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

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URL	<a href="https://oacis.repo.nii.ac.jp/records/1974">https://oacis.repo.nii.ac.jp/records/1974</a>

**Table 1** Specifications of the developed system

Units	Items	Specifications
Pinger	Size	24 mm in diameter and 100 mm in length
	Weight	77 g in air and 31 g in water
	Frequency	62.5 kHz
	Source level (propagation distance)	155 dB re 1 $\mu$ Pa at 1 m (about 500 m)
	Battery life	1 month (transmission interval is 1 s)
Surface unit	Hydrophone size	45 mm in diameter and 150 mm in length
	Receiver size	170 mm by 100 mm and 40 mm in height
	Display of Receiver	LCD panel

**Table 2** Results of the evaluation experiment

Measurement number	Number of data (erroneous data)	Duration of measurement (min)	Reception ratio (%)	Percentage of erroneous data (%)	RMSE (including error) (m)	RMSE (excluding error) (m)
First	823 (165)	24	72.0	20.0	2.2	0.3
Second	210 (39)	5	92.0	18.6	3.7	0.7
Overall	1033 (204)	29	75.3	19.7	2.6	0.4

**Table 3** Summary of the two implementation experiments

Date	Operation No.	Total of depth data (erroneous data)	Duration of operation (min)	Reception ratio (%)	Percentage of erroneous data (%)	Boat speed during trolling (knot)	Wind speed (m/s)
21 Nov. 2013	1	439 (2)	29	32.5	0.5	-	4.2
	2	368 (8)	27	28.9	2.2	-	4.3
	3	233 (11)	28	17.6	4.7	-	4.3
	4	368 (24)	26	30.0	6.5	-	5.3
	5	235 (36)	30	16.7	15.3	-	4.6
	6	410 (19)	33	26.3	4.6	-	4.0
	7	337 (25)	33	21.7	7.4	-	4.0
11 Mar. 2014	8	448 (36)	29	32.8	8.0	1.0 ± 0.2	0.5
	9	956 (129)	29	70.4	13.5	1.2 ± 0.3	0.9
	10	776 (162)	32	50.9	20.9	1.1 ± 0.3	1.7
	11	1265 (113)	34	79.0	8.9	1.1 ± 0.3	2.7
	12	735 (279)	45	34.3	38.0	1.2 ± 0.2	2.7
	13	936 (137)	26	75.6	14.6	1.0 ± 0.2	4.2
	14	701 (48)	38	39.3	6.8	1.0 ± 0.2	4.6

**Table 4** Results of calculated error values for each operation

Operation No.	Average (m)	Standard deviation (m)
1	No data available	
2	13.8	1.3
3	10.8	2.4
4	13.3	2.6
5	12.1	1.8
6	11.8	2.3
7	11.8	2.3
8	14.4	1.8
9	12.6	2.3
10	17.2	2.5
11	15.8	2.5
12	15.5	2.1
13	14.6	1.3
14	16.6	1.4