

# DISTRIBUTION OF THE SUBANTARCTIC INTERTIDAL TELMATOGETON MAGELLANICUS (CHIRONOMIDAE) UNDER CLIMATE CHANGE SCENARIOS IN THE CAPE HORN BIOSPHERE RESERVE.

## 1) INTRODUCTION

Freshwater insects are highly suitable organisms for studying climate change. By studying changes in their life cycles, physiological adaptations, and distribution patterns, we can generate predictions about their adaptation to climate change and the progression of this process, making them good indicators of climate change. Using ecological niche modeling (ENM), we aim to evaluate changes in distribution patterns under climate change scenarios for the sub-Antarctic dipteran *Telmatogeton magellanicus* (Chironomidae), native to the intertidal habitats of the Cape Horn Biosphere Reserve (CHBR, 54.1°S - 56.2°S).

## 2) METHODOLOGY

The intertidal zone of the southern CHRB was sampled (2017-2020), recording 27 occurrences of *T. magellanicus* (Fig1). Climatic layers were downloaded and prepared at 1km<sup>2</sup> from Worldclim. ENMs for the present, ssp2-4.5 and ssp5-8.5 scenarios (IPCC, 2022) were obtained using the maximum entropy algorithm (MaxEnt).

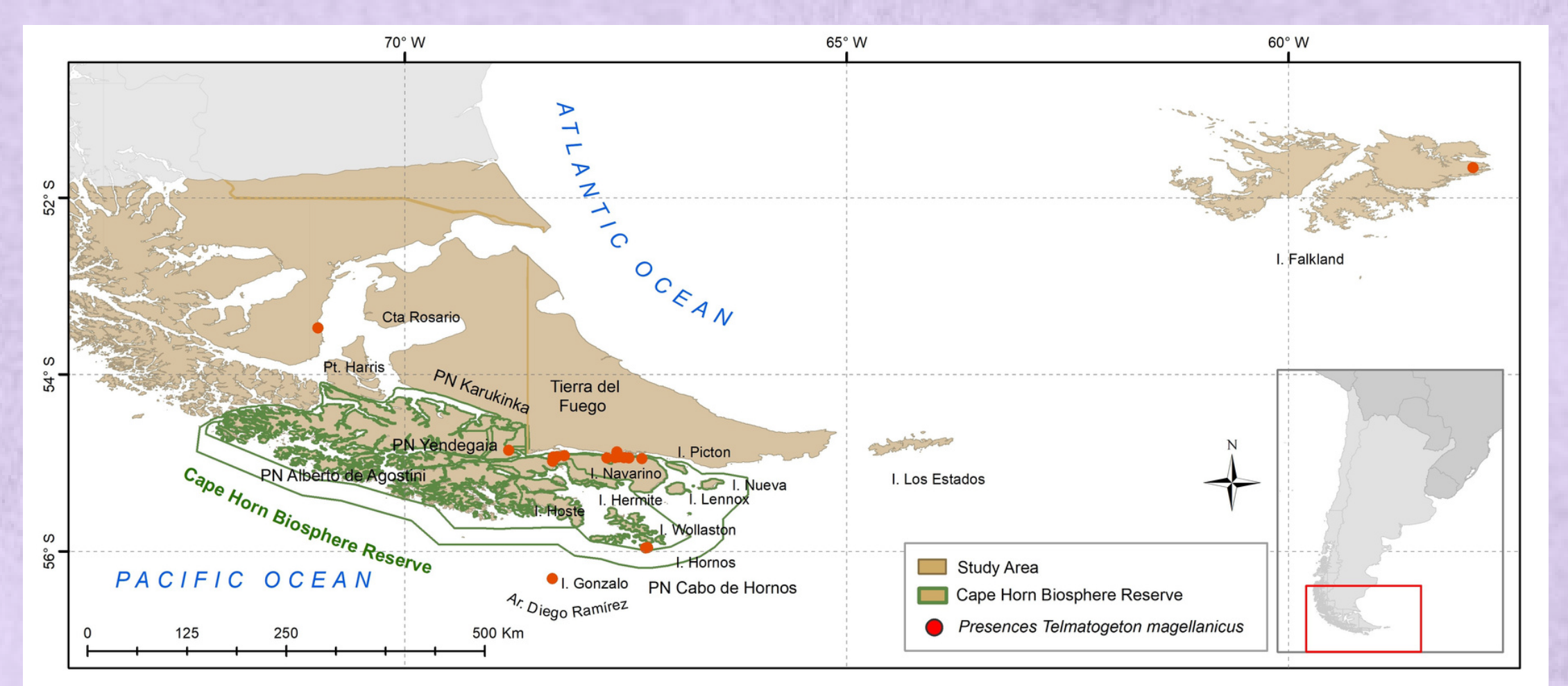


Figure 1. Distribution of *T. magellanicus* on the CHBR

## 3) RESULTS

The model validation indices indicate that the model is very good (AUC= 0.98 and Boyce=0.93). According to the percentage (%) of suitable habitat (SH) for each scenario, we observe that currently *T. magellanicus* occupies only 1.6% of the study area, concentrated in the CHRB, Tierra del Fuego, and Isla de los Estados (Fig.2). For the period 2040 –2060 in both scenarios (ssp2-4.5 and ssp5-8.5) increases its probability of SH to 2.5% and 1.9%, respectively (Fig. 3A and 4A). In contrast, for the period 2080-2100, in both scenarios their % of SH decreases to 1.3% and 0.4% (Fig. 3B and 4B).

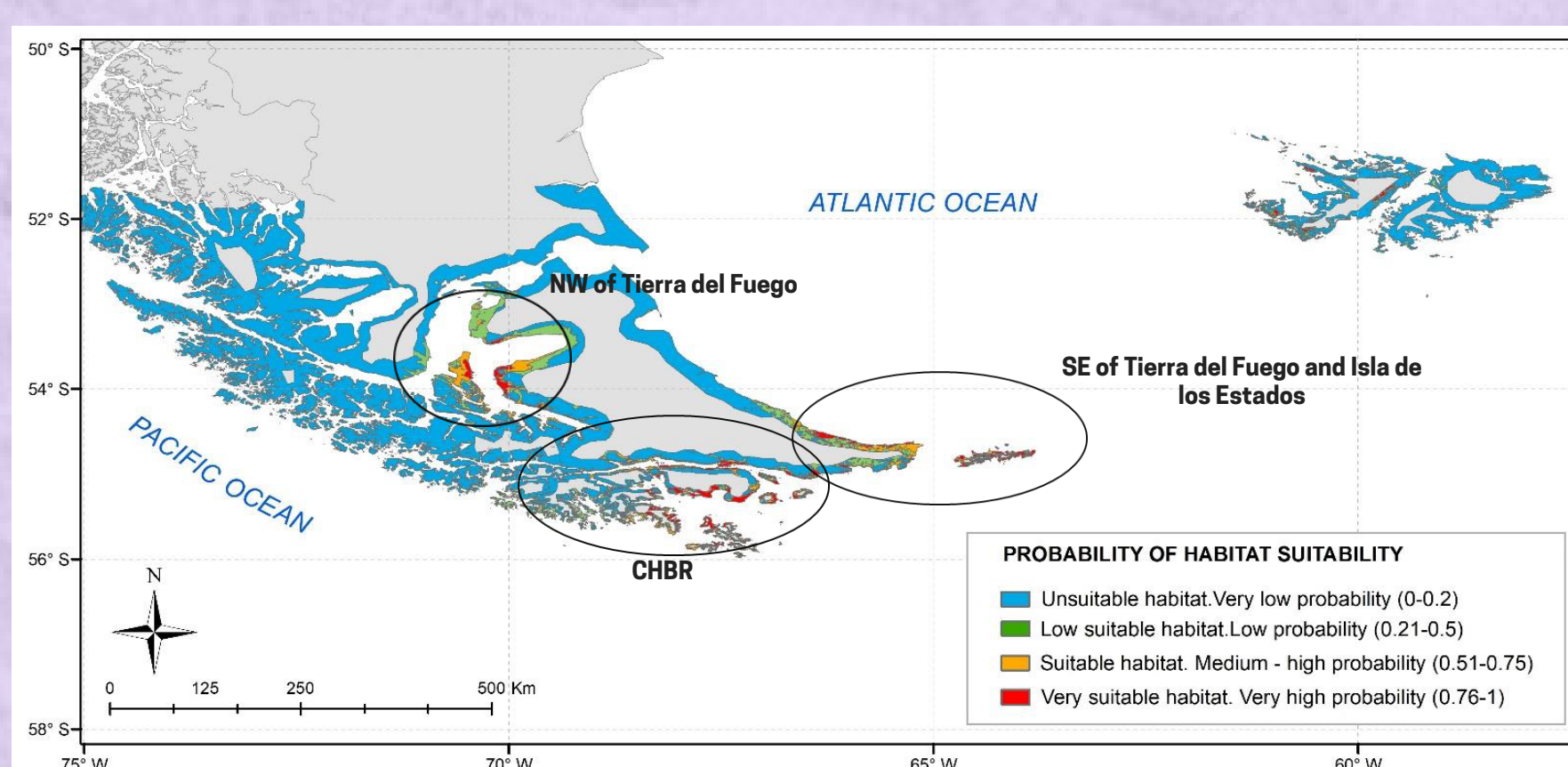


Figure 2. Current ENMs for *Telmatogeton magellanicus*.

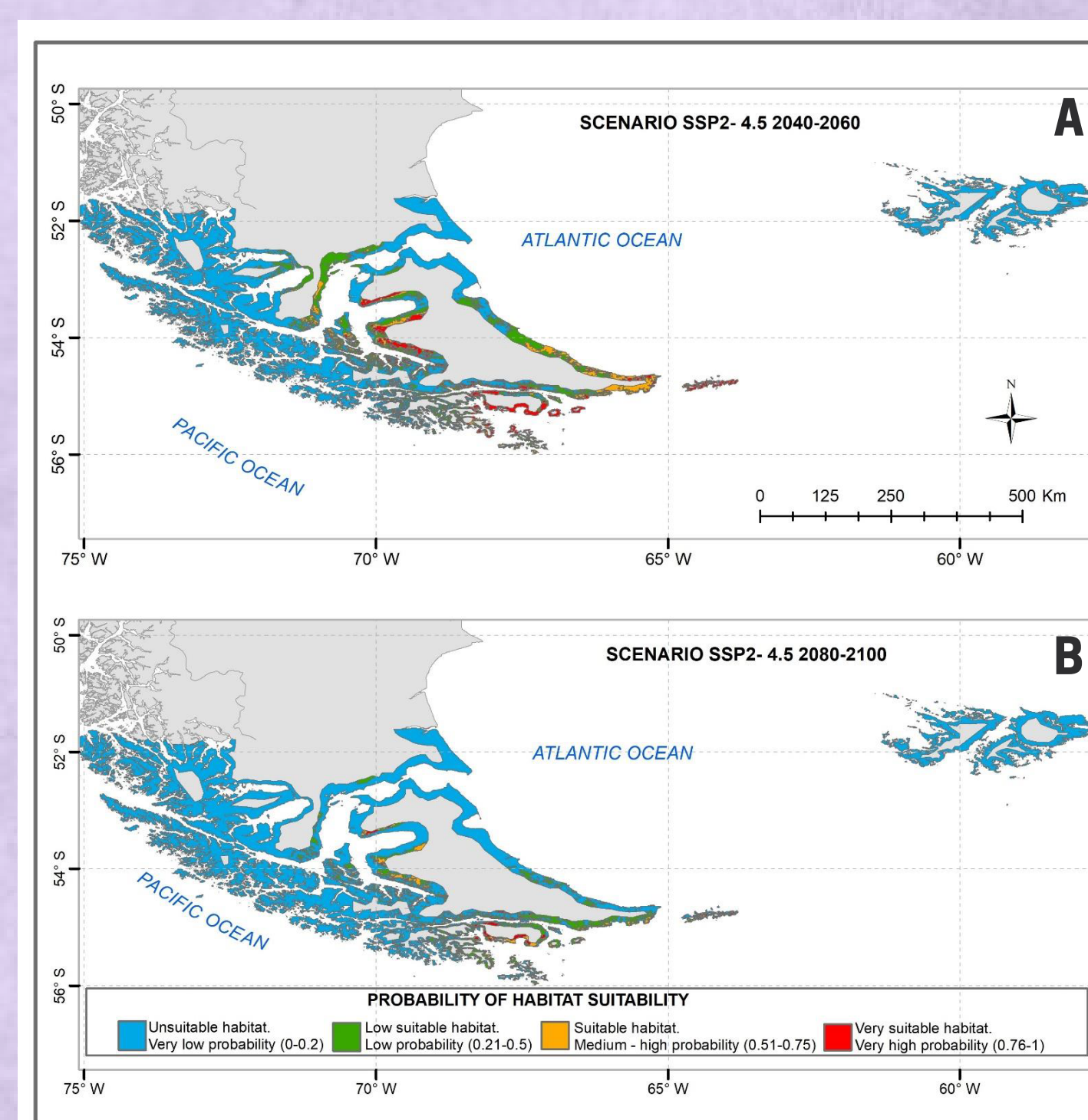


Figure 3. Projected distribution for scenario SSP2-4.5. A) 2040-2060 and B) 2080-2100.

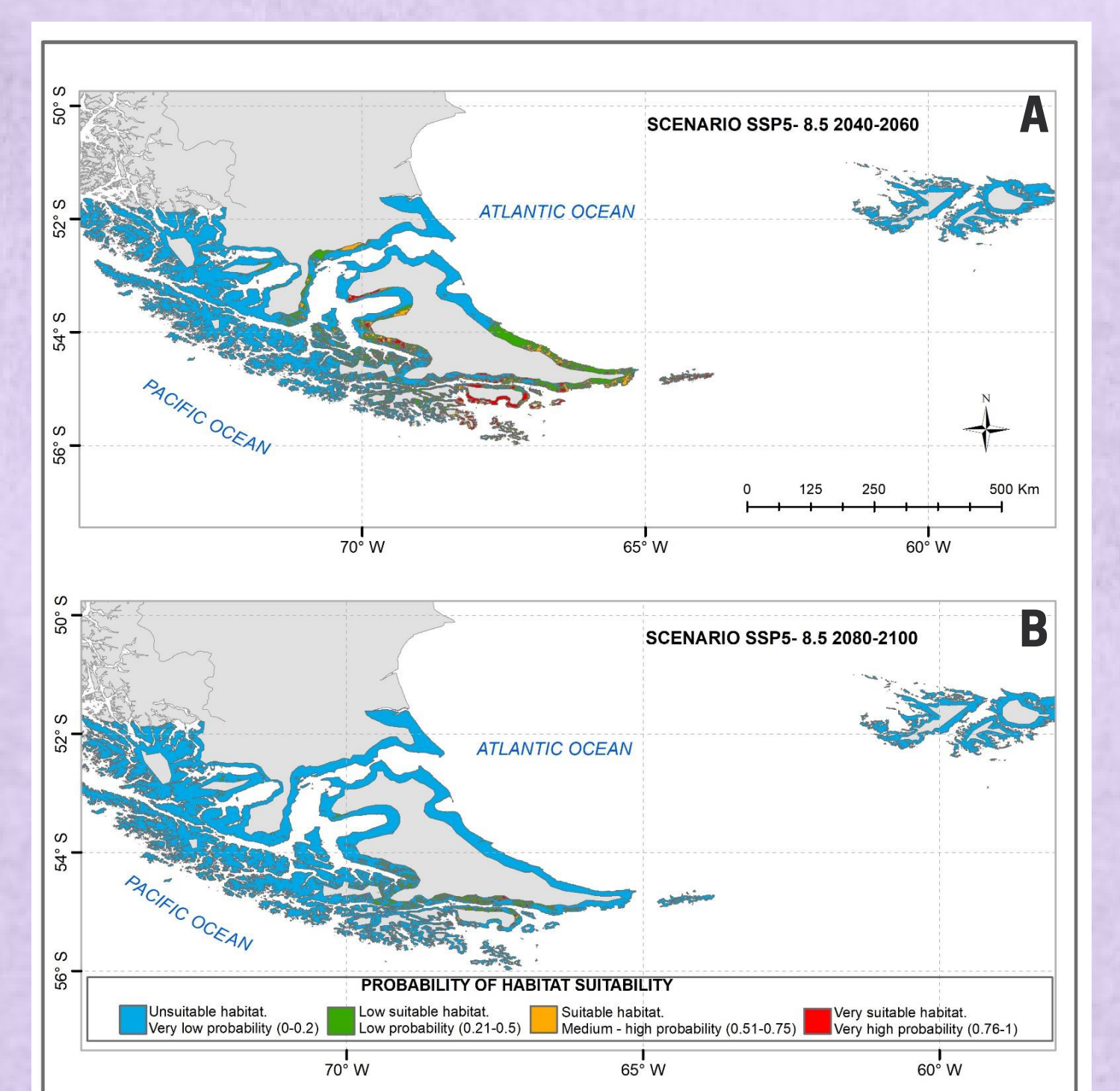


Figure 4. Projected distribution for scenario SSP5-8.5. A) 2040-2060 and B) 2080-2100.

## 4) DISCUSSION

- The SH in the current ENM is less than 2%, indicating habitat specificity (Simoes, 2020), this variable can be integrated into future models to improve the distribution.
- The scenarios for 2080-2100, would not favor *T. magellanicus*, almost completely eliminating its SH, which could lead to the local extinction of several populations.
- *T. magellanicus*, along with other chironomids such as *Parochlus steinenii* (Contador, 2020) and *Eretmoptera murphii* (Barlett, 2020), could be considered a sentinel of climate change.
- The obtained ENMs provide the basis for future studies on the ecology and general biology of the insect. Subsequently, models will be generated that integrate information on the phenology and physiology of the species (mechanistic models) because it generates more robust predictions.