

“Experimental verification in the Caspian Sea of the possibility of using the scientific multi-beam echo sounder of the “Sector” at the R / V “Issledovatel Caspiya” for detecting fish in a wide viewing band”

An experimental verification was carried out in the Caspian Sea of the possibility of using the scientific multi-beam echo sounder of the Sector at the R / V “Issledovatel Caspiya” to detect fish in a wide viewing band. Simultaneous hydroacoustic recordings were obtained from the scientific multi-beam echo sounder of Sector and the scientific echo sounder Simrad EK60. Comparison of records showed the advantage of a wide band of the multipath echo sounder PGLS "Sector" over a narrow band of the Simrad EK60 echo-sounder.

Keywords Scientific multibeam echo sounder, wide viewing band, fish detection.

From July 12 to August 8, 2016, flight No.34 of the R / V “Issledovatel Caspiya” was performed, during which experimental studies were carried out using the scientific multi-beam echo sounder “Sector”. A feature of this sonar instrument is the ability to use both a narrow directivity (XN) in radiation (7 degrees wide), comparable to the XH of a scientific echo sounder Simrad EK60, and a wide XN (90 degrees wide). In the process of performing experimental studies, special attention was paid to the coastal areas of the Middle Caspian from the mouth of the river Shura-Ozen to the mouth of the river Terek and further from the island of Chechen to Kizlyarsky Bay. The depth in these areas varied from 10 to 15 m, the water temperature was about 25 degrees Celsius and salinity - about 14 ppm.

The subsea unit of the scientific semiconductor echo sounder "Sector" was fixed on the rod of the outboard device installed on the right side of the R / V " Issledovatel Caspiya " (see Fig. 1). The depth of the underwater block relative to the surface of the water was about one meter. The length of the vessel underwater block was located in the center of mass of the vessel. The control device and display multi-beam echo sounder "Sector" and the workplace operator hydroacoustics located in the scientific laboratory R / V. The average speed of the vessel during the execution of the research was 8 knots, the excitement of the sea surface reached 3 points, which is clearly seen on the echogram with a wavy bottom line.

Before the hydroacoustic surveys, the calibration of the scientific multi-beam echo sounder "Sector" was performed. A tungsten carbide sphere with a diameter of 38.1 mm was used as a reference target. The sphere was suspended according to the three-point scheme and was located at a distance of 15 m from the sonar antenna, the depth under the keel was about 50 m.



Figure 1. Outboard bar with multibeam echo sounder in the working position

With an average depth in the survey area of 15 m, the actual survey bandwidth of the multi-beam echo sounder Sector when using a wide XH was 30 m. For comparison, the Simrad EK60 actual sonar band was 1.8 m under the same conditions. the echo sounder "Sector" has a span of 16.7 times more than that of the Simrad EK60 echo sounder.

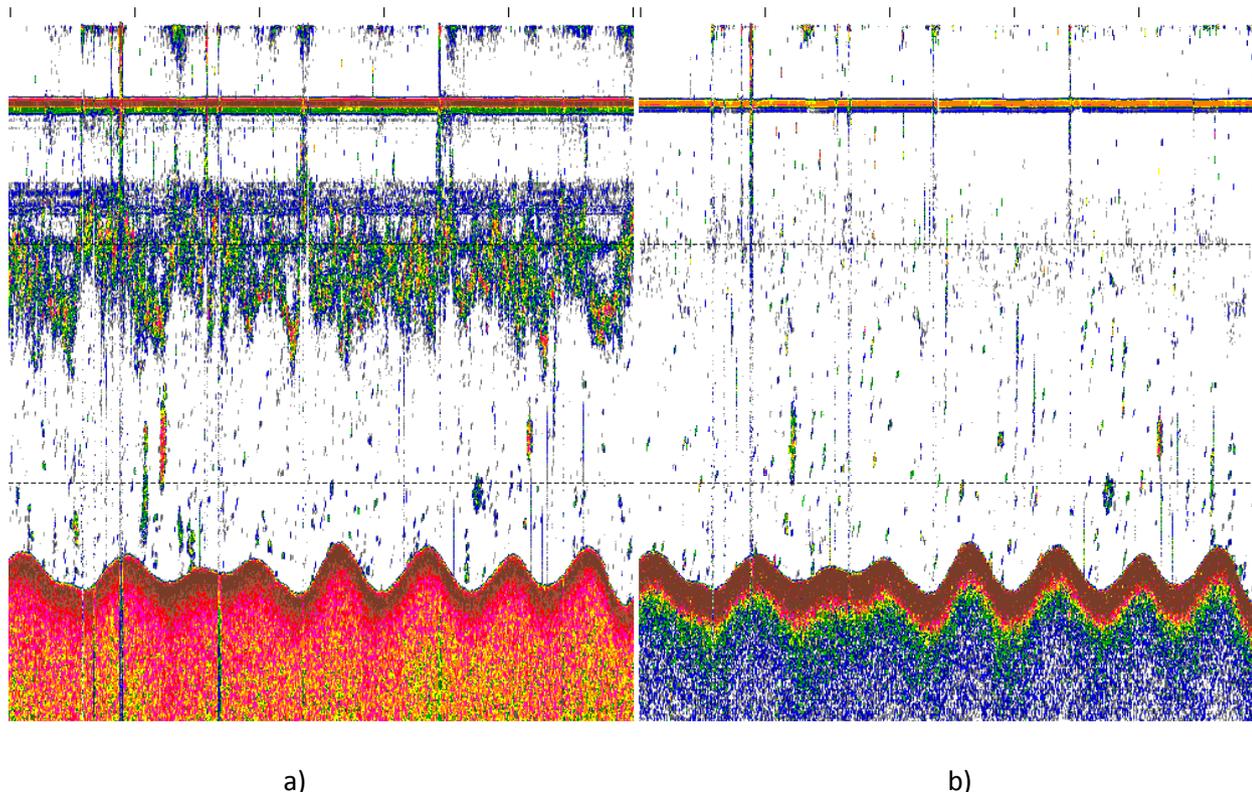


Figure 2. Echogram with wide swath (a) and narrow swath (b)

Figure 2 (a) shows the echogram of the Sector multi-beam echo sounder using a wide swath. Figure 2 (b) shows the echogram of the Sector multipath echo sounder using a narrow field of view equal to the Simrad EK60 echo sounder.

On the echogram in Figure 2 (a), a greater number of single fish and fish assemblages are distinguishable than in the echogram in Figure 2 (b). Along with this positive effect, the use of a wide band of view leads to a more noisy sonar data, because the expansion of the spatial spectrum leads to an increase in the energy of spatial noise, and on the echogram this manifests itself in the summation of useful signals and interference when displayed on one plane.

Experimental verification of the multi-beam echo sounder of the Sector in the Caspian Sea confirmed the possibility of its use for detecting fish in a wide viewing band. However, to improve the efficiency of the echo sounder in this mode, it is necessary to continue the improvement of algorithms for processing of hydroacoustic data in terms of noise filtering.