14 INTRODUCTION TO THE SEASONAL DYNAMICS OF THE SUB-ANTARCTIC BIRD COMMUNITIES IN DIFFERENT HABITAT TYPES OF THE CAPE HORN BIOSPHERE RESERVE

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The four papers that make up this section all provide descriptive information about the bird assemblages of the Cape Horn region. Attaining a solid understanding of the species composition and basic natural history of this area's main habitats is a crucial first step towards developing more detailed questions in both basic and applied ecology.

For much fundamental ecological research to proceed, researchers need to know the interactions that individual species are likely to have with one another so that studies can be planned appropriately. This requires that we know which species are present in a given place at any given time, in what numbers they occur, and what they are likely to be doing. For birds – with their propensity to move seasonally between habitats, altitudes, latitudes, and sometimes all three – this information is especially important. Northern Hemisphere researchers tend to take it for granted that this information is already available for the majority of the species that they are likely to study. Indeed, hundreds of pages have been filled with this basic natural history information in book projects such as the Birds of the Western Palearctic (Cramp *et al.* 1977-1994) and the Birds of North America (Poole 2011) series. But, in many tropical and southern temperate areas, even the basics are poorly known.

With the many changes that are affecting habitats worldwide, the need for this basic ecological knowledge is becoming more acute. Obtaining a baseline understanding of how species live their lives and interact with one another is fundamental to devising studies for how emerging conditions will change natural ecosystems. This is true whether one is interested in the introduction of non-native species, which both homogenizes global species assemblages and creates entirely new ones; or, the consequences of habitat loss and change due to development, extraction, and other human activities; or, the effects of climate shifts, which are likely to be especially severe at higher latitude sites, such as the Cape Horn Biosphere Reserve.

Two of the papers in this section focus on forest ecosystems and two on wetlands. Anderson and Rozzi (2000) documents the *Nothofagus* forest avifauna at sites on Isla Navarino and Península Antonio Varas, describing differences between the two sites and between forest interior, forest edge, and open patch habitats within sites. Focusing on the Isla Navarino site, found in the southernmost expanse of forest on Earth, Ippi *et al.* (2009) describe phenological changes in bird occurrence and abundance throughout the annual cycle. The general results of these studies are not surprising: fewer species were found at the more southernmost sites, species richness peaked in summer and declined as birds migrated north for the winter, and species composition differed between forest interior and edge habitats. But the details of how individual species contributed to these changes clarify our understanding of range limits, migration timing, and habitat use. The two wetland papers focus on the temporal and spatial factors that influence species occurrence (Ibarra *et al.* 2009) and on the importance of peat bogs (Ibarra *et al.* 2010). Wetland-associated species make up a large proportion of the Cape Horn avifauna and the total species richness of this habitat is more than double that found in the forest studies. Many of these species are coastal birds and, although Isla Navarino is not a large island, distance from the coast had a notable effect on species occurrence and abundance in wetlands. Relatively small changes in elevation also affected wetland bird assemblages, perhaps also because of the loss of coastal species at higher sites. Thirdly, wetlands that contain *Sphagnum*-dominated peat bogs appear to have bird assemblages that were distinctive compared to wetlands without bogs.

Although these studies have provided information that we previously lacked, there is much that we still do not know. To better understand the ecological factors influencing species assemblages, much more comprehensive sampling is needed. Ideally, one would like to see standardized sampling across the region, for example in the form of an "atlas" project (Donald & Fuller 1998). Implementing such large-scale projects can be difficult; however, this often relies on experienced volunteers to help gather data. The rapid development of on-line systems for compiling distributional data perhaps provides a cost-effective alternative. For instance, the Cornell Laboratory of Ornithology's eBird project <http://ebird.org/content/ebird/>, which allows birdwatchers to enter lists of species seen during their birding activities and links them to specific geographic locations in a single database, has great potential for providing fine-scale range descriptions. The recent

expansion of this system to allow sightings from anywhere in the world will prove especially valuable in places that lack detailed geographic information about species occurrence. Between 2000 and 2010, for example, the number of checklists entered from the Magallanes region increased ten-fold from 18 to 196 per year (Fig. 1). As awareness of this resource spreads, we can anticipate much more growth in its use. Exploration of the data s*et al.*o could be used to guide directed surveys to places of particular interest, such as those where unusual species have been reported or where sampling has been especially limited. These sighting data, linked with habitat information gathered from remote sensing sources, would allow the development of predictive distribution maps for most of the region's species.

Disentangling the importance of different potential mechanisms that underlie the variation in assemblage composition among sites is another important next step. Identifying these causal relationships will allow better predictions to be made about how assemblages will change as future conditions shift. As data accumulate, additional analyses can also be used to guide conservation decisions. For example, nestedness analysis (Ulrich *et al.* 2009) would allow one to determine whether variation among wetlands is caused simply by the loss of coastal specialists as one moves away from the coast, or whether interior and higher elevation sites have distinct assemblages of their own. If the former is true, and assemblages are highly nested, then protection should focus primarily on the most species-rich sites, which will generally be those close to the coast. But, if species-poor sites offer something distinct to the region's avifauna, then this should be accounted for, complicating conservation decisions.

Over the coming decades we can expect to see substantial changes to the Cape Horn Archipelago. Climate change is at the forefront of most people's minds, and is likely to be a major factor shaping the region's biota. Without major interventions, non-native species, such as beavers (*Castor canadensis*) and minks (*Neovison vison*) are likely to continue to spread. Land use changes, such as grazing and peat extraction, may also play an increasing role. Even relatively benign activities, such as increased ecotourism, may prove harmful if their effects are not closely monitored and regulated. Consequently, taking the current studies and building on them to develop sufficient understanding to design effective management strategies is essential if we are to prevent biodiversity loss and the erosion of ecosystem services.

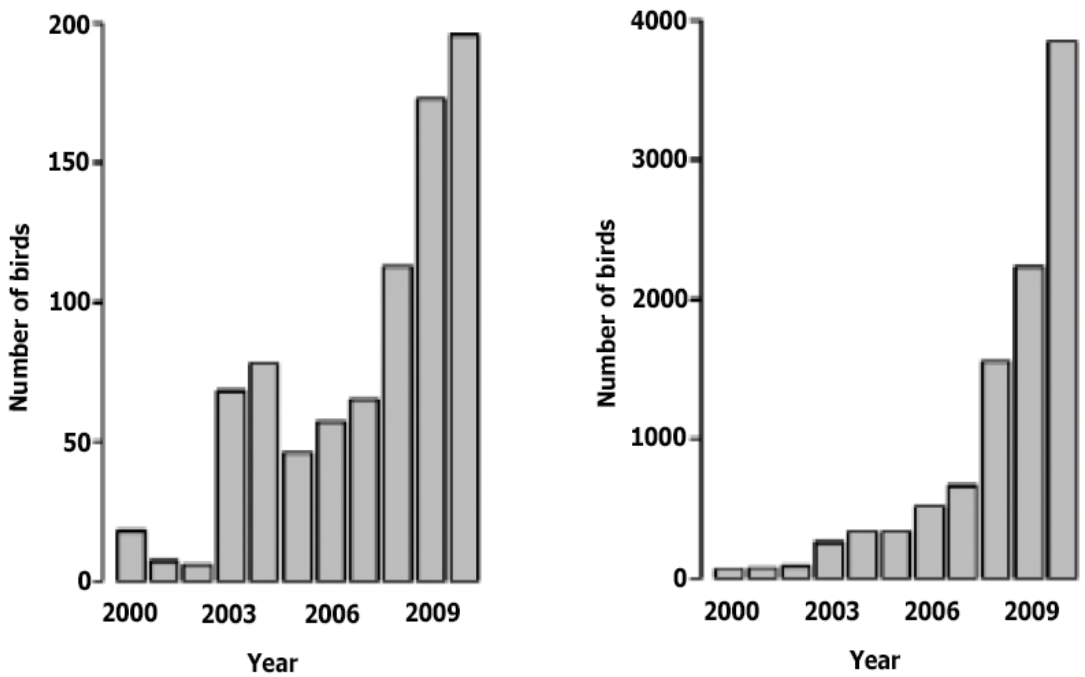

Fig. 1. Annual number of bird lists submitted to the eBird website of the Cornell Laboratory of Ornithology (http://ebird.org/content/ebird/) for (a) Magellanes and (b) Chile, showing the rapid growth in this program and its potential to compile information on bird distribution.

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