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Research activities on small cetaceans in the Taiji Office of the Institute of Cetacean Research in the 2024/25 season

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ABSTRACT

In the spring of 2024, the Institute of Cetacean Research (ICR) established a new facility in Taiji, Wakayama Prefecture, to replace its Ayukawa laboratory, Miyagi Prefecture, which had been forced to cease operations due to the Great East Japan Earthquake. Following the establishment of a new research facility in Taiji, a locality with a longstanding historical affiliation with whaling, the ICR initiated a series of feasibility studies targeting small cetacean species. This report presents two major initiatives conducted during the 2024/25 season as part of the feasibility studies undertaken at the newly established facility. The first study investigated the school structure and movement of small cetaceans targeted by the drive fisheries in Taiji. Comprehensive data collection included measurements, biopsy sampling, photo-identification, tagging, and satellite telemetry, which provided insights into short-term movements. These efforts aim to clarify small cetaceans' school cohesion, reproductive status, and ecological traits for improved resource management. The second study focused on developing bycatch prevention devices for set nets. Using captive dolphins, visual, tactile, and acoustic deterrents were tested. While some effectiveness was observed, rapid habituation underscored the need for refinement. These studies highlight the Taiji Office of the ICR's role in advancing scientific understanding and practical tools to promote sustainable management of small cetacean populations and coexistence with coastal fisheries.

INTRODUCTION

The Institute of Cetacean Research (ICR), established in 1987, is a non-profit organization that conducts scientific research on whales and other marine mammals to support proper resource management. The background to the establishment of the ICR was the moratorium on commercial whaling adopted by the International Whaling Commission (IWC) in 1982. The Moratorium was adopted by the IWC to address concerns regarding the lack of scientific knowledge at the time, and it was stated that further scientific research on cetaceans was necessary before commercial whaling could resume. Therefore, ICR had implemented several whale research programs under special permit in the Antarctic Ocean and the western North Pacific Ocean, as planned by the Japanese government. Since the resumption of commercial whaling in 2019, the ICR has expanded its activities beyond resource management research to include efforts aimed at improving the efficiency of Japan's whaling industry and increasing the added value of whale meat products.

Under these circumstances, ICR established a new facility in Taiji, Wakayama Prefecture, in the spring of 2024 to replace its Ayukawa laboratory, Miyagi Prefecture, which had been forced to cease operations following the Great East Japan Earthquake. The Taiji Office is on the International Cetacean Center (a two-story steel-frame building with a total floor area of 1,880 m^2), developed by Taiji Town. As a research facility, it is equipped with laboratories and facilities for genetics, chemistry, biochemistry, biology, ecology and other fields, and possesses much of what is necessary for land-based research contributing to resource management. The laboratories for genetics, chemistry, biochemistry and biology that were already in place at the Tokyo office were relocated to the Taiji office upon its opening, where experimental activities have begun.

The operations of the Taiji Office can be broadly categorized into two primary domains. The first encompasses research activities conducted under the institutional objectives of the ICR, which have traditionally been carried out at the Tokyo Office. These activities are particularly focused on laboratory-based investigations and include the Genetic Laboratory, the Biochemistry Laboratory, and the Cetacean Biology Laboratory. Additionally, certain

components of the Population Dynamics Laboratory, which incorporate field surveys, are also included. Ancillary functions such as library management and public outreach are likewise part of this domain. In addition to these Tokyo-based research initiatives, the Taiji Office has recently commenced new projects that reflect its unique geographical and cultural context. Situated in Taiji Town, a region historically and economically linked to cetaceans, the office has begun addressing emerging issues related to the management of small cetacean resources and their interactions with local fisheries. This report aims to introduce and outline these newly initiated research themes at the Taiji Office.

Here, we introduce the two research activities on small cetaceans (a study on small cetacean school structure and movement, and the development of bycatch prevention devices) conducted over the past two years since the establishment of this new research facility.

Study on small cetacean school structure and movement in Taiji

Drive fisheries targeting dolphins in Taiji Town are conducted under the authorization of the Governor of Wakayama Prefecture and encompass nine species of small cetaceans. Many of these species form large schools ranging from tens to over a thousand individuals in offshore waters. Biological investigations have been conducted on specimens obtained through drive fisheries, alongside sighting surveys using research vessels to estimate abundance. In recent years, non-lethal methodologies such as satellite tagging and biopsy sampling have been increasingly employed to investigate movement ecology, stock structure, and reproductive cycle. Regarding small cetacean school composition, previous studies have shown that in striped dolphins (*Stenella coeruleoalba*), school structure varies according to sex, growth, and sexual conditions (Miyazaki and Nishiwaki, 1978). However, comprehensive research on school composition, social associations, and life history traits remains limited, particularly in the context of collective behavior and social structure. For gregarious small cetacean species, information on school structure and social bonds is critically important from the perspective of resource management and conservation.

The primary objective of this study was to establish a methodological framework for collecting biologically and ecologically relevant data from entire dolphin schools captured in drive fisheries, to contribute to the future management of small cetacean populations. Specifically, the study focused on implementing a comprehensive data collection protocol that included attaching identification tags to all individuals within a dolphin school, external observation for body length measurement and sex determination, biopsy sampling of blubber and skin tissues, photographic identification for natural markings, and the deployment of satellite telemetry devices to monitor post-release movements.

In the 2024/25 season, a total of 98 individuals from four schools of three small cetacean species— Risso's dolphins (*Grampus griseus*), Rough-toothed dolphins (*Steno bredanensis*), and pantropical spotted dolphins (*Stenella attenuata*)—which had been driven by dolphin fishing operations in Taiji, were subjected to the following procedures: body length measurement, sex determination, photographic identification of natural markings, biopsy sampling, and attachment of identification tags (Figure 1).

In addition, satellite tags (Figure 2) were also attached to two individuals to collect geolocation data. After these procedures, all individuals were released offshore. All procedures were conducted under the supervision of a licensed veterinarian. Location data were obtained from satellite tags deployed on one Risso's dolphin and one pantropical spotted dolphin, and tracking signals were received over 10 and 9 days, respectively (Figure 3).

In the future, genetic and stable isotope analysis

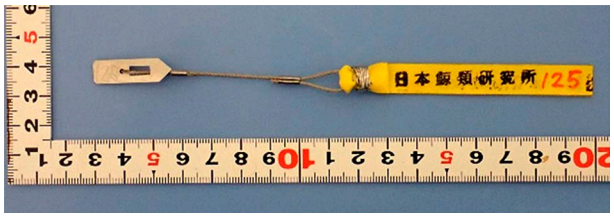

Figure 1. Identification tag for dolphins.

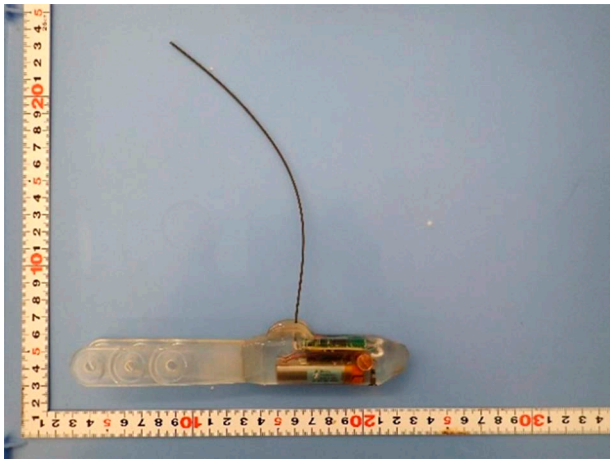

Figure 2. Satellite tag (SPOT-399, Wildlife Computers Inc.) used for dolphin tracking research.

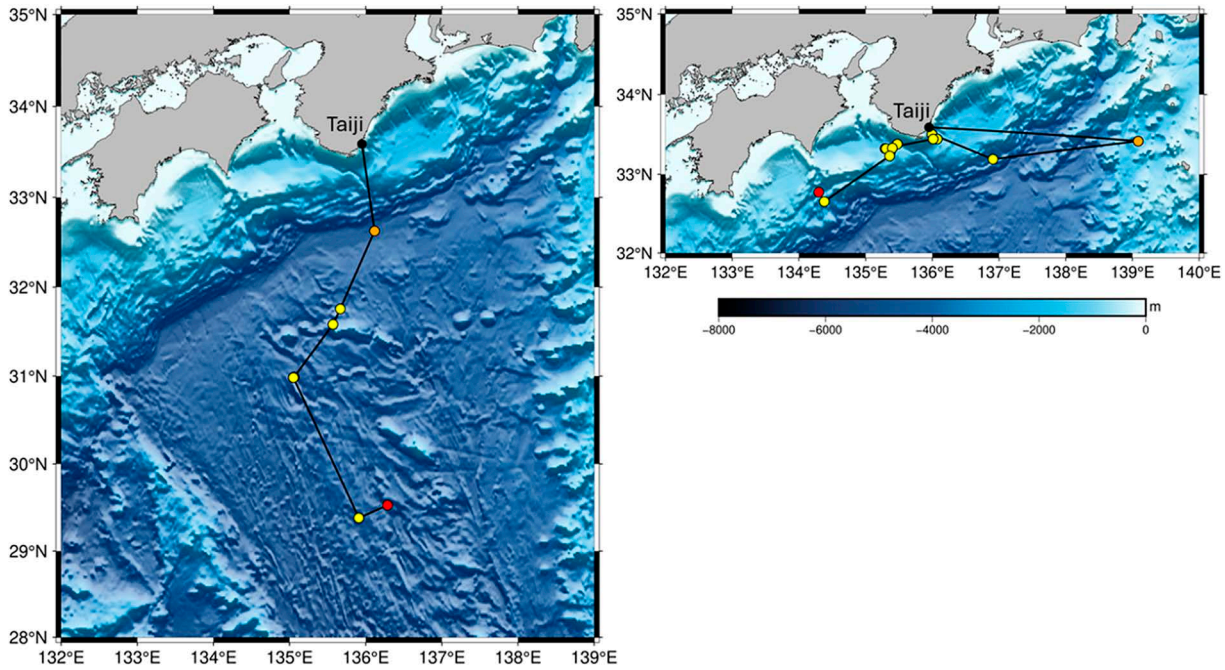

Figure 3. Locations and tracking data obtained by satellite tags of a Risso's dolphin (left: 10 days) and a pantropical spotted dolphin (right: 9 days) released from Taiji Port in the 2024/25 survey. The orange circle indicates the first signal location, red indicates the final signal location, and yellow indicates the position between orange and red.

will be conducted to identify stocks and clarify parent-offspring relationships, and diet. Also, sex hormones will be analyzed to determine sexual maturity and seasonality of breeding for understanding the reproductive status and school structure of individuals. If tagged individuals are recaptured after release, biological information on the school will be collected to clarify the school's cohesion and social structure. Furthermore, the relationship between location and movement data from satellite tags and oceanographic data such as sea surface temperature will be analyzed to deeply understand the ecology of these small cetaceans. Continuing these surveys can be expected to deepen our understanding of the life cycle of small cetaceans migrating off Taiji and contribute to improving resource management strategies.

Development of bycatch prevention devices

In recent years, there have been frequent incidents of cetaceans straying into set nets, causing disruptions to fisheries operations. Once inside the nets, these animals damage the catch and cause physical harm to the fishing gear. In particular, the damage caused by the intruding animals eating the catch results in severe economic losses. To address this problem, efforts have been made to develop fishing gear that prevents cetaceans from approaching or entering nets, as well as to design deterrent devices using firecracker sounds (Iwasaki, 2009), however, neither approach has proven to be a sufficient solution. Accordingly, this study conducted experiments to develop a deterrent device that affects cetaceans' vision, touch, and hearing (acoustics), with the aim of reducing bycatch by preventing their entry into set nets. The experiments were carried out using captive small cetaceans, six bottlenose dolphins (*Tursiops truncatus*) and three Risso's dolphins, kept in Moriura Bay, Taiji.

An experimental platform was constructed to evaluate the effectiveness of the deterrent devices (Figure 4). The platform connected the rearing and feeding pens (each 12 m square), with a net stitched between the rearing and feeding pens, and weights were used to open and close a passageway that allowed small cetaceans to move between the pens. The deterrent devices were installed in this passageway, and cetacean movements during feeding times, as well as the frequency of their entries into the feeding areas were observed. For comparison, control experiments were also conducted without the deterrent devices.

Three types of deterrent devices were tested: (1) a light-reflecting spiral-type blind, (2) a spiked-type blind designed to provide visual and tactile deterrence, and (3) five types of acoustic stimuli delivered through an underwater speaker (Figure 5). Each trial lasted 30 minutes and was repeated for up to five consecutive days. These experiments investigated whether the cetaceans

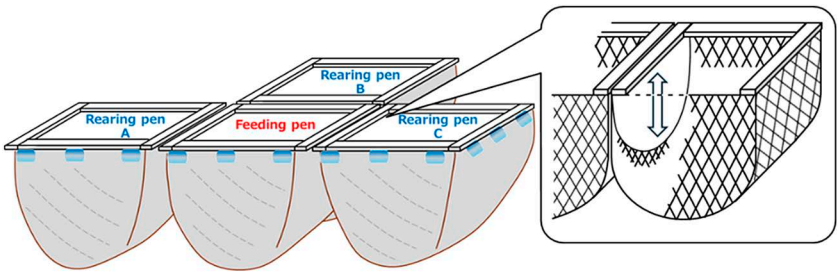

Figure 4. The experimental platform used to evaluate the effectiveness of the deterrent devices. It was configured to allow controlled opening and closing between the rearing and feeding pens via a rope equipped with a weight.

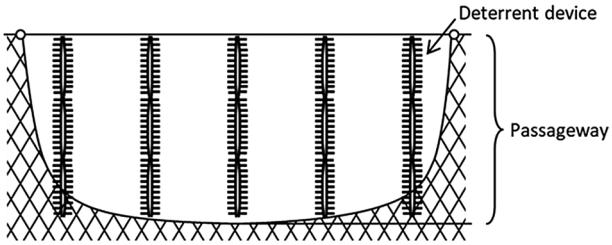

Figure 5. Schematic diagram of a deterrent device (spiked-type blind) installed on the passageway of the experimental platform used to evaluate the effectiveness of the deterrent devices.

exhibited aversion behavior toward each deterrent device and whether they became habituated to them. All experiments were conducted under the supervision of a veterinarian.

The results of the 2024/25 experiments showed that each type of deterrent device demonstrated some effectiveness. Compared with trials without deterrent devices, the number of passages through the spiked-type blind device was lower than through the spiral-type blind (52% vs. 86% of control levels). Similarly, the number of passages decreased by 68% when the acoustic deterrents were used compared with no sound. However, habituation occurred rapidly, in several cases, cetaceans initially avoided the deterrent device but passed through the gate without hesitation on the following day. These findings indicate that further refinement and improvement of deterrent devices are necessary. Future experiments will continue to use the established experimental platform to advance the development of effective bycatch prevention technologies.

CONCLUDING REMARKS

Following the establishment of a new ICR office in Taiji, a town with a long historical association with cetaceans, two new research initiatives on small cetaceans have been launched: school structure and movement of small cetaceans targeted by the drive fisheries and development of bycatch prevention devices for set nets. Although these initiatives are still in their preliminary phases, further investigation is being planned. These efforts are consistent with the ICR's longstanding commitment to contributing to the sustainable management of cetacean populations. The ICR will continue to actively address future research needs and respond to emerging issues.

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