5. Summary

1. The population of white leaf hoppers (WLH) *Cofana spectra* and the endoparasitoid Strepsiptera *Halictophagus australensis* were found to vary between the months with a peak in abundance during March through May and October to December, coinciding with the *boro* (winter) and *aman* (monsoon) rice cultivation period. The proportion of parasitization by *H. australensis* varied with the relative abundance of *C. spectra*. Apart from these the environmental factors like temperature (*X1*), rainfall (*X2*) and relative humidity (*X3*) exhibited negative correlation with the abundance of normal (*Y1*) and parasitized (*Y2*) *C. spectra*. The multiple regression equation $Y_1 = 702.34 - 9.57 X_1 - 0.17X_2 - 3.18 X_3$ and $Y_2 = 5.13 - 0.61 X_1 - 0.01 X_2 + 0.19 X_3$ describes this relation.

2. The life table features indicate that the parasitization by *H. australensis* increments the longevity of male *C. spectra* significantly (27.76 days) compared to uninfected individuals (23.64 days). In case of females the though the infected individuals (33.29 days) lived long, it was not significantly different from normal individuals (31.97 days). The instar duration of infected individuals varied significantly with seasons ($F = 12.13; df = 2, 8; P < 0.003$) and with the normal individuals ($t = 3.36; P < 0.01$ $df = 3$). The survivorship of normal [number surviving (y) = 86.11 - 18.22 ln age (x)] and infected [number surviving (y) = 90.33 - 18.7 ln age (x)] *C. spectra* remained different.

3. The morphometric studies showed that the significant dimorphism exists between male and female *C. spectra*, with the traits inclined towards the female in terms of size. Differences in the value of these morphological traits
were also prominent between normal and infected *C. spectra* for both the sexes. This is supported by the Principal component analysis, where contrast to normal, instead of a single factor, two factors was required to explain the observed variations in the trait values. For both normal and infected *C. spectra*, correlations between the morphological traits remained highly significant, which support that parasitization affects the traits as a whole. However, considerable variation was noticed in the ordination of the traits (value) in the biplots against the extracted components. The aedeagus length and ovipositor length were oppositely affected by parasitization. While ovipositor length decreased in infected individuals, aedeagus length increased in males, indicating sex dependent variation in parasitization by *H. australensis*.

4. The relationship between wing length and aedeagus length and ovipositor length remained different for normal and infected individuals. This is evident from the regression equations on these traits of *C. spectra*; for normal male:

\[
\text{Aedeagus length (y)} = 0.125 + 0.03 \times \text{Wing length (x)}
\]

while for infected male:

\[
\text{Aedeagus length (y)} = 0.38 - 0.005 \times \text{Wing length (x)}
\]

for normal female:

\[
\text{Ovipositor length (y)} = 1.458 + 0.179 \times \text{Wing length (x)}
\]

for infected female:

\[
\text{Ovipositor length (y)} = 0.598 + 0.0282 \times \text{Wing length (x)}
\]

These support that the infection by *H. australensis* affects the life history traits and overall fitness, prompting their potential in regulating of *C. spectra*.

5. The fecundity of *C. spectra* was a positive function of oviposition period

\[
\text{Fecundity (y)} = 5.63 \times \text{(oviposition period - 56.67)}
\]

and number of times a female oviposited

\[
\text{Fecundity (y)} = 14.61 \times \text{(oviposition event - 3.89)}
\]

The oviposition period, oviposition event and thus fecundity varied between the months,
significantly. Fecundity \( (y) \) of \( C. \) \( spectra \) as a function of months \( (x) \) could be expressed as: \( y = 1.409 \times + 48.214 \). Among the reproductive structures of \( C.\) \( spectra \), the size of styles were significantly \( (t =3.299; \text{df} = 18; P<0.05) \) reduced in stylopized males \( (30.3 \text{ mm}) \) contrast to normal males \( (36.08 \text{mm}) \).

6. From these observations, it appears that the parasitization by \( H. \) \( australensis \) affects the life history and thus abundance of its specific host \( C. \) \( spectra \). Considering the propositions of earlier workers (Chaudhuri & Dasgupta 1979; Mazumdar 1995; Chaudhuri & Mazumdar 2000; Oyediran 2000; Mazumder & Chaudhuri 2004; Kathirithamby 2009; Litsinger et al 2009), and in view of the present findings, the strepsipteran parasitoid \( H. \) \( australensis \) can be utilized as biological resource to combat the white leaf hoppers \( C. \) \( spectra \) in rice fields. Further research involving the bio-demography of these insects (Carey 2001) along with the emphasis for integrated pest management issues may be carried out to substantiate these propositions.