**Review of Master's Thesis Entitled "Investigating the impacts of the natural enemy *Trichogramma chilonis* Ishii on populations of *Crocidolomia pavonana* in Samoa" by Philip John Tuivavalagi, University of Queensland**

**Overall Comments**

This is the best Master's thesis I have ever reviewed. It is well organized and well written, except for the life tables section which needs improvement for clarity.

**Specific Comments**

Most of the following comments are suggestions rather than required changes.

Note: Page numbers start with page 1 of the pdf file, not page 1 of the thesis.

p. 1
US$780
->
US$780M

p. 1
(CIA 2015) does not have a matching reference. If you are referring to the US Central Intelligence Agency World Factbook, be aware that this is not a very reliable data source. They still list copra as a major crop for Guam even though there has been no copra produced on Guam in the past 50 years. If you want to cite an online source, it is custumary to include th URL and download date in your reference.

p. 1
(CBS 2008) does not have a matching reference. Epand to (Central Bank of Samoa 2008)

p. 1
"since the invasion of the Giant African Snail in the late 1990's a new and devastating pest has confronted almost all agricultural crops."
-> "since invasion of the Giant African Snail, SCIENTIFIC NAME, in the late 1990's, this new pest has devastated almost all agricultural crops."

p. 13
"Temperatures in Samoa are seasonally uniform with mean daily maximum and minimum temperatures of 32.4°C and 17.6°C"
-> "Temperatures in Samoa are uniform throughout the year with mean daily maximum and minimum
temperatures of 32.4°C and 17.6°C"

p.14
diamondback moth (*Plutella xylostella* L. (Lepidoptera: Plutellidae), the large
cabbage moth (*Crocidolomia pavonana* F. (Lepidoptera: Crambidae) and the centre grub
(*Hellula undalis* L. (Lepidoptera: Crambidae),
->
diamondback moth, *Plutella xylostella* L. (Lepidoptera: Plutellidae), the large
cabbage moth *Crocidolomia pavonana* F. (Lepidoptera: Crambidae) and the centre grub
*Hellula undalis* L. (Lepidoptera: Crambidae),

p. 14
Additionally, the influence of urban migration of young family
members to find jobs in the capital, Apia is continuously on the rise ...
->
p. 14 Additionally, urban migration of young family
members to find jobs in the capital, Apia, is continuously on the rise ...

p. 14
The most recent available survey data reports
->
The most recent available survey data (REF NEEDED) reports

p. 15
The diamondback moth ...
->
Diamondback moth ...

p. 15
every continent apart from the Arctic and Antarctic.
->
every continent apart from the Antarctic.
[Artic is not a continent]

p. 15
between 12 and14 days at typical of tropical temperatures.
->
between 12 and 14 days at temperatures experienced there.

p. 16
Previously Iqbal et al. (1996) reported resistance to various strains of Bacillus thuringiensis (Bt)

Resistance to BT by DBM was first reported by Tabashnik in Hawaii in the mid 80s.
You may want to find and include this reference.

p. 17
Many approaches have been tested to develop effective methods to control insecticide resistant DBM, resistant crop cultivars (Dickson et al., 1990),
->
Many approaches have been tested to develop effective methods to control insecticide resistant DBM: resistant crop cultivars (Dickson et al., 1990),

P. 18
*Brassica oleracea* var.capitata
Italicize capitata

p. 20
Hymenoptera (Whitfield, 1998; Querino et al., 2010); it is
->
Hymenoptera (Whitfield, 1998; Querino et al., 2010). It is

p. 23
Furthermore, Trichogramma chilonis Ishii was used against Ostrinia furnacalis eggs in Guam (Nafus & Schreiner, 1986), in India (=Trichogramma confusum) (Nagarkatti &Nagaraja 1978), in Indonesia (=Trichogramma minutum) (Leefmans, 1929; Kalshoven 1981), and in the Philippines (Shibuya & Yamashita 1936).

Does this mean that T. confusum and T. minutum are junior synonyms of T. chilonis?
If so, it might bee better to state this explicitely to avoid confusion.

p. 23
T. ostrniae releases
Check typo and italics

p. 23
1996and

p. 23
Nagarkatti and Nagaraja (1979) examined of syntype material
->
Nagarkatti and Nagaraja (1979) examined syntype material

p. 27
There are several reports of T. chilonis being successfully deployed
->
T. chilonis has been successfully deployed

p. 28
visits to selected farms sites where
->
visits to selected farms where

p. 28
The second experimental chapter of the thesis reports on used mechanical exclusion techniques to assess the impact of T. chilonis on experimental cohorts of C. pavonana.
->
The following chapter of the thesis reports experiments in which mechanical exclusion techniques were used to assess impact of T. chilonis on experimental cohorts of C. pavonana.

p. 28
The objective of the study was to determine the capacity of the endemic
T. chilonis population to suppress C. pavonana populations in the absence of insecticides so that its potential for incorporation into an IPM approach from Brassica crop management could be assessed.
16
->
The objective of the study was to determine the degree of C. pavonana population suppression by ambient abundance levels of T. chilonis in the absence of insecticides
so that I could assess the potential importance
of this egg parasitoid as a component of a Brassica IPM program.

CHAPTER 2

p. 30
Using the data
->
Using data

p.37
Interesting that none of your farmers used B.t. Is this because of availability or cost? If the reason is known it might be good to put a sentence or two in the text somewhere to satisfy curious readers.

p. 44
Small formatting problem for first application indicator.

P. 50
Typo in y axes: “appliactions”.

“Mean number of insecticide applications per week throughout the crop cycle (F7,88 = 1.95; P= 0.07) and mean number of active ingredient applications per week (F7,88 = 3.52; P = 0.002) (Field Site-2 and Field Site-8 significantly different) at Field Sites 1-8.”

The above is quite confusing. I suggest something along these lines::

“Mean numbers of insecticide applications per week throughout the crop cycle were not significantly different among fields (F7,88 = 1.95; P= 0.07). Mean numbers of active ingredient applications per week were significantly different among fields (F7,88 = 3.52; P = 0.002) as indicated by different letters above bars.

P. 51
number applications was significantly different between field sites
->
numbers of applications were significantly different among fields

Chapter 3

P. 55
In general the natural enemies of *C. pavonana* have not been well documented ...
->
Natural enemies of *C. pavonana* have not been well documented …

P. 56
Although records of parasitoids attacking *C. pavonana* have been reported from Indonesia (Sastrosiswojo et al., 2004; Sastrosiswojo and Setiawati, 1992), India (Mandal and Patnaik, 2006; Das and Mandal, 2005; Men and Kandalkar, 2000), and Papua New Guinea (Saucke et al., 2000; Saucke, 1996) none of these studies report effective parasitoids of *C. pavonana* which have the potential to be developed as biological control agents.
->
Although records of parasitoids attacking *C. pavonana* have been reported from Indonesia (Sastrosiswojo et al., 2004; Sastrosiswojo and Setiawati, 1992), India (Mandal and Patnaik, 2006; Das and Mandal, 2005; Men and Kandalkar, 2000), and Papua New Guinea (Saucke et al., 2000; Saucke, 1996), none of these studies show that these parasitoids are effective biological control agents.

In a recent study an egg parasitoid, *Trichogramma chilonis* Ishii Hymenoptera:Trichogrammatidae) was reported to parasitize eggs of *C. pavonana* in Samoa (Uelese et al.,2014).
->

In a recent study (Uelese et al.,2014), an egg parasitoid, *Trichogramma chilonis* Ishii Hymenoptera:Trichogrammatidae), was reported to parasitize eggs of *C. pavonana* in Samoa.

“Germinated seedlings were separately transplanted into individual pots (10 cm diameter) containing potting mix.” Is the potting mix the same sand/soil mixture you used for germination, or is this something else? Needs explan
ation.

*Brassica oleracea* var.capitata cv. FS
Italicize capitata

P. 58
This is a nice diagram, but a little confusing. I take it that the only difference should be the length of the nylon mesh screen. However, the ellipses which represent the tops of the exclusion cages are different. They are colored different shades of grey and one has a dotted border. Please fix to avoid confusion.

P. 59
elevation of 100m above seas level
Typo: seas

*Brassica oleracea* var.capitata cv. FS
Italicize capitata

utilized is the studies
Typo: in the studies

P. 60
Potted plants were allocated to a position in the grid entirely at random.
->
Potted plants were positioned at random within the grid.
(Just a suggestion)

Eggs masses were then incubated (25±2°C; L:D 12:12h) until eggs hatched or they turned black due to parasitism. Egg masses that contained eggs that turned black were photographed again to enable the number of parasitized eggs to be accurately determined.
->
Eggs masses were then incubated (at 25±2°C; L:D 12:12h) until eggs hatched or they turned black due to parasitism. Parasitized egg masses were photographed again to enable the number of parasitized eggs to be accurately determined.
(Would be cool to include one of theses photos in your thesis.)

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Data Treatment and Analysis

This section is hard to interpret and needs to be rewritten for clarity. Would be great if the raw data and analysis scripts could be added as “additional material” so that the reader could see exactly how the data were handled.

I suggest something along these lines to explain what data were recorded:
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The number of eggs in each egg mass (N) was counted when plants were placed in field cages on day 0. The eggs were counted again when egg masses were removed from the field on day 3 and the number of missing eggs (M) was calculated.

At the end of the incubation period (day ?), we tallied the number of eggs which hatched (H), inferred from the number of first instar caterpillars collected, and the number of eggs parasitized (P), inferred from the number of eggs which turned black.
Thus, we enumerated the outcome for all eggs: N = M + H + P

I suggest adding an additional table, similar to Table 3.1, where the raw count data are provided instead of proportions.
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P. 61
Elkington et al. (1992)
There is no reference provided for this citation, nor is Elkington 1992 referred to in Furlong 2004b.

The explanation for increasing the estimate for proportion of eggs parasitized by partitioning the missing egg count is a little confusing, partially because of the substitution of “rate” for “proportion”. Stick with “proportion”. These are not really rates. (In my mind, rates use two different units such as miles per hour, whereas you are using only one unit (eggs per egg)).

If you are going to make this adjustment for the estimate of the proportion of eggs parasitized, shouldn’t you also make the same adjustment for the estimate of the proportion of eggs which hatched?

P. 62
Please use “proportion” instead of “rate”

P. 63
Table 3.1: It is not clear to me if the “Mortality” column includes death by parasitism.

P. 64
I realize that you are using the classical life table format, but I think you still need to provide a definition for lx, dx, qx. Perhaps you did, but the end of the table is cut off in my copy.

P. 64
It appears that the table is cut off at the bottom.

P. 68
no parasitoid swere seen
Typo: swere

Please use “proportion” instead of “rate”

some eggs masses
Typo: eggs

P. 70
Italicize P. xylostella and C. pavonana and Brassica