

Images of Australian Odonata Wings

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ABSTRACT. A recently finished project has created an openly accessible, high-resolution, photographic library of wings of Australian dragonflies and damselflies, order Odonata. The library is an open resource for identification and research. Both male and female wings of 318 species of dragonfly and damselfly have been photographed with a specialist set-up using identified museum collection material. In general, both wings were removed from the insect body to produce an image with a minimum of visual artefacts. Each resulting image shows a pair of right wings, a scale, an identifying taxonomic name and sex.

Introduction

Historically, there have been no readily accessible, good quality images of all Australian dragonflies and damselflies (Odonata), for identification purposes. Comparative morphology is arguably the most informative first step in any dependable identification process but it relies on high resolution, detailed imagery of diagnostically important structures across all known species. Ideally such imagery should be of the most typical representatives of a species (type specimens) or specimens that are expertly identified, and every image standardized in such a way that humans or human-assisted machines can consistently detect and process similarities and differences. It is possible that certain structures, thought to be diagnostically uninformative, are found to be much more useful when all species of a large group are assembled in the same orientation, format, and scale.

In the past, Odonata specimens in some of Australia's largest insect collections have been photographed at different times using a range of methods and images have been made available online. Such resources are not specifically images of wings or of any other particular structure. For example, the Australian National Insect Collection has imaged whole drawers of insect specimens, including dragonflies and damselflies (see Mantle *et al.*, 2012). Another example, *DigiVol*, a volunteer program developed by the Australian

Museum, has been generating images of whole specimens together with their label-data to streamline registration and cataloguing (see *DigiVol*, 2020).

Such images add intellectual value to the specimens and to the collections that accommodate them ultimately leading to a better understanding of the Australian Odonata fauna. Intellectual value is significantly increased in direct relationship to confidence of identification—the more confident the identification, the more valuable the data.

The popularity of image sharing sites such as *Flickr*, and citizen science observation sharing sites such as *iNaturalist*, has resulted in a significant number of high-quality images of live dragonflies and damselflies being made freely available. In 2020, *iNaturalist* held about 30,000 Australian observations of Odonata, 88% at *Research Grade* (identification agreed by two or more people) (*iNaturalist*, 2020); *Flickr* held about 20,000 images tagged as a dragonfly or damselfly in Australia (*Flickr*, 2020).

Wing morphology, especially venation, is not only diagnostically significant in taxonomy (e.g., Tillyard, 1917), but is used for demonstrating species variation (e.g., Stewart, 1982), for field identification (e.g., Theischinger, Hawking & Orr, 2021), for understanding wing function and evolution (e.g., Salcedo *et al.*, 2019), and other studies (e.g., phylogeny, Trueman, 2001). This project has created a resource for identification and research based on high-quality wing photographs.

Keywords: Odonata; Insecta; Dragonfly; Damselfly; morphology; wing venation

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