



UNIVERSITY OF LEEDS

This is a repository copy of *Assessment of impacts and potential mitigation for icebreaking vessels transiting pupping areas of an ice-breeding seal*.

White Rose Research Online URL for this paper:

<https://eprints.whiterose.ac.uk/117227/>

Version: Supplemental Material

Article:

Wilson, SC orcid.org/0000-0002-1239-1912, Trukhanova, I orcid.org/0000-0001-9058-4481, Dmitrieva, L et al. (8 more authors) (2017) Assessment of impacts and potential mitigation for icebreaking vessels transiting pupping areas of an ice-breeding seal. *Biological Conservation*, 214. pp. 213-222. ISSN 0006-3207

<https://doi.org/10.1016/j.biocon.2017.05.028>

Reuse

Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.



eprints@whiterose.ac.uk
<https://eprints.whiterose.ac.uk/>

Assessment of impacts and potential mitigation for icebreaking vessels transiting pupping areas of an ice-breeding seal

Susan C. Wilson, Irina Trukhanova, Lilia Dmitrieva, Evgeniya Dolgova, Imogen Crawford, Mirgaliy Baimukanov, Timur Baimukanov, Bekzat Ismagambetov, Meyrambek Pazyzbekov, Mart Jüssi, and Simon J. Goodman

APPENDIX A

Supplementary figures A1–A8

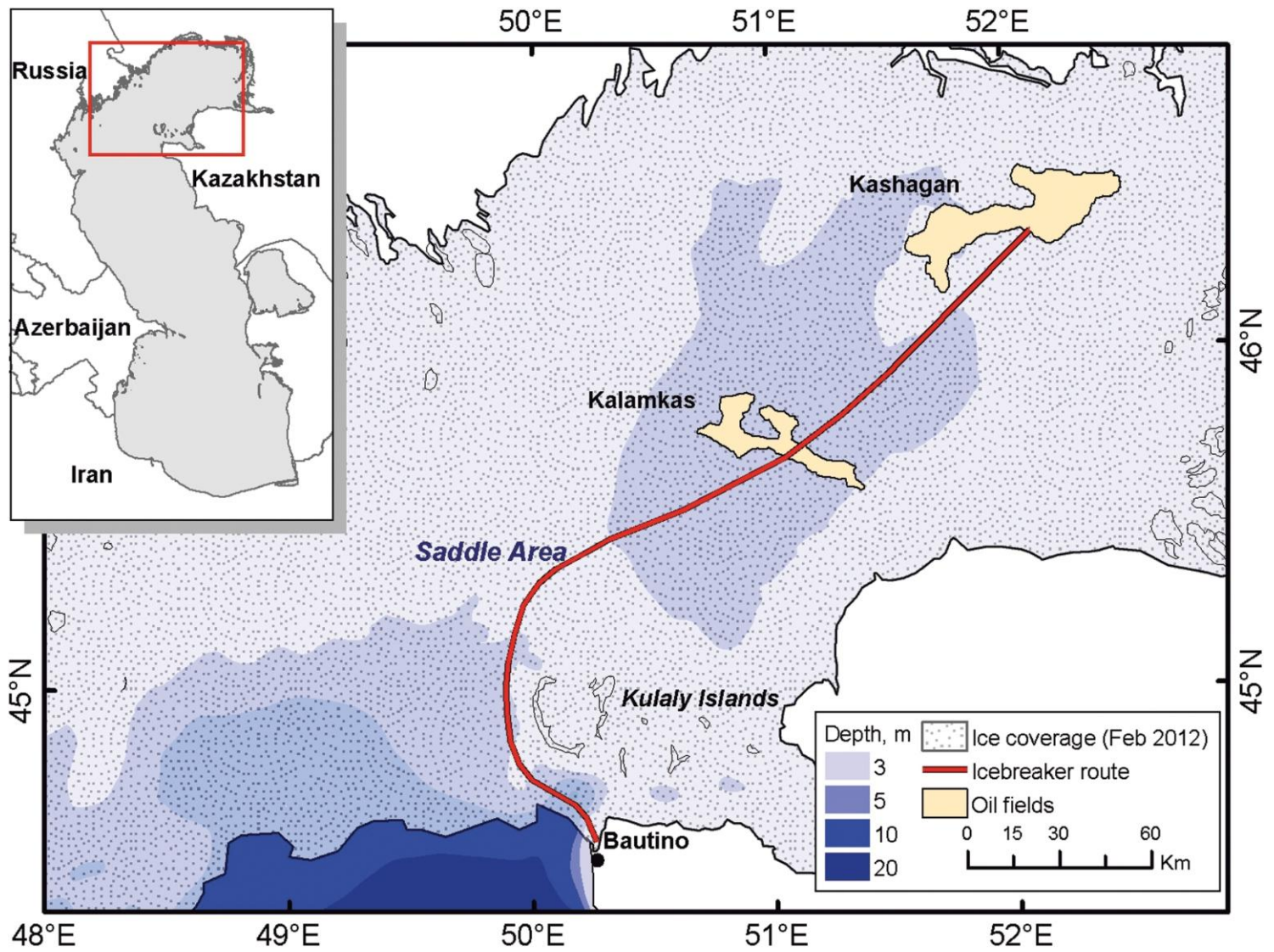


Fig. A1. Map of the north east Caspian Sea showing the approximate maximum limits of the ice edge (2012 data), plus the Kashagan and Kalamkas oilfields (from Wilson et al. 2017, figure used under Creative Commons licence). The red line indicates the approximate centre line of the navigation corridor for vessels travelling between Bautino and Kashagan.

Reference:

Wilson, S.C., Dolgova, E., Trukhanova, I., Dmitrieva, L., Crawford, I., Baimukanov, M. and Goodman, S.J., 2017. Breeding behavior and pup development of the Caspian seal, *Pusa caspica*. *Journal of Mammalogy*, 98(1): 143–153, doi: 10.1093/jmammal/gyw176

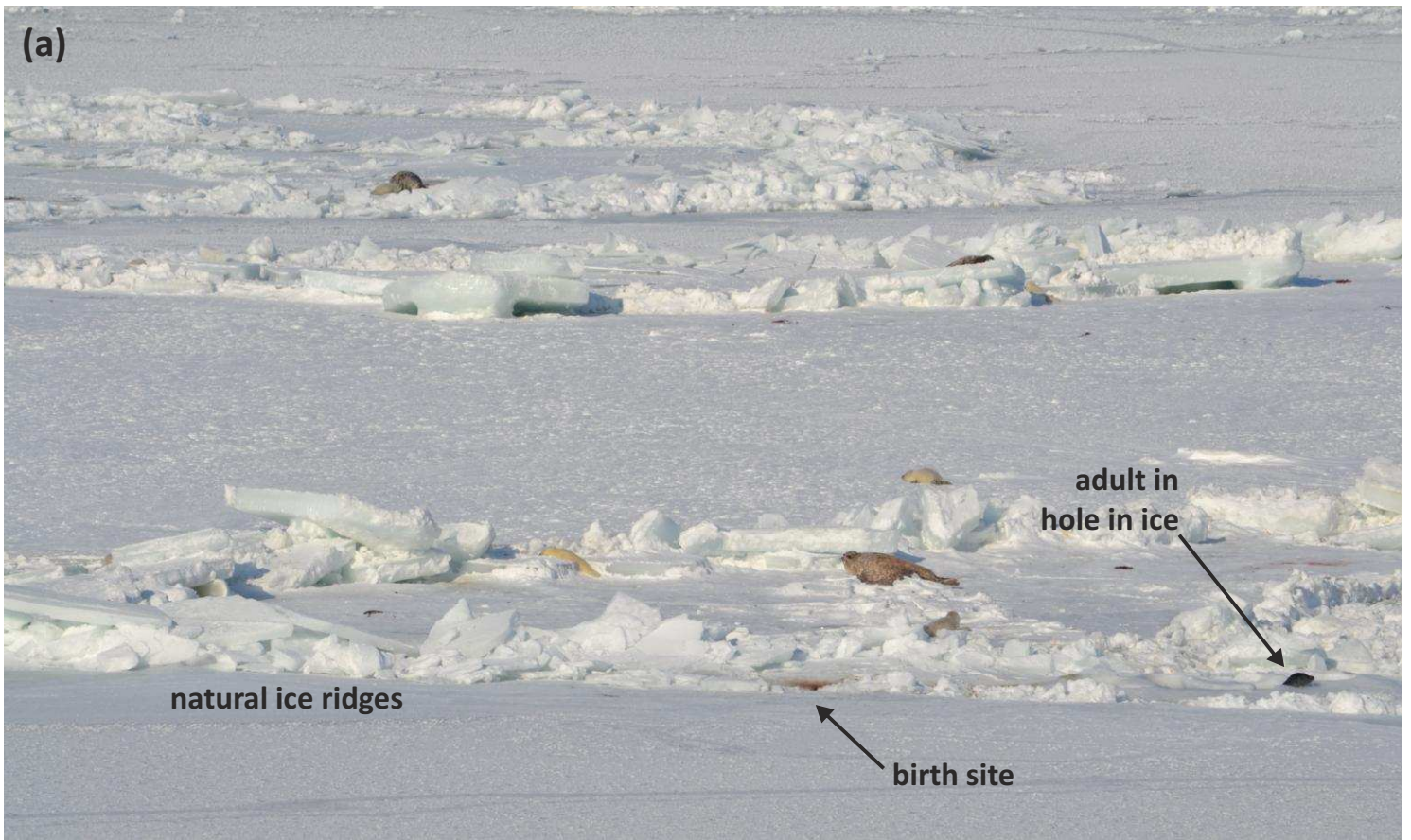


Fig. A2 (part 1 of 2). Undisturbed pupping habitat.

(a) Several pups and mothers in ice rubble field.

(b) Mother-pup pair beside a natural polynya; 2nd adult in the water.



Fig. A2 (part 2 of 2). Pupping habitat disturbed by vessels.

(c) Lone pup (unusually dark lanugo) in brash ice created by vessels, attempting to haul out on area of more solid ice.

(d) Pup reluctant to follow its mother into the brash ice created by vessels.

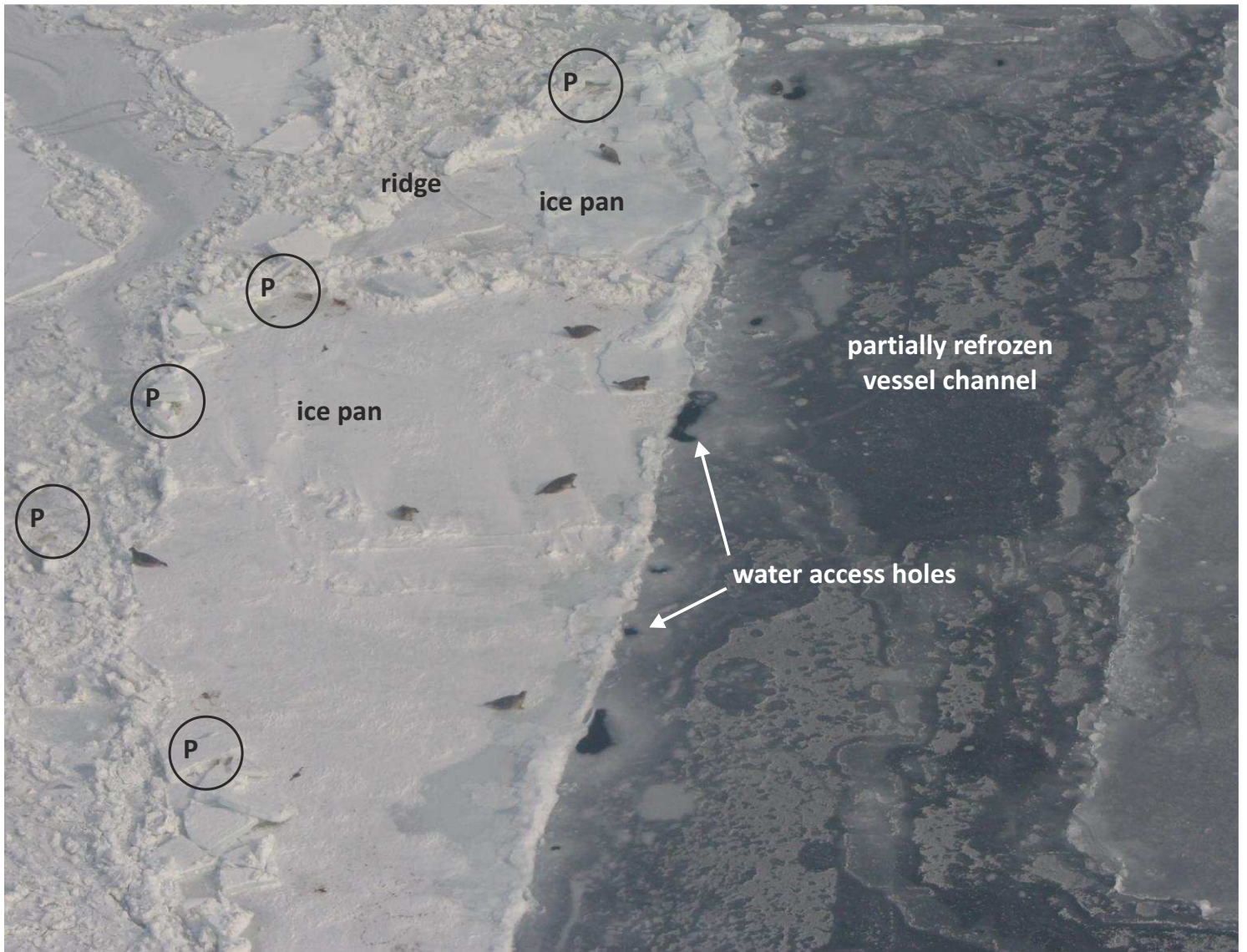


Fig. A3. Mothers have colonised shipping channel edge. Pups (P) have been born close to the ice ridges surrounding the two ice pans.

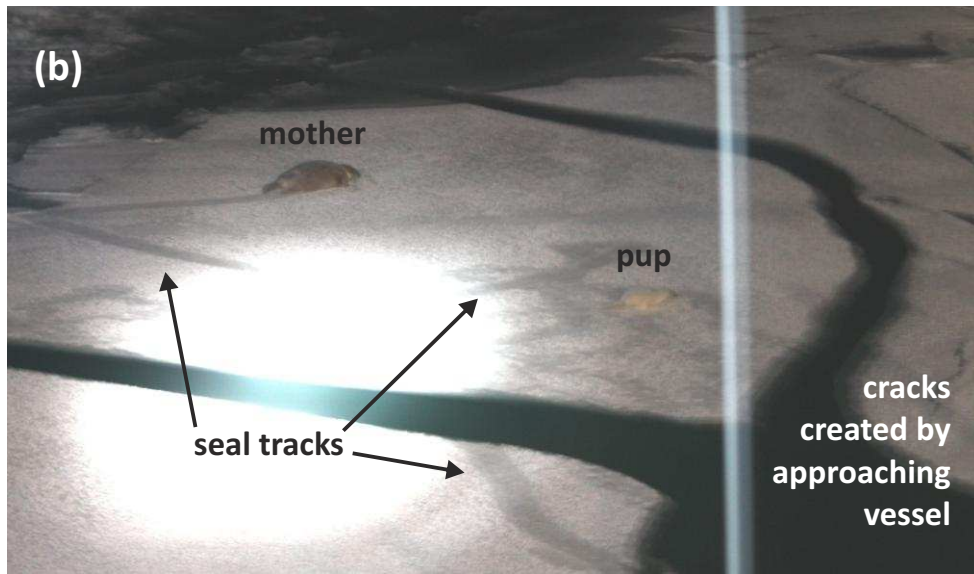
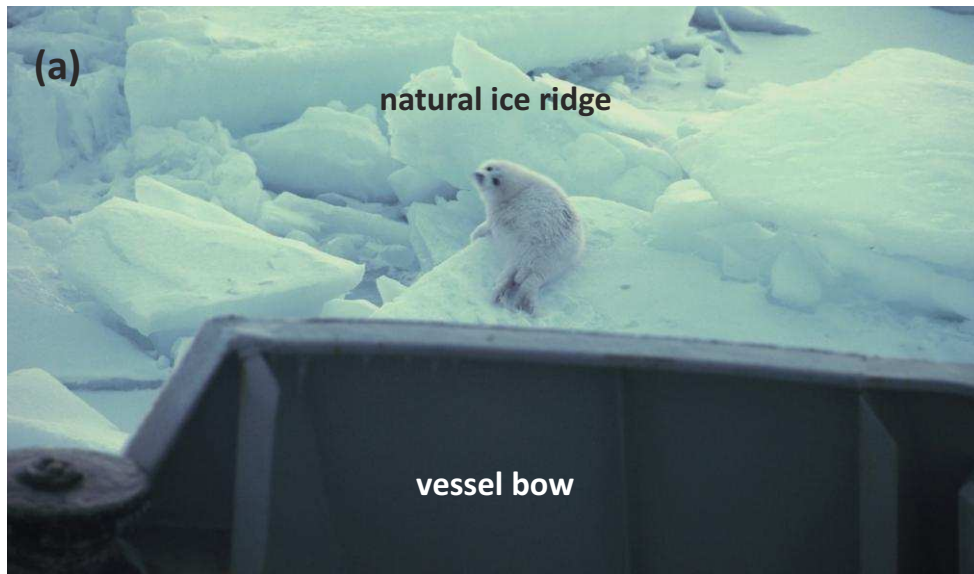


Fig. A4. Vessels transiting pupping habitat.

(a) Vessel passing through previously unbroken ice-rubble pupping habitat.

(b) Vessel at night passing through previously undisturbed habitat. The pup is visible to left of ship mast, the mother at top left of photo.

The pup has made multiple tracks on the ice towards the edge of the ice crack.

(c) Vessel passing along a pre-existing ship channel, which has been colonised by mothers and newborn pups.

Mother and pup move away from the birth site just ahead of the vessel.



Fig. A5. Lone pups seeking cover as vessel passes.

(a) Lone pup takes refuge under an ice slab in nursery site.

(b) Moulted (stage 4) lone pup seeks refuge in ice ridge cover as vessel passes.

Pup leaves trail of urine and faeces as it moves away from vessel.

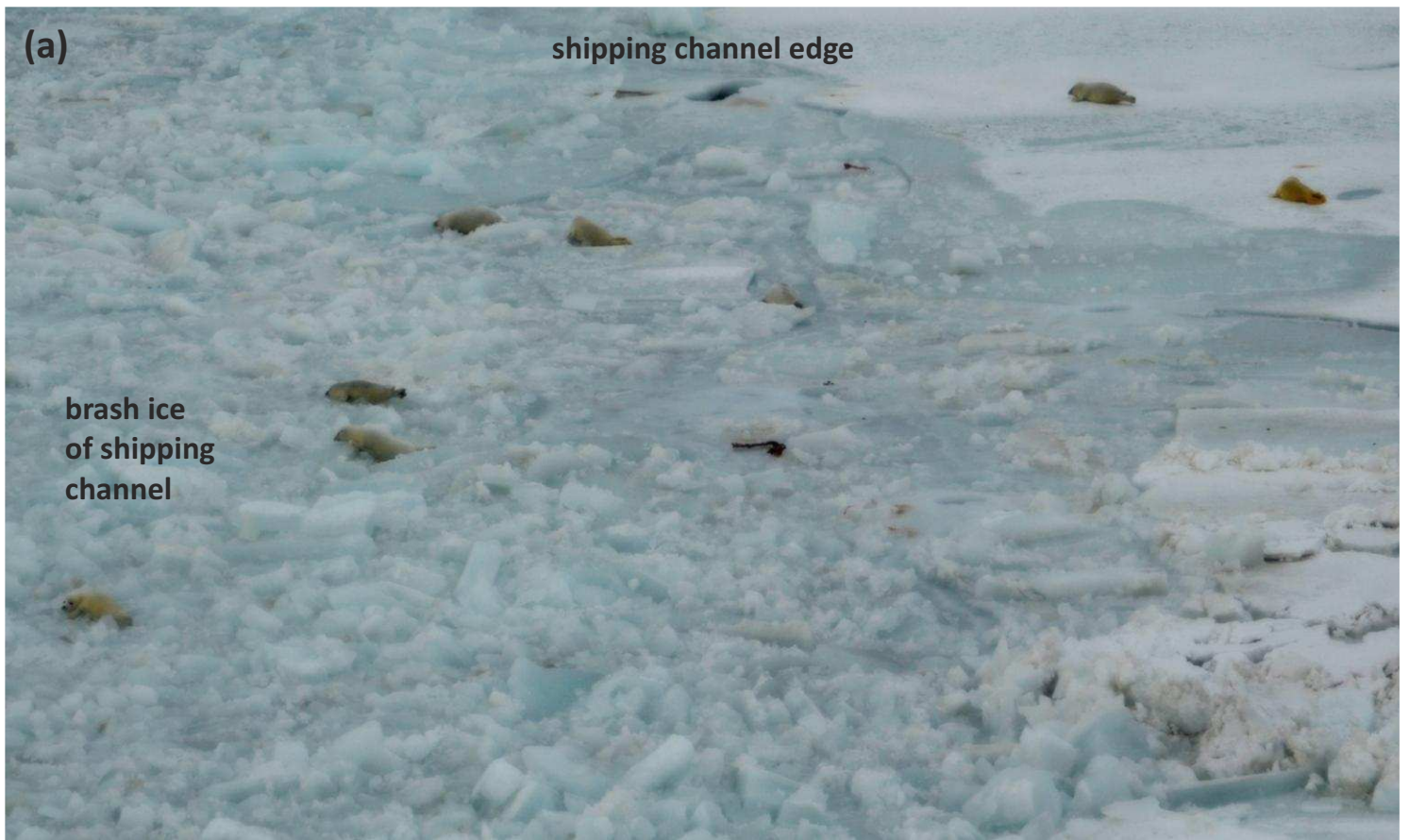


Fig. A6. Lone pup groups along edge of shipping channel.

(a) An unusual aggregation of lone lanugal pups, six of eight in photo straying into brash ice of shipping channel, ahead of vessel.

(b) Three lone pups following one another away from vessel; the second pup is much thinner than normal for pups in partial lanugal moult (stage 3).

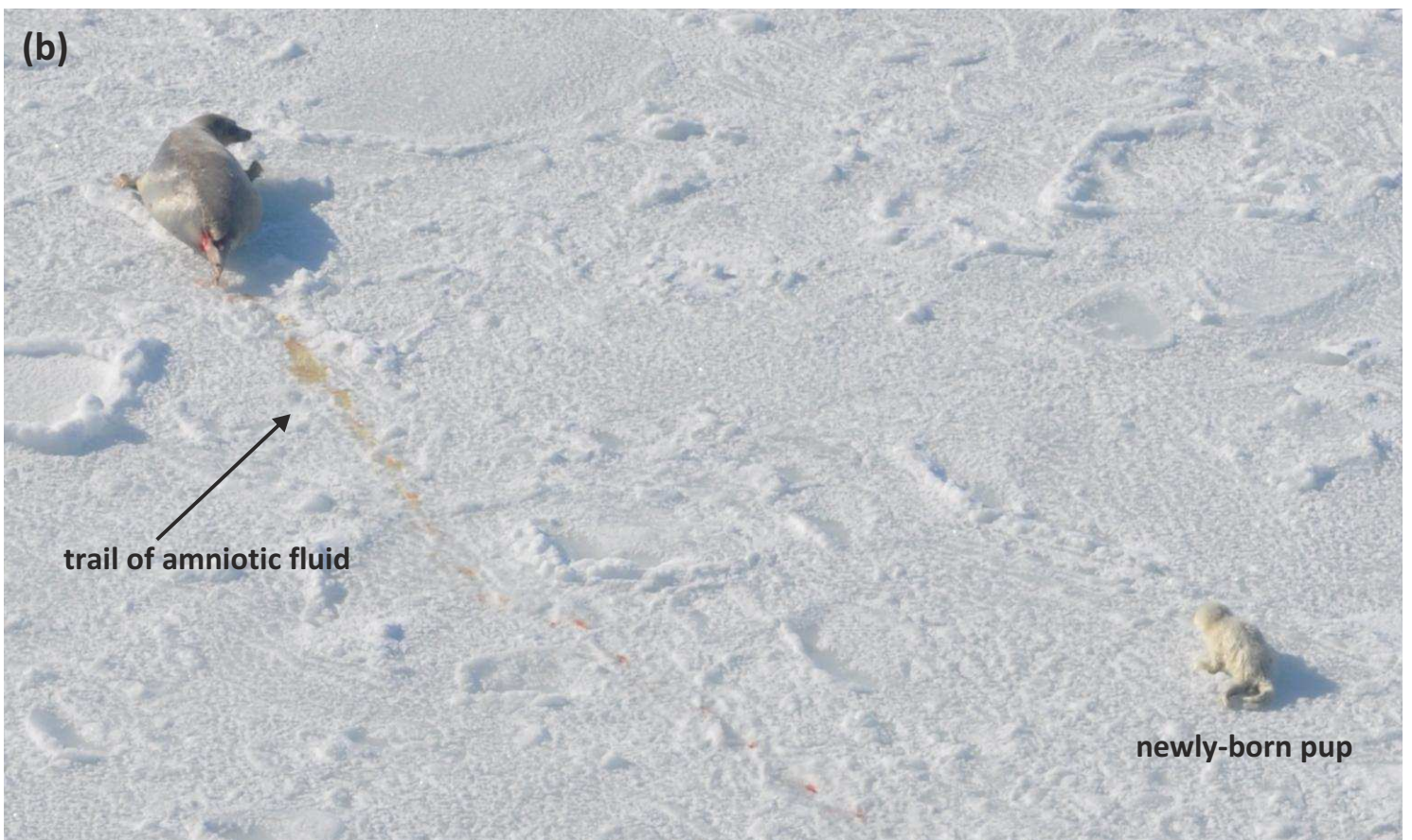
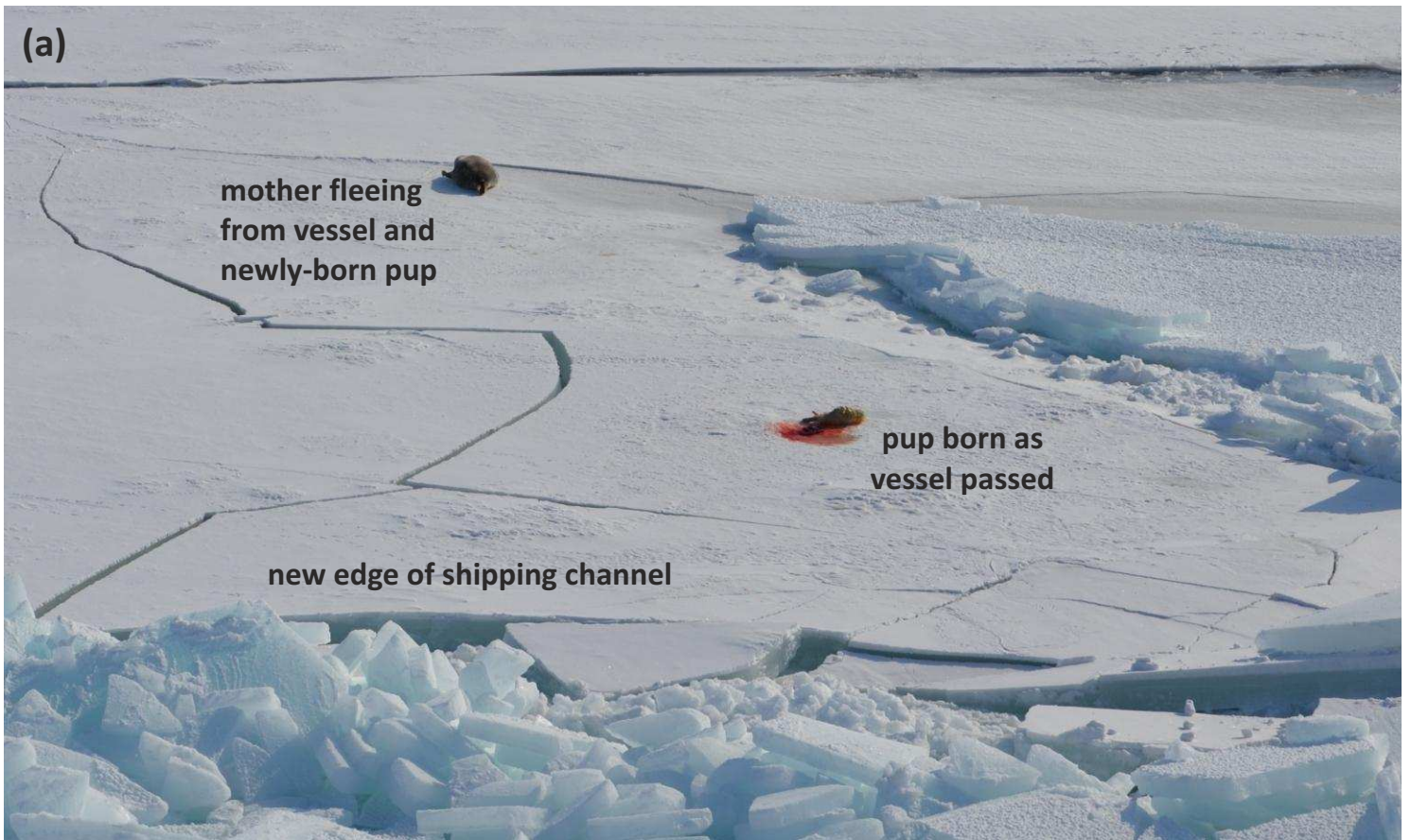


Fig. A7. Parturient mothers move away.

(a) Mother gives birth as she moves away from vessel. The vessel passage has broken the edge of the nursery site and caused a crack across the area of the birth.

(b) Mother moves away from vessel just after giving birth, leaving trail of amniotic fluid.

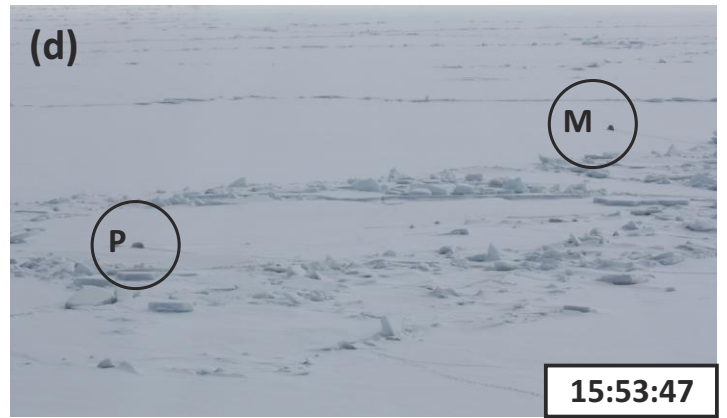
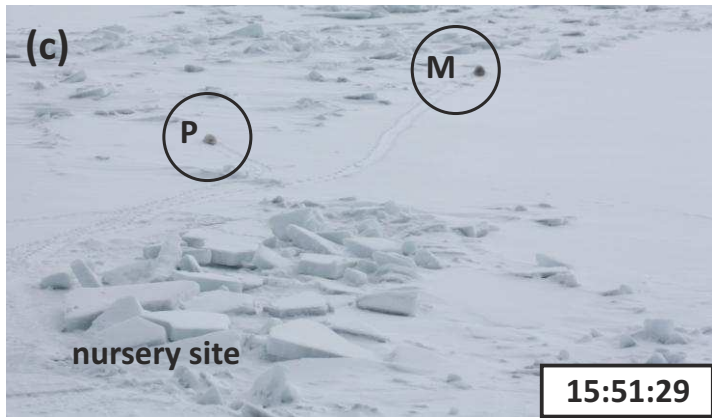


Fig. A8. Separation of a mother-pup pair as they move away from the side of the vessel.
(a) Pup follows mother as they start to move away from nursery site (c. 60m to side of vessel).
(b) Pup's direction diverges from mother's track.
(c) Mother and pup continue on totally different trajectories.
(d) Mother and pup continue to move, now about 200m apart with ice ridges between them, nearly 3 minutes after the start.