

Biologging reveals behavioral coordination of Adélie penguins traveling in groups

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Collective behavior is prevalent in wild animals and brings various benefits to members of the group. However, collective behavior can also be costly, as each individual in a group needs to coordinate their behaviors to maintain group cohesion. Documenting when and how wild animals coordinate their behavior in a group is important to understand the cost and benefit of collective behavior, but there have been limited studies on free-ranging animals due to the difficulties in the observation. Penguins are known to breed colonially, travel, and forage at sea in groups, though the dynamics and behavioral coordination of group members remain unknown.

Here, we used biologging to examine the behavioral coordination of Adélie penguins traveling in groups from the breeding colony to the land-fast sea-ice edge for foraging near the Syowa Station, East Antarctica. GPS tracking showed that three groups of seven birds (2, 2, and 3, out of 14 tracked birds) departed the colony, traveled 39.7-41.3 km for 14.8-16.7 hours, and reached the ice edge together. In all three groups, individuals adjusted their traveling speed to each other, maintaining group cohesion until reaching the ice edge. We also collected records of the 3-axis acceleration for one group of three birds, which allowed us to classify behaviors (resting, walking, or tobogganing) and examine the coordination of behaviors among group members in detail. The results showed two possibilities of mechanisms of synchronous traveling. First, penguins matched the timing of rest between individuals, suggesting that the rest of one individual initiated the rest of the others. Second, the time spent for walking/tobogganing differed among individuals, reflecting differences in locomotion speed. The individual of slower travel speed moved a relatively longer distance by tobogganing, a fast way of moving, to catch up with the group. Our results suggest that Adélie penguins continuously maintain group cohesion while traveling to the foraging site by coordinating behaviors depending on the social context.