Abundance of *Mepraia spinolai* in a Periurban Zone of Chile

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Mepraia spinolai *is a silvatic species of Triatominae which prefers microhabitats near to or in rock piles. It is also able to maintain similar or higher size populations near houses. The density of bugs in quarries near Santiago, Chile, differed within microhabitats and varied significantly within sites according to season.* M. spinolai *was not found in sites characterized by human perturbation of quarries. Our results confirm* M. spinolai *as a silvatic triatomine whose importance as a vector of Chagas disease will depend on contact with humans. This could occur if the habitats where populations of this species are found become exploited for the building of urban areas.*

Key words: *Mepraia spinolai* - relative abundance - population density - Chagas disease - Chile

Mepraia spinolai (Hemiptera, Reduviidae, Triatominae) is the only sylvatic vector of Chagas disease in Chile, and the only species of Triatominae to show marked alary polymorphism (Schofield et al. 1998). It occurs in arid regions of the north and central parts of the country (Canals et al. 1998, 1999) and also on some off-shore islands (Sagua et al. 2000) roughly between 18° and 34°S, although the northern forms have recently described as a separate species, *M. gajardoi* (Frías et al. 1998). In general *M. spinolai* seems mainly associated with rockpile habitats, and although it has often been found infected with *Trypanosoma cruzi* (eg. Ordenes et al. 1996) the parasite strain has usually been found to be different to the strain most commonly found infecting humans in Chile (Schofield 1994). Nevertheless, there is concern that *M. spinolai* may adapt to a closer association with humans, representing a possible risk for vector borne transmission of Chagas disease. The aim of the present study was to examine seasonal abundance of *M. spinolai* in a periurban region close to the city of Santiago.

MATERIALS AND METHODS

The study was carried out in the locality of Colina (33.12S, 70.43W) approximately 20 km from center of Santiago, during the period from October 1997 to September 1998. This locality is characterized as semi-arid, with extensive slate quarries and a few houses.

We considered habitats in two areas (Fig. 1): domestic (DOM) which we defined as areas within 20 m of human dwellings, and wild (WILD), which were areas 4 km from the nearest house. Within each of these we distinguished three types of microhabitats. In the DOM areas we examined (i) a stone quarry (CAND), (ii) peridomiciliary structures (PER) such as animal yards, cellars, and piles of fire wood, and (iii) pile of stones (PIE). In the wild areas we examined (i) drystone walls separating fields (PIR), (ii) a rocky slope near a stone quarry (LAD) and (iii) the stone quarry itself (CANS). Within each microhabitat we considered six sampling points of 4 m^2 each. Each month for each sampling point we recorded the number and developmental stage of bugs encountered in a 20 min period. In addition we used the Lincoln-Bailey mark-recaptured index (Caughley 1978), to estimate the absolute density of *M. spinolai* in the wild quarry site (CANS) where the bugs appeared most abundant. For this, the captured bugs in two quadrants of 1 m^2 were marked with non-toxic red powder on the connexivum, release within 1 h of capture at the centre of the quadrant, with the second search and capture carried out 5 h later.

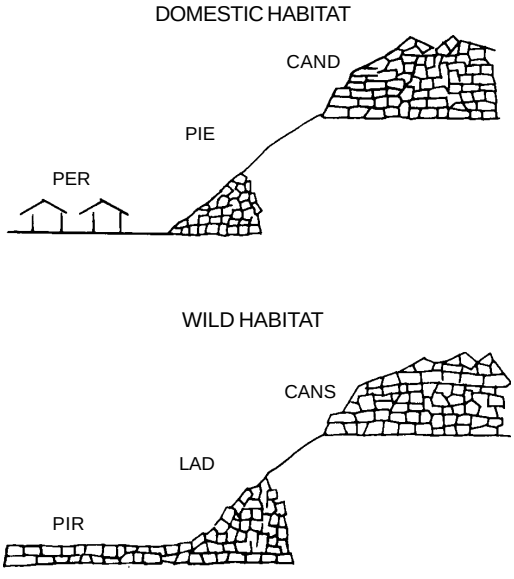

Fig. 1: sampling areas of *Mepraia spinolai*. Domestic (DOM) and wild (WILD) macrohabitats, respectively. A stone quarry (CAND), peridomiciliary structures as animal yards, cellars, pile of fire wood etc. (PER) and pile of stones (PIE) in macrohabitat DOM. Drystone wall separating fields (PIR), a rocky slope near the stone quarry (LAD) and the stone quarry (CANS) in macrohabitat WILD.

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RESULTS

No bugs were encountered in the PIE and PER of the "domestic" area. The observed abundance of *M. spinolai* differed between the other sites (Friedman = 20.81, $p < 0.01$) and also varied within sites according to season (Friedman = 19.4, $p = 0.05$) (Fig. 2). Multiple comparisons showed that microhabitats CANS, LAD and CAND were most similar in relative abundance, with CAND having the highest overall abundance and PIR the lowest. The overall average abundance was about 10 insects captured per hour (range 0-181).

The estimated density of bugs at sites in the stone quarry (CANS) varied over the year (Kruskall-Wallis = 20.1 , $p < 0.05$) (Table) although there were no significant differences in the estimated density between the sampling quadrants points (Kruskall-Wallis = 2.78, $p > 0.05$). The maximum overall density for both sites was estimated for the summer months, February - March (Table) with 2nd and 3rd instars predominating in autumm and winter, 5th instars predominating in the spring, and adults, 5th and 1st instars predominating in the summer (Fig. 3).

DISCUSSION

Our results indicate that in this periurban region, *M. spinolai* is most abundant in the stone quarries themselves, rather than among neighbouring peridomestic habitats, and that its abundance in the quarries seems unaffected by the presence of nearby human dwellings. We consider that its abundance in the stone quarry reflects the relatively constant climatic conditions within the slate cracks, because our recordings showed constant temperatures about 20°C at 15 cm depth, even when the ambient temperature was above 30°C. This temperature does not differ significantly from the preferred temperature for this species, of 24.8°C recorded in experimental laboratory conditions (Canals et al. 1997). Additionally, the stone quarry habitat appear to offer an abundance of potential host species – mainly rodents, rabbits and the marsupial *Thylamys elegans*. The high density of bugs in quarries near human dwellings could be indicative of a slow but progressive aproximation to sources of blood from different hosts, including humans and companion fauna. Adults bugs were present in the samples during warm and hot weather, and first instars were represented throughout the year with a peak during summer months, which we interpret to indicate a main reproductive period during spring and summer as also suggested by Schofield et al. (1998) from studies of northern populations of *M. spinolai*.

TABLE

Population density estimations of *Mepraia spinolai* in two sites located at stone quarry (individuals/m^2 ± 1 standard error)

Month	Site 1	Site 2
October	0	0
November	0	0
December	0	0
January	66 ±19.1	0
February	237 ± 49.1	364 ± 89.5
March	198 ± 36.4	71 ± 10.7
April	15 ± 8.4	0
May	30 ± 20.9	16 ± 1.0
Jun	36 ± 15.2	37 ± 14.8
July	47 ± 9.5	31 ± 14.8
August	80 ± 33.9	54 ± 21.3
September	24 ± 2.6	21 ± 7.5

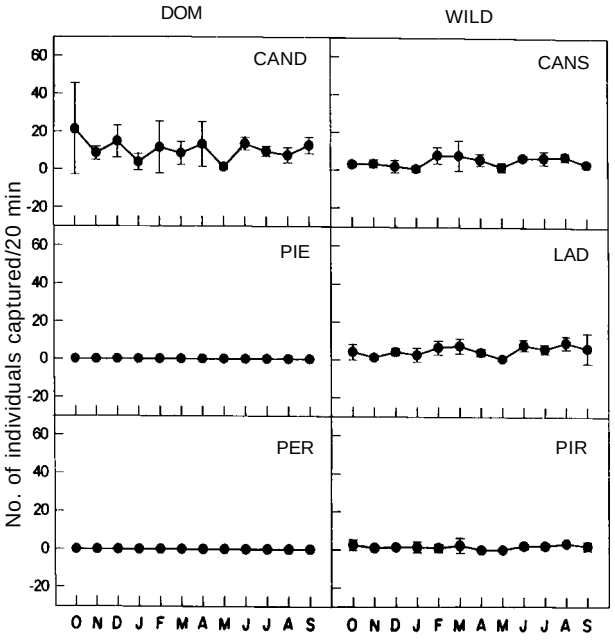

Fig. 2: monthly captures of *Mepraia spinolai* in the micro-habitats (average ± 1 standard deviation). Abbreviations as in Fig. 1.

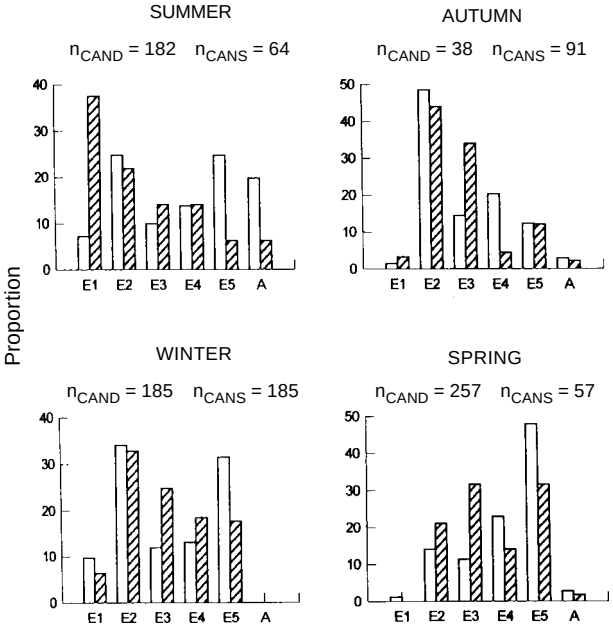

Fig. 3: seasonal distribution of the proportion of the different nymph instars and adults (E1 to adults) in the total captures in the stone quarry (CAND) (□) and CANS (▨) sites.

Schofield et al. (1998) found that inland population of this species in northern Chile showed balanced alary polymorphism whereas adults from coastal populations were invariably wingless. The overall proportion of winged males found in our samples was 7% but dispersal flights were never observed. Human blood index for *M. spinolai* shows that this bug is not yet an important vector for *T. cruzi*, notwithstanding recently reported levels of 4.6% (Canals et al. 2001) lightly superior to the 2.4% reported previously. High density of this species in quarries near human dwellings and the reported increase of the human blood index could suggest a possible sinanthrophic process of *M. spinolai*.

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