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Australian Frog Atlas: Species' Distribution Maps Informed by the FrogID Dataset

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Abstract. We use data from the citizen science project FrogID, comprised of expert-validated, spatially accurate occurrence records of frog species across Australia, to map the known distributions of Australia's frogs. We combined over half a million occurrence records of 209 species from the FrogID dataset with expert-checked occurrence data from the national biodiversity data aggregate (Atlas of Living Australia) and published literature, to create distribution maps for all 247 native frog species known from Australia and the introduced cane toad (*Rhinella marina*). These maps represent the most up-to-date, accurate and detailed set of Australian frog species maps available, and reveal species richness patterns across the continent. They are an Open Access resource for researchers, conservation practitioners and land managers, with the aim of better understanding and conserving Australia's frogs. This is version one of the Australian Frog Atlas, which we expect to update on an approximately annual basis. The Australian Frog Atlas maps—as shapefiles and in KML format—are published online as an Open Access supplemental dataset (see Cutajar *et al*., 2021).

Introduction

To mitigate biodiversity declines, a good understanding of species' distributions is required (Fjeldsa & Rahbek, 1997; Graham *et al.,* 2004). However, such knowledge is reliant on adequate species occurrence records (Chapman, 2005). Traditionally, the collection of georeferenced species observations has depended on heavy investment of time and resources in field surveys, and as such, species occurrence datasets are often very limited (Ahrends *et al.,* 2011; Rovero *et al.,* 2014). In addition, many existing datasets suffer inaccuracies due to misidentification of species (Beerkircher *et al.,* 2009; Shea *et al.,* 2011; Costa *et al.,* 2015), unaddressed changes in taxonomy (Tessarolo *et al.,* 2017), imprecise localities, erroneous conversion of coordinates between systems, and post hoc assignment of observations to the wrong locality (Maldonado *et al.,* 2015). Such errors effectively make the records with which they are associated false positives and distort our knowledge of species' true ranges (Maldonado *et al.,* 2015).

At least some of these issues are being mitigated through the development of techniques that can collect data far more rapidly than with the traditional field survey model. For example, the advent of citizen science now means that biodiversity data can be collected extremely rapidly and in vast volumes for some groups, potentially addressing data quantity issues in species occurrence datasets (Silvertown, 2009; Soroye *et al.,* 2018). In fact, millions of occurrence records are submitted to large scale citizen science projects every year (Sullivan *et al.,* 2014), dramatically increasing

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