Nesting habits and brood development of *Parapolybia indica* SAUSSURE (Hymenoptera: Vespidae)*

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According to VAN der VECHT[1], the genus *Parapolybia* of the Tribe polybinii, which consists of only five species, is widely distributed from Iran in the West to the Phillipine Islands and New Guinea in the East, and two species spread northward to Japan[3] and Korea.[4]

The species of the genus *Parapolybia*, like the other species of the Tribe polibinii of the polistinae,[4] are generally considered to be a more primitive social wasp than the Polistini and Vespinae. However, there are only a few reports on the nesting biology of these wasps[3,9,11], and the life mode of this genus is not well known in detail and seems to be very interesting because of probable local difference in life cycle due to the wide geographic range, especially in temperate region.

Since 1976 we have been engaged in a biosociological study of *Parapolybia* wasps in Japan through the observation of their life history, and have obtained some information about their bionomics. In this paper, being the first of a series of reports, data are given concerning nesting habits and brood development of *Parapolybia indica* mainly based upon observations in Tsu, Southern Japan.

Study Area and Methods

The data for this study were mainly gathered from 1976 to 1980 in the field in Kawakita, Tsu-City, Mie Prefecture. This area is about 50−100m above the sea level, and covrred with secondary mixed forests consisting of pines, deciduous and evergreen oaks, cherries etc., with some remnants of the primary lucidophylous forest, *Shiia, Camelia*, etc..

Each nest was numbered consecutively in order of its discovery in each year from 1976 to 1980. In order to check for daily brood development, cell maps were made at their natural sites every day throughout their nesting period on each nest which we found there, and the position and contents of each cell were recorded as either "newly constructed", "empty", "egg", "larva in each instar", or "cocoon" with the dates of cocoon spinning and emergence for individuals of the brood.

Results and Discussion

1. Habitat and Nest Site Preference

According to IWATA[3] Japanese *Parapolybia* are distributed in hilly or submountaine areas, not in urban areas. Our experience confirmed this finding. A total of 129 nests of *Parapolybia indica*, which we have so far observed in Kawakita, were all found in secondary forest areas near villages, where the vegetation consisted of mainly pines with some deciduous and evergreen trees such as *Quercus serrata, Q.glauca, Machilus thunbergii, Prunus*

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jamasakura Most trees were more than 10m high. The undergrowth was dominated by ferns, though some shrubs and herbs, such as *Deutzia, Rubus, Lonicera, Adenophora,* were sparsely found along forest roads.

Foraging acitivities of *P. indica* were usually confined to these areas of secondary forests and we have very rarely observed either nests or foraging wasps of this species in human residences near forests.

As shown in Table 1, *Parapolybia indica* exclusively built their nests on trees or in bushes as reported by IWATA [3] and MATSUURA [7] Most of the nests, i. e. 117 out of 129 nests, or 90.7%, were found on the underside of leaves of small evergreen plants such as *Neolitsea sericea* (54.3%, 70/129 nests) and *Quercus glauca* (22.5 %, 29 /129 nests). All these nests were attached to the midrib on the underside of a leaf where rainwater can be avioded to some extent; the leaves to which the nests were attached were sheltered from rainwater by thick branches of trees over them. The height of the nesting sites from the ground varied considerably (Table 1), but most of the nests observed in Kawakita were built at lower levels about 20−30 cm above the ground and were never found above 1.9 m (Fig. 1). The trees preferred for nesting sites were mostly young ones which were less than 2m high. As the nesting sites exist in dark sheltered places, avoiding direct to the sun throughout a day, the illumination at and around the nest was usually below 5Lux even during fine weather in summer day time.

Table 1. Nesting plants of *Parapolybia indica* at Kawakita Tsu.

Nesting Plants	No.	%	Height(cm)
Neolitsea sericea	70	54.3	43.5
Quercus glauca	29	22.5	56.8
Machilus thunbergii	7	5.4	38.6
Ligustrum japonicum	4	3.1	114.8
Symplocos glauca	3	2.3	55.7
Rubus buergeri	3	2.3	24.7
Dendropanax trifidus	2	1.6	105.5
Cleyera japonica	1	0 8	49.0
Eurya japonica	1	0.8	34.0
Quercus serrata	1	0.8	50.0
Kadsura japonica	1	0.8	108.0
Smilax china	1	0.8	25.0
Houttuynia cordata	1	0.8	32.0
Others	5	3.9	29.2
	T. 129		Ave. 49.3

YOSHIKAWA [13] divided Japanese *Polistes* into two types with regard to their nesting place: semi-highland type and flat-land type. *P. rothneyi, P. mandarinus, P. snelleni* and *P. japonicus* belong to the former type and *P. chinensis* and *P. jadwigae*, to the latter. The nests of the species of the former type are most frequently found on twigs of trees [10) 13)]. In Kawakita we have so far found some nests of *P. rothneyi* and *P. japonicus* on twigs of trees, but never found their nests on the underside of leaves like a nest of *Parapolybia indica*. Thus the nest site preference of *Parapolybia* seems to differ

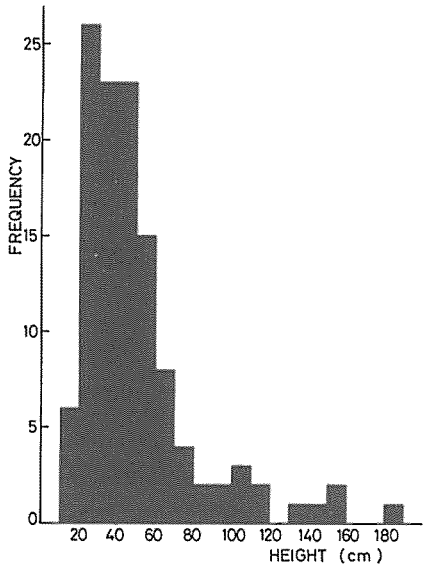

Fig. 1. Frequency distribution of height of nesting sites in *Parapolybia indica*.

characteristically from Japanese *Polistes* species.

2. Nest Construction

1) Nest Material: The nest material of *Parapolybia indica* is pliable and white or grey with a tinge of buff. We often observed that the queens of this species frequently collected plant hairs from the young leaves of *Neolitsea sericea* and the hairs from the surface of the leaves of *Pourthiaea villosa*. The workers also gathered the hairs on the twigs of *Neolistsea sericea*. But we have never obserbed the queens collecting woody bast fibers from the surface of dry wood, as reported in many Japanese *Polistes* wasps.[4),7),10)]

In gathering plant hairs the wasp assumed a position with its body parallel to the leaf or the axis of the stem, and walked slowly backward, cutting off the hairs with mandibles and preparing a pellet of about 3mm in diameter. She then chewed the pellet with her mandibles, mixing a salivary secretion with it before flying to the nest with it. As wasps repeatedly visited the same foraging place, usually within about 10m of the nest, such places could be easily distinguished by the hairless parts on the young leaves as shown in Figs. 5 and 6.

According to IWATA,[3)] *Polistes mandarinus* collects the furlike material from the leaves of *Populus sieboldi, Sorbus japonica* and *Malus tschonoskii* to use as nest material, while most of the Japanese *Polistes* species use bark fibers as building material.

2) Nest Structure: There are only a few reports on the nests of *Parapolybia indica* from Japan.[4),7)] The typical queen nest of this species is shown in Figs. 7 and 8. The queen always makes a rectinidal nest without envelope on the undersurface of wide and large leaves. A pedicel attached to the first cell is made vertically, and the comb consists of hexagonal cells opening downwards, which are arranged in 3 to 5 rows. After the emergence of workers, the number of cell rows increases to between 8 to 10, and the dorsal side of the comb bends inward as illustrated in Fig. 11. When the cells increase in num-

ber during the latter half of nest construction, the pedicel, as well as the upper part, i.e. the basal part nearest to the pedicel, is stretched downward and reinforced in the form of a plate to support the comb as shown in Fig. 9. As the leafstalk to which the nest is attached is also coated with nest materials to be firmly fixed(Fig.10), the nest is reinforced and protected from rain and wind.

The average diameter of cells at the widest part was 4.5mm (range: 4.1–5.4mm, n=30) in the central cells which were built by the queen in early stage of nesting, and 5.4mm (range: 4.5mm–6.1mm, n=30) in the peripheral cells built by workers at the latter stage of nesting. In all the nest of this species, cells made earlier are smaller in cell size than those made later: a trait common to all species of the Japanese social wasps.[8]

The pedicel of incipient nests was always in the shape of a club (Fig. 7), like that of *Polistes* wasps, and its size was 2.9mm in average (range: 2.5–3.7mm, n=16) in length and 0.6–0.9mm in diameter, and that of mature nests became plate-shaped, 2.8mm on average in length and 2.3–20.5mm in width.

3) Nest Foundation: During 1976–1980 we found a total of 108 nests of *Parapolybia indica* in Mie, Nagano and Wakayama Prefectures. All of them were founded by a single queen, that is, haplometrotic foundation, like most of polistine colonies in Japan.[3] We have never found anything to suggest that the colony of this species was started by more than one queen, or pleometrotic foundation, which has been very rarely observed in some Japanese *Polistes* wasps.[7][12][13]

A single queen constructed on average 43.4 cells (range: 23–61) and reared 10.9±1.2 larvae (range: 5–16) up to the pupal stage by herself (Table 2 and Fig. 2). These cells are always smaller in size than those produced later by workers so that the brood reared by the queen emerge as the smallest individuals throughout the season.

The ratio of the cells, constructed by the queen, to total cells made until the disintegration of colonies was about 39.6% on average (Table 2).

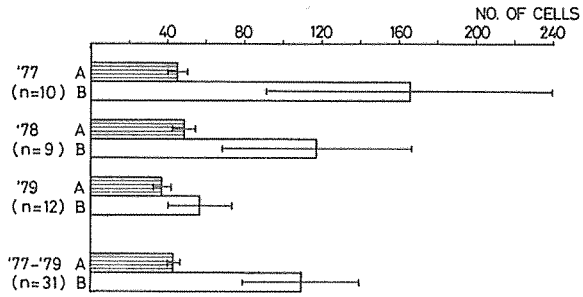

Fig. 2. Number of cells in *Parapolybia indica* nests. A: No. of cells constructed by queens in solitary stage, B: No. of cells at dissolution. Horizontal bars indicate 95% S. E.

According to MATSUURA[7], the number of cells built by a single queen in the Japanese *Polistes* wasps 20–25 in *P. jadwigae*, 25–35 in *P. mandarinus* and *P. japonicus* 30–40 in *P. chinensis*, *P. snelleni* and *P. rothneyi* in southern Japan. Our data indicate that the queen nest of *Parapolybia indica* in southern Japan tends to be larger than that of any other Japanese *Polistes*.

4) Reconstruction of Nests : *Vespa tropica*, which depends exclusively on *Polistes* and *Parapolybia* brood for feeding its larvae, is the most important enemy of *Parapolybia indica* colonies in Kawakita (Fig. 12). The strong predation by this hornet accelerated the break up of the *Parapolybia* colonies during the early stage of nesting. The adult wasps then abandoned their nest and reconstructed a new nest near around the original nest (Figs. 13, 14, 15 and 16).

Table 2. Number of cells constructed by queens of *Parapolybia indica* with some records on case histories in each nest.

Nest no.	Date of discovery	Date of emergence of first workers	No. of brood reared by queen	No. of cells made by queen (A)	No. of cells at termination (B)	A/B × 100 (%)	Date of dissolution	Duration of co-operative period(days)
7701	May 11	June 25	5	34	34	100	July 28	33
7702	May 12	June 27	11	49	199	24.6	Aug 15	49
7703	May 13	June 21	14	56	77	72.7	July 31	40
7704	May 13	June 17	12	49	230	21.3	Aug 16	60
7705	May 13	June 15	14	44	266	16.5	Aug 22	68
7706	May 13	June 20	7	35	37	94.6	July 6	16
7707	May 19	June 17	15	42	198	21.2	Aug 10	54
7710	May 19	June 24	12	50	269	18.6	Aug 8	45
7711	May 24	June 14	13	45	54	83.3	Aug 10	57
7712	June 4	June 15	16	51	291	17.5	Aug 14	60
7801	May 12	June 17	8	33	66	50.0	Aug 6	50
7802	May 12	June 19	6	38	41	92.7	July 10	21
7804	May 17	June 19	12	49	177	27.7	Aug 14	56
7805	May 19	June 19	15	61	108	56.5	July 23	34
7806	May 19	June 19	13	49	70	70.0	July 27	38
7807	May 22	June 19	10	54	88	61.4	July 23	34
7810	May 22	June 21	14	53	245	21.6	Aug 6	46
7811	May 24	June 21	13	53	147	36.1	Aug 1	41
7812	June 5	June 21	11	50	113	44.2	Aug 6	46
7903	May 9	June 18	12	44	45	97.8	July 23	35
7904	May 9	June 22	6	31	36	86.1	July 28	36
7906	May 10	June 22	13	39	40	97.5	July 2	10
7907	May 10	June 22	5	33	95	34.7	Aug 13	52
7908	May 10	July 1	8	34	101	33.7	Aug 18	48
7911	May 10	June 22	9	35	35	100	July 31	39
7912	May 11	June 21	12	39	41	95.1	June 23	2
7914	May 12	June 21	11	45	48	93.7	July 19	28
7917	May 12	June 21	13	47	56	83.9	July 23	32
7918	May 13	June 21	5	23	31	74.2	Aug 1	41
7929	May 19	June 22	12	47	100	47.0	July 28	36
7921	May 21	June 20	10	32	60	53.3	July 23	33
Ave.			10.9	43.4	109.6	39.6		40.0

Table 3 shows the case histories of the reconstruction of some nests of *Parapolybia indica* which were attacked and destroyed by *Vespa tropica*. Complete observations from the start to the finish of a relocation are scarce. The following description was made by combining fragmentary records and information observed by us. From the start of attacks by *V. tropica*, the queen and workers of *P. indica* stop their building activity, though they continue to stay on the comb without any counter-attack. The attack of *V. toropica* is repeated until all the immature stages except for eggs are consumed. This takes from 3 to 10 days. After *V. tropica* has attacked the nest of *P. indica* two or three times, some workers leave the nest and fly about to search for another nesting site nearby. When a suitable site is found not far from the original nest the scout workers settle on the place and spend most of their time resting on it with occasional returns to the original nest. With the start of searching for a new nest site, the workers in the original nest stop nest building activities and the queen stops oviposition. Then, she leaves, frequently by herself, to search for new nest site, which will be on the underside of a leaf or on the twig of various kind of plants near the ground (Table 3). About a day after the arrival of the queen the workers usually start building a new nest and the queen begins to lay eggs in each cell as shown in Fig. 14. The distance between the two nests is mostly within 1−3m (Table 3), reaching 4m at the maximum. After they reconstruct a new nest, most of the workers frequently visit the original nest

Table 3. Records on reconrtructed nests of *Parapolybia indica*.

Nest no. *	Nesting site **	Height (cm)	Date of dissolution	No. of cells at dissolution	Production of female	Production of male	Distance between both nests(cm)
7602	L	50	July 26	130	some	some	97
7607	T	17	?	89	none	some	
7604?	L	80	?	40	none	none	400
7608	L	111	Aug 13	26	none	none	
7703	L	48	July 31	58	some	?	418
7723	T	79	Aug 11	62	some?	?	
7710	L	19	Aug 8	182	some	?	455
7714	T	45	Aug 20	147	none	none	
7715	L	49	?	96	some	?	406
7716	T	34	Oct 19	61	?	?	
7718	L	52	?	92	some	?	160
7719	L	24	Sep 28	81	?	?	
7813	L	29	July 23	74	some	some	88
7814	L	32	Aug 3	70	none	some	
7926?	L	49	July 26	43	some	none	250
7927	L	114	Aug 11	16	none	none	
7927?	L	44	July 23	51	some	none	100
7928	L	37	Aug 11	21	none	none	

* above : original, below : reconstructed nest.

** L : Underside of leaf, T : Twig of tree.

for several days (Fig. 13). But they never reuse the original nest even if *V. tropica* has stopped attacking it.

Nine out of 30 nests which had been attacked by *V. tropica* during July—early August in 1976–1979 were reconstructed and some of them produced new queens or males. However, when the colonies were attacked after mid August, i.e. at a later stage of nesting, all the adult wasps remained on their nest and the queen stopped egg laying, and a new nest was not constructed.

According to YOSHIKAWA[14], when the nests of *Polistes jadwigae* were destroyed by natural enemies, the reconstruction of a nest would be successful at the early nesting stage, but unsuccessful at the later part of nesting, because the remnant of the brood were eaten by workers.

3. Brood Development

Table 4 shows an estimate of seasonal change in the mean duration of the egg, larval and cocoon stage of the Nests 7702, 7705, 7707, 7710 and 7804.

1) Eggs: The development time for eggs *Parapolybia indica* varied considerably according to when the eggs were laid. The eggs laid in May required 11.2 days on average in Nest 7707 and 13.5 days in Nest 7702 to develop, both of which were the longest throughout the nesting period. The eggs laid in June required on average 7.8 days in Nest 7702 and 10.7 days in Nest 7710, and July eggs required on aveage 6.4 days in Nest 7702 and 7.2 days in Nest 7710. Since the development of the egg is not dependent upon food supply, it appears that these differences are probably affected by temperature at different nesting sites.

YOSHIKAWA[13] gave 7 days as the duration for the first eggs of *Polistes jadwigae*. EVERHARD[1] gave 13 days as the mean duration of the egg stage for *Polistes fuscatus* with a wide range of 7 to 18 days.

Table 4. Duration of each developmental stage of *Parapolybia indica* in each oviposition period (in days).

Nest No.		Duration of egg stage			Duration of larval stage			Duration of pupal stage			Duration of total brood period		
		May	June	June·	May	June	June	May	July	July	May	June	July
7702	Mean	13.5	7.8	6.4	25.2	11.8	9.8	14.2	13.1	12.6	53.0	32.7	28.7
	S.E.	0.8	0.4	0.4	1.8	0.7	0.5	1.1	0.5	0.3	1.2	0.9	0.7
7705	Mean	13.1	10.5	7.0	23.9	13.8	10.9	13.1	13.0	13.2	50.1	37.2	30.9
	S.E.	2.3	0.5	0.2	2.2	1.4	0.3	1.0	0.2	0.2	2.7	1.6	0.4
7707	Mean	11.2	10.6	6.4	25.8	15.8	9.6	13.4	13.4	13.0	50.2	39.9	29.1
	S.E.	2.2	0.8	0.6	1.4	1.7	1.4	0.7	0.2	0.9	3.9	2.1	1.5
7710	Mean	11.3	10.7	7.2	26.3	14.7	13.7	12.5	13.6	——	50 1	39.0	——
	S.E.	1.3	0.7	0.2	2.0	1.1	0.6	0.7	0.2	——	2.7	1.8	——
7804	Mean	13.2	8.9	6.6	19.5	16.1	10.6	14.2	13.1	12.6	46.8	38.9	30.7
	S.E.	0.5	0.5	0.2	1.7	1.1	0.3	0.6	0.4	0.4	3.3	1.4	0.7

2) Larvae: The development times for the larval stage also varied considerably at different stages of colony development. Fig. 3 shows the relationship between the order of emergence of workers and the duration of larval stage in Nests 7804 and 7919. The first larvae usually required only 13—14 days, while all subsequent larvae required increasingly more days to develop. The egg which hatched on May 27 required the maximum time of 26 days in Nest 7804, and the duration of the larval stage shortened gradually. In Nest 7804 the larvae which were produced from the eggs laid in June required 16.1

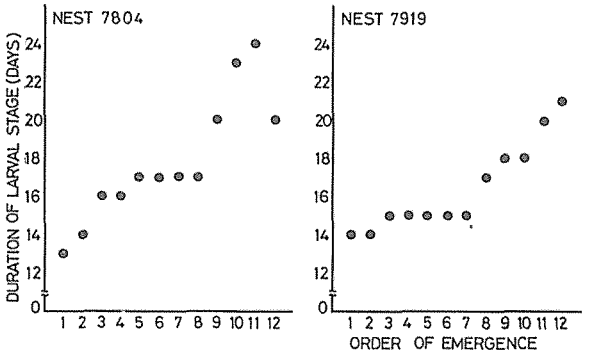

Fig. 3. Relation between order of worker emergence and the duration of the larval stage.

days (range: 10—23 days, n=42), and in July 10.6 days (range : 8—22 days, n=126).

The variations of the development time of larvae are probably affected by quantita tive larval nutrition at different stages of colony development, as already pointed out in *Polistes* spp[1]. and in *Mischocyttarus drewseni*[5]. YOSHIKAWA[13] noted that the queen of *Polistes jadwigae* had a tendency to feed more food to accelerate the emergence of the first few workers. Such rapid growth of the first larvae is also reported in *Mischocyttarus drewseni*[5]

3) Cocoons: As shown in Table 4, the mean duration of the cocoon stage varied much less than did that of the larval stage. In Nest 7804 the average length of the cocoon stage was 14.2 days for May eggs, 13.1 days for June eggs and 12.6 days for July eggs. Temperature probably affects the developmental rate of pupae as reported by EBERHARD[1] in *Polistes* spp., though EBERHARD's data for the duration of the pupal stage (=cocoon stage) show a wide variation of 9—33 days in *Polistes fuscatus* and of 7—32 days in *P. canadensis*.

4) Duration of Immature Stages: Total development times from egg to adult varied considerably according to the stage of colony development (Table 4 and Fig. 4). The first brood required more than 50 days, which is the maximum. The total development time

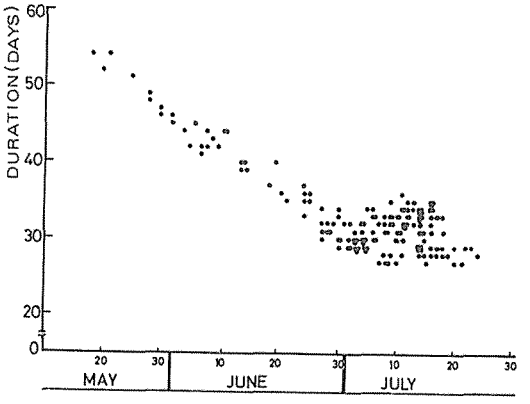

Fig. 4. Change of the total developmental periods from egg to adult observed in Nest 7705.

of brood decreased gradually to around 30 days and most of the eggs which were laid in July required 27–35 days to develop. However, eggs laid after August did not develop to adulthood because they were attacked by *Vespa tropica*, or used as food for the males and new queens.

Summary

Biosociological studies on *Parapolybia indica* SAUSSURE have been carried out by the authors since 1976. The present paper deals with the nesting habits and brood development of this wasp in Kawakita, Tsu, Mie Pref., southern Japan, in comparison with those of other Polistinae.

Some peculiar habits on nidification are : 1) nidification on the underside of a leaf of evergreen trees ; 2) the use of the hairs mainly collected from the young leaves of *Neolitsea sericea* for nest material ; 3) a single laterinidal comb without envelope ; 4) exclusive haplometrosis ; 5) nest reconstruction in colonies attacked by *Vespa tropica.*

The number of cells constructed by a single queen was 43.4 cells on average, and the developmental time from egg to adult required more than 50 days at earlier stages and around 30 days during the later stages of nesting.

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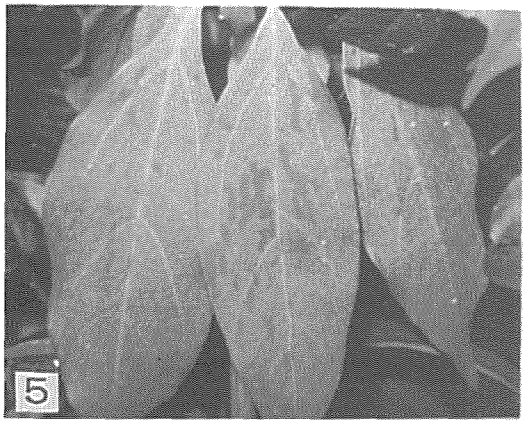
References

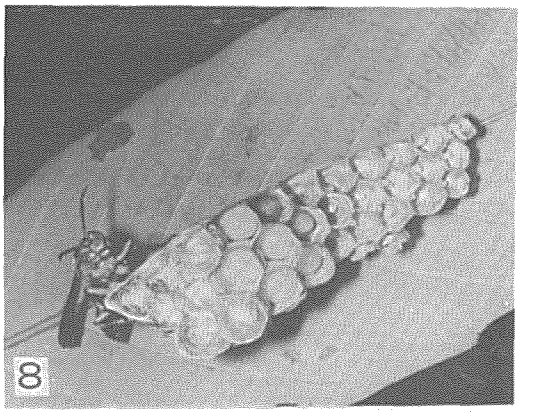
1) EBERHARD, M.J.W. 1969. The social biology of polistine wasps. Misc. Publs. Mus. Zool. Univ. Michigan, No. 140, Ann Arbor, 101pp.
2) GIORDANI-SOIKA, A. 1976. Vespidi ed Eumenidi raccolti in Corea (Hymenoptera). Ann. Hist. -nat. Mus. Nat. Hung. 68 : 287-293.
3) IWATA, K. 1969. Nidification habits of *Ropalidia* and *Parapolybia*. Kontyu, 37 : 437-443. (In Japanese).
4) ————, 1971. Evolution of Instinct. Comparative ethology of Hymenoptera. Yamatoshi, Mano-shoten, 503pp. (In Japanese).
5) JEANNE, R.L. 1972. Social biology of the neotropical wasp, *Mischocyttarus drewseni*. Bull. Mus. Comp. Zool. 144: 63-150.
6) MATSUURA, M. 1968. Life of hornets. Part 12. Jap. Bee J. 21 : 49-52. (In Japanese).
7) ————. 1976. Notes on the social wasps and bees in Wakayama Pref. Nankiseibutsu, 18: 5-11,(In Japanese).
8) MATSUURA, M. and S.F. SAKAGAMI. 1976. A bionomic sketch of the giant hornet, *Vespa mandarinia*, a serious pest for Japanese apicuiture. J. Fac. Sci. Hokkaido Univ. Ser. VI. zool. 19 : 125-162.
9) PAGDEN, H.T. 1958. Some Malayan social wasps. Malay. Nat. J. 12 : 121-148.
10) TABUCHI, Y. 1962. The life of paper wasps of Japan. Tokyo, Kôdansha. 183pp. (In Japanese).
11) VAN der VECHT, J. 1966. The East Asiatic and Indo-Australian species of *Polibioides* and *Parapolybia* Zool. Verh. 83 : 1-42.
12) YAMANE, S. 1969. Preliminary observations on the life history of two polistine wasps,

Polistes snelleni and *P. biglumis* in Sapporo, northern Japan. J. Fac. Sci. Hokkaido Univ. Ser. VI. zool. 17 : 78-105.

13) YOSHIKAWA, K. 1962. Introductory studies on the life economy of polistine wasps. I. Scope of problems and consideration on the solitary stage. Bull. Osaka Mus. nat. Hist. 15 : 3−27.

14) ————. 1974. Social insects with special reference to social wasps. Tokyo, Kyoritsu-Shuppan, 130pp. (In Japanese).





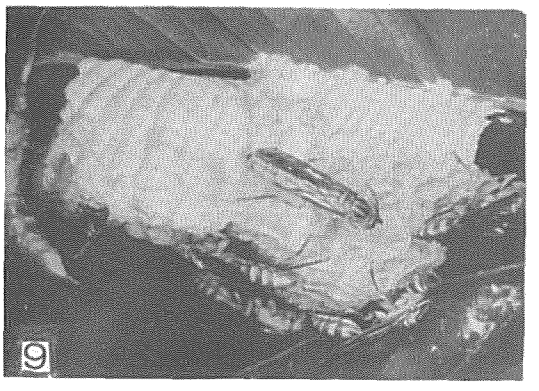


Fig. 5. Leaves of *Neolitsea sericea* with the marks to show where *Parapolybia indica* have visited to collect the nest materials.

Fig. 6. The same; some parts of the hairs on a leaf are cut off by the wasps.

Fig. 7. Incipient queen nest of *P. indica* attached to the midrib on the underside of a leaf of *Neolitsea sericea*.

Fig. 8. Mature queen nest of *P. indica*, consisting of cells arranged in three rows, attached to the midrib on the underside of a leaf of *Quercus glauca*.

Fig. 9. Mature nest of *P. indica* with a developed plate-like pedicel.

Fig. 10. Two workers coating nest materials on the leafstalk of a leaf to which the nest is attached.

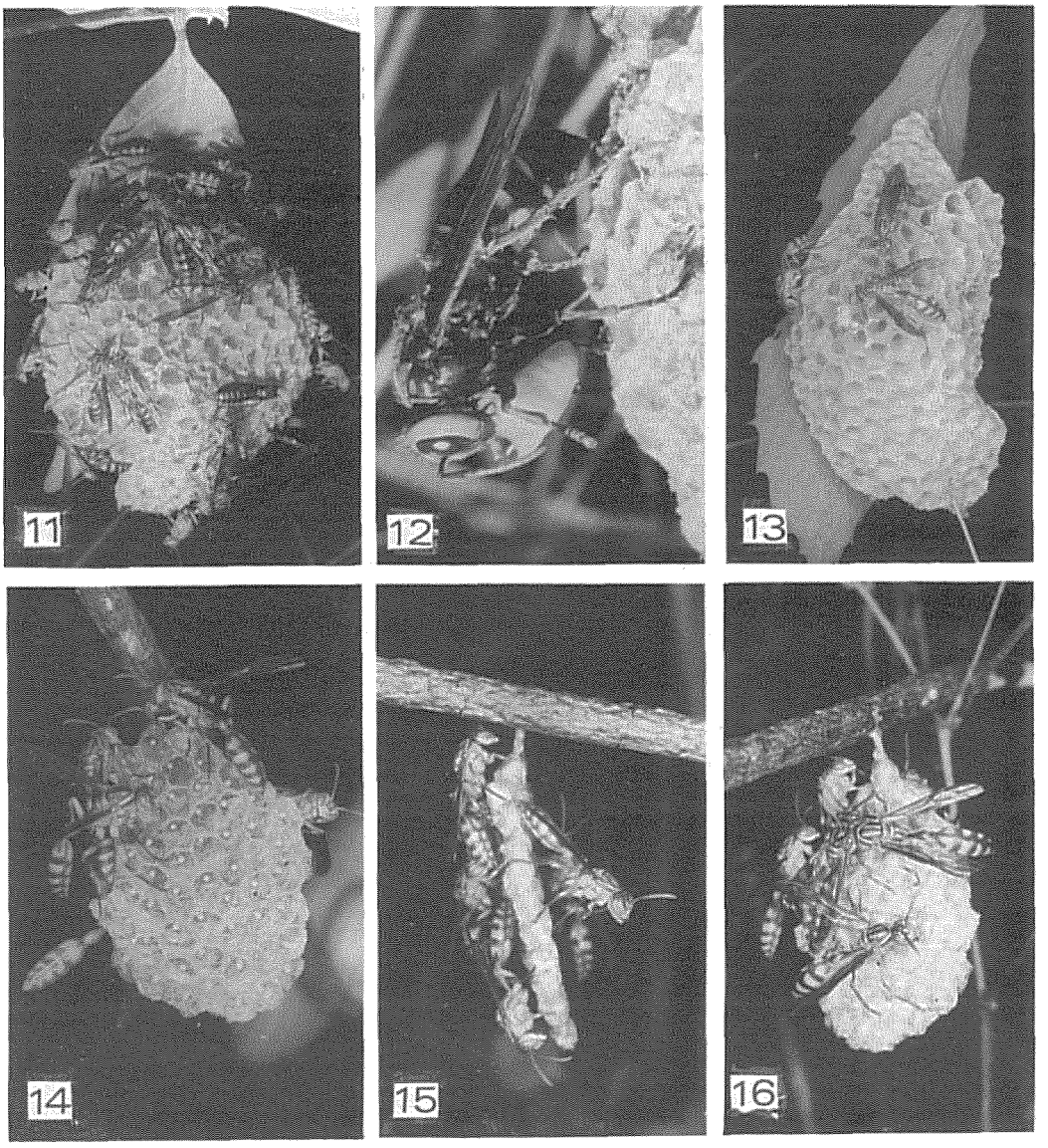


Fig. 11. Mature nest of *P. indica* where the dorsal sides of the comb bend backward.
Fig. 12. *Vespa tropica* worker manipulating a prepupa of *P. indica* on the nest of the latter species.
Fig. 13. Abandoned nest of *P. indica* with a few workers remaining on it (Nest 7602).
Fig. 14. Reconstructed nest of *P. indica* with only eggs in each cell (Nest 7607).
Fig. 15. Side view of the same nest.
Fig. 16. Dorsal aspect of the same nest.

摘　　要

ホソアシナガバチの営巣習性と蜂児の発育

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里山生態系の高次捕食者であるホソアシナガバチ（*Parapolybia indica* SAUSSURE）について，1976年より1980年の間，三重県津市一身田町川北地区の山林内で観察を行ってきたが，本稿では営巣習性と各発育態の生育所要日数に関する調査結果を述べた。

1）本種の営巣場所は，二次林内の林床に自生する常緑樹の幼木の葉裏で，とくに川北地区では営巣樹としてシロダモ（54.3%，70/129）とアラカシ（22.5%，29/129）が選好されていた。

2）造巣材料として，シロダモ及びカマツカの新葉及び若枝の表面に密生する毛茸を採取し，唾液と混ぜて利用するのが確認された。

3）巣は無外被の垂直巣盤で，1本の巣柄で支えられるが，巣の発達とともに支柱は板根状となって下方に伸展した。

4）5年間に観察した108巣における創設個体は，いずれも1頭の受精女王であり，したがって本種は「単雌創設」とみなされる。

5）女王が単独で創設した育房数は平均43.4房（最少23，最多61）で，そのうち10.9頭（S.E.±1.2頭）を営繭期まで養育した。

6）本種の天敵であるヒメスズメバチ *Vespa tropica pulchra* の攻撃を受けた30巣のうち，近接した場所に再築を確認した例が9巣で，そのうちの8巣（27.7%）が次世代の繁殖階級を産出した。

7）卵から羽化までの発育期間は，女王蜂の養育による最初の数頭の働き蜂では50日以上を要したが，以後短縮傾向となり，7月に産付された卵では羽化までに30日前後を要した。