



Corrigendum: Seasonal and Ontogenetic Variation in Depth Use by a Critically Endangered Benthic Elasmobranch and Its Implications for Spatial Management

James Thorburn^{1*}, Peter J. Wright², Edward Lavender¹, Jane Dodd³, Francis Neat⁴, Julien G. A. Martin⁵, Caroline Lynam⁶ and Mark James¹

¹ Scottish Oceans Institute, School of Biology, University of St Andrews, St Andrews, United Kingdom, ² Marine Laboratory, Marine Scotland Science, Aberdeen, United Kingdom, ³ NatureScot, Oban, United Kingdom, ⁴ Global Oceans Institute, World Maritime University, Malmö, Sweden, ⁵ Department of Biology, University of Ottawa, Ottawa, ON, Canada, ⁶ School of Biology, University of Aberdeen, Aberdeen, United Kingdom

Keywords: *Dipturus intermedius*, flapper skate, highest density intervals, home and core depth range, marine protected area, Rajidae, spatial ecology

A Corrigendum on

Seasonal and Ontogenetic Variation in Depth Use by a Critically Endangered Benthic Elasmobranch and Its Implications for Spatial Management

by Thorburn, J., Wright, P. J., Lavender, E., Dodd, J., Neat, F., Martin, J. G. A., Lynam, C., and James, M. (2021). *Front. Mar. Sci.* 8:656368. doi: 10.3389/fmars.2021.656368

OPEN ACCESS

Edited and reviewed by:

Adrian C. Gleiss,
Murdoch University, Australia

*Correspondence:

James Thorburn
jat21@st-andrews.ac.uk

Specialty section:

This article was submitted to
Marine Megafauna,
a section of the journal
Frontiers in Marine Science

Received: 16 August 2021

Accepted: 25 August 2021

Published: 21 September 2021

Citation:

Thorburn J, Wright PJ, Lavender E, Dodd J, Neat F, Martin JGA, Lynam C and James M (2021) Corrigendum: Seasonal and Ontogenetic Variation in Depth Use by a Critically Endangered Benthic Elasmobranch and Its Implications for Spatial Management. *Front. Mar. Sci.* 8:759630. doi: 10.3389/fmars.2021.759630

In the original article, in the **Discussion** paragraph 5, the reference (Brander, 1981) was incorrectly written as (Du Bait, 1976) in the sentence “Based on these rates and an estimated fecundity of 40 eggs per year (Brander, 1981).”

In the original article, in the **Discussion** paragraph 5 the reference for (Little, 1995) was incorrectly written as (Little, 1997) in the sentence “Not every female over 200 cm showed prolonged use of shallow water, which could be explained by a biennial reproductive cycle, previously suggested for flapper skate (Little, 1995).”

In the original article, there was an error. “Based on these rates and a maximum fecundity of 40 eggs per year.” This value of 40 is an estimated fecundity, not a maximum.

A correction has been made to Discussion, paragraph 5. The below correction includes the updated references mentioned above.

“Other drivers for seasonal and ontogenetic depth use in skate species may be related to reproductive events (Hunter et al., 2006). Common skate were thought to lay eggs over the spring and summer (Whitehead et al., 1986), but little is known about the egg-laying behaviour of flapper skate specifically. A preference for depths <50 m was most noticeable in skate over 200 cm TL, all females assumed to be mature. These shallow depth ranges are similar to those of a flapper skate egg nursery identified on the west coast of Scotland (NatureScot, 2021). This suggests that the increased use of shallower depths may be caused by mature females utilising habitats suitable for egg deposition. Unlike viviparous species, female oviparous elasmobranchs need to remain in the vicinity of an egg nursery for prolonged periods while depositing eggs. Egg-laying rates for Rajidae have been reported between 0.24 and 1 egg per day (Holden et al., 1971; Concha et al., 2012). Based on these rates and an estimated fecundity of 40 eggs per year (Brander, 1981), mature

female flapper skate may be associated with egg nurseries for between 40 and 160 days. This could result in the extended preference for shallow depths observed in some large females. Variation in the timing of egg deposition among females through an extended egg-laying season, as shown in other skate species (Luer et al., 2007), may account for the individual variation in shallow-water use. Not every female over 200 cm showed prolonged use of shallow water, which could be explained by a biennial reproductive cycle, previously suggested for flapper skate

(Little, 1995). It is also possible that females lay eggs at different depths. However, as egg nurseries are thought to be selected based on the provision of optimal conditions for embryo development (Leonard et al., 1999; Hoff, 2008, 2010), variation in egg nursery habitat is likely to be limited.”

The authors apologize for these errors and state that this does not change the scientific conclusions of the article in any way. The original article has been updated.

REFERENCES

- Brander, K. (1981). Disappearance of common skate *Raja batis* from Irish Sea. *Nature* 290, 48–49. doi: 10.1038/290048a0
- Concha, F., Oddone, M. C., Bustamante, C., and Morales, N. (2012). Egg capsules of the yellownose skate *Zearaja chilensis* (Guichenot 1848) and the roughskin skate *Dipturus trachyderma* (Kreff and Stehmann 1974)(Rajiformes: Rajidae) from the south-eastern Pacific Ocean. *Ichthyol. Res.* 59, 323–327. doi: 10.1007/s10228-012-0293-z
- Hoff, G. R. (2008). A nursery site of the Alaska skate (*Bathyraja parmifera*) in the eastern Bering Sea. *Fish. Bull.* 106, 233–244.
- Hoff, G. R. (2010). Identification of skate nursery habitat in the eastern Bering Sea. *Mar. Ecol. Prog. Ser.* 403, 243–254. doi: 10.3354/meps08424
- Holden, M. J., Rout, D. W., and Humphreys, C. N. (1971). The rate of egg laying by three species of ray. *ICES J. Mar. Sci.* 33, 335–339. doi: 10.1093/icesjms/33.3.335
- Hunter, E., Berry, F., Buckley, A. A., Stewart, C., and Metcalfe, J. D. (2006). Seasonal migration of thornback rays and implications for closure management. *J. Appl. Ecol.* 43, 710–720. doi: 10.1111/j.1365-2664.2006.01194.x
- Leonard, J. B., Summers, A. P., and Koob, T. J. (1999). Metabolic rate of embryonic little skate, *Raja erinacea* (Chondrichthyes: Batoidea): the cost of active pumping. *J. Exp. Zool.* 283, 13–18. doi: 10.1002/(sici)1097-010x(19990101)283:1<13::aid-jez3>3.0.co;2-s
- Little, W. (1995). Common skate and tope: first results of Glasgow Museum's tagging study. *Glasgow Natural.* 22, 455–465.
- Luer, C. A., Walsh, C. J., Bodine, A. B., and Wyffels, J. T. (2007). “Normal embryonic development in the clearnose skate, *Raja eglanteria*, with experimental observations on artificial insemination,” in *Biology of Skates*, eds D. A. Ebert and J. Sulikowski (Berlin: Springer), 133–149.
- NatureScot (2021). *Flapper Skate Protection: NatureScot Advice to the Scottish Government*. Edinburgh: The Scottish Government.
- Whitehead, P. J., Bauchot, M. L., Hureau, J. C., Neilson, J., and Tortonese, E. (1986). *Fishes of the North-Eastern Atlantic and the Mediterranean*, Vol. I, II and III. Paris: United Nations Educational, Scientific and Cultural Organisation (UNESCO).

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2021 Thorburn, Wright, Lavender, Dodd, Neat, Martin, Lynam and James. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.