



Hibernation on the Nest of the Paper wasp, *Polistes (Gyrostoma) olivaceus* (De Geer) (Hymenoptera: Vespidae)

Phong Huy Pham

Institute of Ecology and Biological Resources,
Vietnam Academy of Science and Technology,
18 Hoang Quoc Viet Road, Hanoi, Vietnam.

(Corresponding author : Phong Huy Pham)
(Received 08 April, 2014, Accepted 23 May, 2014)

ABSTRACT: The hibernation on the nest of the paper wasp, *Polistes olivaceus*, is observed. Most individual wasps left the nest late January. Three wasps, nevertheless, remained their hibernaculum on the nest till late March. Its hibernant habits are also showed and analyzed.

Key words: hibernation, nest, paper wasp, phenomenon, *Polistes olivaceus*

INTRODUCTION

The social wasps belong to the family Vespidae, including 3 subfamilies (Stenogastrinae, Polistinae, and Vespinae) with 37 genera (Picket & Capenter, 2010). Of these, *Polistes* has received considerable attention. It is a cosmopolitan genus of about 1000 species, most of which are tropical or subtropical in distribution. It forms a separate behavioural category characterized by simply, open nest that can be easily studied. The nests typically comprise a single comb of paper cells which lack any external envelope, and are suspended from above by a slender stalk (Harris, 1979).

Polistes olivaceus, in the genus *Polistes*, is one of the large distributional species in the world. This species often build its nest in the house of the people. It will however leave its nest when it is disturbed. This is one of the more defensive *Polistes* species. While it will tolerate activity near the nest, the workers will be quick to spot, locate and attack all that moves and comes too close. However the attack is frequently aimed solely at the intruder. The sting of this species can be quite painful (Barthelemy, 2008). For these reasons, it is really difficult for researchers to study on biology and behaviors of the one.

The most extensive previous behavioral study of *Polistes* was mentioned by authors such as Boijartg, 1912; Rau, 1942; Richards and Richards, 1951; West-Eberhard, 1969; Yamane, 1969; Hermann and Dirks, 1975; Yamane and Okazawa, 1977; Harris, 1979;

Gobbi and Zucchi, 1980; Reeve, 1991; Gobbi *et al.*, 1993; Giannotti and Machado, 1994; Giannotti, 1997. However, to *Polistes olivaceus*, studies on behavior or biology are hitherto very poor and very fragmentary. Specially, studies on hibernation are still very lack of documents.

At the beginning of December 2013, accidentally, my colleague notified me of a nest of this wasp at a laboratory, Institute of Ecology and Biological (IEBR). It was as an involvement to the study indulgence, I decided to study on biology of this one. The observation reported here provides new data on (1) its hibernant place, and (2) its hibernant habits.

MATERIALS AND METHODS

The nest was built at a laboratory (the third floor), Institute of Ecology and Biological (IEBR), Hoang Quoc Viet road, Cau Giay, Vietnam, (21°02' 876" N, 105°47' 964" S, altitude 17m), and attached to an electric light stand on the ceiling with a height of about 3.5m from the floor. At this time, the nest was with 317 cells, including 21 individual wasps, and no any egg, larva or pupa in. The observation took every day with a frequency of 2 times/day (9 am and 15 pm), and the time was from 20-30 minutes for each. All actions of individual wasp were minutely written, and pictures were taken by a digital camera Canon SD3500 IS. The temperature in the laboratory was automatically marked by a Humidity and Temperature Recorder, Exttech RH520.

RESULTS AND DISCUSSION

From early December to late March of next year, the number of individual wasps evidently left the nest over time, with 20 on December 11, 2013 (Fig. 1), just remaining 3 on January 26, 2014. These three remained their hibernaculum on the nest until late March (22th,

25th, and 27th, March 2014) (Fig. 2). Most individual wasps thus remained on the nest till late January. These left individuals are to seek a secret hibernaculum. Because the temperature here is no direct cause to influence this transference (analyzed below).



Fig. 1. The number of individual wasps at the start of observation.

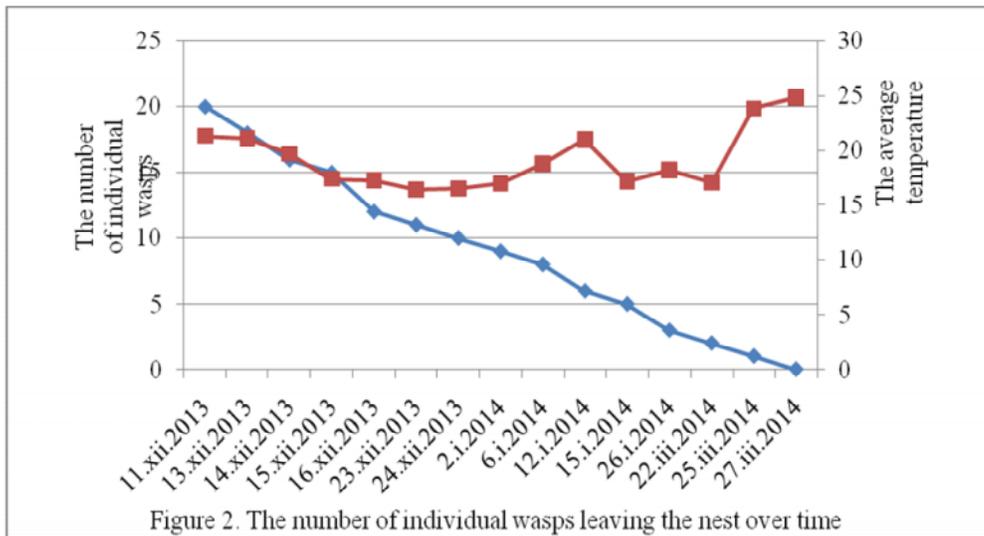


Figure 2. The number of individual wasps leaving the nest over time

Previous studies on *Polistes* wasps showed that: Fecundated females overwinter in protected places (hibernacula) such as: between the inner and outer walls of houses, under shingles and loose tarpaper, in cracks between boards, and beneath the loose bark of trees, *fuscatus* (Bohart, 1942); Crevices of rocks, *annularis* (Rau, 1942); vacancies under roof tiles and above the ceiling, *chinensis* and *jadwigae* (Yoshikawa, 1963 b); Rotting woods and barks of dead trees, North American *Polistes* (Michener and Michener, 1951) (cited from Yamane, 1969). This is thus a new datum about the hibernaculum reported to *P. olivaceus*, and to *Polistes* wasps in general. The following two seasons for this problem are inferred: (1) its nesting site is in a laboratory where always has a higher temperature level than the outdoors, and also is in a place with a minimum of disturbances, including its natural enemies. Because this lab is with a main door that is almost closed all day long, with a window that is been ajar every day, and with just an employee with her present time of about 5-6 hours/day. 2) Its nest is attached to an electric light stand that is with 2 fluorescent lamps by the petiole (about 11 mm long). Every day these fluorescent lamps that are turned on will provide these wasps with the heat. This is very meaning to them.

Because they need also to be supplied with the heat to confront cold weather.

In all hibernant time I also observed their move by change of perch sites, perch upon each other as well as movement of the parts of the body when they were on the spot such as antennae, legs, wings, or the head. Thus their body is absolutely no anabiosis. This means their anabiosis of the body is intermittent, and sometime the operation of the body still has a run. But this activity has to be minimum to evade consumption of energy of the body. To limit energy loss, they took the following three habits: (1) They restricted the move, the fact show that most wasps complied with this way closely, 3-4 days or even a week they did not leave the initial site; (2) they perched near light bulbs where they received the heat from (Fig. 3); and (3) They had a warm each other by the stack (this one perched upon the other) (Fig. 3). It is open to the question whether or not they are fertilizing when they perch upon each other? According to my meticulous observation here, they are not due to the following three reasons: (1) three wasps all are female, (2) previous studies (Bohard, 1942; Eberhard, 1969; Yamane, 1969; Hermann, 1975) showed that *Polistes* wasps are fertilized before their hibernation. Or in other words, females and males mate each other in pre-hibernant stage, and (3) the fecundation is not able to last to weekly.



Fig. 3. Hibernant habits of *P. olivaceus*

ACKNOWLEDGMENT

Author is grateful to Mrs. Nguyen Thi Thuy (IEBR) for her help in creating favorable conditions for study.

REFERENCES

Bohart, E. 1942. Notes on some feeding and hibernation habits of California *Polistes*. *The Pan-Pacific Entomologist*. **18**(1):30-31.

Giannotti, E. & Machado, V.L.L. 1994. The seasonal variation of brood stages duration of *Polistes lanio* (Fabricius, 1775) (Hymenoptera, Vespidae). *Naturalia*. **19**: 97-102.

Giannotti, E. 1997. Biology of the Wasp *Polistes (Epicnemius) cinerascens* Saussure (Hymenoptera: Vespidae). *Anais Da Sociedade Entomológica Do Brasil*. **26**(1):61-67.

- Gobbi, N. & Zucchi, R. 1980. On the ecology of *Polistes versicolor versicolor* (Olivier) in southern Brazil (Hymenoptera, Vespidae, Polistini). I. Phenological account. *Naturalia*. **5**: 97-104.
- Gobbi, N., Fowler, H.G., Chaud Netto, J. & Nazareth, S.L. 1993. Comparative colony productivity of *Polistes simillimus* and *Polistes versicolor* (Hymenoptera: Vespidae) and the evolution of paragyny in the Polistinae. *Zoologische Jahrbücher-Abteilung für Allgemeine Zoologie und Physiologie der Tiere*. **97**: 239-243.
- Harris, A.C. 1979. Occurrence and nesting of the yellow oriental paper wasp, *Polistes olivaceus* (Hymenoptera: Vespidae), in New Zealand. *New Zealand Entomologis*. **7**(1):41-44.
- Hermann, H.R. & Dirks, T.F. 1975. Biology of *Polistes annularis* (Hymenoptera: Vespidae). I. *Spring Behavior. Psyche*. **82**: 97-108.
- Pickett, K.M. & Carpenter, J.M. 2010. Simultaneous analysis and the origin of eusociality in the Vespidae (Insecta:Hymenoptera). *Arthropod systematics & Phylogen*. **68**(1): 3-33.
- Rau, P. 1942. Temperature as a factor inducing the hibernation of *Polistes annularis*. *Annals of the Entomological Society of America*. **35**(1): 94-96.
- Reeve, H.K. 1991. The social biology of wasps (Eds. Ross, K.G. and Matthews R.W.). *Polistes*, Cornell University Press, Ithaca, p.99-148.
- Richards, O.W. & Richards, M.J. 1951. Observations on the social wasps of South America (Hymenoptera, Vespidae). *Transactions of the Royal Entomological Society of London*. **102**(1): 1-169.
- Yamane, S. 1969. Preliminary Observations on the Life History of Two Polistine Wasps, *Polistes Snelleni* and *P. biglumis* in Sapporo, Northern Japan. *Journal of the Faculty of Science Hokkaido University, Series VI, Zoology*. **17**(1): 78-105.
- Yamane, S. & Okazawa, T. 1977. Some biological Observation on a paper wasp, *Polistes (Megapolistes) tepidus malayanus* Cameron (Hymenoptera: Vespidae) *In New Guinea. Kontyu, Tokyo*. **45**(2): 283-299.
- West Eberhard, M.J. 1969. The social biology of Polistine wasps. *Miscellaneous Publications Museum of Zoology, University of Michigan*. **140**: 1-101.