

Development of a real-time depth monitoring system for small fishing gear using an acoustic telemetry technique

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Caption list

Fig. 1 System for monitoring small fishing gear consisted of a pinger (a), an omni-directional wired hydrophone (b), a one-channel receiver (c), and a depressor (d)

Fig. 2 Transmission of fishing gear information from a pinger. The depth information is included in the interval of the first and second pulses (upper figure). If a temperature sensor is added, the interval of the second and third pulses includes temperature information (figure below)

Fig. 3 Diagram of hairtail trolling gear operated in the Bungo Channel

Fig. 4 Map showing the area of implementation experiments conducted in the Bungo Channel

Fig. 5 Arrangement of the developed system on the fishing gear and on the fishing boat

Fig. 6 Comparison of results for the depth values measured by the developed system and the depth data logger in the evaluation experiment. The upper graph shows the pinger depth, the middle one shows the logger depth, and the lower one shows the difference between the pinger depth and the logger depth recorded at the same time (D_{Pi-Li}). The data during 0 to 25 minutes are recorded in the first measurement, and the data during 35 to 40 minutes are recorded in the second measurement

Fig. 7 Frequency histogram of the error values (D_{Pi-Li}) and definition of the range of the erroneous data.

Fig. 8 Relationship between the vertical velocity of the pinger and the error value. The circles show data in the first measurement, and the x-marks show data in the second measurement. The absolute value was shown in the figure

Fig. 9 The depth of the fishing gear measured using the developed system in the implementation experiments. Operations No.1–No.7 were conducted on 21 November 2013, and No.8–No.14 were done on 11 March 2014

Fig. 10 Relationship between the gear depth and the water depth measured by the echo sounder in the operations No.8, No.12, and No.13. In the operation No.13, the water depth could not be measured until 7 minutes after the start of this operation because the range of the echo sounder was set to 200 m

Fig. 11 Propagation paths of a pulse from the pinger

Fig. 12 Frequency histogram of calculated error value. The negative values show erroneous data measured shallower than other data around the erroneous data, and the positive values show the erroneous data measured deeper.