

Notes and comments

The invading parthenogenetic cockroach: a natural history comment on Parker and Niklasson's study

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Introduction

Parker et al. (1977), Parker (1984), and more recently Parker and Niklasson (1995) investigated genetic diversity and particular genotypes in clones of the parthenogenetic cockroach *Pycnoscelus surinamensis* (related to the bisexual *P. indicus*). Their studies addressed interesting problems of relationships between genotypes and parthenogenesis with reference to the rate of successful invasion by these clones.

Parker and Niklasson (1995) commented on the value of the “general-purpose” genotype of clones of *Pycnoscelus surinamensis* regarding its rate of successful invasion. According to Roth (1974) and Roth and Willis (1961), they considered that the parthenogenetic clones had invaded (*sic*) wide geographical areas. With reference to their own work they stated that the rate of successful colonisation and invasion of *P. surinamensis* clones was not related to a general-purpose genotype, and that “Parthenogenesis, in itself, may be the most important life-history difference explaining geographic distributions of *P. indicus* and *P. surinamensis*”. In this paper, we do not want to comment on the genetic studies but on the interpretations of their results, especially regarding the notions of “geographic distribution”, “colonising” and “invading”. We argue that the conclusions of the authors should

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be tempered using observations of parthenogenetic populations in the field. We address these comments based on our own field observations of *P. surinamensis*.

P. surinamensis should not be considered a purely feral (i.e. non-synanthropic) species (Roth and Willis, 1961; Roth, 1974; Parker, 1984). It has generally been considered a peridomestic species, living near human constructions or crops, and relying on transport by man to increase its distribution throughout the world (Rehn, 1945; Roth and Willis, 1960; Cornwell, 1968). We argue that it is particularly important to take human influence into account for evaluating the possible role of parthenogenesis in the invading success of this species. This human influence has been under-emphasised by Parker and Niklasson (1995).

The increase in the distribution range of *P. surinamensis* could actually be related to two factors: high invading ability related to the influence of parthenogenesis on post-colonisation population dynamics (Parker et al., 1977; Parker, 1984; Parker and Niklasson, 1995), and the opportunities of transport by man of the original populations where parthenogenesis first appeared. It seems difficult to discriminate between the two factors. However, the influence of the first factor – invading ability – may be indirectly assessed through the examination of distribution patterns in the field as follows. Is *P. surinamensis* only found near active or abandoned human dwellings or cultures? This would suggest that it was transported by man near these settlements and that it established colonies there without extending further. Can *P. surinamensis* also be found far from human locations? This might mean either that it was first transported by man to human settlements and subsequently was able to invade many neighbouring areas, or that it succeeded so much in invading that it increased its distribution to include several human dwellings and the natural areas between them.

Material and methods

Several locations were visited in French Guiana, Cameroon, the Central African Republic and the Loyalty Islands. Study plots were established both near human dwellings (gardens, fields, plantations, young secondary forests, etc.) and far from them (undisturbed forests or savannahs). Matched study plots were also considered which were respectively subject to human intervention or not, stood less than one kilometre away from one another and were not separated by a major geographic boundary (river, mountain, etc.)

Study plots were about 600 m² and cockroach sampling in each plot was carried out during several hours by direct observations of the ground, humus and mould, under rocks or rotten branches or the bases of plants, where this species is known to burrow (Roth and Willis, 1960).

Results

According to our observations, *P. surinamensis* was absent from all plots without human dwellings, while it was present only in some of the plots around human

Table 1. Distribution of *P. surinamensis* according to presence or lack of human settlement. The numbers indicate the plots where the species was found compared to the total number of sampled plots. Study plots in Trinidad were caves (cockroaches were found in cave soil).

Location	Near human settlement	Undisturbed locations
French Guiana	1/4	0/10
Trinidad Island	2/4	0/3
CAR	2/2	0/8
Cameroon	32/67	0/8
Loyalty Islands	2/2	0/3

dwellings (Tab. 1). The examination of matched plots also showed that *P. surinamensis* was never found in a natural area near a plot with human presence (Tab. 2). These results clearly support the current opinion which considers this species to be synanthropic or at least peridomestic. Also, the rate of successful invasion of this species does not appear so high, considering that it was found in but a part of the sampled areas with human presence, and in none of the undisturbed areas neighbouring observed populations.

Discussion

These results and previous observations (Roth and Willis, 1960, 1961) do not completely support the statement of Parker and Niklasson (1995) that parthenogenesis can explain the wide distribution of *P. surinamensis* (compared to the narrow distribution of bisexual *P. indicus*). The first obvious explanation of the geographic distribution of *P. surinamensis* appears to be its transport by man (probably on vegetable mould carried with cultivated plants). There is no indication of high intrinsic colonising and invading abilities in this species since it was never found far from human dwellings. It is clearly able to develop only limited populations near the place to where it has been transported.

In conclusion, we argue that it is irrelevant to directly compare the geographic distributions of feral and synanthropic species in order to study their correlates. In

Table 2. Number of plots where the presence of *P. surinamensis* was recorded in the plot near human settlement and not recorded in the matched plot undisturbed by man.

Location	Matched plots
French Guiana	1
Trinidad Island	1
CAR	1
Cameroon	2
Loyalty Islands	2

the case of synanthropic species, the influence of man could have strongly biased the distribution patterns in such a way that it would be nearly impossible to discriminate today between the respective possible past influence of biological traits (like parthenogenesis) and transport by man on distribution. Also, the terms “colonising” and “invading” appear misleading regarding what is known of *P. surinamensis*'s life history. They should not be used in this case because they unfairly support the hypothetical influence of parthenogenesis on the increase of distribution range while they tend to minimize the role of transport by man.

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