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Is every female equal? Caste biasing in tropical paper wasps

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The division of labour in the form of castes among group members in eusocial societies is a hallmark of social evolution. Differing degrees of caste commitment helps define levels of social complexity from primitive to highly eusocial species. The classical paradigm for species representing the early stages of social evolution, such as *Polsites* paper wasps, proposes that castes differ only in behaviour, with individuals remaining plastic and reversible throughout adulthood. Without caste-biasing, females are equally capable of exploiting reproductive opportunities when they arise. Recent studies on temperate *Polistes* spp. suggest potential biasing of castes during development through mechanisms such as differing larval nutrition and mechanical stressors. However, *Polistes* are thought to have a tropical origin. Thus, it is not clear whether such biasing is a secondary product of selection for over-wintering in temperate environments. Here, we provide the first test of caste-biasing in a tropical primitively eusocial insect, where their continuous life cycle without a diapause phase is likely to represent the ancestral state. Using the wasp *P. canadensis* we investigate individual-level variation in caste expression. Specifically, we test the hypothesis that some females are biased towards particular caste roles, as evidenced by developmental timing and diverging behavioural profiles over the lifetime of individually tracked wasps. We found no evidence of phenotypic divergence among individuals during development, suggesting that females were equivalent on emergence. Developmental caste-biasing is therefore unlikely to be an ancestral trait in *Polistes*, and patterns found in other species may reflect a secondary adaptation to temperate climates. Conversely, we found evidence for two distinct behavioural phenotypes that emerge during adulthood, with individual-level variation in investment into maternal care and reproductive strategies among age-matched females. Variation in female reproductive potential during adulthood may be an important source of trait variation in the evolution of castes and sociality.