

Activity patterns and abundances of Andean Flamingo (*Phoenicoparrus andinus*) at two contrasting wetland sites in Argentina

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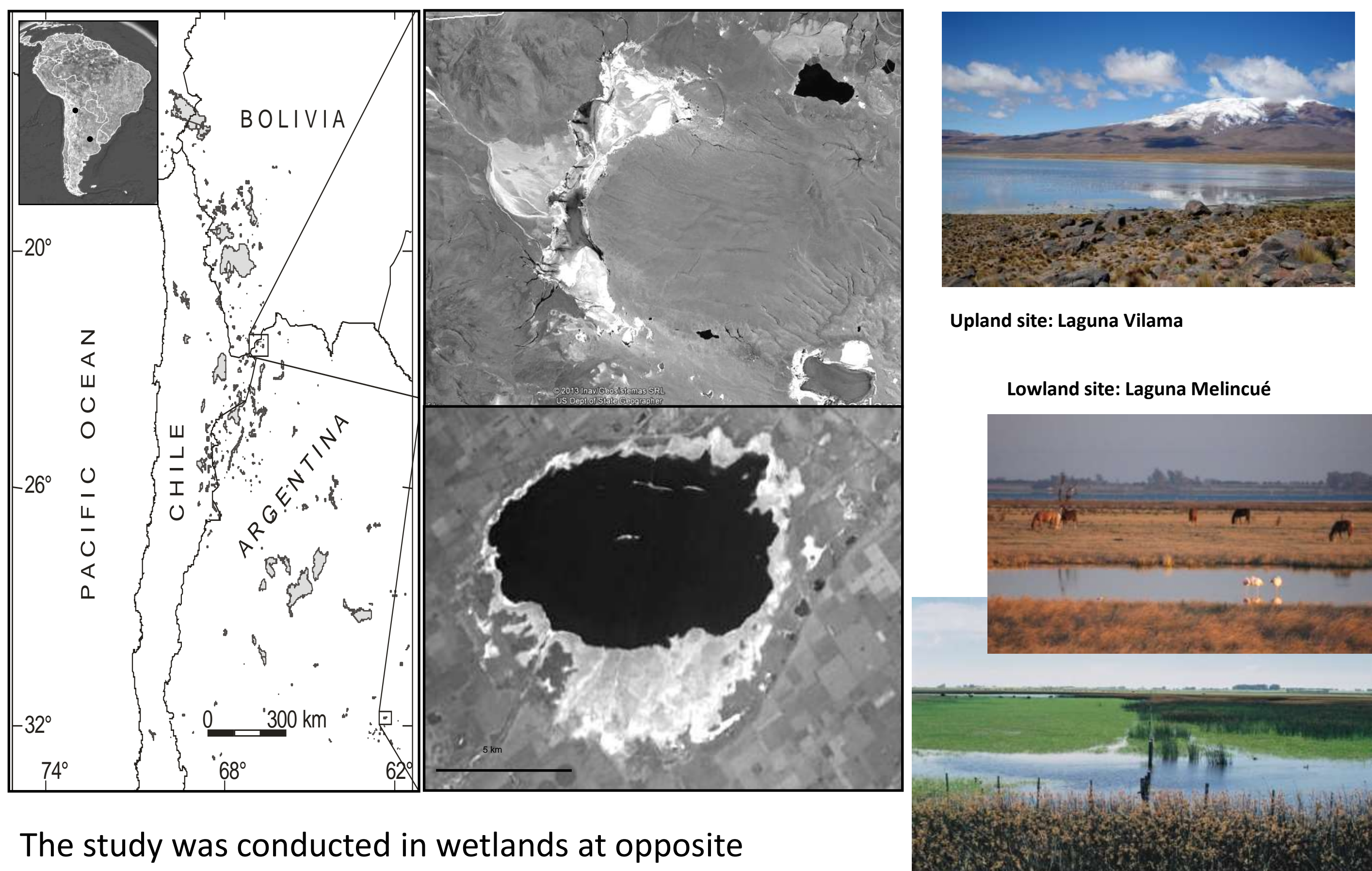
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Abstract

The Andean Flamingo (*Phoenicoparrus andinus*), one of three flamingo species in southern South America makes complementary and alternative use of high Andean wetlands in Argentina, Bolivia, Chile and Peru, and lowland wetlands in Argentina over its life cycle. Previous studies have focused on its behavior at Andean sites, but there are no studies on flamingo at lowland sites. Therefore, we analyzed the activity patterns, marching displays and individual abundance of this flamingo species at two contrasting wetland sites, Laguna Vilama, located at 4500 m a.s.l. in northwestern Argentina and used in summer during the breeding season, and Laguna Melincué, a lowland wetland located at 84 m a.s.l. in central east Argentina and used in winter during the non-breeding season. There were marked differences in flamingo abundance and activity patterns between sites and years. At Laguna Vilama, flamingos were feeding most of the time (95%), whereas at Laguna Melincué, flamingos showed a broader range of behaviors, with only a 60% of the time spent feeding. We did not record marching displays at Laguna Vilama, whereas at Laguna Melincué we recorded marching events in each of the three sampling years, being more frequent and lasting longer in the year with higher abundance of Andean Flamingos. The differences in behaviors at these sites are associated with resource quality and availability and with timing of the reproductive cycle, with lowland wetlands providing critical habitats for courtship displays that influence reproductive success of this species breeding colonies in high Andean wetlands.

Contrasting wetlands: Vilama and Melincué



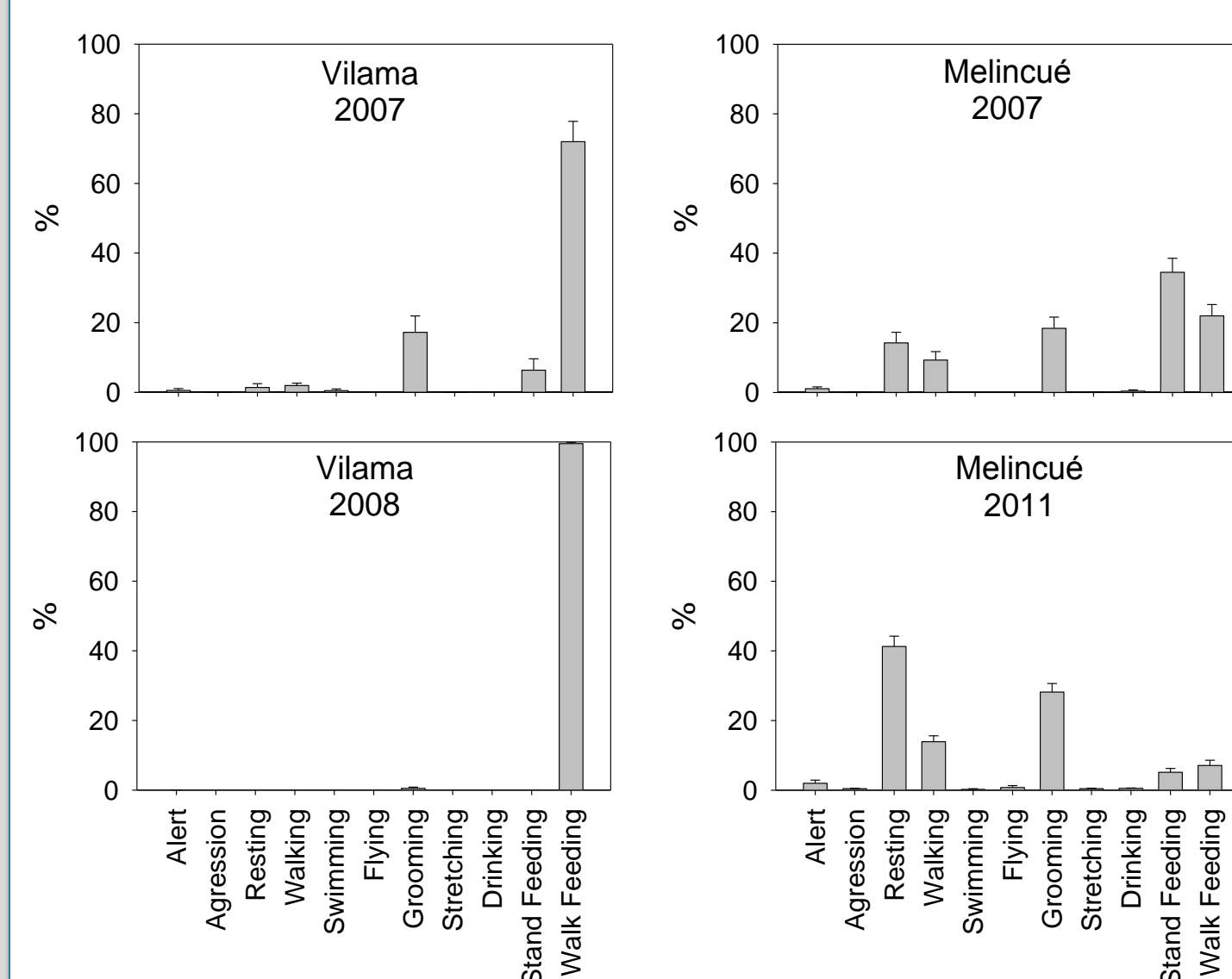
The study was conducted in wetlands at opposite

extremes of the Andean Flamingo distribution in Argentina: Laguna Vilama in the high Andes, and Laguna Melincué in the lowlands. Both saline endorheic basins are considered key sites for flamingo conservation and are listed as Wetlands of International Importance under the Ramsar Convention.

Activity patterns and abundances

We recorded Andean Flamingo activity patterns, marching displays and estimated abundances during four sampling sessions, two during the breeding season at Laguna Vilama and two during the non-breeding season at Laguna Melincué.

We recorded time spent in 11 behaviors for focal individuals: stamp feeding, walk feeding, resting, grooming, walking, flying, alert, aggression, swimming, drinking, and stretching. Courting flocks were recorded separately.



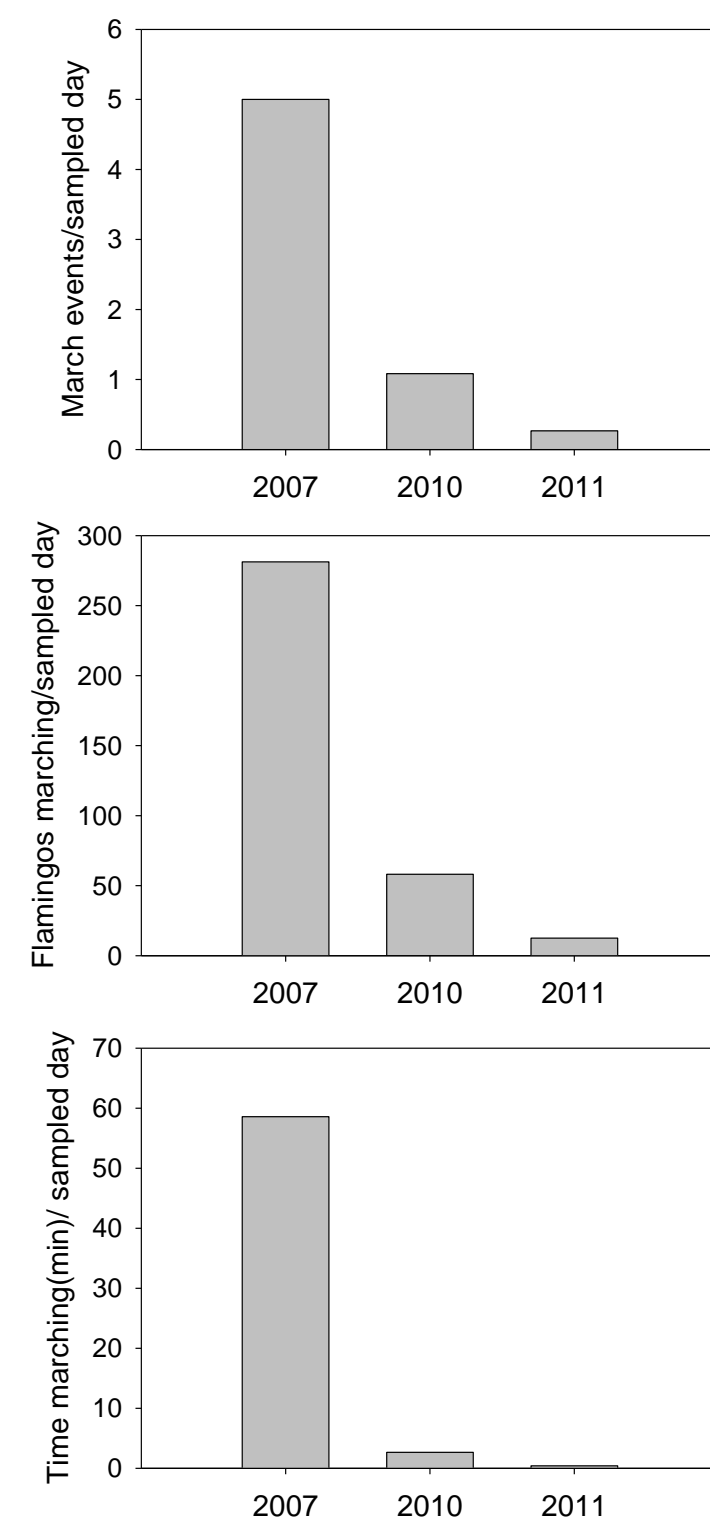
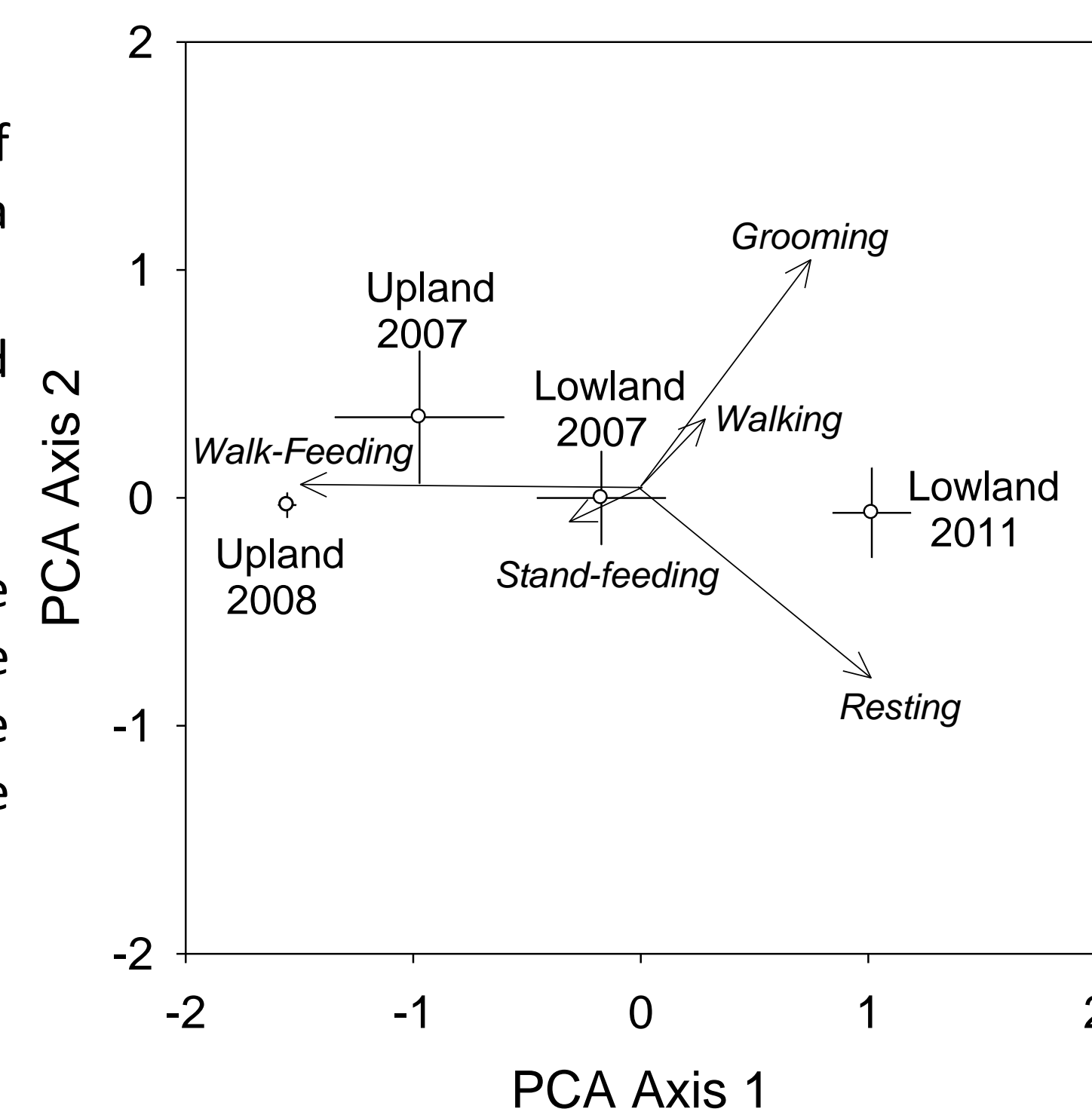
Proportional time (mean % ± SE) spent in different behaviors for Andean Flamingos at two wetland sites.

We found significant differences in activity patterns between Laguna Vilama and Laguna Melincué and between years ($T = -116.2$, $A = 0.25$, $P < 0.00001$).

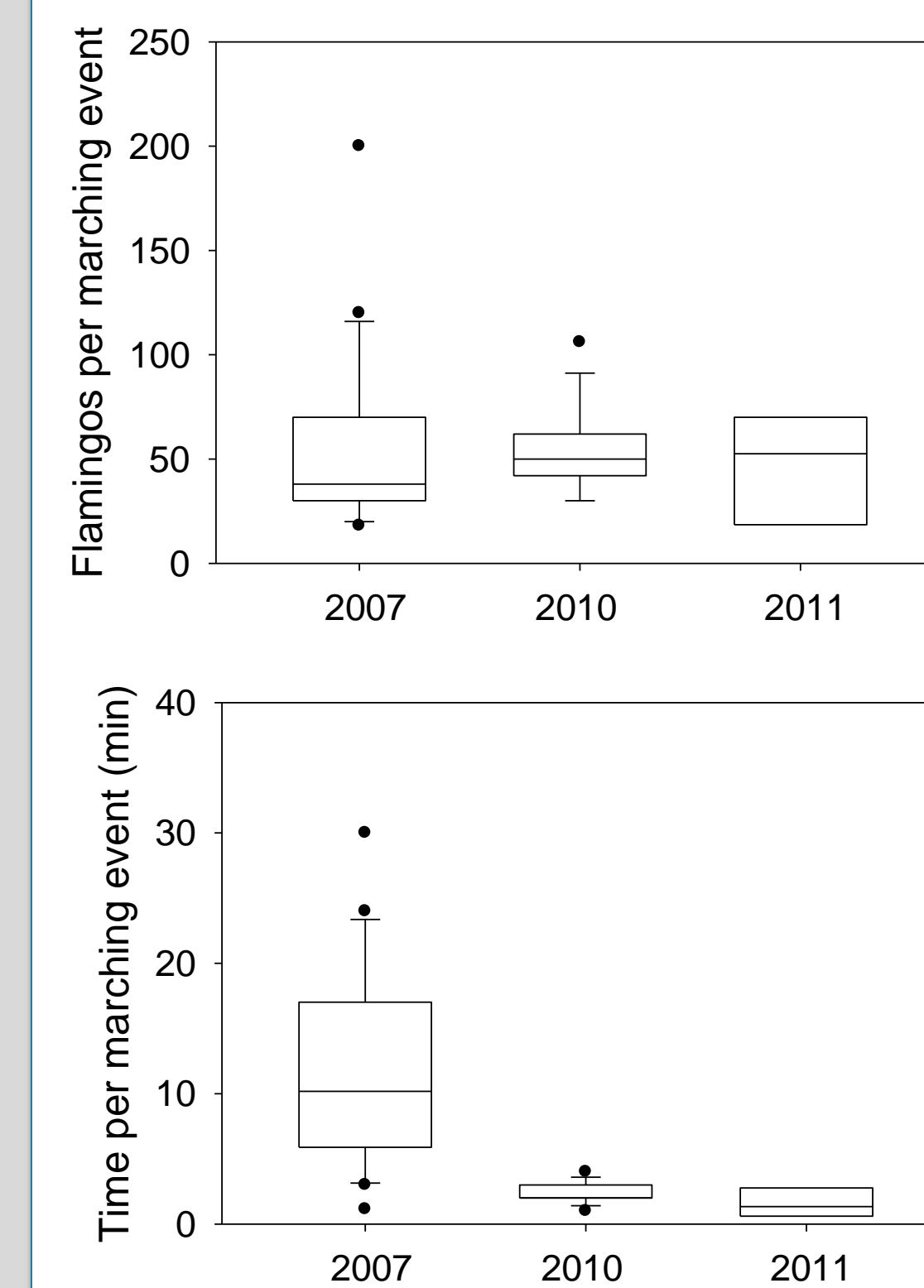
PCA biplots showing the distribution of flamingos at Laguna Vilama and Laguna Melincué in different years

The first three axes of the PCA explained 78.3% of the data.

The first axis (43.5%) segregates those flamingos that spent most of their time resting or grooming from those individuals that spent most of their time walk-feeding.



We did not observe marching displays at Laguna Vilama during the breeding season in any year, while in Laguna Melincué, we observed Andean Flamingos forming marching flocks during our three sampling sessions. However, there were differences among years



Flock size and time spent in courtship display for Andean Flamingos for each marching events at the lowland site (Melincué) in the non-breeding seasons in 2007 (n = 20 marching events), 2010 (n=13) and 2011 (n = 4).

Time spent marching was not associated with flock size ($r_s = -0.06$; $P = 0.718$).

There were differences in the duration of each marching event ($K = 21.91$; $P = 1.744e-05$).

Marching events in 2007 lasting markedly longer than those in 2010 and 2011 (55 minutes vs. fewer than 5 minutes).

We did not record any copulation after these marching events.

Discussion and conclusions

- Numbers of flamingos using the two sites were different between years, and dominant behaviors were different between sites and between years.
- In Laguna Vilama, used during the breeding season, flamingos spend 80% of their time feeding. At Laguna Melincué time spent feeding was lower, there was a broader repertoire of behaviors, including courtship and dominant behavior changed between years.
- Higher feeding effort in Laguna Vilama could be associated with a higher energy demand associated with breeding
- We recorded marching flocks in Laguna Melincué and in other nearby lowland wetlands.
- Marching events were more frequent and lasted longer in years with flamingos were more abundant.
- Similar courtship behavior patterns have been recorded well away from breeding colonies for other flamingo species.



Andean site: Lag. Vilama

Lowland site: Lag. Melincué

Conservation implications

- Our data on flamingo behavior provided an initial description of the activity patterns of the most threatened flamingo species in the world at two contrasting sites.
- While this study provides preliminary information on the dynamics and use of different wetlands used by Andean Flamingos, there is a need for further research on feeding ecology and reproductive physiology of Andean Flamingo, as well as a detailed studies of wetland hydrology and food availability.
- Continued studies monitoring flamingo abundances and recording behaviours and activity patterns at different sites throughout the year are necessary to fully understand the conditions that ensure the persistence of Andean Flamingo populations.

