September, 2003

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A Report on Aconitum aquarius

The fascinating, poisonous insect of Terra 3, and its predator, Rana volatus acer

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Introduction

Aconitum aquarius and its predator, Rana volatus acer, are fascinating creatures found only in the dangerous jungles of Terra 3, the tropical jungle planet. Both animals were specially designed for Terra 3 and were recently added to the ecosystem. The purpose of this report is to educate the public about these two creatures.

Section 1: Aconitum aquarius

Introduction

Aconitum aquarius[*] is now a common insect in the jungles of Terra 3 and was introduced to cut down the population of Sudis sanies (Latin for pointy and venom, to mean "pointy, venomous plant"). S. sanies is a serious threat to animals and scientists on the planet. All creatures of Terra 3 that are injected with venom will die (other than A. aquarius and R. volatus acer). Due to the enormous threat from S. sanies, A. aquarus and R. volatus acer were produced, and then finally released into the wild.

Description

A. aquarius is a beetle that, when full grown, is about 6 inches long, 3.5 inches wide, and 2.5 inches at it's tallest. The adult is usually dully colored, though the males (Figure 2) are brilliant oranges, yellows, reds, and purples during the courtship season once a year. The most prominent difference between males and females (Figure 3) is that males have a horn on their head that stores poison and food. The females store poison in a massive, sack of compressed poison located in its abdomen (the male has this sack too). Both sexes look like gigantic scarabs.

The caterpillars (Figure 1) are monstrous 6-inch creatures that are ≈1 inch in diameter, and vary in shades of yellow, green, and brown, and can change color. The caterpillars also have a large horn on their last abdominal segment, similar to the hawk moth larvae of earth.

[*] Aconitum aquarius is Latin for "strong poison belonging to water"

Habitat

A. aquarius lives all throughout Terra 3, as the planet's dual stars provide one, continuos season.

"Terra 3 is tropical: wet and hot. Most of the planet is covered by rainforest. The planet is very flat. Water collects in large pools and lakes that have water in them throughout the entire year. Sudis sanies (a species of poisonous plant) grows thickly on the ground The spines of this plant are poisonous, and any animal that steps on one is sure to die (but except for A. aquarius and R. volatus acer, of course). The vegetation is plentiful, and includes leaves, fruits, and nuts. Animals include carnivorous snakes, varieties of insects, a tool making primate, monkeys, fish, and birds.[i]"

Life Cycle

After hatching from a small white egg in one of the two the jelly filled glands on the side of the male A. aquarius, the caterpillar begins to make a high-pitched vibrating sound by forcing the nutrient jelly in the gland through its digestive system rapidly. By doing this, the caterpillar tells that male that it is ready to emerge from the gland and the digestive system begins to develop more fully. After sounds have reached a high enough frequency for 30 minutes, pores begin to open up on the glands. Each caterpillar then crawls into a dent in the one of the male's elytras. There they receive nutrients for 2 weeks, until the glands on the male's thorax have completely disintegrated. After that, the male releases a chemical that drives the caterpillars away and into the jungle.

The caterpillars feed on S. sanies and begin to grow, and soon they are gargantuan creatures measuring 6 inches in length and 1.5 inches in diameter. The full-grown caterpillar resembles the larvae of the hawk moth of North America, having a large horn on the last segment of its body, which is used for intimidation, mostly. It usually takes the caterpillars 6 months to become full-sized caterpillars.

A week after the caterpillars have reached full size, they crawl off their host plant at about 2:00 am and find a soft spot of soil under an S. sanies plant. Then they burrow 2 feet under the ground and 3 days later, they pupate (Figure 7).

In another 4-6 weeks, the full grown beetle will begin to emerge. Once it is fully emerged, it digs up to the surface, where it exercises its wings and specialized mouthpiece. After that, the full-grown Aconitum aquarius flies off to find a body of water, preferably still.

A fascinating part of this insect is that segment 1568 of its DNA is either AGTCGGTTCA, AGAGTCCGGT, TGATTCTGAT, or AGTCCGTTCA[†]. Each segment determines when the insect will begin to court, one year, two years, three years, or four years from emergence.

When the insect has reached its courtship period, the males begin to lose their dull brown and yellow colors. They become brilliant orange, purple, yellow, and red, as well as being very decorated in the ultraviolet spectrum. At this time of the year, the male insects are most vulnerable because they are so easily seen. This is why 75% of larvae are male.

The females then seek the most colorful male (the females can see in both the ultraviolet and visible light spectrums). Each female carries a small variety in segment 56 of its DNA that

[†] A for Adenine, G for Guanine, T for Thymine, and C for Cytosine

makes the females prefer different aspects of male insects (ex. one female may prefer purple, another a lots of swimming barbs on the males back legs, etc.). This broadens the variety in the species, so minute, new traits are bountiful, but the insects remain the same species.

After a female has selected its favorite male, it attaches its mouthparts to the male's, and then the eggs are transferred from the female to the male, and stored in the glands on the side of the male. Fertilization takes place within the rearing glands shortly after the eggs are deposited. In 2 and a half months, they larvae emerge and crawl to the male's shell.

Adaptations

The most interesting adaptations of A. aquarius are color changing in the larvae, the mouthparts in adults, and the dents in the shell and the rearing glands in the males. These adaptations are described in the following sections:

Color Change in Larvae

Because S. sanies varies in shades of brown, yellow, and green, the A. aquarius caterpillars can change color. The caterpillars have 6 main layers of skin that make this possible:

1) ***The protective layer***
   The protective layer is a thick, strong, transparent layer that protects the caterpillar from the spines of S. sanies, the elements, and predators. The protective skin also has small pores in it for the light sensing organs and the spiracles.

2) ***The red layer***
   This layer, like all the colored ones after it, can change in opacity. The blend of the colored layers creates color.

3) ***The green layer***

4) ***The blue layer***

5) ***The light source***
   The light source is between two minor skin layers, the primary and secondary light layers. In between these two layers, a species of bacteria found in S. sanies acquired by eating the plant lives off a very minute portion of poison that the caterpillar stores, and creates light as a by-product. The bacteria work with the light sensing organs to ensure that the caterpillar does not glow, but the bacteria provide just enough light to produce color.

The Mouthparts

The adults of A. aquarius have mouthparts (Figure 4) similar to several dragonfly nymphs in Quebec. The mouthparts fit perfectly under the head but can shoot out and poison a fish in a manner similar to that of a hypodermic syringe, though the mouthparts actually hold the fish and inject the poison at the same time. The poison that the beetle gains from the plant is converted in to a powerful neuropoison that will instantly kill a fish that is less than 60 pounds, greatly facilitating hunting.

The insect converts the plant's poison into different poisons of varying strengths during its pupal stage. They are the hunting poison (extremely poisonous), the defense poison (a strong tranquilizer. If an animal gets an overdose, it will likely take 2 days to awaken, if it awakens at all), and the internal defense poison (this will be rejected by an animal the moment the

insects gets into its mouth, and if an animal continues to eat the insect it will die in a day or two, unless the animal is Rana volatus acer).

Here is a scenario that shows how A. aquarius hunts:

"The female A. aquarius is hungry. She flies over to one of the many lakes of Terra 3 and stops, landing on the surface. She wiggles her legs to attract a fish, and finally her success pays off. A ten-pound catfish-like creature slowly surfaces, waiting to eat the insect. Then, suddenly, the female A. aquarius blasts its mouthpieces at the fish! The fish doesn't stand a chance. It dies instantly. The insect knows that it must act fast. If it doesn't eat quickly, more fish will come to claim her prize. She quickly injects another chemical with her mouthpiece. This chemical dissolves the fish's innards, creating a slimy stew that is sucked up by the mouthparts. In about 5 minutes, the female has eaten her fill. She flies away. Soon a great spotted eagle smells faint traces of the soupy liquid. It rushes to the fish and gobbles it down instantly!"[ii]

The mouthparts are also an invaluable tool in reproduction, since the female passes her eggs to the male through a small tube in the mouthparts. Both genders have these tubes. During mating, the tubes expand to fill about half of the mouthpiece, and then the eggs are transferred.

The Dents and Rearing Glands

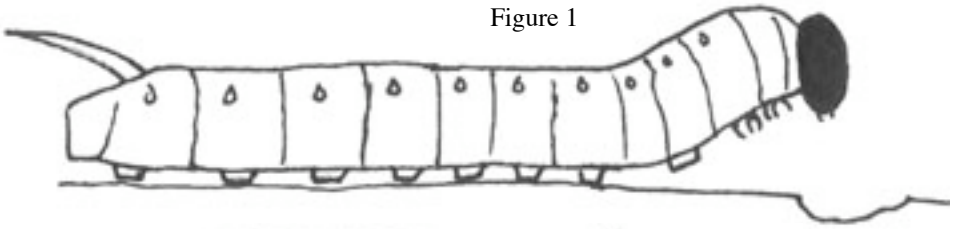
In the male insect, there are two organs that enable it to care for it's young, the rearing glands (Figure 6) and the dents (Figure 5).

The rearing glands are invaluable, since they allow the eggs to grow, and eventually caterpillars to hatch. After the eggs are transferred to the glands via the reproductionary tubes, they're fertilized. The glands are filled with jelly and the blood stream brings nutrients and takes waste out. Nutrients are absorbed by the jelly, and then by the eggs. After about 2 months when the male hears a certain frequency made by the caterpillars for 30 minutes, it will release the caterpillars by opening the glands. The caterpillars will then crawl into the dents. Unhatched eggs will be absorbed when the rearing glands disintegrate.

The dents provide refuge for the caterpillars after hatching. A caterpillar crawls into one and there it finds nutrient gel. I the dents the caterpillar becomes more independent. It begins to breathe air, change colors, and its digestive system becomes fully developed. In 2 weeks, when the rearing glands have disintegrated, the male releases a chemical that drives away the caterpillars. If the caterpillars do not move, they will die and be absorbed in the nutrient gel and will be food for the male. Having slow caterpillars absorbed ensures that the fittest survive, and boosts the survival rate for the species.

A. aquarius Figures

Figure 1



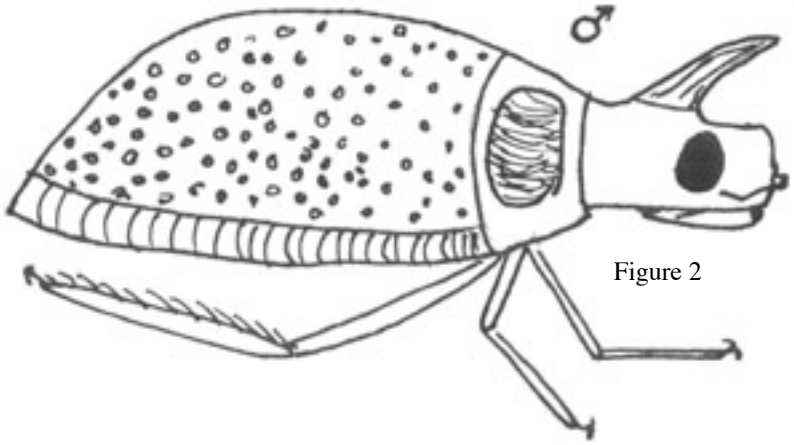


Figure 2

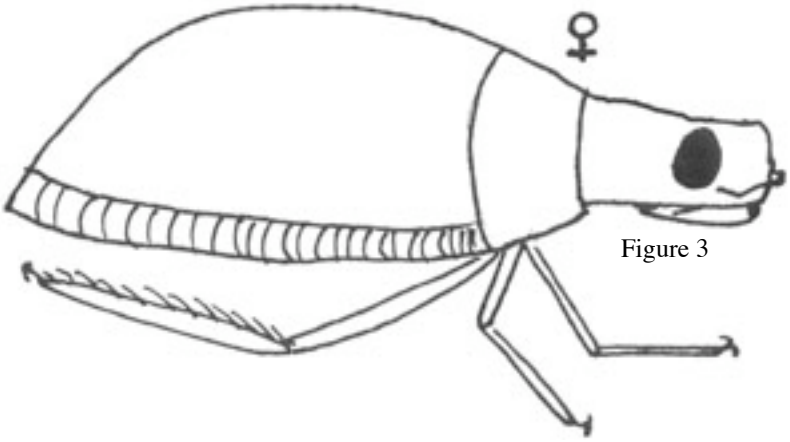


Figure 3

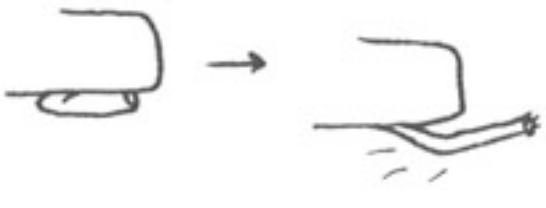


Figure 4

Figure 5

Figure 6

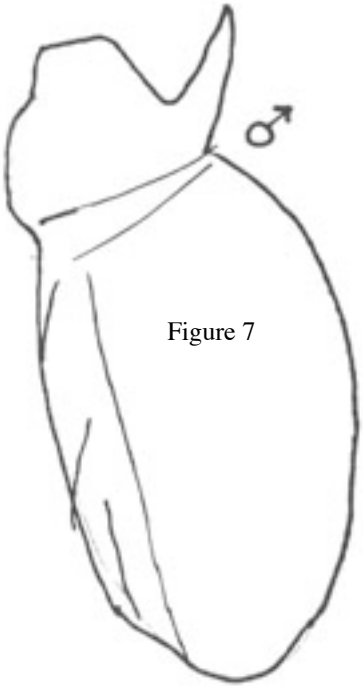


Figure 7

Figures 1-7; A. aquarius. Figure 1; larvae. Figure 2; male A. aquarius. Figure 3; female A. aquarius. Figure 4; A. aquarious mouthparts. Figure 5; dent and 1st instar larvae. Figure 6; rearing gland. Figure 7; male pupae.

Section 2: Rana Volatus Acer

Introduction

Rana volatus acer, Latin for fast flying frog, is a common inhabitant of Terra 3. As its name implies, R. volatus acer actually flies. It has an immense helium sack on its back and a smaller CO_2 sack on its throat. It uses the Helium to stay in the air and the carbon dioxide for propulsion and ballast.

R. volatus acer was introduced to Terra 3 to ensure that A. aquarius did not overpopulate.

Habitat

R. volatus acer lives mainly around the lakes and rivers that A. aquarius lives in, and floats over the water searching for the creatures.

Description

R. volatus acer adults are about 17 inches long, 13 inches wide, and about 8 inches tall. They look like any other frog, except for the large He sack on its back and the holes in its throat sack. The males are easily identifiable, their ears are larger than their eyes. The female's ears are about the size of their eyes, or smaller.

Life Cycle

R. volatus acer's life cycle begins when the eggs hatch 4 weeks after they are laid, when minute tadpoles hatch from their eggs. The tadpoles eat voraciously for 2 years, until they have reached full size. By this time, the tadpole has legs, arms, and their sacks, although they are not filled. When the tadpole is fully developed, it crawls on to land. After a week, the frog's body has absorbed the tail, and the frog has made enough He and CO_2 to fly. After another week, the frog is an expert flier. In another 5 weeks, the frogs mate, and the life cycle begin again.

Adaptations

The most interesting adaptations of R. volatus acer are described in this section, How it is capable of eating A. aquarius, and how it flies.

How R. volatus acer can Eat A. aquarius

R. volatus acer is capable of eating A. aquarius due to the large amount of carbon dioxide in its body. The poisons all contain $H_60_{19}C_6$ which reacts which large amounts of CO_2 as shown:

$$H_60_{15}C_4 + 2\ CO_2 \rightarrow 4\ CO_2 + 2\ O_2 + 3\ H_2O$$

This formula that the frog uses turns all the deadly poisons of the insect into harmless chemicals.

How R. volatus acer can fly

R. volatus flies by placing stored helium from a gland in its body into the sack on its back. For varying lift, the frog can adjust the temperature from 1-5 kilos/cm. The sack on the frog's neck is also very important. It contains a main chamber of compressed CO_2 and valves to three other chambers, the right steering chamber, the left steering chamber, and the propulsion chamber. By opening these valves, the frog can steer while in flight.

Here is how R. volatus acer feeds:

"The adult male R. volatus acer silently floats above the waters of the murky pond. Its sharp eyes detect movement on the surface of the water. It care fully lowers its self over the water and "Whish.." it flies over the water and grabs the feeding A. aquarius!"

Conclusion

I hope that you enjoyed my report and learnt something about two of Terra 3's most fascinating creatures, R. volatus acer and A. aquarius.

-DAS

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[i] From "Terra 3, an Introduction", by Terra 3 research group

[ii] From "The Fascinating Poison Bug: for children" by David Schlachter