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SEAL UNDERWATER VOCALIZATIONS AS AN INDEX OF ACTIVITY

by

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Harp seals (Pagophilus groenlandicus) emit at least 16 types of underwater sounds while in the breeding areas in the Gulf of St. Lawrence (Møhl et al. 1975). These calls are believed to serve a social, communicative, function. An overnight recording session in mid-March 1971 indicated that the seals were vocally active throughout the night but were relatively quiet at daybreak. This indicated that vocalizations may serve as an index of activity. We investigated the feasiblity of examining recordings of underwater vocalizations of harp seals to determine if the calls could be used to monitor various activities.

A hydrophone (2m below the ice) and a casette recorder (frequency range 0.2 - 8 kHz) were left among seals from March 5 to 19, 1975. A timing device turned the recorder on for a 4 minute (± 15 sec) period every 3 h. The system could operate for 39 hours without attention. The apparatus was placed in an insulated box and was heated (15 C) by batteries. Recordings were obtained on the hours and days as per Fig. 1. Storms and an inability to readily relocate the box resulted in gaps between the periods.

The recorder had an automatic level control so the overall intensities of all of the recordings were the same. The number of calls detected by this sytem was so great that they were overlapping. It was not possible to pick out single vocalizations. This precluded counting the numbers and/or types of calls.

To obtain a measure of the relative number of high frequency calls, the tapes were played back through a band pass filter set at 3.6 to 4.4 kHz (slopes were 24 dB/octave). The intensities of the high frequencies passed through the filter were recorded on a 50 dB range strip chart. All settings and adjustments were identical for the 4 tapes which were analyzed. The average intensity of each of the 4 min recording periods was calculated. All of these measures were divided by the largest to obtain a relative index of the occurrence of high frequency vocalizations throughout the study period (Fig. 1). Within each of the 4 tapes, every intensity measure was divided by the largest. This provided a measure of the relative occurrence of high frequency vocalizations over a 24 hour period which was not unduly influenced by the monthly changes. These values were averaged and the resulting means and standard deviations are shown in Fig. 2. The data from the periods at 4, 7, 13 and 16 hours were compared with the other 4 daily periods. Using a T test at the 95% confidence level, a significant difference was found between the two groups.

The overall index of vocalizations (Fig. 1) indicates a mid-March increase in activity. This coincides with the onset of mating and the related increase of courtship behaviour. Two divers observed both of these activities underwater at this time (B. Merdsoy and W. Curtsinger, personal communication). On-ice behavioural ob-

servations support the underwater observation. It appears likely that many of the harp seal vocalizations are emitted in conjunction with courtship behaviour. This may explain the lack of harp seal vocalizations detected on the molting patches (Møhl et al. 1975). The above evidence suggests that major changes in behaviour of vocally active marine mammals can be detected.

Seasonal behavioural changes can be determined by examining records of vocalizations. Stirling (1973) compared winter and spring vocalizations of ringed seals (Phoca hispida). He found that the frequencies of 2 call types reversed and attributed this to a possible change in aggression behaviour.

The daily vocalization index (Fig. 2) indicates that harp seals are active all night and that their behaviour changes at daybreak and in the early afternoon. On-ice observations indicate that the majority of the adult seals are in the water just after sunrise and that the greatest number of seals are on the ice in the early afternoon. The periods of lowest vocal activity reflect a change in the seal's behaviour but they do not indicate the reason. It is possible that at daybreak the seals begin to feed and in the early afternoon they begin a resting period.

The results of these and other studies indicate that monitoring calls of vocally active marine mammals can be used to index various activities. The amount of information obtainable will vary

with the sophistication of the recording and analyzing devices, the time available and the ability to obtain pertinent behavioural and physiological data. Depending upon the species under study and the recording situation, various parameters such as the absolute numbers and/or intensities of calls, the occurrence of specific call types and the relationships of occurrence between the various calls can be examined.

Modern electronic devices open observational avenues which are not possible for humans due to climatic or other hazards. Sea water will not conduct light or radio waves over great distances. Sound therefore, may be the only way of transmitting information over long distances once a marine mammal under study has submerged. Through "eavesdropping", we may be able to extract information that is not obtainable by other means.

Summary

Recordings of harp seal (Pagophilus groenlandicus) vocalizations obtained over a number of 24 h recording periods during the breeding season were examined with regard to the relative occurrence of high frequency calls. The results indicate that a peak occurred in mid-March and that this was associated with the onset of courtship and mating. A daily activity pattern indicated that the seals were least active at daybreak and in the early afternoon. The inactive afternoon period coincided with the time that the greatest

number of seals were resting on the ice. Monitoring of vocalizations may provide a means of indexing the activities of various marine mammals when they cannot otherwise be observed.

References

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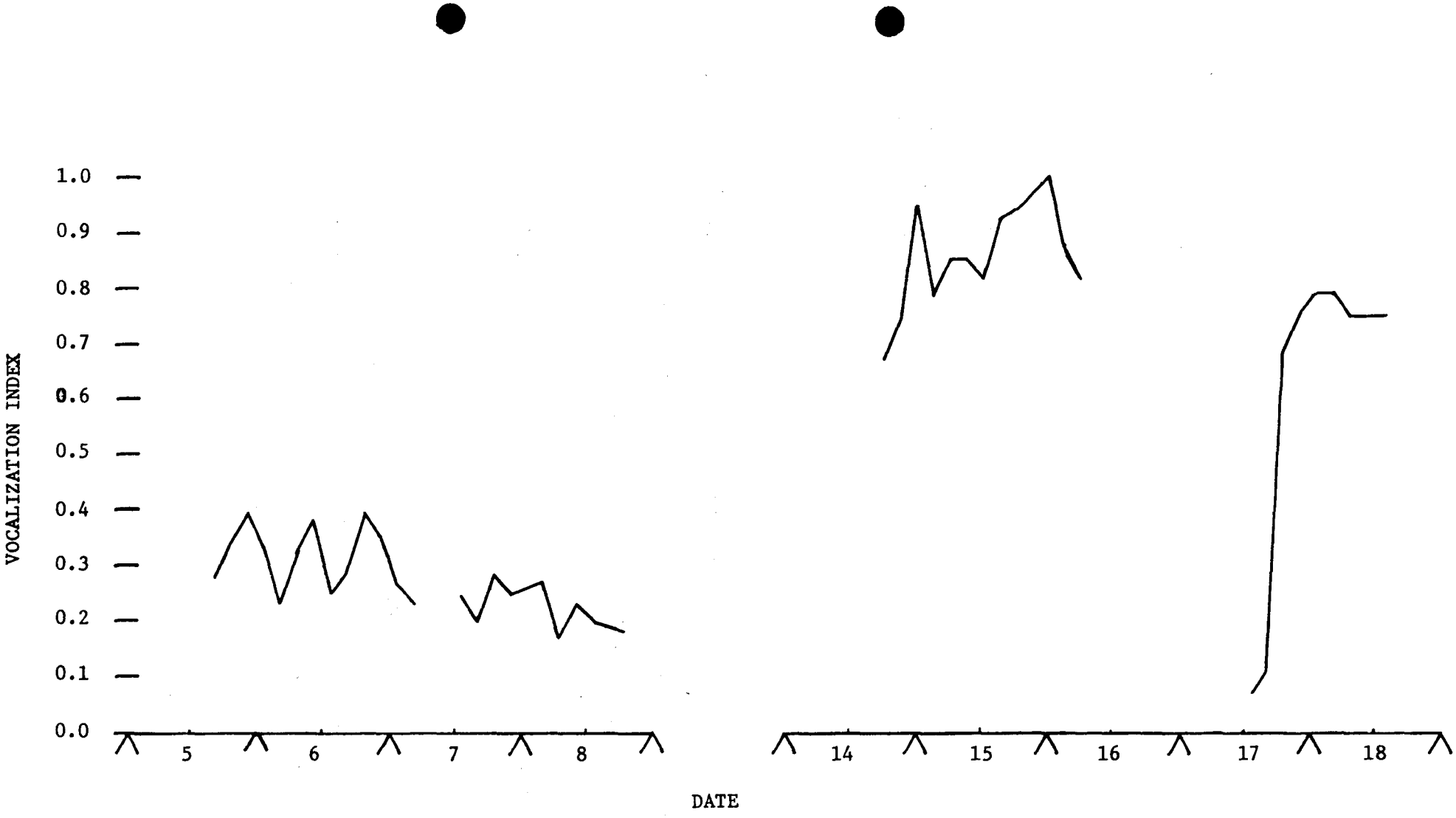

Fig. 1. Relative occurance of high frequency vocalizations of harp seals during March, 1975.

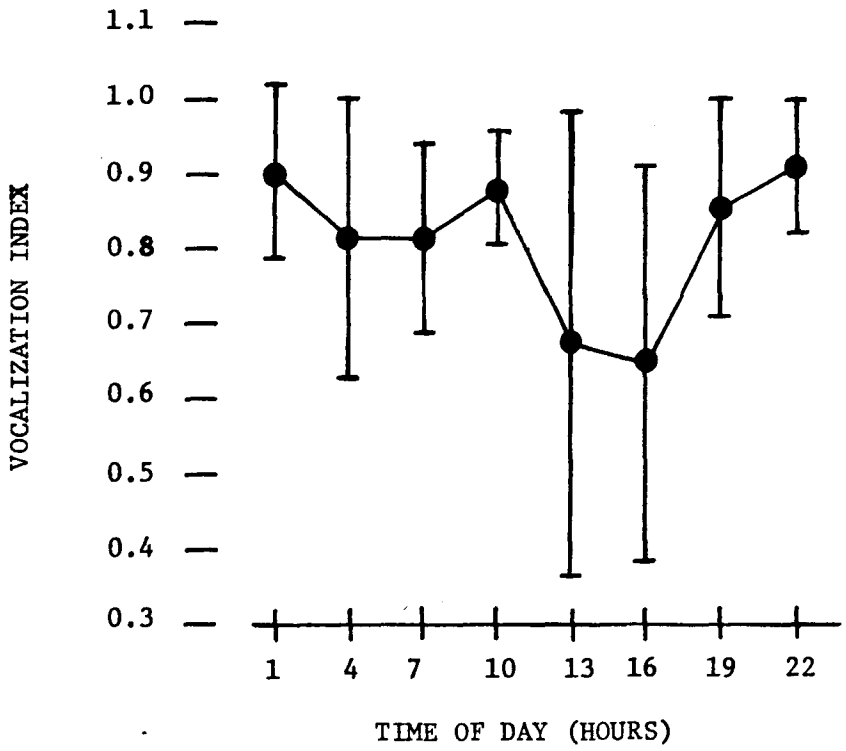

Fig. 2. Relative occurance of high frequency vocalizations of harp seals per day.