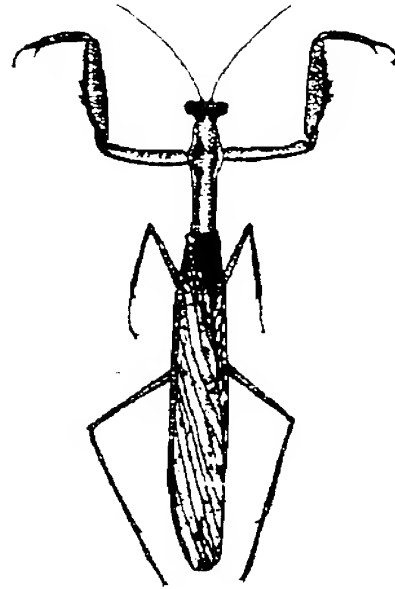


# Mantis Study Group Newsletter 13

August 1999

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## Editorial

Again, many thanks to Andy Lasebny for his large contribution to the newsletter. There are no Mantis Abstracts in this newsletter, they will appear in the next issue.

Those of you writing articles for the newsletter on computers can save me a lot of time and effort by sending the article on disk. However, the text should be sent in either *WordPerfect 5.1 (for DOS)*, or in *ASCII (DOS Text)*; I cannot read *Word* files (users of *Word* should use the "save as" option and select *WordPerfect 5.1* from the menu). Do not send graphics on disk, I have neither the hardware or software to handle them.

## Exhibitions

Dates to note are:

### Sunday, 21st November 1999.

West of England Creepy Crawly Show, Newton Abbot racecourse, Devon.

### Saturday, 2nd October 1999.

AES Exhibition, Kempton Park Racecourse, Sunbury, Middlesex. Open from 1100-1630. The racecourse is close to junction 1 of the M3.

### Sunday, (1st or 2nd in December?) 1999

Midlands Entomological Fair. At Kettering Leisure Village Arena. I have not been told the exact date yet, but it is usually the first Sunday in December.

## Message from the Livestock co-ordinator — Jo Wheat.

Change of address. My new address is 37 Trafalgar Close, Muxton, Telford, Shropshire, TF2 8DQ. Tel: 01952-676190.

## Veterinary Invertebrate Society

This is a UK-based society with an international membership. Membership is aimed at vets and those in disease research. Further details are available from: John Chitty, Strathmore Veterinary Clinic, London Road, Andover, Hants., SP10 2PH.

## High density mantids — Andy Lasebny.

I found a posting on the internet from someone who said he found over 100 mantis egg cases, all in one field. I contacted the person, and it turns out that he is in central New Jersey, only 20 minutes from where I work. I talked to him about it, and went to see his property. Since I am reasonably familiar with the distribution and population density of mantids in New Jersey, this seemed quite extraordinary.

What had happened was that this meadow of very dense weeds and wildflowers was at the back of the person's vegetable garden, and it was filled with grasshoppers and crickets. These were going into the garden and eating much of the lettuce and other vegetables. Not wanting to spray insecticides, the property owner decided to order three praying mantis egg cases: *Tenodera aridifolia sinensis*, the only species available as biological pest control in the USA. He put these in the garden, and they hatched. When they became adults, he did see a few in his garden and in the meadow (he really did not look very thoroughly, however), and there did appear to be a noticeable drop in the number of crickets and grasshoppers, because there was little damage to the garden.

It was not until later in the autumn, when all the leaves had fallen off the trees, and the plants in the meadow died back, that he noticed the true results of the mantis introduction. When going into that meadow and looking at the dead stalks of the remaining plants, he found numerous egg cases. The more he looked, the more he found, finally counting over 250 egg cases, all in a meadow that is about 80m by 25m. At first, he assumed that most of the egg cases came from mantids that came from other nearby similar areas. However, when he did a thorough search of other nearby fields, farms, meadows, and woods, he did not find a single mantis egg case! It appears that all these egg cases were made by the mantids he introduced. What does this say about the survival rate? With three egg cases, there could not have been more than 600 to 700 hatchlings. There must have been at least 125 adult females alive at the end of the season in order to make that many egg cases, assuming each one got to make two. An approximately equal number of males must also have been in there, I suppose.

In the cooler parts of New Jersey, mantids hardly ever get to make more than one or two egg cases, even though in captivity as many as five can be made. How could there have been such a high survival rate in such a relatively small area? This would surprise me less if it took place in a tropical, or even a semi-tropical area. But this is an area of New Jersey with cold winters and frost that arrives in mid October, with a relatively short growing season. I suppose the enormous quantity of food insects in that meadow, combined with the extreme density of the plants created a very large surface area within, so the mantis nymphs were able to hide from each other and from predators, and were able to grow faster than normal. I would have thought that spiders would have taken a large toll on the nymphs, but apparently that did not happen. There has to have been a large number of spiders in that meadow; I cannot imagine there not being a great number of them in such a meadow. What about birds? They should have eaten a large number of nymphs as well. What is also strange, is that very few egg cases were made in the garden itself, only a few feet away from the meadow. I also saw a few here and there on some woody, more permanent shrubs at the edges of the meadow where the woods begin, but the vast majority of the egg cases were in the sunny part of the meadow, on perennial stalks, a foot or two above the ground. I suppose that with all the abundance of food, the mantids did not need to go anywhere, and stayed within a few feet of where they hatched all their lives.

What are the results of studies of this species in the wild? What is the density of

individuals in a typical meadow in its original habitat in China or Japan? In other areas into which it was introduced? I have seen egg cases of this species in many meadows, overgrown lots, flower gardens, etc., but never anywhere near that number. Usually there are only a few here and there, even in areas much larger than this. What have people seen in other parts of the world? It's hard to believe that starting with only three egg cases, that they could have multiplied this much in one year.

## **The orchid mantis *Hymenopus coronatus* — Francesco Tomasinelli.**

(with drawings by Andrea Mangoni).

*Hymenopus coronatus*, commonly known as the orchid mantis, is one of the most beautiful mantids available on the pet market. Even if not very big, its colours, unusual shape and behaviour are a big attraction for anyone.

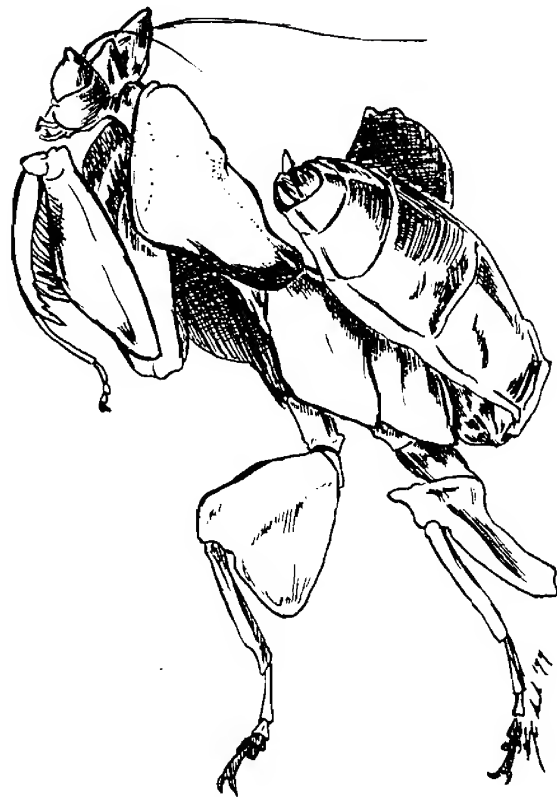
Adult females can reach 6-7cm while males are much smaller, around 3.5cm. They live in tropical rainforest in South East Asia: Indonesia, Malaysia, Brunei.

When just hatched they are red-orange with black-blue legs and head. They look similar to ants and some Reduviidae (assassin bug) nymphs; both animals are quite distasteful and often ignored by many vertebrate predators and spiders.

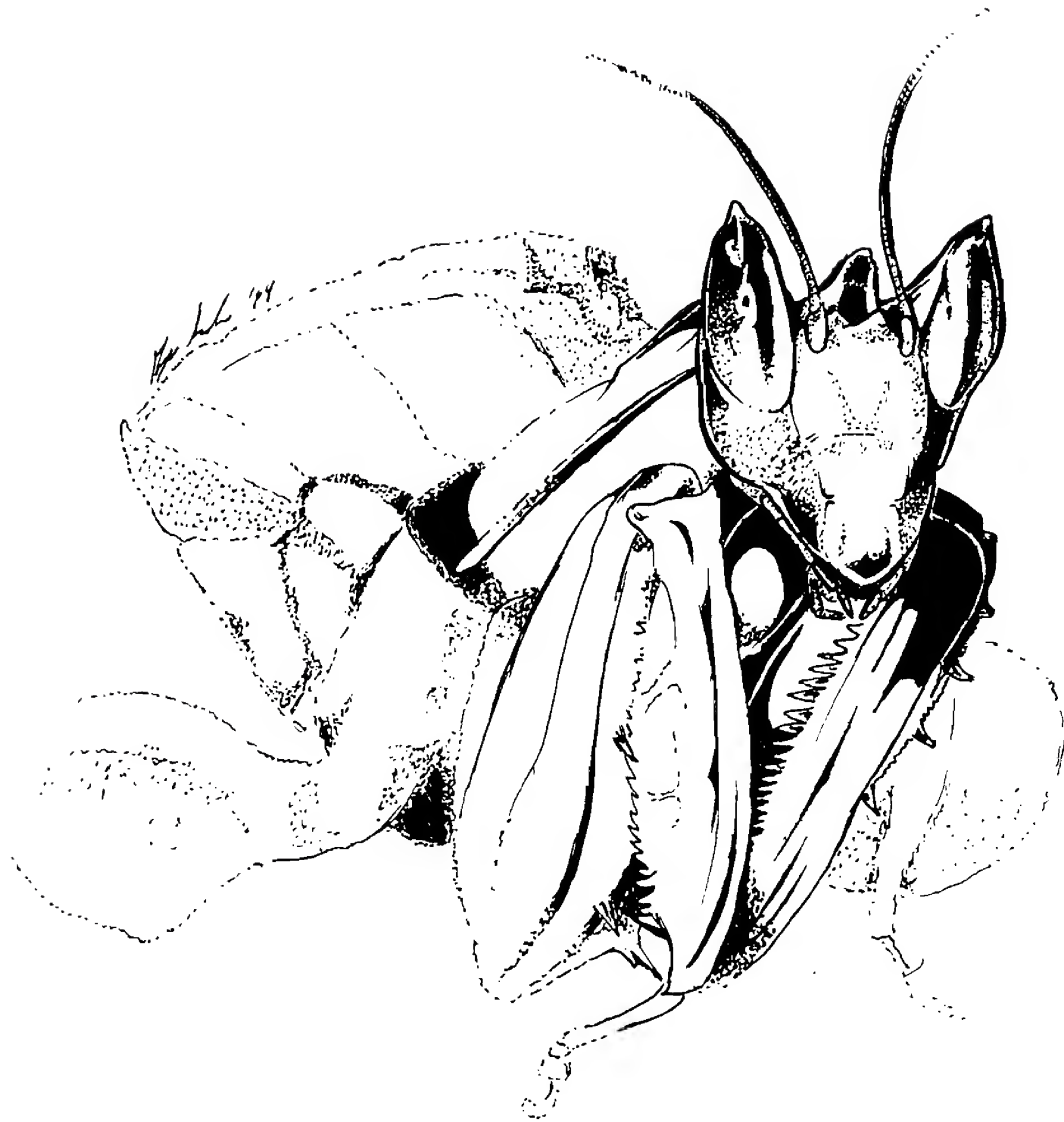
After their first moult they turn translucent white with pinkish shades. It is possible to find completely pink individuals and there seems to be some environmental or seasonal reason for this but as far as I know colour patterns are not completely understood. Beside this they develop particular flat expansions on femora, big sharpened violet-grey eyes and keep, like most mantids nymphs, the abdomen curved up over the back (see drawings).

In its natural habitat the insect sits quietly on flowers waiting for prey. But it features many tricks to survive, much more one would normally suppose at a first thought.

The white and pink pattern matches common flowers in the tropical rainforests but the shape is not similar to any flower in particular, the animal seems to just employ general resemblance to escape capture and to hunt. There is a small green band across the thorax also. It is an useful decoy to break up the mantis' outline into two different parts, making it resemble two separate flowers. Many keen sighted animals are often confused this trick, man included. On the head, between the eyes there is a small horn, simulating a



flower reproductive apparatus (see drawings for details).



The insects, mostly flies (Diptera), are taken while visiting the flower. There is a dark spot on the last part of the abdomen, near the anus. It was demonstrated it has the property to attract small flies, mistaking the spot for an individual of the same species foraging on a flower. A certain number are attracted this way but sometimes they are not taken due to their small size; but when a bigger specimen approaches it is immediately captured.

Lastly there are many longitudinal brown stripes along the upper side of the abdomen. These structures are very similar to orchids' "honey guides" and are directed toward the mantis' thorax. Some insects are attracted this way but usually the dorsal surface of the abdomen is not visible in the rest position.

According to other studies, sometimes *Hymenopus* hunts on green foliage. Here colour and shape look really conspicuous but this way the mantis is investigated by various flower

seeking insects. This is confirmed by the fact that various Diptera and Lepidoptera are attracted by white, pink, yellow objects, even a piece of paper, positioned on plants. The very famous *Idolomantis diabolicum* uses a similar ambush tactic, simulating a flower with its big colourful thorax. In this, as in the *Hymenopus*' abdomen there are some small black spots resembling flies feeding.

When moving slowly the animals use characteristic swinging movements, similar to a plant moved by a weak breeze. When a prey item is not within reach and the mantis is hungry it will try to close the distance in this way. Several seconds are necessary to cover a single centimetre but the insect remains difficult to detect. *Hymenopus* can track flying targets with good accuracy and sometimes takes them during manoeuvres or landings.



When young they have a limited ability to jump when threatened. The jump is not high but it must be said its purpose is just to abandon the hunting position with a lightning move. The animal on the

ground, on green or brown, is extremely visible but of course can be easily misidentified by an unexperienced observer for a fallen flower.

Sometimes young specimens in danger assume a particular position: lowering the body on the substrate, keep femoral expansion close to the ground, stretch the raptorial legs forward while keeping them in the praying position. The abdomen is flattened and kept perpendicular to the ground. This way any resemblance to a living creature is lost.

A final word about their requirements. It is best to keep them at 25°C and high humidity, especially when younger. Remember to feed them often, they have a good appetite. Ideal prey items are fruit flies and later flies. But sometimes provide them with crickets and mealworms to change the diet a little. They should moult every 15 days but later phases take a little longer with the last one requiring almost a month.

In Malaysia natives calls the *Hymenopus* "Kanchong" and consider it extremely rare. They say just a few men manage to see more than one in all of their lives.

Francesco intends to cover adult forms and reproduction of *Hymenopus* in the future.

## **Mantis 98 - *Creobroter gemmatus* — Andy Lasebny.**

I received two *Creobroter gemmatus* egg cases on 31<sup>st</sup> August 1998. I gave one to someone else, just so we do not have everything in one place, in case something happens. This way at least someone will have them. They hatched on Sunday morning, September 6<sup>th</sup>. About 35 individuals came out. They are definitely less active than the *Sphodromantis lineola* newly hatched nymphs. They also do not seem to eat as well, and do not really bother to chase after the fruit flies, but seem to wait until they are in the just right location before striking. Many individuals seem to not even bother to try the fruit flies, as if they are too big. The nymphs are an interesting shade of orange-red and black, with very long antennae that are part black and part white.

**September 7** - I separated half of the individuals into another identical container. They still are not eating much, only a few individuals are.

**September 9** - After giving them more fruit flies this morning, more seem to be eating than they did before. I need to separate more of them before the cannibalism starts.

**September 15** - Not only have they been eating well, some of them have moulted. I can see a pattern of stripes on their legs, and they seem more orange now.

**September 21** - I have to start separating them quickly, since the cannibalism has now started. There are 25 left, and I put 15 into individual containers, the small plastic fruitfly containers with foam stoppers, and a piece of metal window screen inside to cling to. A small amount of soil on the bottom helps absorb excess water when I spray them. The rest are still in the larger containers, with three or four in each. I will see what happens with these. Every so often I see an individual face another one, and go into what appears to be the threat position - forelegs stretched outward, as wide as possible to the left and right. There are now several subtle colour shades visible, some rather pale with a lot of white, others are darker.

**September 22** - The individuals that were together in the larger containers still eat each other - I lost 2 more.

**October 6** - After a month, they are moulting again and are growing fast. Though most are in separate containers, two containers have three each, one has two. They now are eating the larger fruitflies, *Drosophila hydei*, plus small moths that I find in the house. Small spiders that make webs in the corners of the room are also proving to be a good food source. Their colours now range from pale beige, almost white, to darker orange-brown, all with a pattern. I give them water almost each day by spraying some onto the soil substrate and the sides of the containers. So far, this seems to be working.

**October 25** - A few more are moulting again, and are really starting to get larger. The only two that were together in the same container just became one - another case of cannibalism. Even though there were enough places for them to hide from each other, they were constantly staring at one another, and always too close to each other, until one finally ate the other. It was an interesting experiment, and it does show that these cannot be kept together for very long. The 21 remaining nymphs are all in separate containers.

**November 7** - One of the smaller nymphs dies unexpectedly. There are 20 left. One is ahead of the others, and has moulted again and is the largest. This one has long wing stubs, which means that it probably has only one moult to go, possibly two. These are going to be quite small, even as adults. The colours and patterns are quite varied, with all sorts of

stripes and spots. Colours now range from brown, tan, beige, pink, white, and a bit of a greenish tint, with various combinations. The tops of the abdomens have a large eye spot on them. Normally this is not very visible, since they curl up their abdomens and hold them over their backs. I often see one of them put their abdomen down slightly, enough to show the spot, and wave it side-to-side in an apparent threat display, along with widely stretched out forelegs. They do this to other individuals they see in nearby transparent containers, and if I approach certain ones from a certain angle. These also seem to like humidity, and do drink water. I continue to give them water daily, skipping a day occasionally, to allow the container to dry out so it does not get mouldy. Most of the individuals are past the fruit fly eating stage, and take small crickets. Some individuals will tackle a cricket almost as big as they are, others a far more selective about the size of the prey. Some wait for the prey to get near them, others go down and grab it.

**November 24** - One individual has a bad moult - one of the forelegs did not come out of the skin properly, so is not usable. I doubt that it will be able to eat, so it will not last long. The rest are doing well and quite a few are almost adults, with one or two moults to go. Most are now eating small crickets, and fruitflies are now too small for them.

**November 26** - The first adult, a male, emerges, 10 weeks after hatching. He is quite a colourful creature, with stripes on the legs and body, and olive green wings with a yellow and black eye spot in the middle. The hindwings are bright red - I assume this is to frighten a potential predator with the combination of eye spots and a sudden flash of red. What is interesting is just how long his wings are - they extend much further past his abdomen than any other species I ever saw. His total length is almost as long as that of a smaller than average male *Mantis religiosa* - but his body length is far less. His abdomen is half the length of his wings. He will be a very good flier, I guess.

**December 5** - Another male becomes an adult. A few more should within a week or so.

**December 7** - The first adult female emerges.

**December 10** - Another female reaches adulthood.

**December 14** - One more adult male.

**December 17** - An attempt to mate the first pair. I take out the male and put him on a branch. He is quite active and decides to fly around a bit. I put him back on the branch and let him calm down. I take out the female and place her next to the male. As soon as the female looks at him, he panics, and takes off. Repeated trials have the same results - the male is terrified of the female and wants no part of this. At one point I finally get the male to settle down on the branch, and get the female about 5cm above him facing the same way. She moves a bit and he shows interest by staring at her. But she apparently finds that spot comfortable and stops moving. I leave them alone, and about an hour later, she is still in the same spot, with the male still looking at her. I gently coax her to move, she turns her head and looks at the male, and he immediately flies away. I put them back into their containers, and I will try this again this weekend. Maybe she is not ready yet, and he senses that, who knows.

**December 20** - Another female becomes an adult.

**December 22** - The individual who had a bad moult on November 24, moulted again today, and had trouble getting out of the skin. The foreleg seems weak and the mantis is not walking properly. What is interesting about this one is that I managed to keep it alive by

hand feeding small crickets, which it had a great difficulty in catching. Since November 24, it only ate four or five small crickets, yet this was enough to not only keep it alive, but to make it moult again in a month. I doubt it will survive long now, though. I was hoping that another moult would correct the problem with the foreleg, but there now appear to be other problems as well.

**December 25** - Another male is an adult. The first female that became an adult appears to be spitting out some brown fluid - I hope she is not sick. Though I have not actually seen her do it, there are stains all over the plastic container. The nymph that had the bad moult is nowhere to be found - it was free-range for the past month on some Ficus trees that are in the room, but now it disappeared. I assume that it is dead somewhere in the room. Otherwise it would have climbed up to the top near the lights, like it did for the past month. There are 19 individuals left.

**December 27** - Another male becomes an adult. Almost all the individuals are in the larger clear plastic food containers. They were easily able to moult inside the small fruitfly vials up until the second to last moult. Only then was it necessary to transfer them to larger containers. The piece of metal window screen is the most important element in the vials - it not only provides a surface to moult from, but enables either the crickets to climb up to the top where the mantis always is, or enables the mantis to climb down to get the cricket. Otherwise, few of the individuals would eat consistently once they are too large for fruitflies. I placed the screen mesh diagonally in the container, to just below the foam stopper. It is narrow enough to allow the mantis to easily be able to walk around it without getting stuck between it and the vial, but wide enough to provide a secure foothold for maximum comfort. The crickets also appear much more likely to climb up this than up a twig. The larger containers also have a similar set-up.

**December 29** - Another male and another female are adults as well.

**January 3, 1999** - I attempt to get the same two mantids to mate that were unsuccessful on December 17. The male keeps staring at the female, #1, and as she walks he begins to approach, and finally leaps onto her back. Then for the next ten minutes or so something I never seen before happens. The female continually tries to get the male off her back. She roughly shakes herself and wiggles from side to side, and reaches back, up over her head, with her forelegs and tries to get the male off. Whenever she does this, he tightly presses his face into the lower portion of her prothorax, just above her wings. She angrily and violently jerks her body, tries to lift her wings, and keeps reaching back to try to tear the male off of her. Fortunately for him, he is just out of reach, and he presses himself tightly against her, trying to get his abdomen into hers. She does not let him, and continues to reach back and try to pull him off. It is as if she wants to scrape him off and throw him away. Finally, he gives up and takes off. What happened here? Did he not meet some unknown requirements? They both should be ready, since they were the first two to become adults. I take out another pair, and these two begin mating within 10 minutes, without a problem. They remain together for over six hours.

**January 4** - Two more females just became adults.

**January 6** - Another adult female.

**January 9** - A male and a female become adults. There are only three left that are not yet adults. I make an attempt to have another pair mate. I take out the male and place him on a flat vertical surface, and put the female, #3, next to him. Though he keeps staring at



the female, he does not act. Several times she walks out of his range and I put her back closer to him, but nothing happens. I finally put both of them inside a fairly large cage, and wait. Later that night, they are still not mating. I feed the female again.

**January 10** - In the morning, I check to see what is going on, and they are finally mating. About 6 hours later, they separate, and the male is fine. I put him back into his own container. Another male becomes an adult as well today.

**January 11** - The last two become adults, a male and a female. This seems quite unusual - the extreme difference in time that individuals of this species took to become adults. Like all mantids, they hatched all at once, on the same day. They all were under basically the same conditions, and ate the same food. However, it took some only two and a half months to become adults, others more than four months. Other species I had all became adults within two weeks of each other. There are a total of 11 females and eight males.

**January 13** - The first female to mate, #1, has just made her first egg case, right on the side of the plastic container. I attempt to pair up another couple, this time the first male who was rejected by the first female. This time I try a different female, #8, and it is successful. They begin mating within a half an hour. This was at around 2300, and by 0600 the following morning they are finished, and the male is alright. I remove the male from the cage immediately.

**January 16** - I attempt to have two more pairs mate. I put them in two separate cages. They spend the entire weekend in there, and there is no progress. They either cannot find each other, or are not ready.

**January 18** - After no progress after all these days, I try to move the female, who has been in the same spot, closer to the male. Nothing happens. I put a cricket in the cage to try and stimulate the female to move. Instead, the male grabs the cricket and begins to eat it. After about 5 minutes, the female notices the male's movements as he eats the cricket. She begins to slowly walk toward him. After about another five minutes, she is getting too close, and he does not notice her at all. I'm afraid that she will strike at him, so I take her out of the cage and wait for the male to finish eating. Later on, I put her back in with another cricket. The male gets this one also and eats it, and no mating occurs.

**January 19** - Neither mantis has moved, so I try a different male. I put him in, and put the female near him. This results in a 10 minute long staring match - the male above turns his head to look down at the female on the floor of the cage. He moves a bit, and she looks up at him, directly into his eyes. He stops moving, and they stay like that for at least 10 minutes. The female makes some strange movements - she slowly rocks her body forward and backward, (not side to side), and moves her forelegs forward and outward slowly, and then back, one at a time alternating between left and right. Is this some sort of signal to the male? This goes on for a while, with no reaction from the male. Moving the female causes him to panic, and he flies away from her. I put both back into their individual containers. I take out another male, and the female that became an adult first - the one who tried to tear the male off her back the first time I tried to get her to mate on December 17<sup>th</sup>, (#2). I put both of them on the floor of the cage. She walks up, and out of his range several times, and I put her back near him, on the floor of the cage. She does not move as he stares at her, and I touch her to get her moving, causing her to raise her wings and show the bright red portions of her hindwings. When she calms down (the male does not move at all during this), I get her to walk a bit by re-positioning her in the cage. She turns her head slightly, and appears

to see him, but does not look at him directly. The male makes his move, and ends up on her back, but perpendicular to her. He turns 90°, but the wrong way. Soon he re-positions himself, and they begin to mate. The female does not panic this time, and is quite calm. The following morning they are separated and the male is alive.

**January 25** - The female that mated on the 19<sup>th</sup> of this month, (#2), made her first egg case, right on the twig I provided, finally.

**January 28** - The first female that mated, makes her second egg case. It is very long and thin, made right on the bottom side of the twig I provided. It now appears that they need twigs that are quite thick. The twigs I put into the containers are larger in diameter than their own bodies, and that appears to be acceptable to them. Later that evening, close to midnight, I try to get another pair to mate. I take out a very plump female that I just fed (#9). I put a male into a cage, and place the female near him. She moves a bit, but it is hard to get her to walk. The male notices her, and moves a bit. This catches the eye of the female, and she turns her head and looks right at him. He stops moving right away, then moves sideways, away from her, and presses himself toward a piece of cork bark that is in the cage. After about 15 minutes of no movement, I pick up the female, re-position her, and get her to walk a bit. This causes the male to panic, and he flies up to the other side of the cage. I put him back into another container, and take out another male. I put him near the female on the floor of the cage. He immediately shows interest, and leaps onto the female's back. Unfortunately, she runs forward very suddenly, as if she did not expect him to come out of nowhere, and runs right out from under him. I put her back near him, and he stares at her with anticipation. She looks back at him, and another 10 minutes go by with no movement. I get the female to move, and he goes after her. He lands on her back, and turns around several times, as if he is trying to find out which is the correct end. He waves his antennae at her as he turns around each time. Finally he figures it out, and tries to clasp his abdomen onto hers. He appears to have a problem - he slowly slides the tip of his abdomen along the underside of the female's, until he reaches the tip. He stops momentarily at the tip, and cannot seem to clasp onto it. His abdomen slips off, and he begins the process over again, with the same results. He waves his antennae at the female during this, but continues the same exact process of sliding his abdomen from the middle of hers to the tip, and sliding off. He does this about 25 or 30 times before he finally hooks his abdomen into hers and mating begins. She has now turned her head and is looking at him over her shoulder. They stay in that position and I leave them there overnight. The following morning, they are still together at 0630.

**February 5** - Another egg case is made, this time by a female that had not made one yet, #3. Again, these thick twigs are working, and the mantids consistently make these long, very thin egg cases along the bottom of the twig that is leaning against the side of the container.

**February 6** - I try to get another pair to mate, and the results are similar to what has been going on with these - the male tried to leap onto the female, she got startled, raised her wings, and pushed him away. I tried another male a little later, and he panicked when she moved. I put them away, and will try this again another day.

**February 7** - Female #9, which mated on January 28<sup>th</sup>, makes her first egg case, and so does female #8. There are still seven females that have not mated, and they are really a problem. I never had such a problem getting mantids to mate.

**February 8** - Another female makes an egg case, but this one is not fertile, since she did not mate yet.

**February 9** - At around 2300, I try to get another pair together. I place the male on the floor of a cage, and put a female near him. She begins to walk toward the back of the cage, and this time the male jumps right on her back. She partially raises her wings, for a moment she was startled, but immediately calmed down. The male positions himself and begins to move his abdomen around the tip of her's. He tries a few times, the does something very strange - he turns around 180° until he is facing the wrong way - he was right the first time. He then keeps poking the end of his abdomen int the side of her thorax, over and over, while waving his antennae at the tip of her abdomen. The female, #4, stays very still during all this, and appears to be waiting. Finally, he realizes his mistake, and slowly turns around and this time mating does begin. The female relaxes her stiff position, and calmly begins to wander around the cage with the male on her back. The following morning, they are still together at 0700, longer than all the other ones of this species stayed together. The other ones that mated stayed together only about 6 hours.

**February 10** - Another attempt to mate a different pair - with results similar to previous failed attempts - they stare at each other and no one moves (Female #6).

**February 11** - The female that mated 2 days ago is making an egg case at 0600 and is about half done.

**February 12** - Still another failed attempt to get a pair to mate - the same female as on the 10th, different male. He tries several times, but each time the female becomes startled and pushes him away. Why is this happening? I never had this problem with other species. Are the conditions wrong? Is the male approaching the female inappropriately? Also, female #4 makes her first egg case today, and so does female #2, her second.

**February 13** - I take out another female (#5) and a male, and they begin mating in only a few minutes - same conditions. Why did this pair work out so well?

**February 14** - This pair remained together longer than the others - over 8 hours. The female makes an egg case later in the day.

**February 17** - The latest female to have mated, #5, is half finished making her first egg case at 0700 this morning. Later that night, I try to get the female (#6) that has been in the larger cage for the last few days to mate, after previous failed attempts. This time I re-use the male that mated first, on January 3<sup>rd</sup>. He shows interest right away, and they begin to mate. I take out another pair, and the male seems interested, but the female (#7) does not move. After a half an hour of no progress, I leave both pairs alone. The following morning, both pairs are in the process of mating.

**February 20** - Female #7 makes an egg case.

**February 22** - Female #6 makes an egg case.

**February 28** - Female #9 makes her second egg case.

**March 2** - Female #4 makes her second egg case. One of the females, #1, has not been eating for the past week or so. She strikes and misses when I try to hand feed her. She is not grasping the cricket - she strikes at it, without keeping her forelegs closed around it. She immediately re-opens her forelegs after the strike. I wonder what is wrong with her? The other female that is in the same cage with a divider in between is fine.

**March 4** - That female that is not doing well made a small egg case. The non-fertile female that make an egg case on February 8<sup>th</sup> makes another non-fertile one.

**March 8** - Another female, #5, is making her second egg case this morning, female #2 makes her 3rd one.

**March 9** - Female #3 makes another egg case, and so does female #7.

**March 10** - The female that was not eating is dead.

**March 11** - The first one to become an adult, a male, is dead today, without warning. Female #8 makes her second egg case.

**March 14** - The female that made two non-fertile egg cases dies very suddenly - no warning signs. Meanwhile, the other female that did not mate is getting heavier and is not making any egg cases. I tried getting her to mate several times, with no success. I decide to release her into the room on a Ficus tree.

**March 18** - Another male is dead, and the free-range female has found her favourite spot, right up only a few centimetres from the fluorescent light fixture that supplies light for the plants in the room. I hand feed her every other day, and she keeps eating, and getting fatter, but does not make an egg case. I keep giving her water, and she drinks, and she appears otherwise healthy.

**March 22** - Female #6 and female #9 both make their third egg cases.

**March 25** - Another one of the males has reached the end of his lifespan. Yesterday he was on the bottom of the container in a strange position, with his abdomen stuck into the soil, and did not react to anything. Today he is barely moving, and will not last to the end of the day. The other males are not eating well any more, only every few days. The females, however, are still doing well and eat whenever I give them food.

**March 26** - Female #8 makes her third egg case, female #3 makes her third, and female #4 makes her 3rd. All in one day.

**March 28** - Another male is dead, with very little warning. This seems to be typical of males of the smaller species. They die of old age with almost no warning. There are 3 males left, and 9 females.

**April 1** - Female #5 makes her third egg case.

**April 6** - The female that did not mate and could not make an egg case, finally makes one today. She has been an adult for well over three months, and this is her first egg case. It is the largest of all the egg cases, and she made it right on the Ficus tree branch where she has been for the past month. I was sure that she would just die, and never make an egg case. What is wrong with this female? She eats well, however, and drinks water daily.

**April 15** - Female #8 makes her fourth egg case.

**April 16** - Female #4 makes her fourth egg case.

**April 18** - Female #6 makes her fourth egg case, right on top of the other two, which have not hatched yet. These appear to be easy to separate without damaging them.

**April 20** - Female #2 is not doing well - she keeps falling over, and climbing aimlessly. She has been sluggish lately, and does not eat well. Today's sudden additional behavioural change means that she will not last long now. Also, female #7 makes another egg case.

**April 21** - Female #2 is dead. The rest are still doing well, after seven and a half months.

**April 22** - Another male is dead. There are two left. Also, an egg case made by female #2 on March 8<sup>th</sup>, hatched tonight - but only four individuals came out of this very small egg case, less than half the usual size.

**April 23** - An egg case made by female #9 on February 28<sup>th</sup>, hatches. About 50

individuals came out, which I immediately separated into individual containers. Other, earlier egg cases had been given to other Mantis Study Group members, so this is the first big hatch of the ones I kept. These egg cases seem to take about two months to hatch, maybe a little longer. Also on this day, another male is dead. There is only one male left, but there are 8 females.

**April 27** - Female #9 makes her fourth egg case. Female #3 appears weak, and may not last long.

**April 28** - Another egg case hatches, and only eight came out of this one.

**April 29** - Female #3 is now dead. The female that did not mate makes her second egg case. She is still on the Ficus tree in the room, and has not been in a cage for a very long time.

**May 3** - Some of the new hatchlings have already moulted the first time.

**May 5** - Female #9 is dead. She was sluggish the past few days, and lost interest in eating.

**May 6** - Female #4 makes her fifth egg case. Those that remain are eight months old today.

**May 7** - The last male is dead. He has been rather weak the past two days, so I knew he did not have very long. He still lived quite a long time for a male, longer than the New Jersey species normally do.

**May 8** - Female #7 makes her fifth egg case on the top plastic frame of the 11 litre glass tank she is in.

**May 13** - The female that did not mate makes her third egg case - a very small one. She is still free in the room on the plant, and only wanders about occasionally.

**May 14** - Female #8 makes her fifth egg case.

**May 15** - Another egg case hatches - inside female #4's container. The nymphs are just emerging, and have not even stretched out their legs, and already the female has grabbed a bunch of them all at once and is eating them! I immediately remove her from the container. At least 30 survive, and are doing well. She probably got no more than eight or ten. All of these will be given away, since I have more than enough from the previous hatch.

**May 17** - Almost all of the first batch of hatchlings have completed their second moult.

**May 22** - Female #4 is dead, without warning. She looked as if she was ready to make another egg case. There are five left.

**May 23** - Female #7 makes her sixth egg case.

**May 24** - Female #5 makes her sixth egg case.

**May 25** - Female #9 makes her sixth egg case.

**May 30** - Female #7 is dead. She just slowed down the past two days, weakened, and lost interest in food. Most individuals of this species seem to stay healthy almost toward the end of their lifespans - I observed very little deterioration in the way many other species show signs of old age up to a month in advance, where they cannot hold on to branches, become clumsy, and need to be hand fed because they no longer can catch their own food. These function well very close to the end. Outside it is 34°C, and I can see that the egg cases of *Tenodera aridifolia sinensis* are beginning to hatch all across New Jersey.

**May 31** - Female #8 makes her sixth egg case. She is showing signs of deterioration. One eye remains dark, and she is a bit clumsy now, taking several strikes to catch food, and will need to be hand fed soon. Most of the new generation that hatched recently have

moulted for the third time this weekend.

**June 3** - Female #8 is dead.

**June 8** - The free range female is dead, and there are two left.

**June 10** - Female #9 makes her seventh egg case.

**June 11** - One of the nymphs dies unexpectedly. It was hanging from the top of the container in a way that looked like it was about to moult, but was dead on the bottom of the container the next day. I give five nymphs away today, and there are 14 left, plus the 2 adults from last year.

**June 14** - Another nymph dies the same way.

**June 15** - Female #5 makes her seventh egg case.



**June 16** - The same thing happens to still another nymph - it was hanging upside down from the lid as if trying to moult, and died the next day. Is there enough humidity? Or is it too wet in some of the containers? I will transfer them to larger containers soon, since they are still in the fruitfly vials. Maybe they are too big now for this, and need more ventilation.

**June 19** - Female #5 is dead, without warning. There is one left. The young ones are moulting again this weekend.

**June 24** - Female #9, the last one left, makes her eighth egg case.

**July 3** - The last female dies. She lived quite a long time, almost 10 months. Not bad for such a small mantis species. The life cycle is complete, and the new, now more than half grown nymphs are all on their way to becoming adults. A few have only one more moult left, and will be adults very soon. Outside, the temperature is over 38°C, and the mantids in the garden are growing fast. In six weeks, there will be adults outside all over New Jersey...

Conclusion: *Creobroter gemmatus* turned out to be quite an easy species to rear, for something that looks so exotic. Only a few nymphs would die for no apparent reason, and most survive to adulthood. They also remain healthy up to the last few days of their lives, unlike many species which tend to linger on for the last month of their lives and need to be hand fed. There were no instances of parts of the tarsi and lower legs breaking off due to old age, in the way it happens to many other species toward the end of their lifespan. Another advantage is that their small size makes it easy to keep a lot of individuals, since they do not require as much space as the larger species. The only difficulty was getting them to mate. Many attempts are needed to have a successful mating with this species.

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