

## Violent Combat Among *Polistes gigas* Males (Hymenoptera: Vespidae)

by

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### ABSTRACT

Colonies of *Polistes gigas* Kirby located in the New Territories of Hong Kong were monitored over several weeks, with particular attention paid to aggressive male behavior. Several fights between males were observed, supporting the hypothesis that the relatively large head and atypical mandibles of the male are adapted for fighting rather than feeding. Although the instances of combat noted were semi-ritualistic, the use of force appeared unrestrained, and there were no indications of threat-posturing.

Key words: agonistic behavior, *Polistes*, sexual selection, social wasps, Vespidae

### INTRODUCTION

The social wasp *Polistes gigas* Kirby is the largest member of its worldwide genus (forewing length of Hong Kong specimens is typically 25-27 mm in females, 30-38 mm in males). Furthermore, it is distinct enough that it previously formed its own monospecific subgenus, *Gyrostoma* (Carpenter 1996). Although *P. gigas* is very widely distributed, from northern India to southern China and Taiwan (Das & Gupta 1989, Starr 1992), it is not reported to be common anywhere. What little is known of its nesting biology (Iwata 1965, Matsuura 1970, Starr 1992) suggests that colonies are typically small.

While the female *P. gigas* is unexceptional for the genus in gross physical form, the male shows some striking peculiarities. All males that we have seen are larger than females, often outstandingly so. The head of the male is unusually large, and deep behind the eyes (Fig. 1; Starr 1992: Fig. 41b). And the robust mandibles are sickle-shaped, with a strong, blunt tooth near the base

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(Fig. 1; Starr 1992: Fig. 42), so that they appear quite unsuited for feeding.

Examination of museum specimens led Starr (1992) to suggest that the swelling of the male head “serves to accommodate very large mandibular muscles and/or glands” and that the bizarre mandibles are used in fighting



Fig.1. *Polistes gigas* male. Note the enlarged head and bizarre mandibles.

among males for access to females. Here we provide observations in support of this hypothesis.

During the past two years, one of us (JXQL) has examined about 15 males, of which 11 had rather striking injuries, such as torn wings, missing legs, partially missing antennae, and wounds to the head or thorax. In addition, two males each had one mandible with the narrower terminal half broken off. In addition, several amateur naturalists have shown us photographs of injured males from rural parts of Hong Kong.

The strength of the bite of a male *P. gigas* is shown by an instance in which JXQL picked up a male and was deeply bitten on one fingertip. We have each had occasion to grasp live males of several other species of *Polistes*, never with similar consequences.

We can now report behavioral observations consistent with the prediction that fighting among *P. gigas* males is frequent and violent.

## MATERIALS AND METHODS

Between 21 November and 10 December 2005, JXQL found four *P. gigas* colonies in various parts of the New Territories, Hong Kong. The following observations are by JXQL, aided in one instance by Steen Heilesen.

Colonies 1 and 2 nested inside wooden nesting boxes for birds. Colony 3 was inside a large hollow tree branch. Colony 4 nested exposed under a tree branch. It should be noted that nests 1-3 were hardly or not directly visible, and the presence of active colonies is inferred from activities of wasps in and around the entrance holes. During this period colonies 1-3 each had males associated with them. Colony 4, which appeared to be at a late stage of the colony cycle, did not. There was no observed activity at any nest after 14 December, following a period of cold weather. We assume the nests were abandoned and the females gone into hibernation.

Attention was first drawn to colonies 1-3 by loud wing-buzzing and vigorous grappling of males at the nest site, in some cases with two individuals struggling on the ground below. Fights mostly seemed to take place in the late afternoon, between about 15:00-16:00. The following are narrative descriptions of some of these fights. In the case of colony 3, our description is aided by photos taken at the time.

## RESULTS

On 28 November two males were found fighting on the outside of colony 1's nest box near the entrance hole. They grappled with their forelegs while persistently attempting to bite each other's head and legs. After about 40 sec of observation, one wasp was thrown off the nest box and fell to the vegetation below, after which he flew away. Very quickly, a third male, who had been uninvolved nearby, flew to the nest box and engaged the wasp who remained. The two grappled with their forelegs and fell into the undergrowth. After about 90 sec, one of the two wasps flew up and assumed the previous position on the nest box. The other did not re-appear during the observation time. Following this, several other males in turn flew at the positioned wasp, each flying off without landing on the nest box. It appeared that they were trying to land but were prevented from doing so by the positioned male.

On 3 December two males were found fighting on the ground near colony 2, with much vigorous biting of legs and wings. After about two minutes, one wasp flew up and positioned himself on the nest box. The other was badly injured, missing the tip of one antenna, two legs, a large part of a forewing, and an entire hind wing. He was unable to fly and was later found nearby being dismembered by weaver ants (*Oecophylla smaragdina*).

On 2 December a larger-scale fight was observed around colony 3. Two males were found fighting on the nest branch near the entrance hole, with three or four others nearby on the branch. After about 30 sec, one of the fighting males fled. Immediately, one of the others rushed to engage the positioned wasp and drove him off the branch after about 50 sec. The displaced male appeared to have damage to the wings and one foreleg. The newly positioned male went on to similarly defeat four others in turn. Following one especially vigorous fight, the loser fell to the ground, apparently mortally wounded; there was a large gash just behind one eye, and he moved very little, dying after about 10 min.

## DISCUSSION

With the exception of one instance at colony 3, in which two grappling wasps were rushed by a third male, all observed fights were diadic. Especially at colony 3, there seemed to be a ritualistic aspect to the combat, despite its sometimes deadly consequences. As in the many kung-fu movies produced in

Hong Kong, a non-combatant male waited (often posturing) for the outcome of a fight before engaging the winner.

One mating was observed near a nest, but females showed no involvement in any of the fights. There was no indication of females observing fights or awaiting their outcome. It is our working hypothesis that males fight for a narrow territory around the nest and that this territory carries improved access to females. What is puzzling about the mode of combat is the apparent combination of a ritualized aspect (one male at a time challenging the territory holder, not a free-for-all) with unrestrained use of force. Given the physical peculiarities of males, one might reasonably expect a great deal of threat-posturing among them, with mandibles displayed, yet we have observed nothing of the sort.

In common with *P. gigas*, the neotropical *P. bicolor* Lepageletier is widely distributed but is evidently common nowhere, appears to have characteristically small colonies, and is individually relatively large and robust. Furthermore, *P. bicolor* males have robust, curved mandibles (Richards 1978:532; CKS, pers. obs.) quite unlike those of most species. We predict vigorous fighting among males in this species, too.

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