

Studies on the Underwater Sound-VI

On the Underwater Calls of Fresh Water Dolphins in South America

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The investigation on the underwater calls of three kinds of river dolphins, i.e., Amazon Dolphin (*Inia geoffrensis*), Buffe negro (*Sotalia fluviatilis*) and La Plata river dolphin (*Pontoplia blainvillei*) that live in waters in South America was carried out. It has been considered that these dolphins made better use of the underwater calls than any other sea dolphins on account of their circumstances. However, conversely it was made clear that the underwater calls were lacking of the variety and frequencies, and moreover they were different in character from the underwater calls of the Ganges river dolphin (*Platanista gangetica*).

For example, Buffe negro did not emit the stratiformed sound, and both whistle and clicks of Amazon dolphin were limited in the range of low frequency. And also the frequency in their use of calls was exceedingly low.

The underwater calls of La Plata river dolphin could not be recorded though the opportunity of observation was little.

INTRODUCTION

It has been reported as a result of many kinds of experiment and observation that whales, especially the little toothed whales living in the sea emit various calls. And it is well known that those animals are well adapted to live in water and obtain information of the circumstance by acoustic sense just as the animals on land obtain information by visual sense. And also it has been observed that sea dolphins make good use of visual sense as well as acoustic sense to detect the object in a short range. In this case, however, the visual sense is nothing but to play a supplemental role.

Thus, there are a lot of researches on acoustic behavior of the sea dolphins, however, there is a few on the river dolphins.

Hereupon, it is considered that the acoustic behaviors are considerably different between river dolphins and sea dolphins because of their life environment. That is, river dolphins live in water of poor transparency and their visual range is limited to a few centimeters. Consequently, it is conjectured that there is no way to obtain informations without depending upon acoustic sense. By the way, it is well predicted that acoustic utilization of river dolphins is complicated for even sea dolphins that live in clear water constantly make use of acoustic calls for echoloca-

tion.

Nowadays, only some species of dolphins live in fresh waters. Then, it is considered that clarifying the acoustic behavior of these unique river dolphins may contribute greatly to elucidation of the acoustic behavior of all kinds of whale.

Previously, the underwater calls of a river dolphin caught in the Ganges were reported¹⁾, and it was also reported that there live two kinds of river dolphin, i.e., Amazon dolphin and *Bufeo negro*, in the Amazon and they emit underwater calls. The underwater calls of Amazon dolphin were reported by Caldwell et al²⁾ but these were mostly under the circumstance of feeding. There is, however, a rare report by Norris et al³⁾ about the underwater calls of both kinds of dolphin under the condition of natural environment.

Here, the investigation of underwater calls of river dolphins was carried out by the authors, and some knowledges were obtained. Then, the acoustic behavior of river dolphin is reported in comparison with that of the sea dolphin and the Ganges river dolphin.

METHODS

The investigation of the river dolphins in South America was carried out from December 1972 to March 1973. As a link in the chain of the investigation, studies on the acoustic behavior of Amazon river dolphin, *Bufeo negro* and La Plata river dolphin were performed. Among them, La Plata river dolphin was a kind living in the sea.

In the area near Iquitos in Peru, Amazon river dolphin and *Bufeo negro* were found in the upper branch stream of the Amazon. The underwater calls of the respective river dolphins were recorded on the following respective date of February, i.e., a *Bufeo negro* while they were feeding at Rio Tahuayo on 17th, three *Bufeo negros* while they were swimming at the entrance to Rio Momon which was a branch stream of Rio Nanay on 18th, and some Amazon river dolphins at the middle stream of Rio Tahuayo on 20th, respectively. Because of the turbid light brown colored water, these river dolphins in the Amazon could be confirmed only when they came up to the surface in order to breathe. In the course of each recording, no other kind of dolphin was seen nearby and accordingly the recorded calls were considered to be unmixed calls, i.e., calls of only one kind of river dolphin.

The investigation on La Plata river dolphin that comes over to the estuary of the La Plata was carried out at the fishing village named Punta del Diablo in Uruguay in January, 1973. The dolphins were caught by the drifting net for sharks, so the recording was carried out on board a chartered fishing boat, paying attention to recording the calls in the state of natural environment. The hydrophone was sustained 3 or 4 meters under the water surface.

The instruments to record and to analyse were the same as the ones reported previously.

RESULTS AND DISCUSSION

BUFFEO NEGRO

The recorded calls consisted of whistle, clicks and others, however, whistle was used most frequently occupying 60%, followed by the other calls up to 36% and clicks was no more than 4%.

Whistle

This type of calls is said to be used for conversation by the sea dolphins especially by the Bottlenosed dolphin (*Tursiops gilli*). The analysed calls of this type of the river dolphin was dim contour as compared with the ones of the sea dolphin, and the duration was as short as 0.1 to 0.5 second, as shown in Figs. 1 and 2. The range of frequency was from 5 to 16KHz and mostly from 10 to 12

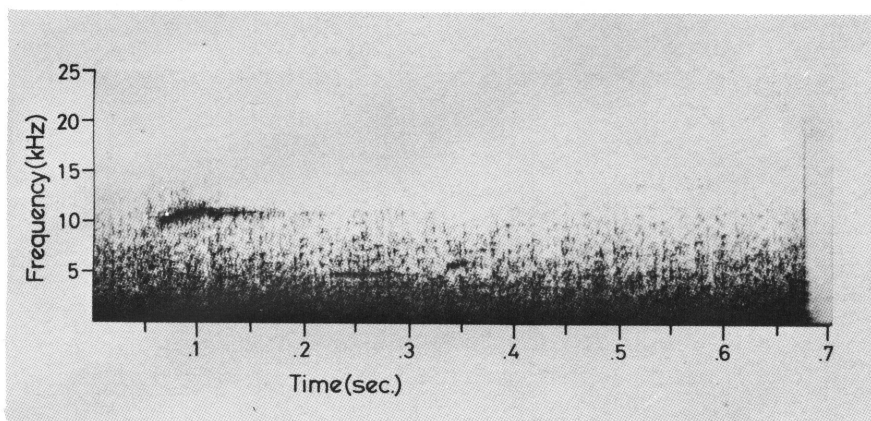


Fig. 1. Whistle of Buffeo negro; the effective filter band-width of analyzer is 150Hz.

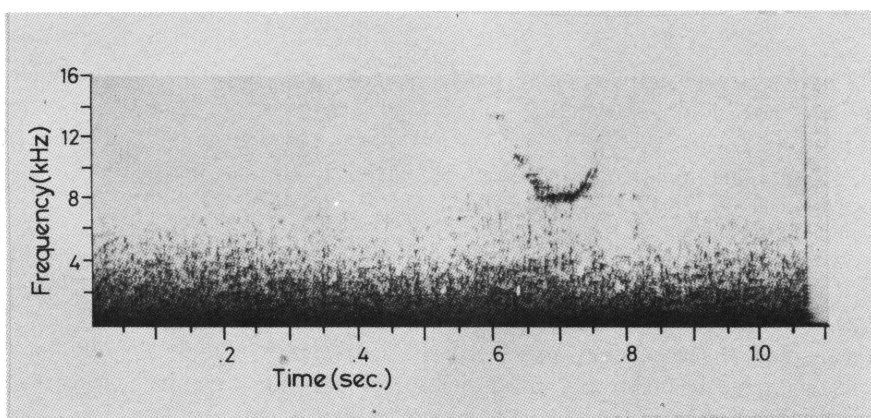


Fig. 2. Whistle of Buffeo negro; the effective filter band-width of the analyzer is 90Hz.

KHz. It was inclined toward the high frequency range of the sea dolphin. The number of calls of this type was less than that of the sea dolphin though some dolphins were observed during the recording period. It was considered that the calls rather resemble the ones of young dugong (*Dugong dugong*) than the ones of whales among the whistles analysed up to the present.

Clicks

It may be characteristic to the *Bufeo negro* that the calls of this type were least while these calls were the most frequent in the Ganges river dolphin. The pattern of frequency range was up to more than 8KHz and the repetition rate was 70 per second. And the fact that 6 or 7 clicks formed a set of continued clicks, as shown in Fig. 3, had not been found in the calls of the sea dolphins.

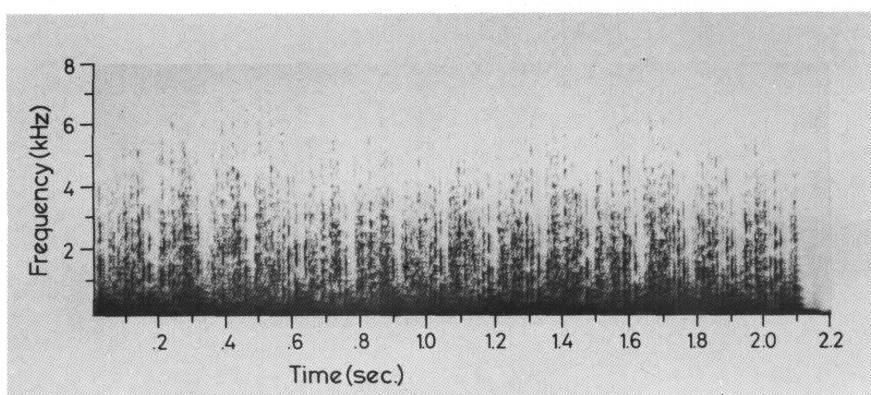


Fig. 3. Clicks of *Bufeo negro*; the effective filter bandwidth of the analyzer is 45Hz.

The others

These types were distinguished from three typical patterns of the underwater calls of the sea dolphin (whistle, clicks and stratiformed sound), and they were somewhat similar to the calls of burst. These types might be emitted when accompanying some behavior, and they appeared to be the featureless white noise type pattern, whose frequency range was from 1 to 4KHz.

AMAZON DOLPHIN

The type and the frequency in use of the calls were closely similar to those of *Bufeo negro*, and whistle was used most also by this dolphin. The stratiformed sound and clicks were observed only in one instance among many.

Whistle

The characteristic feature of whistle of this dolphin was seen as a long duration and a high frequency as shown in Fig.4 which shows a similar pattern to the calls

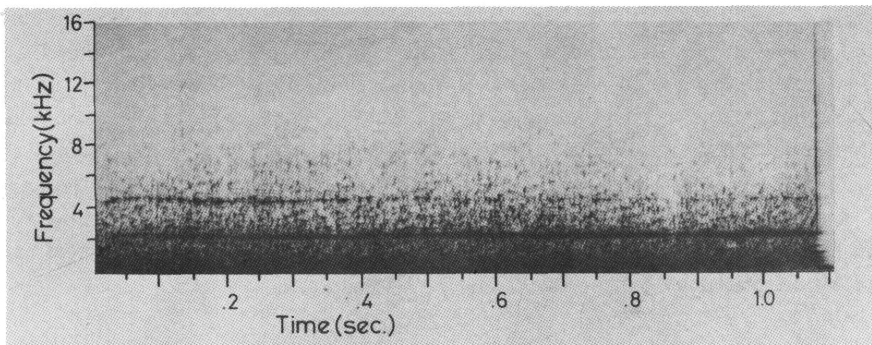


Fig. 4. Whistle of Amazon dolphin; the effective filter band-width of the analyzer is 90Hz.

of False Killer Whale (*Pseudorca crassidens*). However, the frequency range was extremely low being 2KHz with little intonation.

Stratiformed Sound

This type of calls was closely similar to the calls of the sea dolphin not only in analysed pattern but also in frequency in use as shown in Fig. 5. The frequency

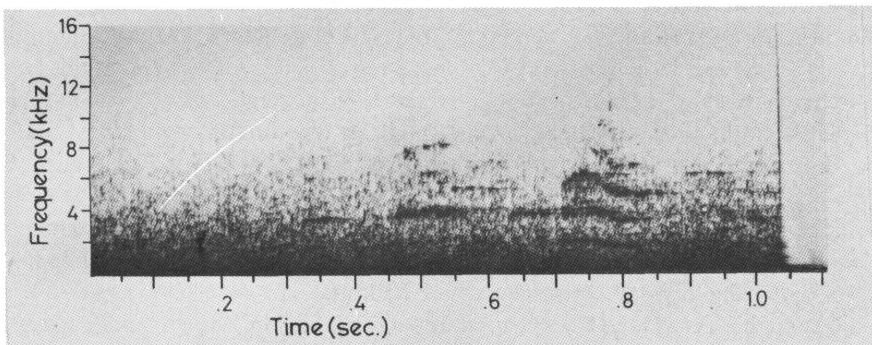


Fig. 5. Stratiformed sound of Amazon dolphin; the effective filter bandwidth of the analyzer is 90Hz.

range was from 1.5 up to 8KHz and accompanied with the 3rd-4th harmonic voice. The duration was extremely short being approximately 0.1 second or less.

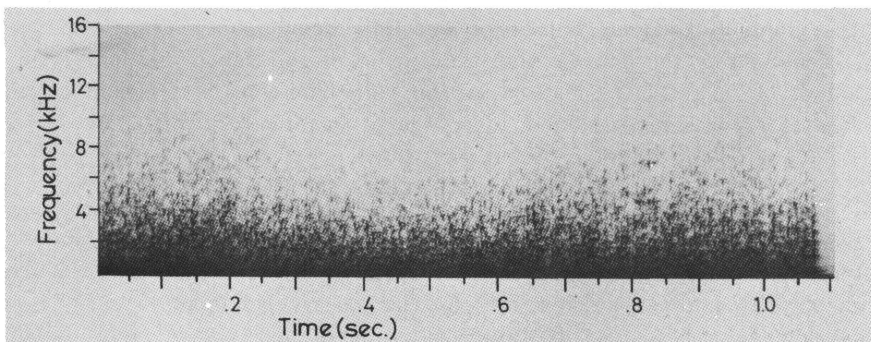


Fig. 6. Clicks of Amazon dolphin; the effective filter band-width of the analyzer is 90Hz.

Clicks

It was noteworthy also in this dolphin that the frequency in use was extremely low. The frequency range was narrow being limited to below 8KHz as shown in Fig. 6. Although the clicks was fitted and actually used for echolocation in other dolphins including river dolphins, it seemed that the clicks of this dolphin for echolocation was not much expected. However, for the reason of less frequency in use, it was considered that some other types of clicks were also emitted. The duration of recorded clicks was as long as 0.3 second and the repetition rate was between 20 to 50 times per second.

The others

The white noise was emitted by this dolphin as well as by the *Bufeo negro*. The frequency range was considered to be the burst with the central energy between 1 and 7KHz and the nature of the calls was the same as that of *Bufeo negro*.

Thus, it was found that there was a remarkable contrast in the underwater calls of both dolphins despite the same life environment. For example, the stratiformed sound was not emitted by *Bufeo negro* and the frequency of whistle was clearly different. Further, the frequency of clicks was low in both dolphins, however, the frequency range of *Bufeo negro* was pointed out to be extremely narrow.

At the start, the use of the clicks by the river dolphins was anticipated to be frequent as compared with the sea dolphins even in view of echolocation, however, it was extremely low in these dolphins in the Amazon. Furthermore, as the number of the other type of calls was small, it was considered that the river dolphins did not take advantage of acoustic effect as compared with the sea dolphins.

It was noteworthy that the Ganges river dolphin with extremely frequent use of clicks showed a different acoustic behavior from the river dolphins in South America despite the similar environment of habitat.

It might also be considered regarding the frequency in use of underwater sound that this dolphin uses the particular call of extremely high or low frequency which could not be detected by the recording apparatus used in the present investigation, or probably only a few kinds of calls might be sufficiently effective in the circumstance of little background noise.

The recording of the underwater calls of La Plata river dolphins was attempted also in the offing of Uruguay but there was only one opportunity to encounter the dolphins. Fortunately the boat was in the middle of the school but not even a call was obtained. It might be immature to conclude from this experience of only one instance that La Plata river dolphin do not emit underwater calls.

SUMMARY

1. The underwater calls of the river dolphins in South America (*Bufeo negro* and Amazon dolphin) were recorded in natural environment and analysed in comparison with the sea dolphin and the Ganges river dolphin.
2. Clear difference between the *Bufeo negro* and the Amazon river dolphin was obtained and further the underwater calls of these dolphins were different from that of the sea dolphins and the Ganges river dolphin.

3. For *Bufeo negro*, the stratiformed sound was not emitted. The frequency of whistle was higher than that of Amazon dolphin and clicks also showed the same tendency.
4. The frequency in use of calls was lower compared with any other kinds of dolphins.

ACKNOWLEDGEMENT

The authors wish to express their hearty thanks to Dr.S. Nishiwaki and Dr.K. Mizue who provided us an opportunity to go abroad for this investigation.

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