**Supporting Information - Marsot et al. PLoS ONE 2013.**

**Appendix S1:** Correction of field tick counts for Siberian chipmunks to have laboratory tick counts.

For the bank vole and the wood mouse, the data of tick burden were counts made in the laboratory on the whole body (almost exhaustive), and for the Siberian chipmunk, counts were made in the field only on the head. We thus estimated the number of ticks on chipmunks, which a laboratory count would have done, based on a count made in the field. One set of data realized in 2007 in Verneuil-sur-Seine (Yvelines) concerned 19 chipmunks, for which counts of ticks were realized at the same time in the field and in the laboratory. Counts were realized by a single experienced person and with high precision. The model corresponds to a linear model between field and laboratory data. The estimation thus was made from the field data, the only data available for chipmunks in our study. The explained variable is thus YF (number of larvae counted in the field) and the explanatory variable YL (number of larvae *I. ricinus* found by an individual in the laboratory).

The count variables for every individual i, are respectively:

YLi~ Poisson (λLi) with E(YLi)=Var(YLi)= λLi , and

YFi~ Poisson (λTi) with E(YTi)=Var(YTi)= λTi .

By taking into account the body surface of every animal i, on which ticks are counted, we obtained:

λLi= μL.Si (Si entire body surface of the animal i, μL mean density of ticks) [1]

λFi= μF .si (si head surface of the animal i, μF mean density of ticks) [2]

We hypothesized that there is a linear relation between μL et μF:

μF = a.μL [3]

where a took into account the difference of density evaluated in the field and in the laboratory and the aggregation of ticks on the head. By using equations [1], [2] and [3], we obtained:

λFi = a.Ri .λLi with Ri = (si/ Si)

We hypothesized that, for a given host species, the rate Ri is constant and did not depend on the animal i: Ri = R

Thus, we obtained:

λFi = a.R.λLi [4]

In the absence of independent measures of a and R, it is not possible to estimate separately these parameters. Thus, we said: α = a.R. With the equation [4], the mean counts in the field and in the laboratory were linked by the expression:

**λFi = α.λLi** [5]

ZLi = √YLi and ZFi = √ YFi represent the square root of the initial counts. As YL and YF followed a Poisson distributions, ZL and ZF followed normal distributions [[27](#_ENREF_27)], such as:

ZLi ~ Normal (√λLi, ¼) and

ZFi ~ Normal (√λFi, ¼).

After standardization of ZL et ZF, we obtained:

ZLi = √ λLi + ε1 with ε1 ~ Normal (0,1/4) and

ZFi = √ λFi + ε2 with ε2 ~ Normal (0,1/4).

With the equation [5], we obtained:

√ **λFi =** √**α .**√ **λLi**

which allowed us to obtain a model of estimation:

ZFi = √ α .ZLi + [ε2 – (ε1.√ α)] with ε1 et ε2 independents.

With e = ε2 – (ε1.√ α), we had E(e) = 0 and Var(e) = ¼ .(α+1), thus an estimation model:

**ZFi = √ α .ZLi + ei**

It corresponded to a classic linear model of regression, which did not require the estimation of an intercept. We obtained =² and ²residual= ¼. [ + 1], where  represented the estimation of the slope and ²residual the residual variance of the regression model.