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Gene expressions for the sexually-dimorphic antennae in a ponerine ant

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Many of eusocial hymenopterans show conspicuous sexual dimorphisms due to sex differences in social behaviors. In most species of ants, antennae involved in sophisticated chemical communications showed distinctive sexual differences in the number of segments (12 in females and 13 in males) and in the scape length (longer in female). By understanding the proximate developmental mechanisms of dimorphic traits controlled under the molecular genetic bases, the evolutionary origin of sexual dimorphisms can also be inferred. The expressions of antennal patterning genes (i.e. toolkit genes or morphogenetic factors), regulated downstream of sex-determination genes such as doublesex (*dsx*), were thought to be different between sexes. In this study, therefore, to identify the responsible genes for the sexually-dimorphic development, the expression patterns of *dsx* and 18 antennal patterning genes in antennal discs of last (fourth) instar larvae (4L) were investigated in a ponerine ant *Diacamma sp.* The qRT-PCR results showed that 1) *escargot* (*esg*, related to dorsoventral patterning), *Notch* (related to segmentation in insect appendages) and a female-specific isoform of doublesex (*dsxF*) were highly expressed almost exclusively in females, while a male-specific doublesex isoform (*dsxM*) were highly expressed in males. Furthermore, in situ hybridization for these genes showed that *esg* was only expressed in antennal discs of female 4L. On the other hand, the homothorax (related to proximal patterning) expression was restricted in the intermediate region of discs in females while in the proximal-intermediate region in males, although the expression level was not significantly different. Taken together, it is suggested that sex-specific manners in expression levels and localizations of the patterning genes are responsible for the sex differences in antennal morphology in *Diacamma sp.*