Supplementary Material

(Perspectives in Ecology and Conservation)

# Strengthening top-down strategies are also required for conservation of the Araucaria Forest

# Carlos R. Brocardo a, b, \*, Neucir Szinwelski c, d, José Flávio Cândido-Jr e, Larissa I. Squinzani d, Victor M. Prasniewski f, Marcelo Limont g and Rodrigo Fadini h

# a Programa de Pós-Graduação em Biodiversidade, Universidade Federal do Oeste do Pará, Rua Vera Paz, Santarém, Pará, Brazil.

# b Instituto Neotropical: Pesquisa e Conservação, Curitiba, Paraná, Brazil

# c  Programa de Pós-Graduação em Biodiversidade Neotropical, Universidade Federal da Integração Latino Americana, Foz do Iguaçu, Paraná, Brazil. ORCID:

# d Programa de Pós-Graduação em Conservação e Manejo de Recursos Naturais, Universidade Estadual do Oeste do Paraná, Cascavel, Paraná, Brazil.

# e  Centro de Ciências Biológicas e da Saúde, Universidade Estadual do Oeste do Paraná, Rua Universitária 2069, CEP 85.890-110, Cascavel, Paraná, Brazil. ORCID: 0000-0002-1324-9003

# f Programa de Pós-Graduação em Ecologia e Conservação da Biodiversidade, Universidade Federal do Mato Grosso, R. Quarenta e Nove, Cuiabá, Mato Grosso, Brazil.

# g Universidade Positivo, Rua Pedro Viriato Parigot de Souza 5300, Curitiba, Paraná, Brazil.

# h Laboratório de Ecologia e Conservação, Instituto de Biodiversidade e Florestas, Universidade Federal do Oeste do Pará, Brazil.

# \*Corresponding author. Email address: carlosbrocardo@hotmail.com

**Calculating the protection in Araucaria Forest domain**

In order to build the Araucaria Forest domain, firstly we used the boundaries of the Atlantic Forest Biome as a basis, since the Araucaria Forest is embedded in it. We chose the “integrative boundary” proposed by Muylaert et al. (2018), since it includes portions of Cerrado and southern grassland where Araucaria Forest occurs as “capões” (forest patches), in gallery forests and Paraná pines can be found isolated in open fields (Hueck, 1953; Maack, 2012; Mattos, 2011).

Following, we used the RadamBrasil project vegetation shapefile from to limit Araucaria Forest in Brazil (https://www.inde.gov.br), and for Argentina we used WWF ecoregion shapefile (Olson et al., 2001). From RadamBrasil project we included as part of the Araucaria Forest domain the polygons indicated as “Mixed Ombrophilous Forest”, the grasslands associated to Araucaria Forest and the transitional zones with broadleaf forests (Semideciduous Forest and Rainforest Atlantic Forest), considering the ecological dynamic and the social aspect. In its ecological dynamics the Araucaria Forest expands over grassland while undergoing retraction with the advance of broadleaf forests (Klein, 1960; Ledru and Stevenson, 2012; Silva and Anand, 2011). Regarding the social aspect, the transition zones between Araucaria Forest and Semideciduous Forest in southern Minas Gerais constitute a great producer of *pinhões*, representing 22% of the Brazilian production in 2019 (IBGE, 2020).

Our analysis indicated 258,855 km² of Araucaria Forest domain (forest = 192,347 km², grassland = 65,678 km², waterbody = 829 km²), distributed across the states of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, Minas Gerais and Rio de Janeiro in Brazil, and Misiones Province in Argentina.

Protected areas in Araucaria Forest domain

The protection in the Araucaria Forest domain was estimated using shapefiles obtained from the websites of Protected Planet (UNEP-WCMC and IUCN, 2021) and *Instituto* *Socioambiental* (Instituto Socioambiental, 2021). Information about protected areas was also confirmed on websites of national and subnational agencies to check some errors and absences.

We identified 124 protected areas (national and subnational governance) in the Araucaria Forest domain (Table S1 – separated file), and also listed two protected areas located in relicts of the Araucaria Forest, Podocarpus State Park (Parque Estadual do Podocarpus) and Kuri’y National Reserve (Reserva Nacional Kuri’y), although they were not considered to estimate protection percentage, since original areas of such relicts are unknown.

To calculate the protection over the Araucaria Forest domain the overlap of protected areas was observed, and when it occurred over strictly and sustainable use protected areas, only the former was calculated, as it is more restrictive. As a result 16,421.4 km² of Araucaria Forest domain is under some protection (6.3%), with sustainable use protected areas covering 12,427.4 km² or 4.8%, while strictly protected areas sum up 3,993.9 km² or only 1.5% of Araucaria Forest domain. Moreover, land tenure regulation is completely settled in less than half of strictly protected areas (Table S1).

All analyses were performed in QGIS software version 3.4.15 (QGIS.org, 2021) using conical Albers projection and datum WGS84.

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