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ADULT LONGEVITY OF *Idea blanchardii* (LEPIDOPTERA: NYMPHALIDAE) CAPTIVE BRED AT LIPI BUTTERFLY BREEDING FACILITY, CIBINONG, INDONESIA

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ABSTRACT

Idea blanchardii is one of many endemic butterfly species in Sulawesi, Indonesia. This species is among the highly traded butterfly species thus requires biological information on the captive breeding. The aim of this study was to obtain data on the adult life-span, to report the multivoltine generation, and to provide conservation-related insight. Captive breeding research on this species was conducted within the period of September 2018 until February 2020. The host plant, *Parsonsia alboflavescens*, was used to support the life of this species for ovipositing and larval food plant. The adults would visit almost any flowers available at the facility. In total, 696 individuals were observed. Data on mating information of the species is presented here. Observations on when a female lays eggs are also revealed. This research showed that *I. blanchardii* is polygamous and polyandrous. Individuals of this species could live much longer than other butterfly species. A few could live over 80 days and one still seen laying eggs at the age of 136 days old.

Key words: breeding, *Idea blanchardii* butterfly, life-span, mating, parental stocks

INTRODUCTION

Butterflies belonging to the genus *Idea* Fabricius, 1807 (Nymphalidae: Danainae) are quite large in size and very attractive though they are only black and white in color. There are 12 species of *Idea* worldwide with distribution range from India, Indo-China, SE Asia to Japan (Morishita, 1981; Kitching et al., 1987; Vane Wright & de Jong, 2003). Eight species occur in Indonesia, and 4 species are endemic to Indonesia, i.e., *Idea blanchardii* which is endemic to Sulawesi; *I. tambusisiana* endemic to central Sulawesi; *I. idea* endemic to Kepulauan Sula, Buru, Ambon, and Seram; and *I. durvillei* endemic to northern Maluku and Papua. *Idea blanchardii* Marchal, 1845 is one of 239 Sulawesi's endemic butterfly species (Vane-Wright & de Jong, 2003). This lowland species (Ackery & Vane-Wright, 1984) is quite common as indicated also by some entries to Kupunesia App in the past year (Peggie et al., 2022). *Idea leuconoe*, which distributes in Thailand, Malaysia, Philippines, Taiwan, Ryukyu Is. Japan, and some small islands off Sumatra, Java, and Sangihe (Morishita, 1981; Corbet & Pendlebury, 2020; Savela, 2024), is popular in butterfly houses because of its beauty and slow and gliding flight. Similarly, *I. blanchardii* is quite impressive, but it is not widely used in butterfly houses, thus efforts to breed

this endemic species are deemed necessary. Data on biology and ecology of butterfly species is not readily available for most species (Bubová et al., 2016) even in developed countries such as Europe. Knowledge on adult life-span and other factors affecting population size need to be obtained to assess species vulnerability (Bubová et al., 2016). This research aimed to provide data on the life-span of adult *I. blanchardii* and the multivoltine generations, and to offer knowledge to stakeholders of conservation initiatives. Indonesia as a tropical country does not have to deal with issues of overwintering species and flight period length for butterflies so we can seek the answer to the question of how many generations can a butterfly species survive in a captive breeding facility.

The species has been bred by PT Ikas Amboina in Bali to supply the butterfly stocks at Bali Butterfly Park in Tabanan but no data was taken for scientific purpose. Data of the life history of *Idea hypermnestra linteata* was reported by Kirton et al. (1982). Igarashi & Fukuda (1997) presented photographs of pre-adult and adult stages of *Idea lynceus* and *I. leuconoe,* as well as *I. blanchardii* (Igarashi & Fukuda, 2000). Here the life duration of adults and longevity of the species bred at the butterfly breeding facility are presented to improve the understanding of the species.

Butterflies have close association with their host plants, which are specific for ovipositing and larval food plants. The host plants for *Idea* spp. are *Parsonsia* spp. of Apocynaceae (Ackery & Vane-Wright, 1984; Corbet & Pendlebury, 2020; Robinson et al., 2023). *Parsonsia alboflavescens* (Dennst.) Mabb. (syn. *P. laevigata*) has been used to breed *I. blanchardii* successfully (Igarashi & Fukuda, 2000; H. Detani pers. comm.). Prior to obtaining the parental stocks of the butterfly species, some *P. alboflavescens* had been planted to be the host plant, on which the caterpillars feed and females lay eggs. Many species of *Parsonsia* contain pyrrolizidine alkaloids (PAs), however, there are great qualitative and quantitative variations and even intraindividual differences e.g., different concentrations in leaves vs roots which have not been systematically studied (M. Boppre, pers. comm.). *Idea leuconoe* sequesters PAs from *Parsonsia* and uses them for synthesizing danaidone (Schulz & Nishida, 1996).

MATERIALS AND METHODS

Study area:

The research was conducted at Biovillage butterfly breeding facility of Indonesian Institute of Sciences (Lembaga Ilmu Pengetahuan Indonesia – LIPI), located at Cibinong Science Center, Cibinong, Bogor, Indonesia. The butterfly breeding facility included a 10x20 m^2. butterfly enclosure, a 4x6 m^2 breeding room, and surrounding area for planting. Various plants were grown inside and outside the butterfly enclosure to support butterflies which included the larval host plants, the nectar-producing plants, and the shade plants. Breeding and research observations were conducted at the facility without interference of temperature control, i.e., the conditions at the field and semi-permanent building, at ambient temperature of 26–34^{0}C.

Materials:

Parental stocks for the research were obtained from PT Ikas Amboina, a private captive breeding company located in Bali. On a visit to the captive breeding company in September 2018, six individuals of caterpillars were brought to LIPI's butterfly breeding facility (Fig. 1), with the permit obtained from local forestry department (Surat Angkut Tumbuhan dan Satwa Liar Dalam Negeri SATS-DN permit letter number 246/SATS/BKSDA.BI-1/PTSL/2018) issued on September 26, 2018.

Methods:

The breeding methods follow Peggie (2018). Upon obtaining the parental stocks, in this case the caterpillars, each larva was placed inside a large plastic container with mesh opening lid and an individual number was given. The caterpillars were fed on fresh leaves of the host plant, *P. alboflavescens*. Observations on the individuals were conducted daily to note the molting of each larval instar and into pupation. Standard procedure for marking an adult butterfly was conducted according to Hagler & Jackson (2001). The application of paint marker pens was used in this research to recognize individuals. The dot marking was given on the underside of left forewing for easy handling (Peggie, 2018). Paint marker pens with 10 different colors were used and applied consistently to indicate separate color for each number. In this study, white was used to indicate number 1, yellow = 2, purple = 3, brown = 4, red = 5, green = 6, blue = 7, orange = 8, silver = 9, gold = 0. The combination of 10 different colors proved to be effective in numbering the butterflies for research purpose. After being marked, the date of emergence and sex were noted in a data book. Male and female can be distinguished by the apparent hairpencils of the male (Morishita, 1981) which are everted when a male is touched. The newly-emerged butterflies were released into the butterfly enclosure on the same day. Observations were then started on the butterflies flying in the enclosure. Mating individuals were photographed and the individual numbers were recorded. Flower-visiting individuals were also photographed. Egg-laying behavior was recorded whenever possible every day during the breeding period.

After mating butterflies or egg-laying female were observed, search for eggs on the host plants was conducted. The eggs of the day were collected into a petri dish and brought to the breeding room to be observed. When the eggs hatched into small caterpillars, each caterpillar was individually placed into a plastic container for observation of next generations.

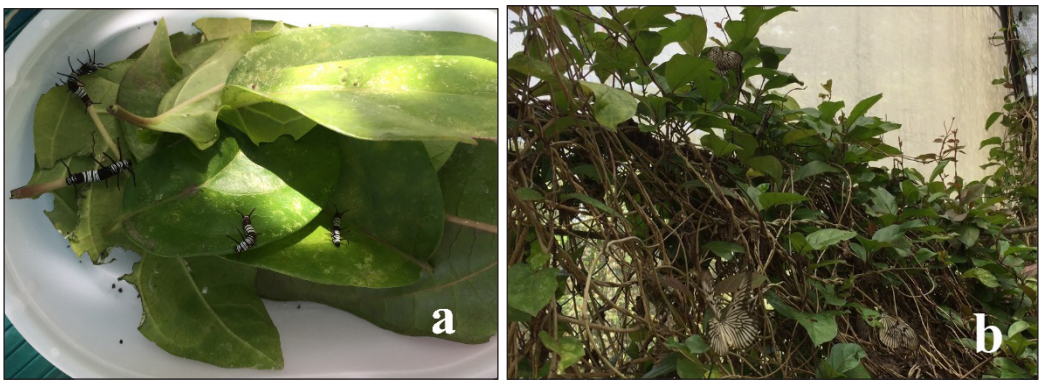

Figure 1. Breeding of *I. blanchardii*: (a) larvae as parental stocks for breeding research, (b) the host plant, *P. alboflavescens*.

RESULTS

The observations of *I. blanchardii* were conducted within the period of September 2018 through February 2020, encompassing 696 observed individuals in total. As the parental stocks, six individuals of caterpillars were all successfully bred to adulthood, resulting in 2 males and 4 females, success rate of the parental stocks was 100%. Mating and ovipositing behavior could not be observed for the parental stocks. The parental stocks (F0) resulted in 192 adults (105 males and 87 females) as the first generation (F1), with 22 individuals failed at larval stage, 1 male and 1 female failed at eclosion, so the success rate of this first generation was very high at 87.5%.

The F1 generation resulted in 209 individuals (111 males and 98 females) as the second generation (F2), the number of failed individuals was not recorded. The F2 generation resulted in 129 individuals (71 males and 58 females) as the third generation (F3), 3 individuals failed at pupal stage, and 1 female failed at eclosion. The F3 generation resulted in 39 individuals (22 males and 17 females) as the fourth generation (F4), 2 individuals failed at pre-pupal stage, 3 failed at pupal stage, and 1 male failed at eclosion.

Subsequent generations were not fully recorded but up to 13 generations were bred in the enclosure until February 16, 2020 when we were forced to stop the generations due to the ripped net caused by a big storm. The data showed that *I. blanchardii* was successfully bred in our facility for over 16.5 months without any additional parental stock.

Observation on mating and egg-laying behavior of *I. blanchardii* was conducted whenever possible. As many as 49 females were observed mating and / or egg-laying during the research period (Appendix 1). Of the F1 generation, 9 females were managed to be observed of which 2 individuals were observed mated and laid eggs, 4 were observed mated, and 3 were observed laid eggs. Of the F1 generation, 5 males were observed mated of which 2 were observed mated twice and with female of F2, and 1 mated with female of F3.

Of the F2 generation, 9 females were observed, in which 5 were observed mated, 3 were observed laid eggs, and 1 was seen distracting a mating pair. Of the F2 generation, 7 males were observed mated of which 6 mated with female of F3 generation, 1 was observed mated twice and 1 mated three times.

Of the F3 generation, 28 females were observed, of which 9 were observed mated and laid eggs (1 individual # 9974 was seen mated 5 times with males of F1, F2, and F3 generations and seen laid eggs twice), 14 were observed mated (2 mated twice and 1 mated three times), and 5 were observed laid eggs. Of the F3 generation, 19 males were observed of which 8 were seen mated once (one male # 10016 mated female of F1), 7 were seen mated twice, 1 male (# 10076) was seen mated three times, and 2 males (# 10015 and 10102) were observed mated four times, and 1 male was seen distracting a mating pair.

Of the F4 generation, 5 females were observed, of which 1 individual (# 10159) was seen mated twice and laid eggs, 3 were seen mated once, and 1 was seen mated twice. Of the F4 generation, 5 males were observed of which 3 mated once, 1 mated twice with female of F3 generation, and 1 male was observed distracting a mating pair.

The duration of life of adult butterflies can be seen from 125 individuals that were found dead (Appendix 1, Fig. 2), ranging from 1 day to 106 days. The average flying time was 42.2 days, which was the longest of all other butterfly species bred in the facility.

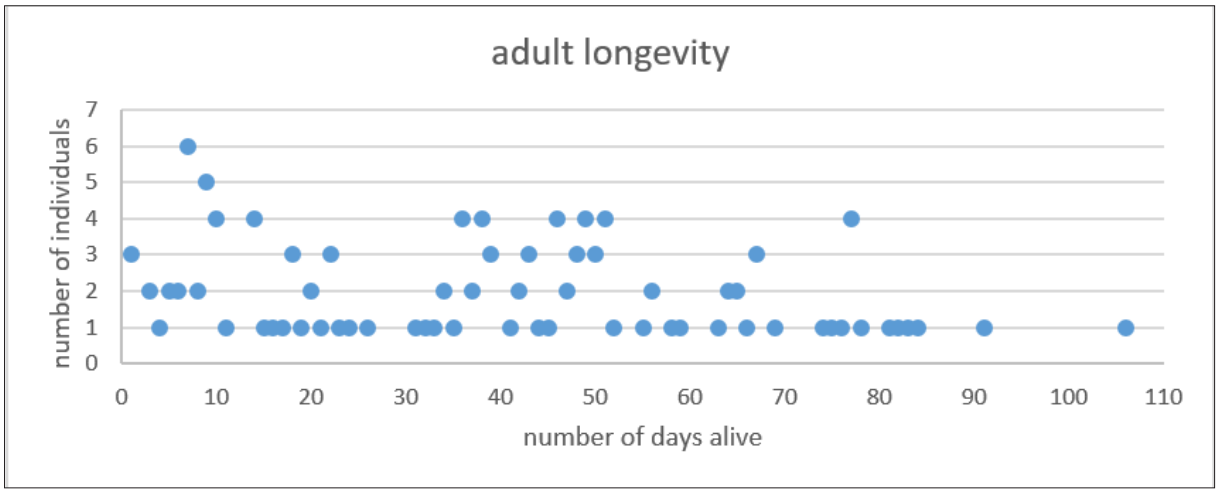

Figure 2. Data on adult's life duration of *I. blanchardii* bred at the butterfly breeding facility was derived from 125 individuals that were found dead.

Adults visited most flowers (Fig. 3) available at the butterfly enclosure such as *Clerodendrum paniculatum*, *Zinnia* sp., *Jatropha integerrima*, *Caesalpinia pulcherrima*, *Ixora* sp., *Pseuderanthemum reticulatum*, *Impatiens* sp. and *Aloysia virgata*, but did not use *Antigonon leptopus*. Nectar feeding activities were observed as early as 07.00 AM. Mating activities (Fig. 4) were observed as early as 08.00 AM, and could last for several hours.

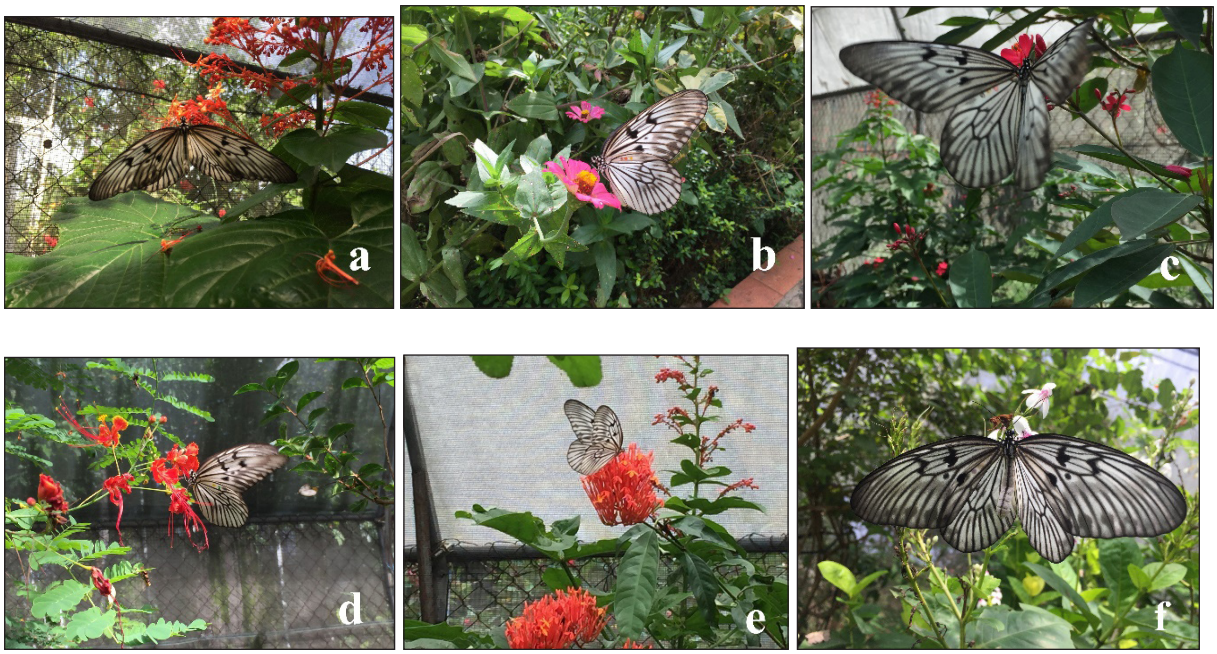

Figure 3. Adults visited various flowers inside the enclosure: (a) *Clerodendrum paniculatum*; (b) *Zinnia* sp.; (c) *Jatropha integerrima*; (d) *Caesalpinia pulcherrima*; (e) *Ixora* sp.; (f) *Pseuderanthemum reticulatum*.

Figure 4. Activities of: (a) mating; (b) disruption by an individual to a mating pair; (c) egg laying by a female observed at the butterfly enclosure.

DISCUSSION

The data of *I. blanchardii* captive bred at the butterfly breeding facility has indicated that this species can be bred for a long time in captivity. In this case, the species lasted for over 16 months without additional parental stocks. Generally, butterflies bred in captivity will need to be replenished with additional parental stocks at least once a year or after 5 generations as the size or quality of descendants becomes smaller or defective (Peggie, 2018). Out of all butterfly species captive bred in our facility, this species showed the best performance in longevity of generations.

The success rate of the parental stock (F0) was 100%, the rate of F1 was 87.5%, but we could not record the fatalities of larvae and pupae of subsequent generations due to limited human capacity to work on some other species at the same time. It was very impressive that 4 females and 2 males of F0 could result in 192 adults (105 males and 87 females) as the first

generation. The failed pupae were blackened because of parasitoid attacks and were removed immediately as to avoid further infections. Inspection on the parasitoid was not conducted on this research. The failure of 1 male and 1 female of the F1 (and of subsequent generations) to emerge successfully out of the pupal case was due to the timing, it took them so long to get out so the wings became crumpled.

The F1 generation resulted in 209 individuals (111 males and 98 females) as the second generation (F2), the number of failed individuals was not recorded as we needed to prioritize the work handled due to very limited help available. The F2 generation resulted in 129 individuals (71 males and 58 females) as the third generation (F3). This number did not reflect the true percentage as we needed to reduce the number of larvae that could be bred due to the diminishing leaves of the host plants (Fig. 5a). We aimed to maintain the butterfly generations to see the longevity but we could not afford to rear every individual. The same condition also happened to F3 generation, which resulted in 39 individuals (22 males and 17 females) as the fourth generation (F4).

Subsequent generations were not fully recorded but up to 13 generations were bred to be in the enclosure until February 16, 2020 when a big storm hit the area resulted in ripped net. The ripped net had made it necessary to remove all existing *I. blanchardii* from the enclosure to avoid any accidental release outside. We had to be very careful with the species all the time to ensure that this Sulawesi species will not escape outside the enclosure. We had two double doors at the enclosure and maintained the insect net cover at good condition without any hole. Therefore, when a big storm damaged the net, we immediately put a roll of insect net overlapping the ripped one and we did not wish to take a risk of accidental escape so the generation had to stop then, and we had to accept that this species at least survived for over 16.5 months without any additional parental stock. The generations would have lived much longer because the wing measurement of some individuals (in prep.) indicated that the individuals of last generations were not getting smaller in size, thus the quality was not diminishing. The host plant was also thriving well to support the larvae. After the ripped net, only local butterflies were left, which unfortunately were wiped out also at a later date due to halted funding and removal of the facility.

Observations on mating pairs were conducted as frequently as possible. The data on mating butterflies showed that males could mate multiple times and with different females and confirmed that they are polygamous. Interestingly, due to their long life, males could mate with females of their own generation or different generation. This also happened to females, thus confirming that they are polyandrous. The data showed that male could mate as early as 5 days old (# 10211) and could still mate at 89 days old (# 9550). Female could mate as early as 3 days old (# 10122) and could still mate at 123 days old (# 9470 – and this individual was observed laying eggs the next day).

Egg-laying observations showed that females could lay eggs at 8 days old (#10071), and at the age of 136 days, a female (# 9471) still seen laying eggs. Even when the host plant inside the enclosure was almost without leaves and we needed to put in some cut branches from outside,

egg laying females seem to be undisturbed and still laid eggs on the barren shrub as if they adopted the approach (Rabasa et al., 2005) that they would survive. It was desirable to know how early actually a female can lay eggs. We had only one enclosure at the time of observations and two smaller enclosures were built later to facilitate observation of egg-laying individual. The observations on mating and egg-laying can be improved by observing only one pair at a time, but this could not be conducted with this research at the time. Distraction from individuals towards a mating pair was recorded. Two males (# 10104, 10236) and one female (# 9773) were seen approaching mating pair. Even mating pair # 10033 and # 10106 were approached by males # 9851, 10104 and 10102 after 5 hours of mating.

Data on life duration or life-span of adults can be seen from 125 individuals (Appendix 1, Fig. 1), that were found dead as we checked for dead butterflies every afternoon and recorded the data. The life duration ranged from 1 day to 136 days. Compared to 50 European species reported with the average of 2.5 to 15 days (Bubová et al., 2016) and our own data (Peggie et al., The average adult life-span was 42.4 days, which was the longest of all other butterfly species captive bred in the facility. This life-span can be compared to those of 50 European species with the average of 2.5 to 15 days (Bubová et al., 2016) and to our own data of adults *Troides helena* which could live well over 2 to 3 weeks and *Pachliopta adamas* which could live over 2 weeks and a few reached 25 days (Peggie et al., 2021). This knowledge is valuable for consideration of conservation and utilization of this species.

It was not possible to trace all individuals for their life duration because some dead individuals might be taken by ants before we picked them up. Even from this data based on dead butterflies, we still had data of a few individuals that lived longer as seen from the female # 9470 which was still alive and mated at the age of 123 days and the female # 9471 which was seen laying eggs at the age of 136 days. As to the question of what prolongs the adult life-span (Haeler et al., 2014) of this species, we do not have the answer yet and it will be very interesting to pursue further. The habitat difference might be the answer when comparing tropical and temperate butterfly species (Karlsson & Wiklund, 2005) but when comparing with other Indonesian species, this species really stands out for the life-span and longevity.

The male and female proportions will be assessed later to see the effect of protandry (Wiklund & Fagerström,1977; Fagerström & Wiklund, 1982) but it seems that this species does not have a problem in captivity. This is probably because we had many individuals and overlapping generations. This research has provided us with new findings about polygamous and polyandrous behavior of the species, about the long life of individuals, and about the longevity of this species. The alkaloid content of the host plants may affect the duration of life which is interesting to observe later.

Adults use almost all flowers for nectar, but were never seen sipping on parts of the host plants. This research confirms that adults of *Idea* do not visit sources of PAs (i.e., they are not PA-pharmacophagous), which are in contrast to other Danaini members, as pointed out by Boppré (per. comm.). In this research, adults of *Euploea phaenareta,* a member of Danaini,

were seen coming to the host plants to sip on the bark of the tree (Fig. 5b). Some other data were obtained during this research and there is much more information to be pursued at a later date to enhance our understanding of this species.

Figure 5. Condition of the host plant: (a) leaves were almost all eaten; (b) *Euploea phaenareta* was observed sipping the leaf of *I. blanchardii*'s host plants, most likely to obtain pyrrolizidine alkaloids (PAs).

CONCLUSION

This study resulted in the knowledge of the long life-span of adult *I. blanchardii*, much longer than other butterfly species. The data on the longevity of this species in captivity is also beyond expectation, survived up to 13 generations without being replenished by fresh parental stocks from the wild. This knowledge is valuable for consideration by stakeholders of conservation initiatives. Further observation can be conducted, also to compare with the biology of the species in its natural habitats in Sulawesi.

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Appendix 1. Informative data on mating, egg laying, and life duration of *I. blanchardii* at LIPI's butterfly breeding facility

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
1	9429	F0	22-Oct-18	female	parental stock taken as larva		
2	9431	F0	23-Oct-18	female	parental stock taken as larva	6-Feb-19	106
3	9433	F0	24-Oct-18	male	parental stock taken as larva		
4	9434	F0	24-Oct-18	female	parental stock taken as larva	6-Dec-18	43
5	9435	F0	24-Oct-18	male	parental stock taken as larva		
6	9436	F0	26-Oct-18	female	parental stock taken as larva		
7	9461	F1	6-Dec-18	male	**first individual of F1**		
8	9463	F1	7-Dec-18	female	mated 14 Dec 2018 (7 days old) at 9.30 with 9465 (6 days old)		
9	9465	F1	8-Dec-18	male	mated 14 Dec 2018 at 9.30 with 9463; mated 12 Feb 2019 with 9806		
10	9470	F1	9-Dec-18	female	mated 11 Apr 2019 (123 days old) with 10016 (43 days old); laid eggs 12 Apr 2019 (124 days old)		
11	9471	F1	9-Dec-18	female	laid eggs 24 Apr 2019 (136 days old) at 11.30		
12	9480	F1	10-Dec-18	male		4-Mar-19	84
13	9501	F1	11-Dec-18	female		31-Jan-19	51
14	9503	F1	11-Dec-18	male		28-Jan-19	48
15	9504	F1	11-Dec-18	female		31-Jan-19	51
16	9506	F1	11-Dec-18	male		31-Jan-19	51
17	9512	F1	12-Dec-18	female		28-Jan-19	47
18	9514	F1	13-Dec-18	male		28-Jan-19	46
19	9524	F1	13-Dec-18	female		4-Mar-19	81
20	9525	F1	13-Dec-18	female		2-Jan-19	46
21	9535	F1	14-Dec-18	female		27-Feb-19	75
22	9536	F1	14-Dec-18	male	mated 2 Jan 2019 with 9595; mated 8 Jan 2019 with 9545		
23	9545	F1	15-Dec-18	female	mated 8 Jan 2019 (24 days old) with 9536 (25 days old)		
24	9550	F1	15-Dec-18	male	mated 13 Mar 2019 at 16.00 with 9974		
25	9554	F1	16-Dec-18	female		2-Mar-19	77
26	9562	F1	17-Dec-18	female		4-Mar-19	78

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
27	9564	F1	17-Dec-18	female		30-Jan-19	44
28	9565	F1	17-Dec-18	male		10-Feb-19	55
29	9568	F1	18-Dec-18	female	laid eggs 19 Feb 2019 (64 days old)	2-Mar-19	74
30	9573	F1	18-Dec-18	male		20-Mar-19	91
31	9578	F1	19-Dec-18	male		7-Feb-19	50
32	9579	F1	19-Dec-18	male		11-Mar-19	82
33	9586	F1	21-Dec-18	male		28-Jan-19	38
34	9587	F1	21-Dec-18	male		28-Jan-19	38
35	9588	F1	21-Dec-18	male		7-Feb-19	48
36	9590	F1	22-Dec-18	male		28-Jan-19	37
37	9595	F1	23-Dec-18	female	mated 2 Jan 2019 (10 days old) with 9536 (19 days old)	28-Jan-19	36
38	9599	F1	23-Dec-18	male	mated 2 Jan 2019 with 9636	27-Feb-19	66
39	9600	F1	23-Dec-18	male	mated 27 Feb 2019 with 9623		
40	9603	F1	23-Dec-18	female		28-Jan-19	36
41	9606	F1	23-Dec-18	male		25-Feb-19	64
42	9620	F1	25-Dec-18	female		18-Mar-19	83
43	9621	F1	25-Dec-18	female		28-Jan-19	34
44	9623	F1	25-Dec-18	female	laid eggs 17 Feb 2019; mated 27 Feb 2019 (65 days old) with 9600 (67 days old) at 13.30 still mated until 15.50		
45	9628	F1	25-Dec-18	male		28-Jan-19	34
46	9630	F1	26-Dec-18	female		7-Feb-19	43
47	9635	F1	27-Dec-18	female	laid eggs 19 Feb 2019 (55 days old)	4-Mar-19	67
48	9636	F1	27-Dec-18	female	mated 2 Jan 2019 (6 days old) with 9599 (10 days old)		
49	9664	F1	30-Dec-18	male		27-Feb-19	59
50	9666	F1	30-Dec-18	female		7-Feb-19	39
51	9673	F1	31-Dec-18	female		27-Feb-19	58
52	9674	F1	31-Dec-18	female		31-Jan-19	31
53	9681	F1	1-Jan-19	male		18-Mar-19	76
54	9690	F2	9-Jan-19	male	**first individual of F2**		
55	9723	F2	18-Jan-19	male		14-Mar-19	56
56	9738	F2	19-Jan-19	female		10-Feb-19	22

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
57	9747	F2	20-Jan-19	female	laid eggs 22 Feb 2019 (33 days old)		
58	9765	F2	21-Jan-19	male	mated 12 Feb 2019 with 9803		
59	9773	F2	21-Jan-19	female	distracted a mating pair 9840 with inside male on 30 Jan 2019		
60	9776	F2	21-Jan-19	female	mated 30 Jan 2019 (9 days old) with inside male		
61	9780	F2	21-Jan-19	female	mated 31 Jan 2019 (10 days old) with inside male		
62	9781	F2	21-Jan-19	male	imperfect wings but can fly	30-Jan-19	9
63	9788	F2	22-Jan-19	male	mated 14 Mar 2019 at 15.00 with 9975		
64	9803	F2	23-Jan-19	female	mated 12 Feb 2019 (20 days old) with 9765 (22 days old); mated 13 Feb 2019 (21 days old) at 9.50 with male number unclear?		
65	9806	F2	23-Jan-19	female	mated 12 Feb 2019 (20 days old) with 9465 (66 days old)		
66	9809	F2	23-Jan-19	male		10-Feb-19	18
67	9810	F2	23-Jan-19	male		1-Mar-19	37
68	9823	F2	23-Jan-19	male		14-Mar-19	50
69	9824	F2	23-Jan-19	male		18-Feb-19	26
70	9828	F2	24-Jan-19	male		4-Mar-19	36
71	9832	F2	24-Jan-19	female	laid eggs 22 Feb 2019 (22 days old)		
72	9833	F2	24-Jan-19	female		7-Feb-19	14
73	9840	F2	24-Jan-19	female			
73	9840	F2	24-Jan-19	female	mated 30 Jan 2019 (6 days old) at 10.30 with inside male, bothered by female 9773, the male fluttered his wings		
74	9851	F2	30-Jan-19	male		20-Mar-19	49
75	9854	F2	30-Jan-19	male	mated 27 Feb 2019 at 10.55 with 9981, still mated at 16.00 (over 5 hours)		
76	9860	F2	31-Jan-19	female		4-Mar-19	32
77	9872	F2	1-Feb-19	male		10-Feb-19	9
78	9873	F2	1-Feb-19	male		10-Feb-19	9
79	9887	F2	2-Feb-19	male		9-Feb-19	7

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
80	9888	F2	2-Feb-19	male		10-Feb-19	8
81	9889	F2	2-Feb-19	male	mated 20 Mar 2019 at 13.40 with 10035 still mated at 15.00; mated 26 Mar 2019 with 10000 at 15.30		
82	9893	F2	2-Feb-19	female		12-Feb-19	10
83	9895	F2	2-Feb-19	male	mated 4 Mar 2019 with 9974 at 13.30		
84	9896	F2	2-Feb-19	male		12-Feb-19	10
85	9897	F2	2-Feb-19	female		12-Feb-19	10
86	9898	F2	2-Feb-19	male	mated 11 Mar 2019 with 10000; mated 13 Mar 2019 with 10103; mated 23 Mar 2019 at 15.30 with 10134		
87	9906	F2	3-Feb-19	male		10-Feb-19	7
88	9907	F2	3-Feb-19	male		12-Feb-19	9
89	9908	F2	3-Feb-19	male		10-Apr-19	65
90	9909	F2	3-Feb-19	female		14-Mar-19	39
91	9915	F2	4-Feb-19	female		27-Feb-19	23
92	9916	F2	4-Feb-19	female		7-Feb-19	3
93	9917	F2	4-Feb-19	male		18-Feb-19	14
94	9918	F2	4-Feb-19	female		11-Feb-19	7
95	9920	F2	4-Feb-19	male		10-Feb-19	6
96	9921	F2	4-Feb-19	female		19-Feb-18	15
97	9922	F2	4-Feb-19	male		18-Mar-19	42
98	9923	F2	4-Feb-19	male		10-Feb-19	6
99	9933	F2	5-Feb-19	male	mated 27 Feb 2019 with 9982	23-Apr-19	77
100	9934	F2	5-Feb-19	female	laid eggs 18 Mar 2019 (23 days old); laid eggs 21 Mar 2019 (26 days old) at 10.50.		
101	9935	F2	5-Feb-19	male		27-Feb-19	22
102	9936	F2	5-Feb-19	male		10-Apr-19	63
103	9937	F2	5-Feb-19	female		10-Feb-19	5
104	9938	F2	5-Feb-19	male		12-Feb-19	7
105	9939	F2	5-Feb-19	male		27-Feb-19	22
106	9941	F2	5-Feb-19	female		12-Feb-19	7
107	9943	F2	6-Feb-19	male		27-Feb-19	21
108	9957	F2	11-Feb-19	female		18-Feb-19	7

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
109	9960	F2	13-Feb-19	male		27-Feb-19	14
110	9962	F2	15-Feb-19	male		1-Mar-19	14
111	9964	F3	18-Feb-19	male	**first individual of F3**		
112	9967	F3	18-Feb-19	male		22-Feb-19	4
113	9973	F3	22-Feb-19	male		18-Mar-19	24
114	9974	F3	22-Feb-19	female	mated 4 Mar 2019 (10 days old) at 13.30 with 9895 (30 days old); mated 13 Mar 2019 (19 days old) at 16.00 with 9550 (89 days old); mated 14 Mar 2019 (20 days old) with 10007 (16 days old); laid eggs 18 Mar 2019 (24 days old) at 8.45; mated 23 Mar 2019 (29 days old) with 10031 (23 days old); mated 12 April 2019 (49 days old) at 15.30 with 10076 (39 days old); laid eggs 29 Apr 2019 (66 days old		
115	9975	F3	22-Feb-19	female	laid eggs 14 Mar 2019 (20 days old) at 11.40; mated 14 Mar 2019 (20 days old) at 15.00 with 9788 (51 days old); laid eggs 18 Mar 2019 (24 days old) at 9.30	12-Apr-19	48
116	9978	F3	23-Feb-19	male	mated 10 Apr 2019 with 10073		
117	9979	F3	23-Feb-19	female		11-Mar-19	16
118	9980	F3	23-Feb-19	female		14-Mar-19	19
119	9981	F3	23-Feb-19	female	mated 27 Feb 2019 (4 days old) with 9854 (28 days old) at 10.55 still mated at 16.00		
120	9982	F3	23-Feb-19	female	mated 27 Feb 2019 (4 days old) with 9933 (22 days old) at 12.00 still mated at 16.00		
121	9988	F3	24-Feb-19	male		4-Mar-19	8
122	9989	F3	24-Feb-19	female	mated 22 Mar 2019 (26 days old) at 15.00 with 10033 (22 days old)	11-Apr-19	46
123	9990	F3	24-Feb-19	male		10-Apr-19	45
124	9991	F3	24-Feb-19	female	laid eggs 22 Apr 2019 (57 days old) at 8.50		
125	9994	F3	25-Feb-19	male	mated 18 Mar 2019 at 11.00 with 10118; mated 20 Mar 2019 at 12.00 with 9997		

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
126	9995	F3	25-Feb-19	male		15-Mar-19	18
127	9997	F3	26-Feb-19	female	mated 13 Mar 2019 (15 days old) at 16 with 10030 (13 days old); laid eggs 18 Mar 2019 (20 days old) at 8.45; mated 18 Mar 2019 (20 days old) with 10019 (19 days old); mated 20 Mar 2019 (22 days old) at 12.00 with 9994 (23 days old) still mated until 13.45, approached by male 10033, approached by male 10110 at 14.45; laid eggs 21 Mar 2019 (23 days old) at 10.50; mated 15 Apr 2019 (48 days old) with 10076 (42 days old); laid eggs 24 April 2019 (57 days old)	2-May-19	65
128	9998	F3	26-Feb-19	male	mated 15 Mar 2019 at 10.15 with 10105		
129	9999	F3	26-Feb-19	female	laid eggs 18 Mar 2019 (20 days old) at 11.00; laid eggs 21 Mar 2019 (23 days old) at 10.50; mated 23 Mar 2019 (25 days old) with 10018 (24 days old)	6-May-19	69
130	10000	F3	26-Feb-19	female	mated 11 Mar 2019 (13 days old) at 14.40 with 9898 (37 days old) still mated at 16.00; mated 26 Mar 2019 (28 days old) at 15.30 with 9889 (52 days old)		
131	10001	F3	26-Feb-19	male		27-Feb-19	1
132	10007	F3	26-Feb-19	male	mated 14 Mar 2019 at 13.40 with 9974		
133	10009	F3	26-Feb-19	male		15-Mar-19	17
134	10015	F3	27-Feb-19	male	mated 13 Mar 2019 at 16.00 with female unclear number; mated 20 Mar 2019 at 11.20 with 10080; mated 15 April 2019 at 13.20 with female unclear number; mated 26 April 2019 at 15.00 with female unclear number	15-May-19	77
135	10016	F3	27-Feb-19	male	mated 11 April 2019 at 15.30 with 9470 (123 days old)		
136	10018	F3	27-Feb-19	male	mated 23 Mar 2019 at 15.20 with 9999		

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
137	10019	F3	27-Feb-19	male	mated 18 Mar 2019 at 11.00 with 9997	7-Apr-19	39
138	10020	F3	27-Feb-19	male	mated 13 Mar 2019 at 16.00 with inside female; mated 20 Mar 2019 at 12.20 with 10040		
139	10022	F3	27-Feb-19	female		2-Mar-19	3
140	10029	F3	28-Feb-19	female	laid eggs 18 Mar 2019 (18 days old) at 8.45; mated 24 Apr 2019 with 10148 (55 days old)		
141	10030	F3	28-Feb-19	male	mated 13 Mar 2019 at 16.00 with 9997; mated 12 Apr 2019 at 15.30 with 10095		
142	10031	F3	28-Feb-19	male	mated 23 Mar 2019 at 16.50 with 9974; mated 15 May 2019 with 10208		
143	10033	F3	28-Feb-19	male	mated 14 Mar 2019 at 10.20 with 10106, still mated at 15.20, approached by 9851, 10104 and 10102; mated 22 Mar 2019 at 15.00 with 9989		
144	10034	F3	28-Feb-19	female		18-Mar-19	18
145	10035	F3	28-Feb-19	female	laid eggs 18 Mar 2019 (18 days old) at 9.30; mated 20 Mar 2019 (20 days old) at 13.40 with 9889 still mated at 15.00		
146	10038	F3	28-Feb-19	male		10-Apr-19	41
147	10039	F3	28-Feb-19	male		12-Apr-19	43
148	10040	F3	28-Feb-19	female	mated 20 Mar 2019 (20 days old) at 12.20 with 10020 (21 days old)		
149	10047	F3	1-Mar-19	male		21-Mar-19	20
150	10050	F3	1-Mar-19	male		22-Apr-19	52
151	10057	F3	1-Mar-19	male	mated 20 Mar 2019 (19 days old) at 12.00 with 10063, still mated at 14.45	17-May-19	77
152	10060	F3	2-Mar-19	male		13-Mar-19	11
153	10063	F3		female	mated 20 Mar 2019 (17 days old) at 12.20 with 10057 (19 days old); laid eggs 22 April 2019 (50 days old)		

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
154	10072	F3	3-Mar-19	female	laid eggs 11 Mar 2019 (8 days old); laid eggs 18 Mar 2019 (15 days old) at 8.40; mated 20 Mar 2019 (17 days old) at 14.45 with 10081 (15 days old); laid eggs 11 Apr 2019 (39 days old) at 15.00; laid eggs 22 Apr 2019 (50 days old) at 8.50; mated 29 Apr 2019 (57 days old) at 13.00 with 10102 (52 days old), still mated at 16.00		
155	10073	F3	3-Mar-19	female	mated 10 Mar 2019 (7 days old) with 9978 (46 days old)		
156	10076	F3	4-Mar-19	male	mated 15 Mar 2019 at 10 with 10122, still mated at 15.00 in the same position, still mated at 17.00 although it rained hard at 16.00; mated 17 Mar 2019 at 9.30 with 10121; mated 12 Apr 2019 at 15.30 with 9974; mated 15 Apr 2019 at 10.15 - 13.20 with 9997		
157	10078	F3	4-Mar-19	male		11-Apr-19	38
158	10080	F3	5-Mar-19	female	mated 20 Mar 2019 (15 days old) at 11.20 with 10015 (21 days old); laid eggs 21 Mar 2019 (16 days old) at 10.50		
159	10081	F3	5-Mar-19	male	mated 20 Mar 2019 at 14.45 with 10072; mated 2 April 2019 at 11.00 with 10159, still mated at 15.00	23-Mar-19	49
160	10084	F3	5-Mar-19	male		14-Mar-19	9
161	10085	F3	5-Mar-19	female		10-Apr-19	36
162	10094	F3	5-Mar-19	male	mated 22 Mar 2019 at 15.00 with 10107; mated 23 Mar 2019 with unclear number	24-Apr-19	50
163	10095	F3	6-Mar-19	female	mated 23 Mar 2019 (17 days old) at 15.20 with 9994 (26 days old), still mated at 16.50; mated 12 Apr 2019 (37 days old) at 15.30 with 10030 (43 days old); laid eggs 15 Apr 2019 (40 days old) at 10.00	24-Apr-19	49
164	10098	F3	7-Mar-19	male		2-May-19	56

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
165	10099	F3	7-Mar-19	female	laid eggs 21 Mar 2019 (14 days old); laid eggs 11 Apr 2019 (35 days old)		
166	10100	F3	8-Mar-19	male		12-Apr-19	35
167	10101	F3	8-Mar-19	male		23-Apr-19	46
168	10102	F3	8-Mar-19	male	approached mating pair 14 Mar 2019; mated 12 Apr 2019 at 15.30 with 10159; mated 24 Apr 2019 at 15.30 with 10215; mated 29 Apr 2019 at 13.00 with 10072, still mated at 16.00; mated 14 May 2019 at 12.00 with 10220	14-May-19	67
169	10103	F3	8-Mar-19	female	mated 13 Mar 2019 (5 days old) at 16.00 with 9898 (39 days old)		
170	10104	F3	8-Mar-19	male	approached a mating pair 14 Mar 2019		
171	10105	F3	9-Mar-19	female	mated 15 Mar 2019 (6 days old) at 10.15 with 9998 (17 days old), still mated at 15.00 in the same position, after rained hard at 16.00 no longer mated; laid eggs 24 Apr 2019 (46 days old)	25-Apr-19	47
172	10106	F3	9-Mar-19	female	mated 14 Mar 2019 (5 days old) at 10.20 with 10033 (14 days old), still mated at 13.40	16-May-19	67
173	10107	F3	9-Mar-19	female	mated 22 Mar 2019 (13 days old) at 15.00 with 10094 (17 days old); mated 26 Mar 2019 (17 days old) at 15.30 inside male; mated 15 Apr 2019 (37 days old) at 10.15 with 10148 (10 days old), still mated at 13.20		
174	10116	F3	11-Mar-19	male		22-Apr-19	42
175	10117	F3	11-Mar-19	female	mated 16 May 2019 (66 days old) with 10211 (5 days old)		
176	10118	F3	11-Mar-19	female	mated 18 Mar 2019 (7 days old) at 11.00 with 9994 (21 days old)		
177	10120	F3	11-Mar-19	male	mated 12 Apr 2019 at 9.00 with 10122, still mated at 11.00		

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
178	10121	F3	12-Mar-19	female	mated 17 Mar 2019 (5 days old) at 9.30 with 10076 (13 days old)		
179	10122	F3	12-Mar-19	female	mated 15 Mar 2019 (3 days old) at 10.00 with 10076 (11 days old); mated 12 Apr 2019 (31 days old) at 9.00 with 10120 (32 days old), still mated at 11.00	15-May-19	64
180	10123	F3	12-Mar-19	female		2-May-19	51
181	10126	F3	13-Mar-19	male		15-Apr-19	33
182	10128	F3	14-Mar-19	male		2-May-19	49
183	10134	F3	19-Mar-19	female	mated 23 Mar 2019 (4 days old) at 15.30 with 9898 (49 days old)		
184	10137	F3	21-Mar-19	male		10-Apr-19	20
185	10142	F3	22-Mar-19	female	laid eggs 22 Apr 2019 (31 days old) at 8.50; laid eggs 24 Apr 2019 (33 days old) at 11.00.		
186	10146	F4	29-Mar-19	male	**first individual of F4**		
187	10148	F4	5-Apr-19	male	mated 15 Apr 2019 at 10.15 with 10107, still mated at 13.40; mated 24 Apr 2019 at 11.30 with 10029		
188	10159	F4	29-Mar-19	female	mated 2 Apr 2019 (4 days old) at 11.00 with 10081 (28 days old), still mated until 15.00; mated 12 Apr 2019 (14 days old) at 15.30 with 10102 (35 days old); laid eggs 22 Apr 2019 (24 days old) at 8.50		
189	10162	F4	10-Apr-19	female		11-Apr-19	1
190	10166	F4	10-Apr-19	female	mated 17 May 2019 (37 days old) at 12.00 with 10168 (37 days old)		
191	10168	F4	10-Apr-19	male	mated 17 May 2019 at 12.00 with 10166		
192	10202	F4	10-Apr-19	male		11-Apr-19	1
193	10208	F4	11-Apr-19	female	mated 15 May 2019 (34 days old) with 10031 (76 days old); perched on host plant (laid eggs?) 22 May 2019		
194	10211	F4	11-Apr-19	male	mated 16 Apr 2019 with 10117		

No.	individual number	status	emerged as adult	male / female	notes	adult lived until	adult life duration (days)
195	10215	F4	12-Apr-19	female	mated 26 Apr 2019 (14 days old) at 14.30 with 10102 (49 days old); mated 6 May 2019 (24 days old) at 14.00 with 10238 (17 days old)		
196	10220	F4	14-Apr-19	female	mated 9 May 2019 (25 days old) at 12.00 with 10102 (62 days old)	22-May-19	38
197	10221	F4	14-Apr-19	male		24-Apr-19	10
198	10235	F4	18-Apr-19	male		23-Apr-19	5
199	10236	F4	18-Apr-19	male	approached a mating pair 16 May 2019		
200	10238	F4	19-Apr-19	male	mated 6 May 2019 at 14.00 with 10215		
201	11403	F5	5-May-19	female	**first individual of F5**		
202	11490	F6	10-Jun-19	female	**first individual of F6**		
203	11562	F7	12-Jul-19	female	**first individual of F7**		
204	11784	F8	21-Aug-19	male	**first individual of F8**		
205	11826	F9	24-Sep-19	male	**first individual of F9**		
206	12226	F10	29-Oct-19	male	**first individual of F10**		
207	12256	F11	2-Dec-19	female	**first individual of F11**		
208	12599	F12	7-Jan-20	female	**first individual of F12**		
209	13135	F13	10-Feb-20	female	**first individual of F13**	last batch	