Trophic Ecology of Breeding White-Headed Steamer-Duck (*Tachyeres leucocephalus*)

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30 min) swimming around the territory (see Moynihan 1958). Observations of this behavioral pattern allowed us to determine the extent of each pair's territory. We delineated territory boundaries using physical references of the landscape (i.e., headlands and exposed rocks), and we calculated distances and angles from these references to document territory boundaries and estimate their areas (Gauthier 1985).

Because White-headed Steamer-Ducks feed only during low tide (Gatto *et al.* 2008), we were able to access the feeding territories during spring tides when low tides were lower than average. To quantify food availability in 15 territories, we collected benthic samples using six ran-

of steamerducks. Some possible explanations for this are that small crustaceans are quickly and almost completely digested and, thus, are under-represented or absent in fecal samples (Swanson and Bartonek 1970), or tanaids could not be prey for adults, but they may be prey for ducklings (Johnsgard 1978). Even though this study provides the first evidence of higher diversity of benthic community and invertebrate abundance in territories, additional research is needed to evaluate the hypothesis of territoriality as a food defense.

McKinney (1965) hypothesized that the degree of territoriality by species in the family Anatidae was a function of the defendability of food resources. Most duck species using seasonal feeding areas where food supply cannot be feasibly defended exhibit little territorial behavior (Talent *et al*. 1982; Duebbert and Frank 1984). Conversely, species with strong territorial defense, like steamerducks (Livezey and Humphrey 1985), occupy more predictable and stable environments such as estuaries, rivers, or permanent wetlands (Savard 1984; Gauthier 1985). White-headed Steamer-Ducks have a restricted distribution in an area where weather and physical conditions are proper for recruitment and development of abundant intertidal food resources (Hidalgo *et al*. 2007; E. Schwindt, pers. commun.). In this regard, strong territoriality of White-headed Steamer-Ducks may be related to the defense of predictable and abundant food resources, although this has not been explicitly addressed.

We found that feeding methods other than diving, especially head-neck dipping 0r420f14.542 0 TDickl3.-1.323meDhButaeusf14.2911 0

ably catch crabs or ragworms by head-neck dipping when these invertebrates leave the shelter or by removing Mitilidae from bottom substrate using the bill with a heavy nail. Furthermore, algae, like kelp beds, provide a protected environment for small mobile animals (Barrales and Lobban 1975). Steamerducks probably feed on these algae filtering on the exposed laminae during low or rising tides, or diving in deeper water (Johnsgard 1978; Livezey 1989).

The frequency of dives in our study was similar to that reported by Gatto *et al.* (2008). In addition, we occasionally found that diving by steamerducks was linked to the presence of kelp beds, consistent with the findings of Johnsgard (1978) and Livezey (1989). In accordance with Livezey (1989), we believe the relatively infrequent dives observed for steamerducks in our study may be due, in part, to the sparseness of kelp beds in the area.

This study provides the first detailed information about key aspects of the foraging ecology of White-headed Steamer-Ducks. It improves our understanding of the relationship between diet, the selection and defense of areas with special invertebrate availability and the foraging techniques used to access and exploit the resources. However, more detailed information on trophic ecology throughout the year, as well as for ducklings and juveniles, is needed. Additional studies should assess the effects of food availability on demographic variation and further address the role of food resources in territorial behavior, spatial segregation and population density regulation.

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