

Commentary

The views expressed here are those of the author and do not necessarily reflect the views of the Institute of Cetacean Research

Comments on the use of lethal and non-lethal techniques in the studies of large whales

Genta YASUNAGA

Institute of Cetacean Research, 4–5 Toyomi-cho, Chuo-ku, Tokyo 104–0055, Japan

Japan designed and implemented whale research programs under special scientific permit in both the Antarctic and western North Pacific. These research programs ceased on 30 June 2019 when Japan withdrew from the International Convention for the Regulation of Whaling (ICRW). The research programs involved both lethal and non-lethal techniques. One of the issues frequently discussed among scientists was of the need to take whales for scientific purposes. I thought it would be appropriate to express my comments on this topic now that the research programs have ceased.

In my view, the following aspects are relevant when making a decision on lethal take of whales for scientific purposes: i) whether the samples and data to be collected are required for conservation and management of the whale stock (s); ii) the availability of non-lethal techniques for getting the same kind of samples and data; iii) the effect of the lethal take on the whale stock (s) involved.

Regarding i) above, it is recognized that considerable biological information is required for the appropriate conservation and management of whale resources. For example, samples and data are required to investigate relevant parameters such as growth, reproduction, recruitment, natural mortality, abundance, distribution, feeding ecology, environmental factors, interactions with other species, and the inter-annual variability of these factors (Ohsumi *et al.*, 2007). Some of this information can be obtained only through the lethal sampling of whales, for example earplugs for age estimation and sexual organs for investigation of maturity and pregnancy. These basic biological data are important for estimating several parameters such as age and length at sexual maturity, natural mortality, recruitment and so forth, which are important parameters in population dynamics models. Lethal sampling is also required to investigate stomach contents (qualitative and quantitative) which, in turn, allows us to investigate the feeding impact of the species (stock) in the ecosystem.

Regarding ii) above, scientists should make efforts to develop new non-lethal techniques to obtain the required information for conservation and management. In this sense, scientists of the Institute of Cetacean Research (ICR) have commenced several research projects to investigate the sexual maturity status of females through progesterone levels in blubber (Inoue *et al.*, 2019). They have also started researching the feasibility of the DNA methylation profiling in skin to obtain age information of whales (Tanabe *et al.*, 2020; Goto *et al.*, 2020). Skin and blubber can be obtained through biopsy sampling. The International Whaling Commission Scientific Committee (IWC SC) recommended that a field and analytical protocol should be developed to assist the evaluation of the utility of novel non-lethal techniques (IWC, 2016). In response to this recommendation, scientists from the ICR developed a protocol consisting of several questions that should be responded to in order to evaluate novel non-lethal techniques (Mogoe, 2018). The protocol consists of four questions: Question 1 is whether tissues or other kinds of samples can be obtained by a non-lethal technique. Question 2 is whether a sufficient number of samples for statistical analyses can be obtained by the non-lethal technique. Question 3 is whether the samples obtained by the non-lethal technique can produce scientific information comparable to that produced by a lethal sampling technique. Question 4 is whether the cost of obtaining the samples is reasonable for producing relevant scientific information. Question 1 and Question 2 are technical in nature. Question 3 is analytical while Question 4 is of a logistical nature. If the answers to all these questions are affirmative, then the non-lethal technique can be considered appropriate and feasible (Mogoe, 2018).

Regarding iii) above, only abundant species and stocks can be considered for lethal sampling. Furthermore, population dynamics models should be applied to evaluate the effect on the stocks of the number of whales taken lethally. For example, in the case of the former Japanese

whale research under special scientific permit in the Antarctic, the effect of the take of 333 whales on the stocks of Antarctic minke whales was examined based on Hitter-Fitter model, and results suggested no negative effect on the stocks (GOJ, 2018).

In summary, the issue of lethal versus non-lethal techniques to study whales is not a 'black and-white' matter. In making a decision on the need for lethal sampling, the utility of the target data and samples for conservation and management, the availability/feasibility of non-lethal techniques to obtain the same samples, as well as the status of the stock (s) should be considered.

REFERENCES

- Goto, M., Kitakado, T. and Pastene, L.A. 2020. A preliminary study of epigenetic estimation of age of the Antarctic minke whale *Balaenoptera bonaerensis*. *Cetacean Population Studies* 2: 5–14.
- Government of Japan. 2018. Research Plan for New Scientific Whale Research Program in the Antarctic Ocean (NEWREP-A). Available at: <https://www.jfa.maff.go.jp/j/whale/pdf/151127newrep-a.pdf>.
- Inoue, S., Yasunaga, G. and Pastene, L.A. 2019. Comparison of progesterone concentrations in blubber and plasma among female Antarctic minke whales of known reproductive status. *Fish Sci* 85: 971–977.
- International Whaling Commission. 2016. Report of the Expert Panel of the final review on the western North Pacific Japanese Special Permit Programme (JARPNI). Paper SC/66b/Rep06 presented to the IWC Scientific Committee, June 2016 (unpublished). 96 pp. [Available from the IWC Secretariat].
- Mogoe, T. 2018. Field and analytical protocol for the evaluation of novel non-lethal techniques in the Japanese whale research programs. *Technical Reports of the Institute of Cetacean Research (TEREP-ICR)* No. 2: 50–55.
- Ohsumi, S., Goto, M. and Otani, S. 2007. Necessity of combining lethal and non-lethal methods for whale population research and their application in JARPA. Paper SC/59/O2 presented to the IWC Scientific Committee, May 2007 (unpublished). 7 pp. [Available from the IWC Secretariat].
- Tanabe, A., Shimizu, R., Osawa, Y., Suzuki, M., Ito, S., Goto, M., Pastene, L.A., Fujise, Y. and Sahara, H. 2020. Age estimation by DNA methylation in the Antarctic minke whale. *Fish Sci* 86: 35–41.