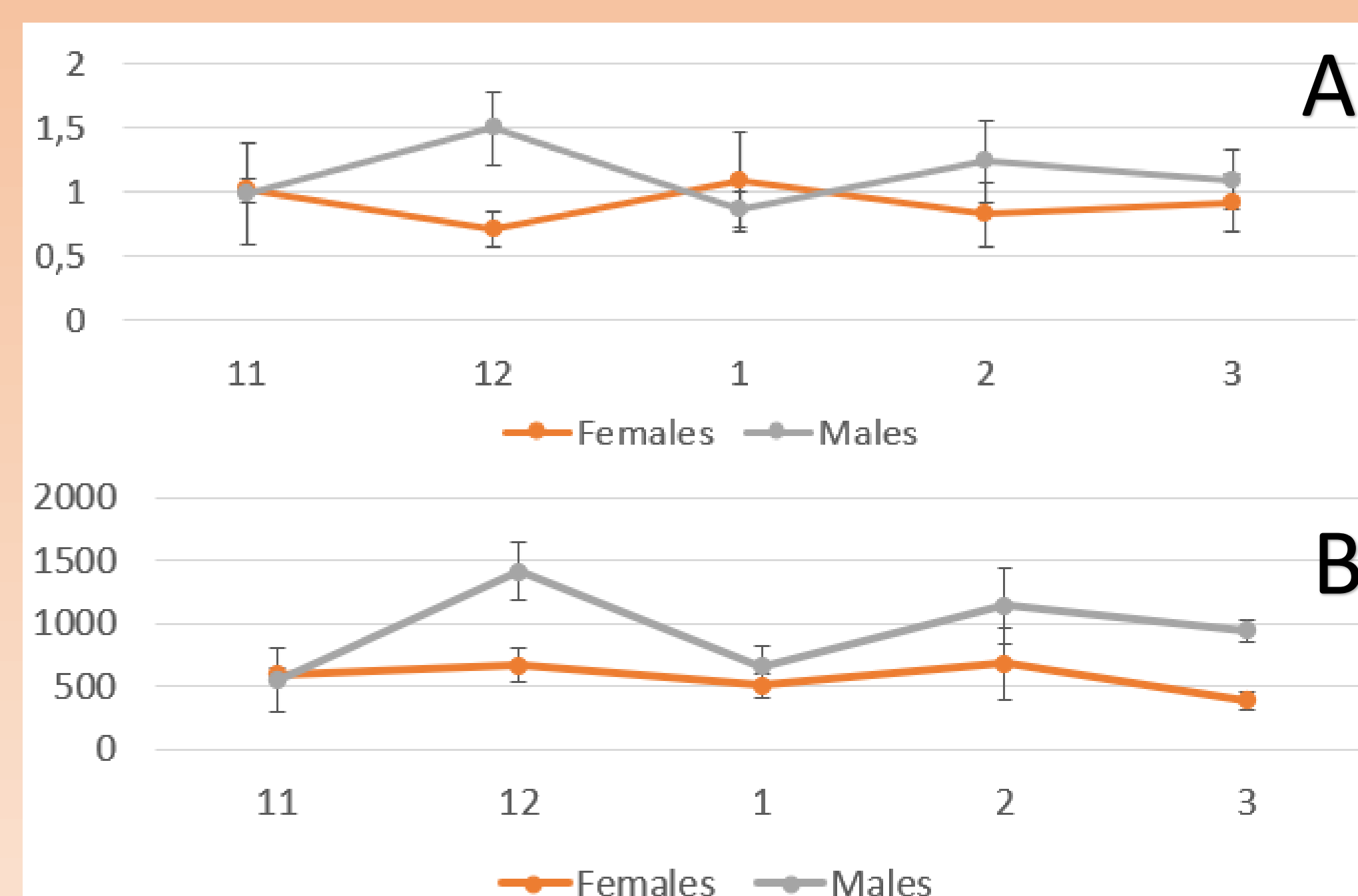
Caspian seal with a satellite transmitter installed on its back.

Results. The average distance traveled by the females was less than the distance traveled by the males, except in November, when the females traveled slightly longer distance than the males ($p < 0.05$, U-test). Two peaks were noted in the activity of males: with an average distance of 941 ± 177 (SD) km for the entire period under review, they passed the greatest distance in December (1416.4 ± 324.9) and February (1140.5 ± 431.8). At the same time, there were no noticeable peaks of activity for females – the average monthly distance traveled by females ranged from 508.7 ± 186 to 681.2 ± 499.7 km. Changes in the speed of movement mostly coincide with changes in traveled distance – in those months when the animals traveled long distances, the index of the speed of movement increased. The exception was January 2020, when the speed index increased with a decrease in the traveled distance, while the speed index for females was higher than for males.

Discussion. The obtained data shows that the covered distances and the speed of movement for males and females were different in different months, with males moving more actively than females. Differences in the nature of animal activity in December may be associated, on the one hand, with the active feeding of males, and on the other – the desire of females to reduce energy losses before the upcoming pupping period. The exception is January, which may be due to the sedentary of the males and the active movements of the females in search of suitable habitats for the pupping season, which starts at the end of January (Ivanov, Sokolskiy, 2000). A further decrease in the activity of movement of females may be associated with the pupping and the lactation period, and an increase in the activity of males may be associated with the movement from feeding sites to mating sites. At the same time, it should be borne in mind that not all of the tagged animals could be mature. In addition, the abnormally warm winter of 2020 could not but have an impact on the behavior of animals. In the future, it is planned to compare the obtained data with the data of the ice coverage to clarify the nature of the use of habitats by animals in abnormally warm climatic conditions.

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Speed index (A) and average distance per month, km (B) (±SD)