The following supplement accompanies the article

Physical and ecological factors explain the distribution of Ross Sea Weddell seals during the breeding season

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Supplement 1.

Instructions for Satellites Over Seals (SOS)

Campaign #1, Spot Our Seals in the Ross Sea.

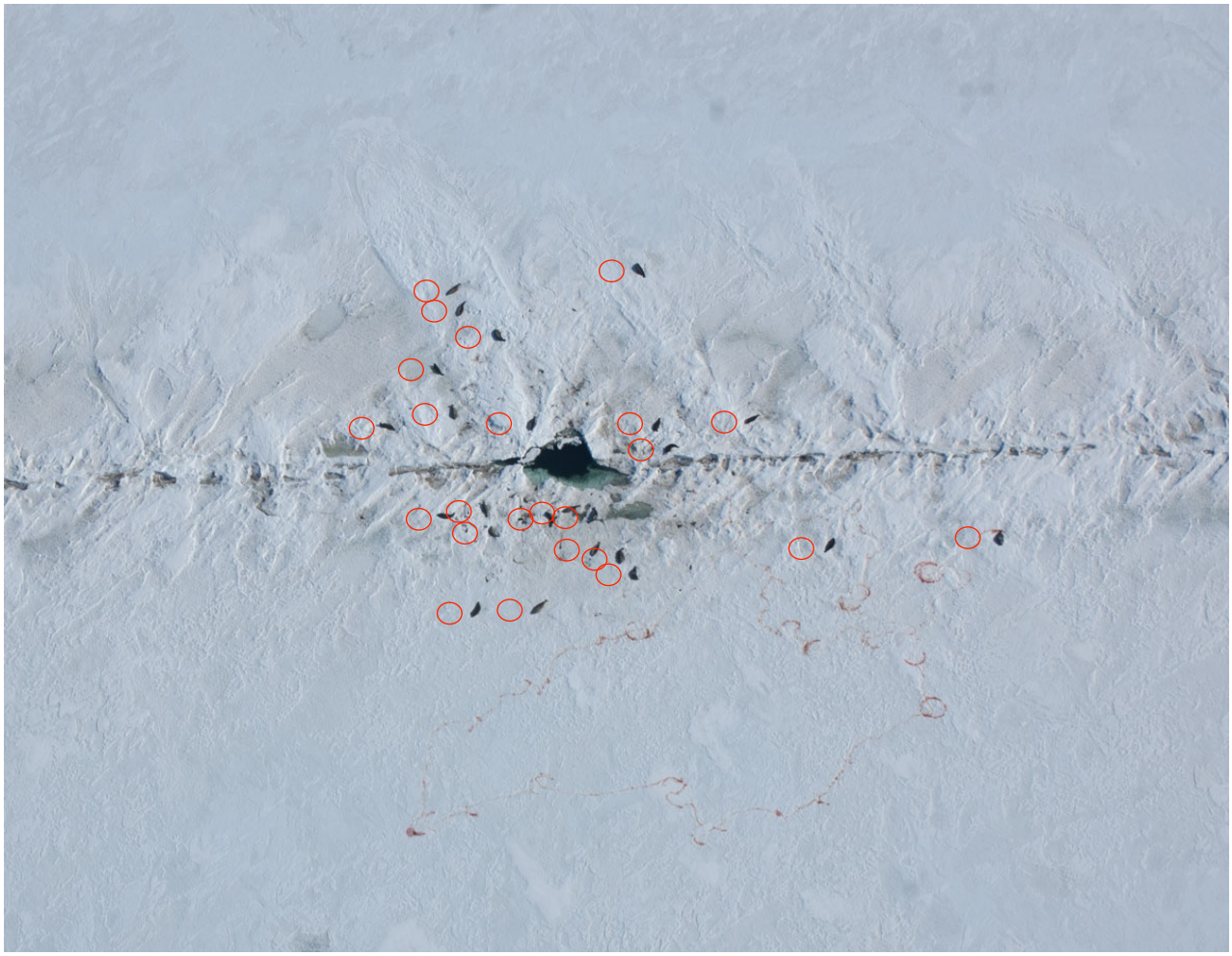
OVERVIEW

The Weddell seal is an iconic species that is important to the Antarctic ecosystem, but nobody knows how many there are. The Ross Sea in Antarctica is the most pristine part of the ocean left, but is threatened by a fishery that targets Chilean seabass – important food for the Weddell seal. We want to know whether the fishery is affecting the seal population; please help us count seals in the Ross Sea!

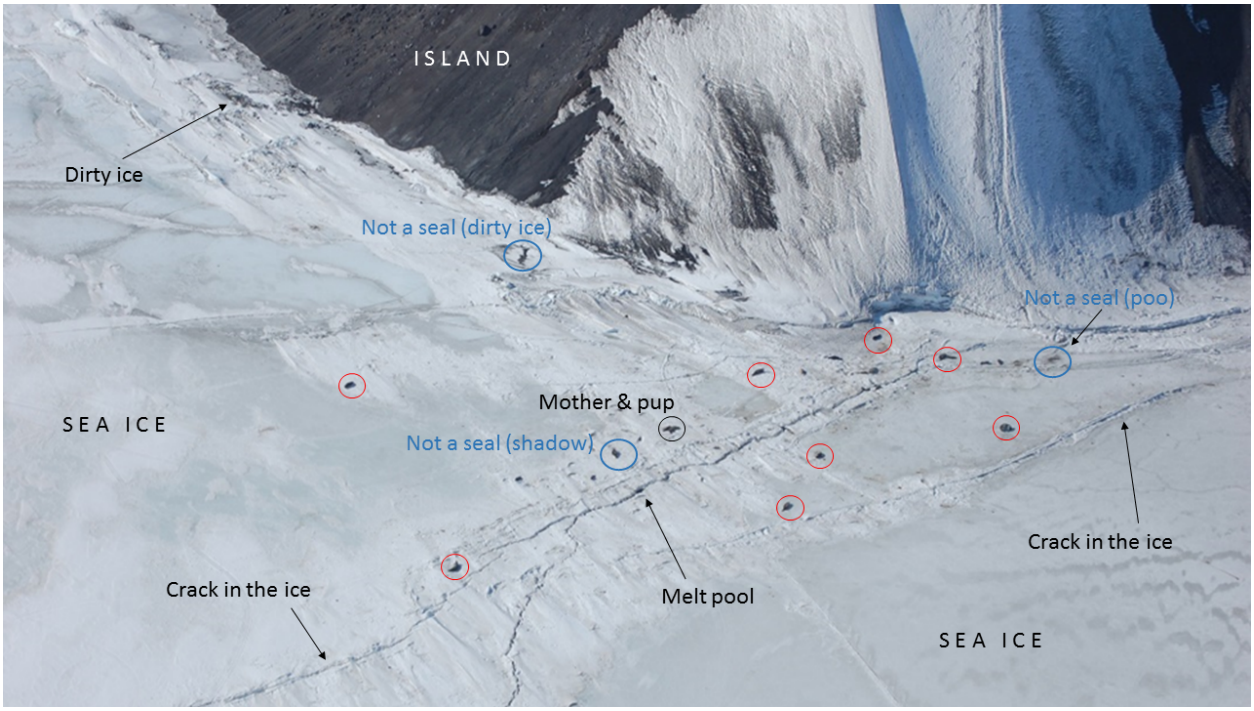
Weddell seal on fast ice (3-4 meters = 10-11 ft long), notice the distinct shape (elongated 'tear drop') and dark color.

Instructions:

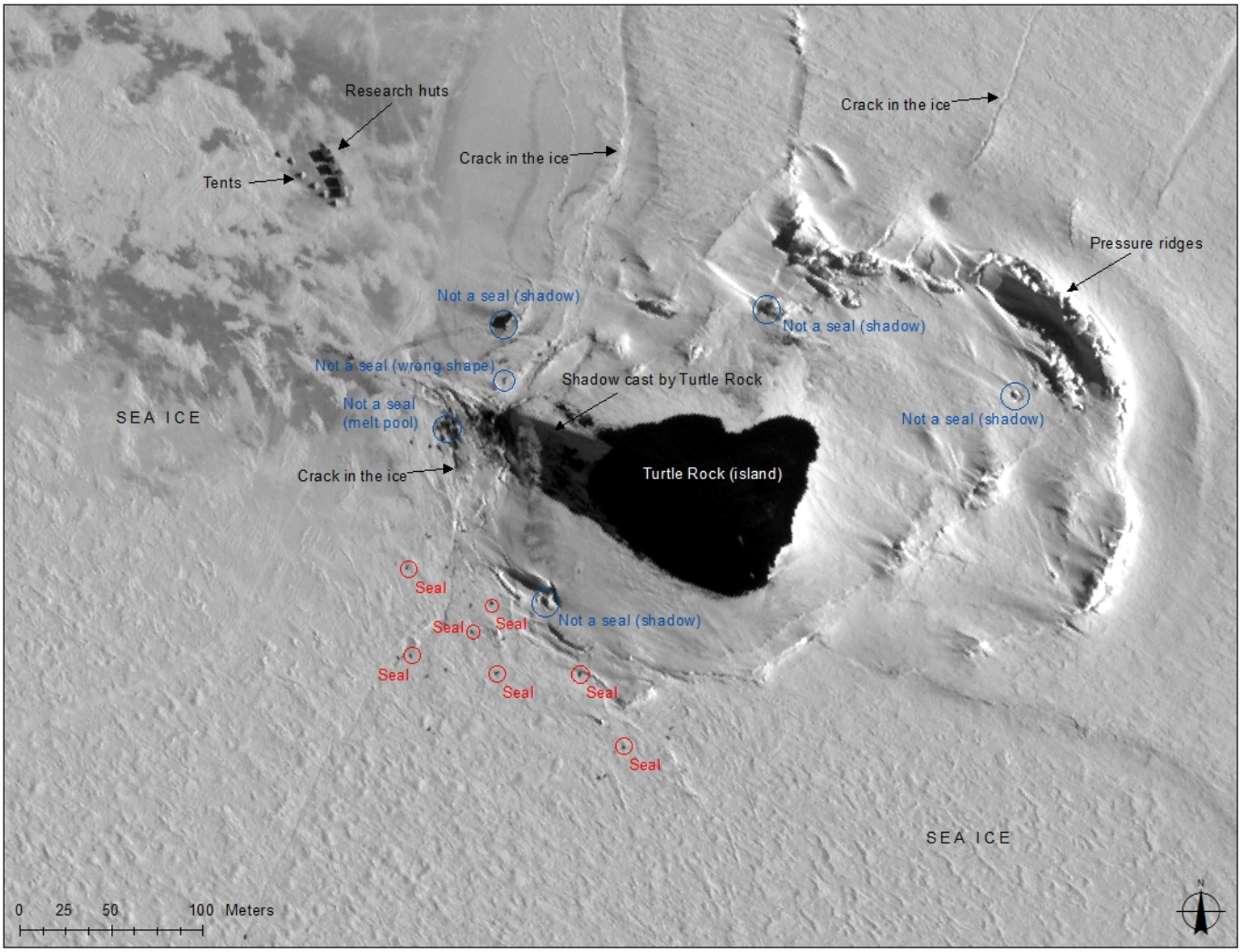
1. Place a tag in the center of every seal you find. Seals will appear as dark, tear-drop shapes, usually near a crack in the ice.
2. If it appears there are two seals touching or almost touching, place only one tag at that location. The smaller individual is a nursing pup and usually has its head resting on its much larger mother.
3. Shadows of large seals may appear as two seals. Check for the distinct shape (probably smaller) of the supposed second seal; if it is smaller and grayer then it is a shadow.



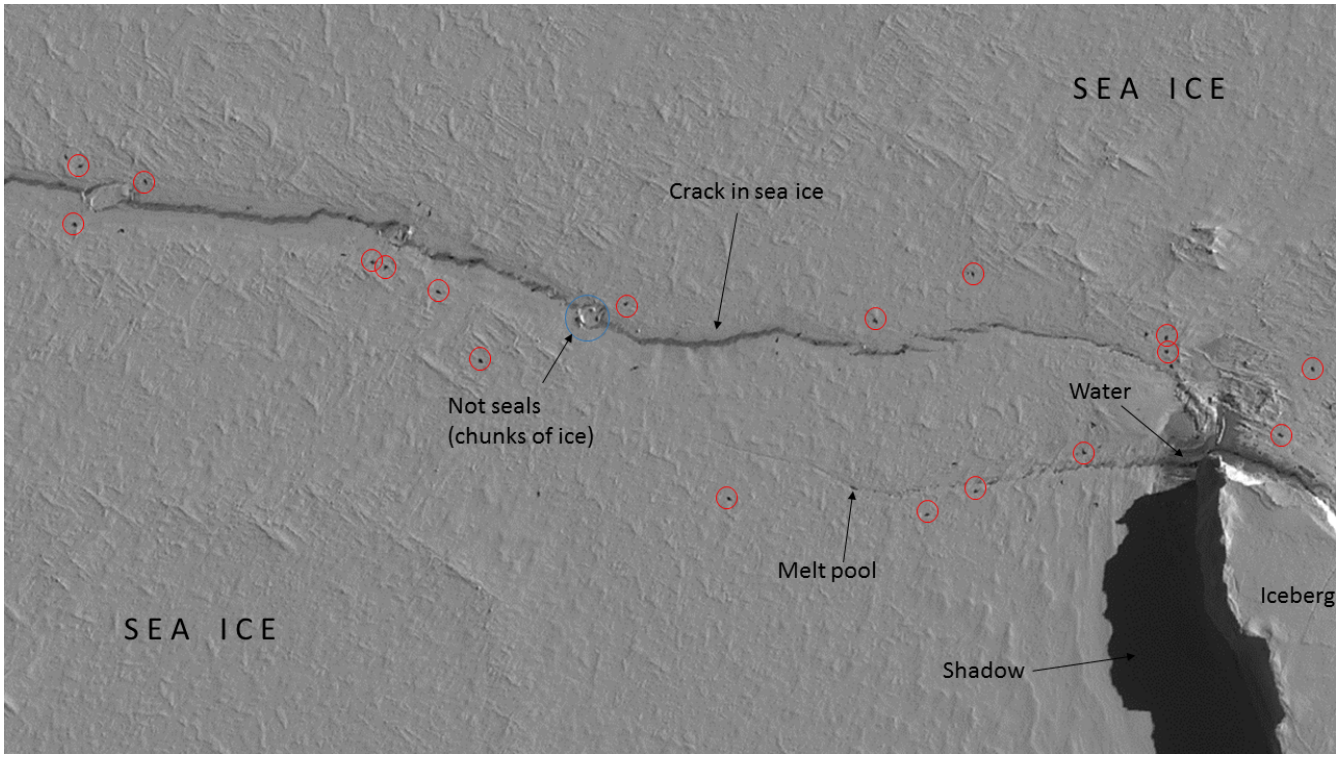
An aerial photo of a group of Weddell seals (n = 24) around a breathing hole which is along a crack in the sea ice.



An aerial picture of Weddell seals (circled in red) along a crack in the fast ice (sea ice fastened to land) near an island.



A WV-01 satellite picture of Turtle Rock in Erebus Bay, Antarctica. Red circles indicate seals - they are dark and very close to cracks in the sea ice. Many items can be mistaken for seals, such as shadows, melt pools, and rocks. A helpful tip is to discard any dark-colored feature that is too big or a different shape than a seal.



A WV-01 satellite picture of seals (circled in red) along a tide crack on fast ice. Not all seals are circled. Compare the seals in this image with the close ups and aerial images shown earlier to generate an image in your mind of what a seal looks like, and how it relates to its environment, from different distances away.

Supplement 2.

CrowdRank algorithm. As "features" are tagged via the Tomnod online platform (in our case, presumptive seals; here we assume that a feature is a seal; Figure 2), the CR algorithm clusters the tags and calculates a score for each cluster (the "feature CR score") as a metric of how much agreement exists among users that the cluster is a feature. The feature CR score is calculated as the joint users' agreement on a feature for all users who identified it (by placing a tag on it), and those who inspected the area and did not tag it. Hence, the feature CR score is based on which users placed a tag in the cluster, and which users viewed the area but did not place a tag. The probability of correctly identifying a feature, or user accuracy score, is uniquely estimated for all Tomnod users and is calculated based on how much each user agreed with peers in identifying and tagging features (Barrington et al. 2011). Users who agree with each other on identifying and tagging the same features receive high probability values, with the clusters upon which they agree receiving a high CR score as well – meaning that such clusters are more likely to be signifying a feature on the icescape. By the same reasoning, users who disagree with other users receive low probability values and reduce the CR score of clusters they tag. This user accuracy score weights all the user's views and tags in the campaign. In summary, tags and views by high-score users are trusted, while those of only low-score users are distrusted (Barrington et al. 2011). Upon review of the features vis-a-vis expert search we are confident that any seal(s) in the images were most likely tagged, and that cells with no seals in them were accurately assigned no features.