

Behavioral Responses of Belugas to Seismic Surveys

Oleg Lyamin

University of California, Los Angeles, olyamin@ucla.edu

Dmitri Glazov

Severtsov Institute of Ecology and Evolution, Moscow, Russia

Oksana Golenok

Lomonosov Moscow State University, Moscow, Russia

Nikolai Shabalin

Center of Marine Research, Moscow State University, Moscow, Russia

Faina Mel'nikova

Severtsov Institute of Ecology and Evolution, Moscow, Russia

Evgeni Nazarenko

Severtsov Institute of Ecology and Evolution, Moscow, Russia

Alena Vishnyakova

Lomonosov Moscow State University, Moscow, Russia

Lev Mukhametov

Severtsov Institute of Ecology and Evolution, Moscow, Russia

Mikhail Tokarev

Center of Marine Research, Moscow State University, Moscow, Russia

Vyacheslav Rozhnov

Severtsov Institute of Ecology and Evolution, Moscow, Russia

There is limited information on the effect of anthropogenic noise on the beluga. The aim of this study was to evaluate the impact of sparker (a sound source used in marine seismic surveys) on behavior and breathing rate in belugas. The subjects were two adult captive belugas housed in a spacious octagonal enclosure (size: 8.5 m; depth: 6 m) in the White Sea. The belugas were exposed to trains of underwater impulses of the sparker (pulse length: 200 ms; frequency: 2 Hz; peak intensity: 105-165 dB; band: 200-4,000 Hz; duration: 6-130 min). The sounds were emitted from a small vessel that passed the enclosure or drifted at a distance. Due to the small number of exposures (a total of 8), the response was evaluated when comparing each measurement (percent of different behaviors, position of animals in the enclosure, and the pattern of breathing) with the three-sigma ranges of the corresponding parameter during the control preexposure periods. Under baseline conditions, the behavior of belugas represented an alternation of resting and floating at the surface and submergings and slow swimming or rest at depth. Consequently, the pattern of breathing was highly stereotypic, manifesting an alternation of periods of regular breathing (up to 85% of all breathing pauses ranged between 2 and 20 s) and apneas longer than 60 s (a maximum of 370 s). The behavioral response of belugas to the sparker with a peak intensity of 120-165 dB and duration up to 24 min was shallow diving and fast erratic swimming at the part of the enclosure that was opposite the vessel. At the same time, the range of breathing pauses narrowed (the majority pauses were between 1 and 120 s) and the stereotypic breathing pattern diminished. Those changes were significant (based on the criteria described) without features of habituation while the noise continued. The behavior of belugas returned to normal within 20-30 min after the noise cancellation. The behavioral and breathing changes were not always parallel because the belugas took longer apneas during erratic swimming when exposed. The sparker noise with a peak intensity between 106 and 112 dB and lasting between 70 and 130 min did not cause significant changes. To conclude, the sparker noise with a peak intensity exceeding 120 dB altered the behavior and pattern of breathing in belugas. The response appeared to be nonspecific because it might be caused by other unexpected stimuli (e.g., small motorboats).