

## **SOUND PRODUCTION BY A NEONATAL DALL'S PORPOISE(*Phocoenoides dalli* )**

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In July of 1987, a Dall's porpoise (*Phocoenoides dalli* ), with her umbilical cord still attached, stranded in Bodega Bay, California. She was transported to Marine World Africa, USA for treatment of pneumonia. Sound production was monitored for sixty hours during the six days she was kept alive. Click trains similar to those reported for adult Dall's porpoises and other porpoise species were recorded. These clicks consisted of a weak low frequency component which sounded like purring, and a strong, ultrasonic component. Clicks contained energy from 100 to over 200 kHz, with a peak typically near 128 kHz. In one click train, the interval between clicks was measured and found to be relatively constant at about 7.4 msec (corresponding to 135 clicks per second). These observations suggest that the ability to produce clicks develops more rapidly in this porpoise species than in the bottlenose dolphin.

The structure of these clicks was similar to that expected from an adult. This suggests that the ability to produce clicks is fully developed within the first week of life. In contrast, Reiss (in press) found a four week period was required for the development of clicks in two bottlenose dolphins. *Phocoenoides* calves are born at over 50% of their adult length, which might account for their precocious development. One apparent difference is that doublets as described by Awbrey et al. (1979) have not been found in the click trains from the neonate analyzed to date. Most clicks analyzed to date were probably elicited by stroking her head or back. Mohl and Andersen (1973) elicited clicks from a harbor porpoise in a similar manner. Thus it is unclear whether the clicks were for echolocation or to serve a social function.

Some whistle-like sounds were heard, but these appeared to be associated with the passage of gas in the digestive tract rather than as a form of vocal behavior. Thus these observations are consistent with previous reports of the absence of whistle production by the *Phocoenidae*.

## **Introduction**

In July of 1987, a female Dall's Porpoise, *Phocoenoides dalli*, stranded in Bodega Bay, California. Based on the presence of the umbilical cord, hair and the soft texture of her skin, she was estimated to be one day old at the time of stranding. She was 103 cm (40.5 ins) long at the time of her death.

Sound production in this species has not been extensively studied. Awbrey et al. (1979) obtained recordings of a single group of free-ranging Dall's porpoises. Hatakeyama and Shimizu (1985) recorded a single individual in captivity. Other studies did not use high frequency recording equipment (e.g., Ridgway, 1966). Since Dall's porpoises are entangled incidental to drift net fisheries, a better understanding of echolocation of this species might be important to their protection.

## **Methods**

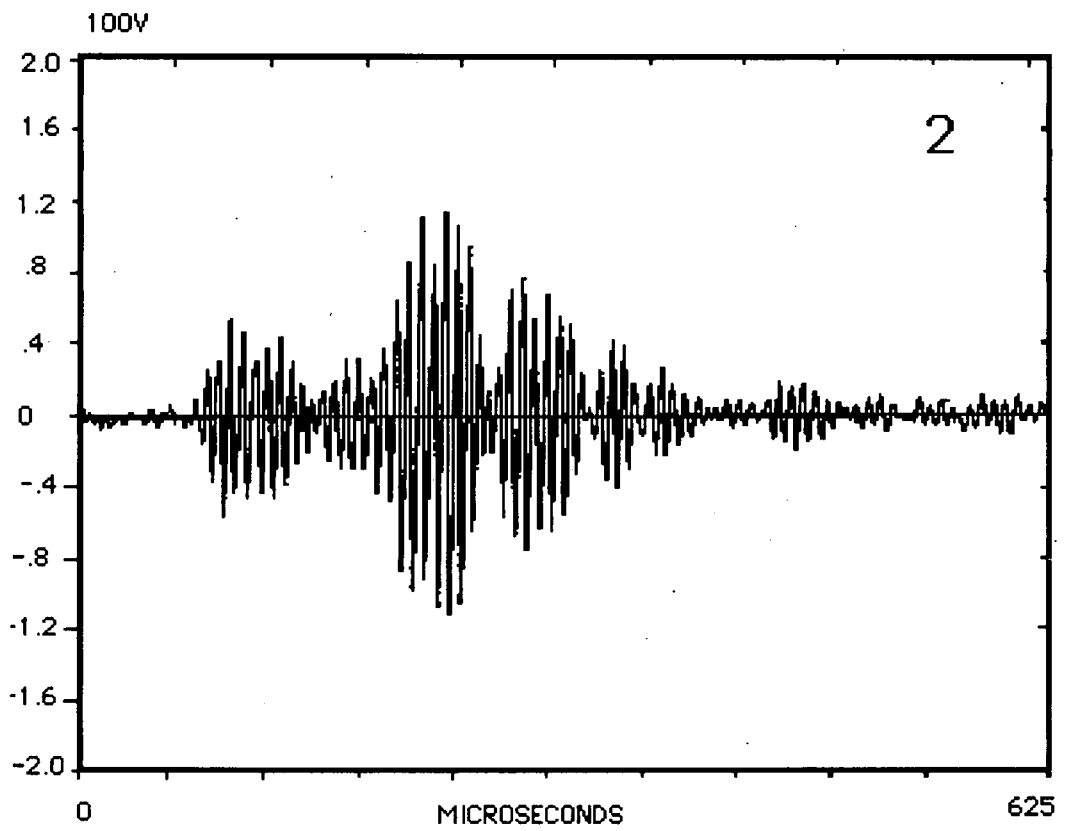
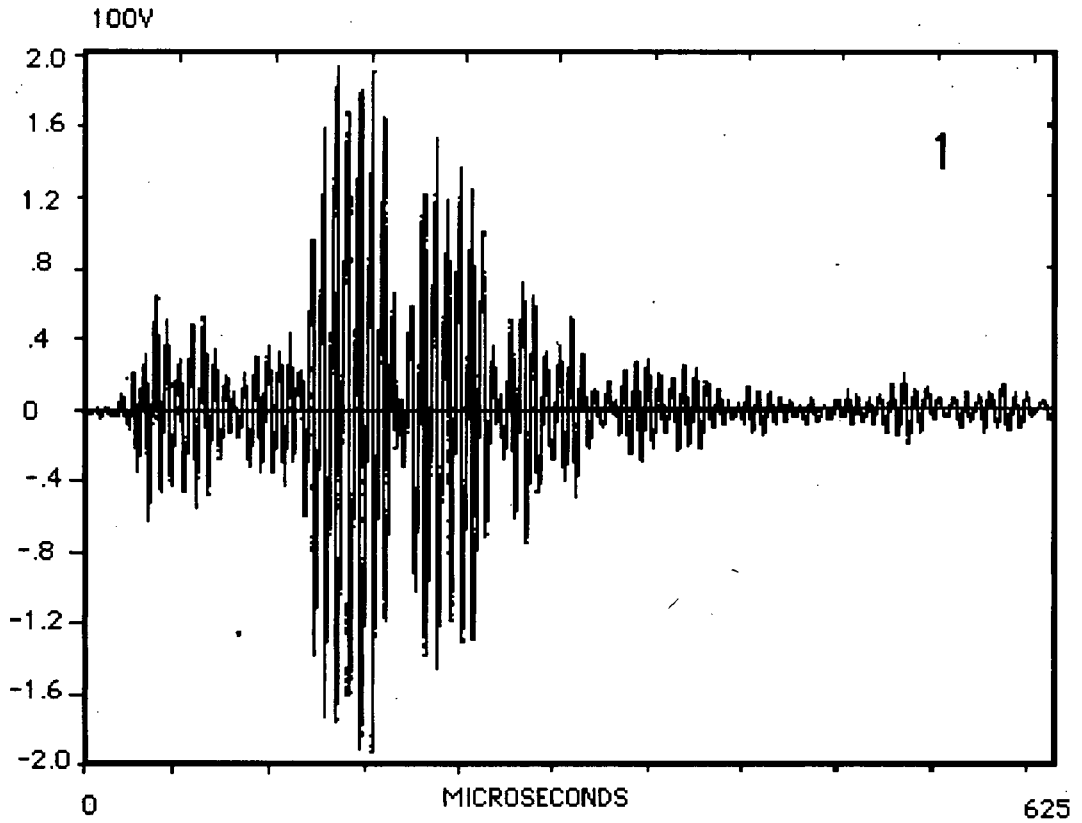
Sounds were recorded with a B & K 8103 hydrophone, B & K 2635 charge amplifier and a Racal Store 4DS tape recorder run at 60 i.p.s. In addition, the hydrophone output was monitored on an oscilloscope for ten hours. Sounds in the frequency range from 1 to 10 kHz were monitored for sixty hours over a speaker. Airborne sounds were monitored by ear continuously. Tapes were analyzed using an HP 5451 C Fourier Analyzer System. The waveforms of the clicks were examined along with their power spectra. These were compared with the results of Awbrey et al. (1979) and Hatakeyama and Shimizu (1985). They were also compared with the clicks of other porpoise and dolphin species.

## **Results and Discussions**

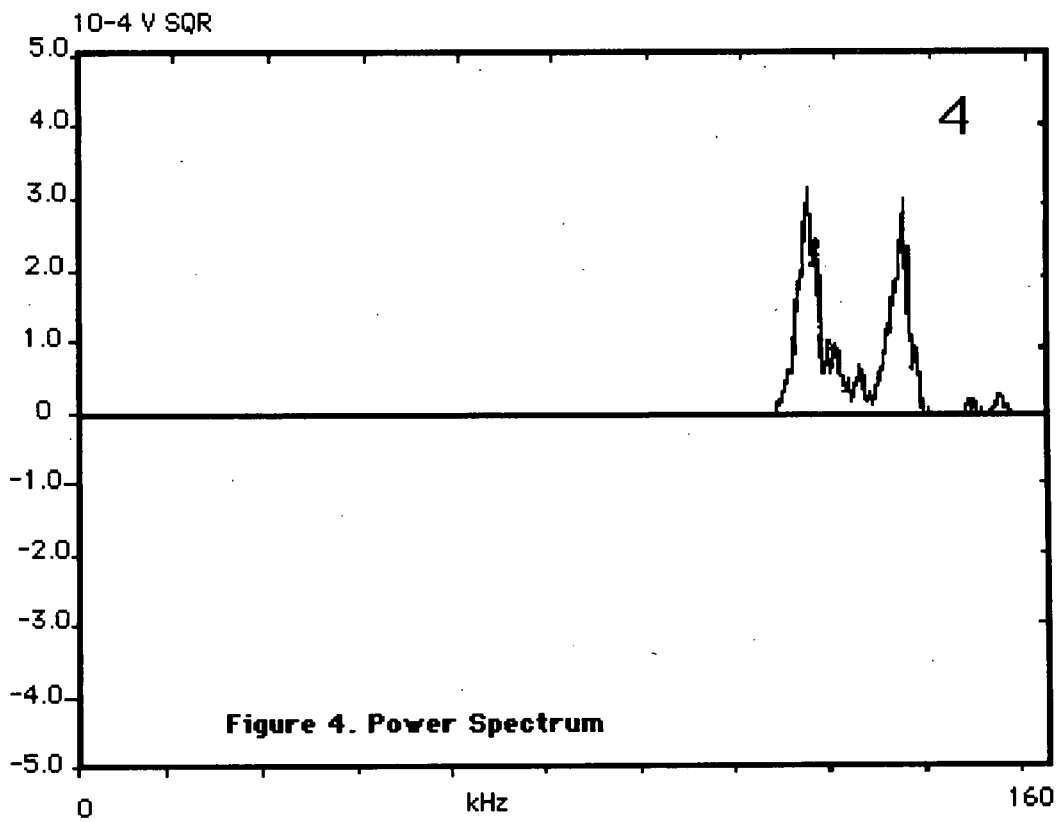
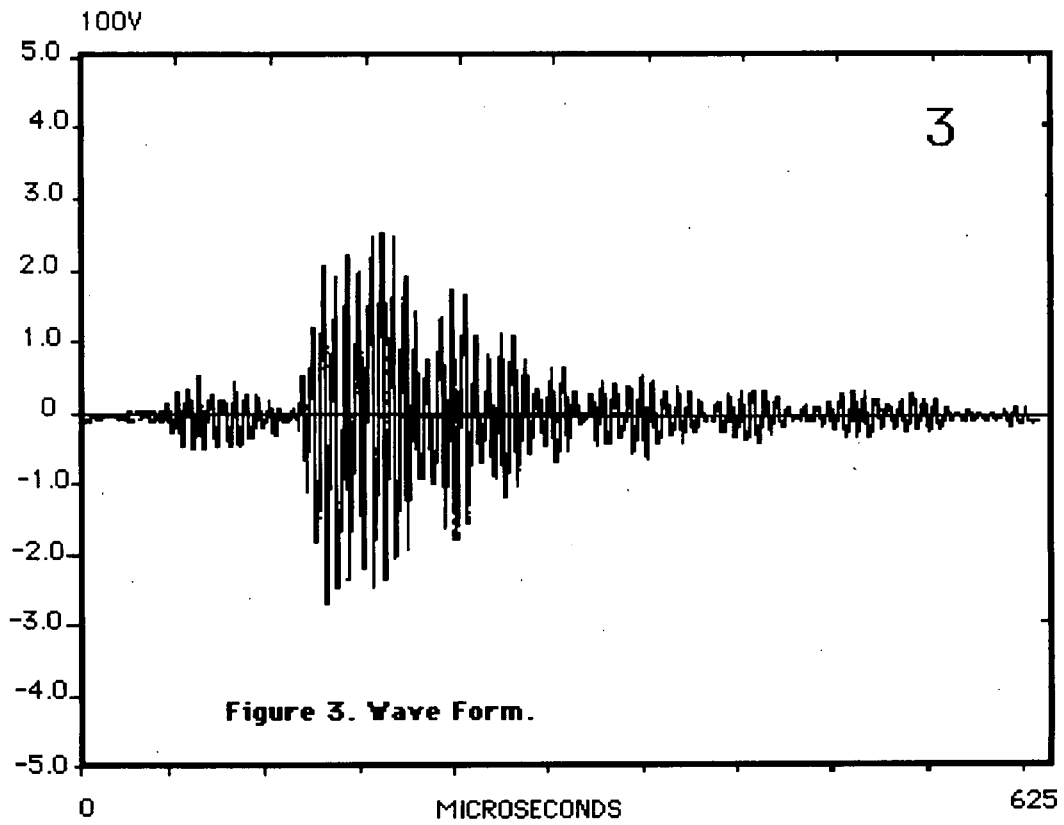
Examples of the wave forms produced are shown in Figures 1-3. The corresponding power spectra are shown in Figures 4-6. Wave forms from other studies are shown for comparison. (Figures 7, 8). Some caution should be used in interpreting these results. It should be noted that the porpoise generally floated with part of her head in air. Therefore, absolute intensity estimates are probably low.

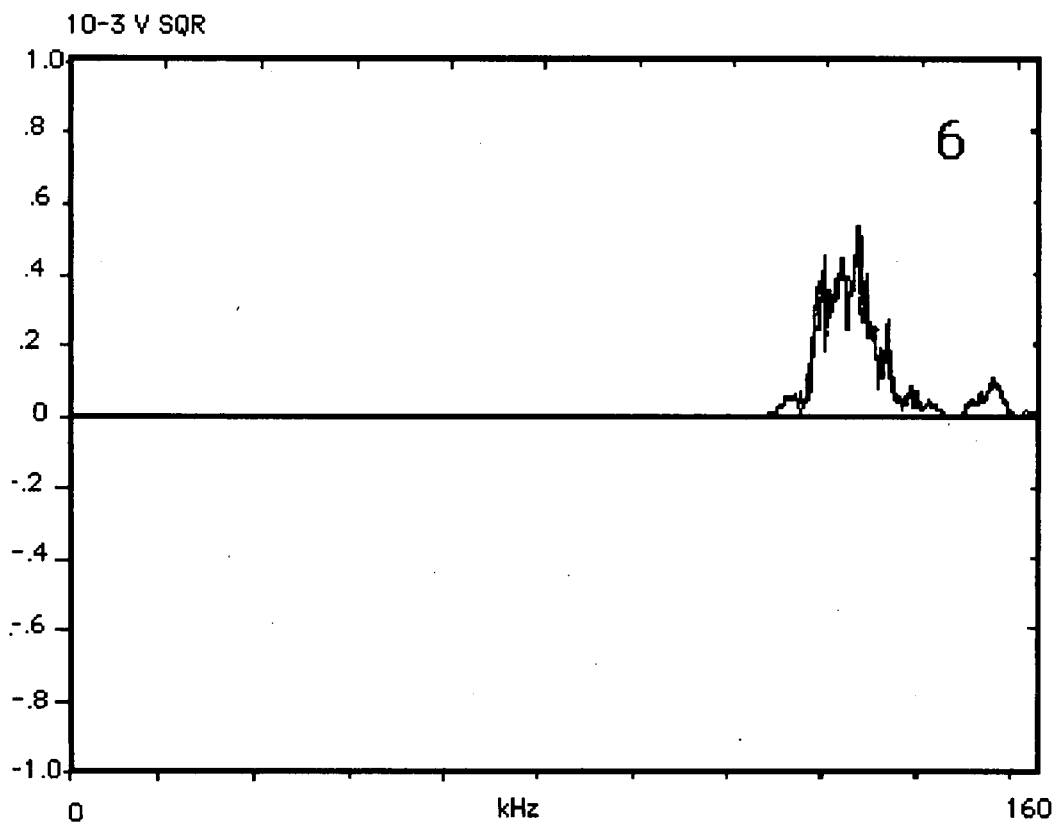
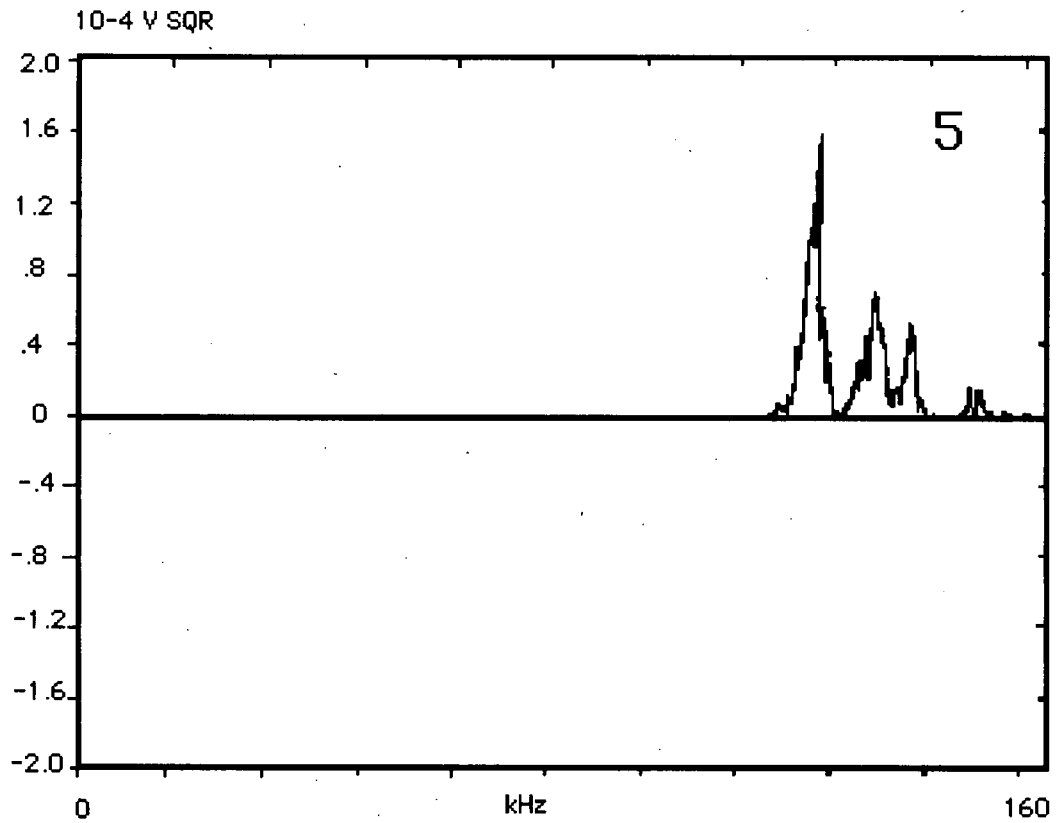
The clicks typically consisted of about four short pulses lasting between 50 and 100 microseconds. The pulses might represent internal reflections of a source pulse. The clicks had peak energies at frequencies of 120 to 160 kHz.

For one set of measurements, she was held about 1 m (3.3 ft) from the hydrophone and oriented towards it. The measured peak sound level was 150 dB re 1 microPascal. Although a low-frequency component similar to the sound of a purring kitten was audible in air, it was too weak to be recorded with the limited dynamic range of the tape recorder.

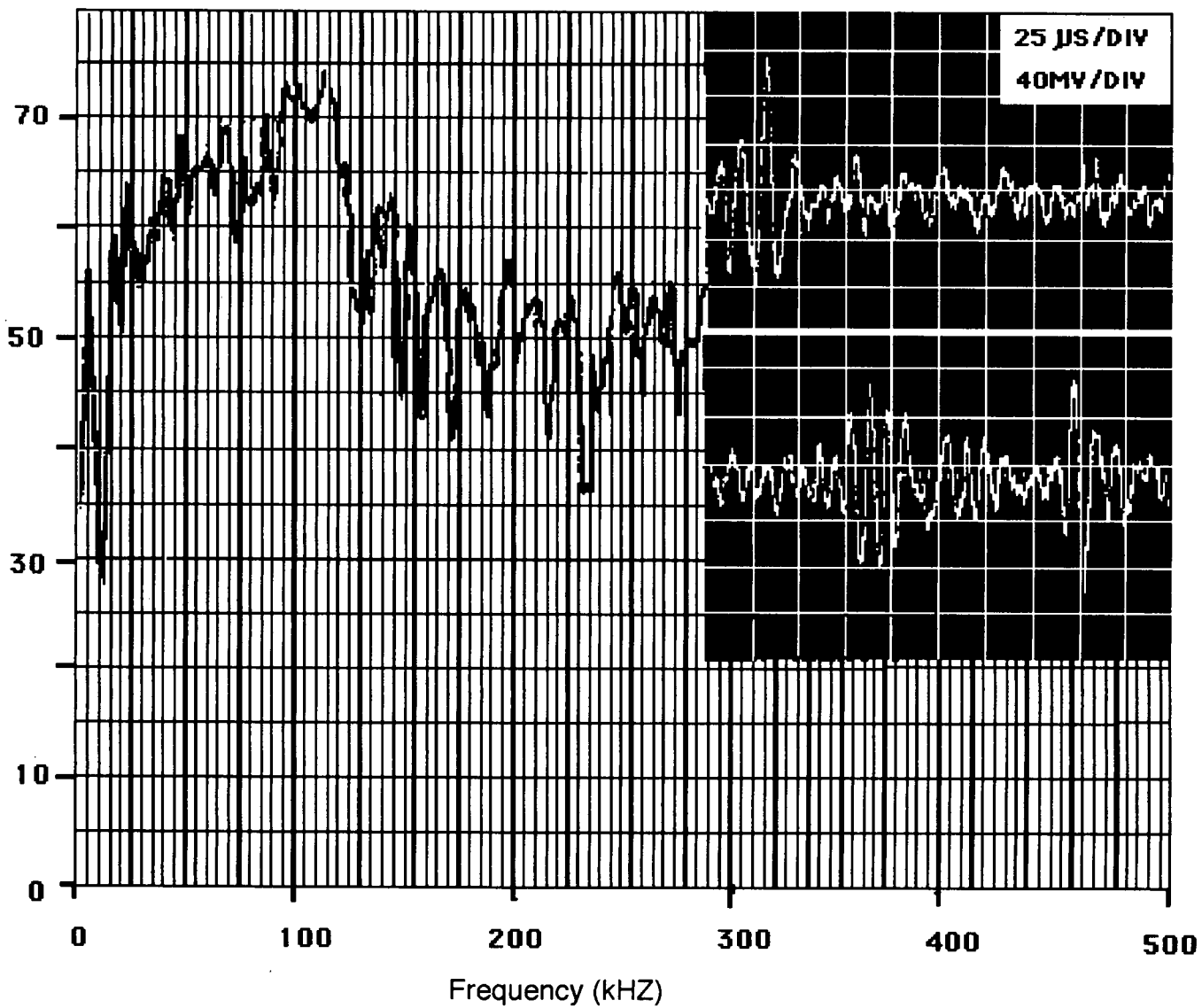


**Figures 1 and 2. Examples of Wave Forms.**

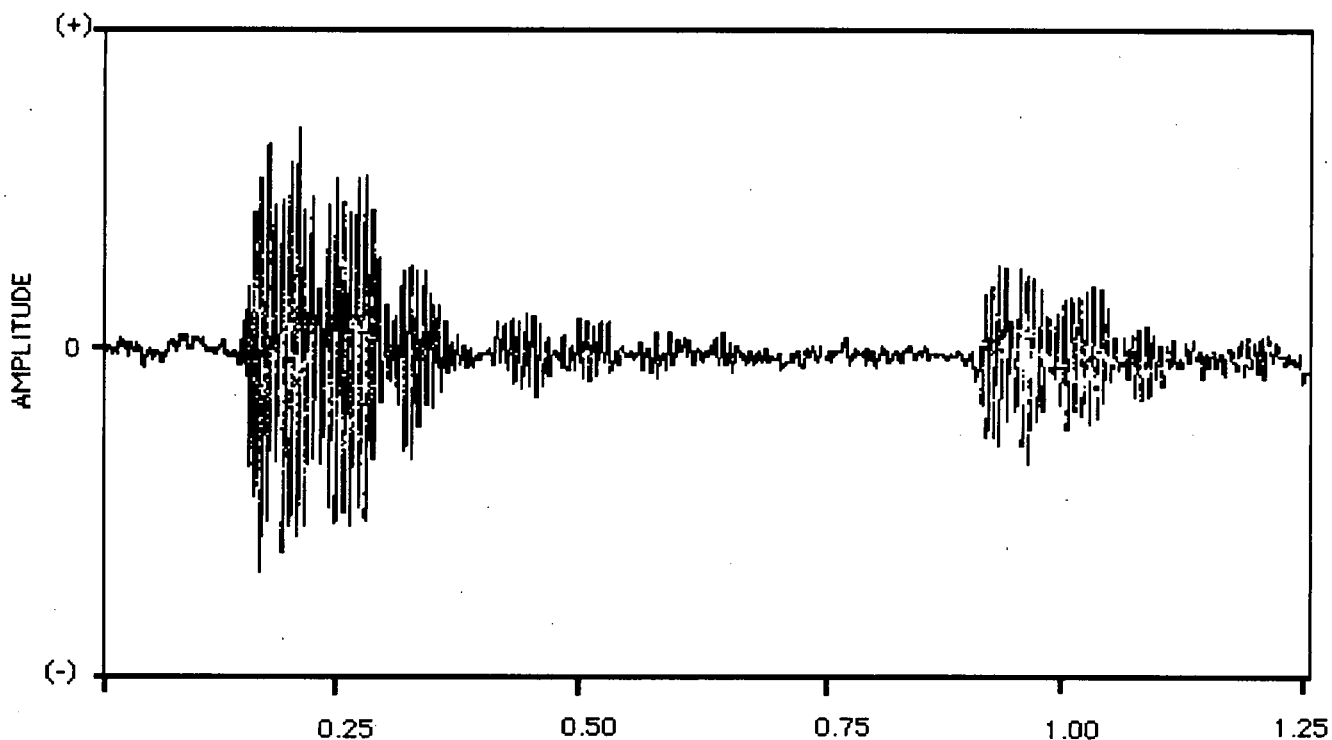




**Figures 5 and 6. Power Spectra.**



**Figure 7. Wave Shape and Spectrum of Clicks (C-60).  
(Hatakeyama and Shimizu. 1985).**



Amplitude was not calibrated so scale is arbitrary. Note the amplitude modulation within each pulse. Interpulse interval is 767 msec. Played back at one-half speed for analysis. (Awbrey et al. 1979).

**Figure 8. Oscillogram of a *P. dalli* double pulse.**

### **Summary and Conclusions**

Clicks suitable for echolocation are produced by very young Dall's porpoises. Whistles appear to be absent from their repertoire. The development of vocal behavior in this species is precocious relative to bottlenose dolphins.

### **Acknowledgements**

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