Parasite lives 'double life'

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Caenocholax fenyesi Pierce sensu lato: neotenic female parasitic in a cricket and free-living male. Bottom image: Male Xenos vesparum Rossi, SEM head ventral view. Credit: Jeya Kathirithamby.

(PhysOrg.com) -- Scientists keen to understand and preserve global biodiversity have been quietly going about a mammoth task: indexing the world's known species.

So far the Catalogue of Life has indexed over 1,368,009 species and the latest edition features a database from Jeya Kathirithamby of Oxford University's Department of Zoology detailing Strepsiptera, a strange order of parasitic insect.

Strepsiptera are endoparasites – they live inside their host – with almost all females spending their entire lives inside the body of other insects and males emerging as free-living adults to mate before they die, just

five or six hours later.

‘The females are totally endoparasitic for their entire life history (except in one family) and all that is visible of an adult female is an extruded cephalothorax,’ Jeya tells me. ‘The female is nothing more than a “bag of eggs”, having lost all structures such as eyes, antennae, mouthparts, legs, wings and external genitalia any other insect would possess.

‘This dramatic difference between male and female makes Strepsiptera interesting model organisms for studying such aspects as mating and reproduction.’

Jeya is a world authority on these parasites where males and females can have such different lives that they even choose entirely different hosts:

‘There is a family where the males parasitize ants and the females parasitize grasshoppers, crickets or mantids. Due to the extreme sexual dimorphism and dual hosts, the sexes could not be matched until recently. We have achieved this using molecular data.’

Surprisingly, although Strepsiptera can infect and live inside the host insect for almost its entire life, the host seems unaffected and can even have its lifespan extended.

‘Strepsiptera have adapted to the life cycle of whatever host they parasitize,’ Jeya explains. ‘The comparison of the strepsipteran life cycle to the life cycles of the various hosts they parasitize is fascinating: For example the strepsipteran life cycle in a host which is a eusocial wasp is different to that of a host which is a solitary wasp and is different to that of a host which is an ant.’

Dr Jeya Kathirithamby is based at Oxford University's Department of Zoology.

Despite its unusual lifestyle this order of insect is far more than a curiosity: there are thought to be more than 600 species, with genetics revealing that individuals that look identical are in fact different species.

A recent molecular study carried out by Jeya and her collaborators found that a monotypic species in the southern states of the USA, Mesoamerica and the Neotropics revealed as many as ten cryptic species – animals which appear identical but are genetically distinct.

'The global Strepsiptera database in the Catalogue of Life has host records and geographical distribution. These will be linked to the database of the hosts and to GenBank data. In our molecular studies, we sequence the hosts as well in order to check for contamination,' Jeya tells me.

'Like most Strepsiptera we find in the field the hosts are also often new to science. Here again there will be links to molecular data of the hosts. Strepsiptera parasitize seven orders of Insecta so this will be a substantial contribution.'

According to Jeya, Strepsiptera could include so many examples of

cryptic speciation because of the different hosts they parasitize or their geographical distribution.

She comments that understanding the factors involved could prove very helpful in the study of a wide range of insects:

‘For instance, we are working on the phylogeny of crickets from Central America because we collected a large sample of crickets while looking for strepsipterans. Many of these crickets are new to science and at present there is no comprehensive data for crickets of Central America.

‘Both the molecular data and the geographical distribution of the cricket hosts will be linked to the database. This information will be invaluable for future researchers. Similarly, we are working on another little known host group in another area.’

Provided by Oxford University