

Title	<Session 2: Fish Telemetry II>Homing behaviour of black rockfish
Author(s)	Mitamura, H; Arai, N
Citation	20th Symposium of the International Society on Biotelemetry Proceedings (2014): 25-26
Issue Date	2014-05
URL	http://hdl.handle.net/2433/187847
Right	
Type	Departmental Bulletin Paper
Textversion	publisher

Homing behaviour of black rockfish

Mitamura H^{1,3}, Arai N^{2,3}

¹ Graduate School of Informatics, Kyoto University, Japan

² Field Science Education and Research Center, Kyoto University, Japan

³ JST CREST

Abstract

A lot of rockfish in the genus *Sebastes* exhibit distinctive homing ability. They can return back to an original location after displacement of metres or even kilometres. The black rockfish *S. cheni* is a site-specific fish, and shows homing to their original habitat after displacement. Using high-resolution acoustic telemetry, we monitored homing behavior of the eight rockfish. The results demonstrated that they spent their time around the release site, and during this period they moved in the upstream and/or downstream direction. Then they gradually returning to their familiar area, and finally showed directed movements to the original habitat.

Keywords: Acoustic telemetry, Homing behaviour, Homing path

Introduction

Some marine fish show strong homing ability and distinct site fidelity to their spawning sites and original habitats. Rockfish of the genus *Sebastes* are well known for homing after displacement. It has been recognised since the 1970s that sedentary and territorial rockfishes can navigate home after being displaced (Love et al., 2002; Mitamura et al., 2002).

Our researches showed black rockfish *S. cheni* in the northwest Pacific Ocean are able to navigate back to their original habitats after 1–4 km displacements (Mitamura et al., 2002). This species is a site-specific fish that utilises a rock crevice or hole for shelter within a small home range. Our previous study on the homing behaviour of vision-blocked and olfactory-ablated rockfish revealed that the species primarily used olfaction to navigate back to the original habitat from displacement (Mitamura et al., 2005). In this paper, we introduced the homing paths after displacement of the rockfish, monitored with high-resolution acoustic telemetry.

Materials and Methods

Study site and the tagged fish

This study was conducted in Uruga Bay, Kanagawa Prefecture, Japan (Fig. 1). The

maximum bottom depth of the study site is approximately 10 m. The circumference of the bay consists of vertical seawalls with an inlet in the innermost area. The sea bottom is flat and primarily mud, but there was a small rocky area approximately 15 m east of the capture point of the black rockfish *S. cheni*.



Fig. 1 Study site, Uruga bay, Japan.

Black rockfish were captured by angling in June 2008, and tagged with an ultrasonic pressure-sensitive transmitter (V9P-1H, diameter 9 mm, length 40 mm, weight 2.7 g in water; Vemco, Halifax, NS, Canada) under anesthesia induced using 0.1% 2-phenoxyethanol. The transmitters have four different frequencies (63, 75, 78, and 81 kHz), and transmit a signal every 2 s. All four fish were released at high tide approximately 70 m away from their capture points on 5 and 16 June 2008 (Figs. 1, 2). The release site was

assumed to be outside of the fishes' home range because the black rockfish normally inhabits complex rocky areas, and the sea bottom at the release site was muddy and flat. There were no apparent potential landmarks around the release site to aid in locating the original capture site.

Acoustic positioning telemetry system

A radio-linked acoustic positioning telemetry system (VRAP, Vemco) was used to monitor the fish movement after release. The system consists of three acoustic-radio buoys and a base station controlled by a computer. This system accurately provides the horizontal position (accuracy: <2 m) and the depth of a transmitter.

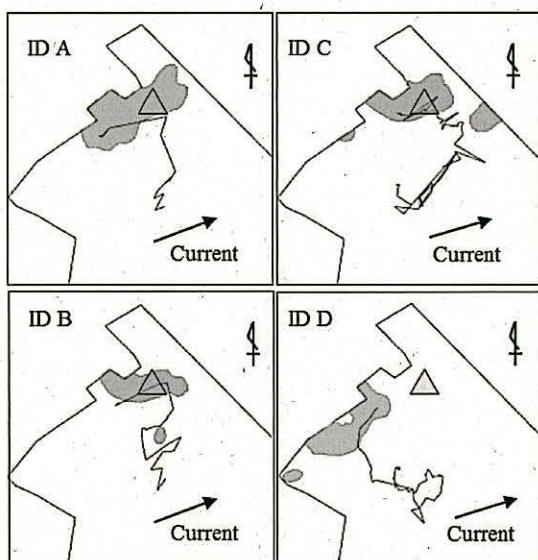


Fig. 2 Homing paths for 4 tagged fish. Shaded polygons show the home range (95% usage) of each rockfish. Triangles indicate rocky areas.

Results and Discussion

All of the rockfish homed to the capture site after their displacement. The average homing duration was 110 ± 90 min ($N = 8$). None of the rockfish exhibited a straight-line homing pattern (Fig. 2). The fish spent their time around the release site just after the release, and moved in the downstream or upstream direction. These suggest that the fish tried to find the direction to their original habitats with

the olfactory cue. The fish gradually reached the original habitat, and showed the relatively quick and directed movement to the capture site after returning to their familiar area within the home range. These suggest that they might use both olfactory and visual cues (landmarks such as a rock and a vertical wall) for homing within their familiar area. Our findings contribute to the homing mechanism in site-specific fish.

References

- [1] Love, M.S., Yoklavich, M. Thorsteinson, L. Movement and activity patterns In: *The rockfishes of the Northeast Pacific* (Ed by Love, M.S., Yoklavich, M. and Thorsteinson, L.). pp. 51-56. University of California Press. Berkeley, Los Angeles and London, 2002.
- [2] Mitamura, H., Arai, N., Sakamoto, W., Mitsunaga, Y., Maruo, T., Mukai, Y., Nakamura, K., Sasaki, M. Yoneda, Y. Evidence of homing of black rockfish *Sebastes inermis* using biotelemetry. *Fisheries Science*, **68**, 1189-1196, 2002.
- [3] Mitamura, H., Arai, N., Sakamoto, W., Mitsunaga, Y., Tanaka, H., Mukai, Y., Nakamura, K., Sasaki, M. Yoneda, Y. Role of olfaction and vision in homing behaviour of black rockfish *Sebastes inermis*. *Journal of Experimental Marine Biology and Ecology*, **322**, 123-134, 2005.

Acknowledgements

The authors would like to express sincere gratitude for T. Kakihara, Y. Miyamoto, K. Uchida, and other people who supported the fieldwork and analyses. This study was partly supported by a Grant-in-Aid for JSPS Fellows (18-2409), a Grant-in-Aid for Science Research (21688015), and the Global COE program "Informatics Education and Research Center for Knowledge-Circulating Society" Japan. The detail for this study is described in the paper "Mitamura et al. 2012. The Journal of Experimental Biology. 215, 2751-2759".

Author's Address

Hirromichi MITAMURA
 Kyoto University, Kyoto 606-8501, JAPAN
 mitamura@bre.soc.i.kyoto-u.ac.jp