Introduction

Coevolution of spermatozoa length and certain dimensions of the female reproductive tract has been shown to occur in some genera of Diopsidae (Kotrba 1995, Presgraves 1999). Here we present evidence for a different kind of male-female coevolution in another genus of Diopsidae. We discovered that males of a Teleopsis species from Singapore bear a particularly long genital process. In females of the same species a long common duct leads up to the separate spermathecal ducts which bear the spermathecae, i.e. the primary sperm storage organs. The male genital process is short and the common spermathecal duct represented only by a short pouch from which the separate spermathecal ducts originate in the previously described T. whitei (fig. 1, Kotrba 1993). Our new finding led to the hypothesis that the male and female features might be involved in some kind of coevolution.

Kotrba (1993) demonstrated that in T. whitei the tip of the male genital process enters the entrance of one of the two spermathecal ducts during copulation (figs. 1, 2). The finding of coevolution of the involved male and female structures would allow for further speculation with respect to an ongoing male-female “arms race” and cryptic female choice, current hot topics of evolutionary biology.

To test our hypothesis, we conferred a comparative study of five additional Teleopsis species available at the ZSM.

Results and discussion

The length of the female common spermathecal duct is closely correlated with the length of the male genital process across the species (r=0.98, p<0.01, df=5, table 1, fig. 4a). This finding corroborates our hypothesis that the two features are coevolving. The common spermathecal duct is always shorter than the corresponding male process (i.e. below 1:1 line in fig. 4a), which seems reasonable, considering that the male process has to pass the entire common spermathecal duct to enter the opening of the separate spermathecal ducts in analogy to the conditions in T. whitei.

Kotrba (1993) speculated that the male genital process might be employed to pry open the entrance, to the female sperm storing organs for sperm transfer (fig. 1). In this case an increase in the distance to the entrance of the spermathecal ducts would necessarily require a corresponding elongation of the male genital process to ensure insemination.

It is unknown to which extent the male genital process length is correlated with other male features or itself a true indicator of male fitness. If, for example the genital process length was correlated with male overall size, then selection for a long process would equal selection for larger males.

The length of the separate spermathecal ducts shows no correlation with the length of the male genital process (fig. 4b). Again this finding seems reasonable because these features do not interact directly. Instead, the separate spermathecal ducts are known to be correlated with the spermatozoon length in some Diopsidae (Presgraves et al. 1999). In this context it might be worthwhile noticing that invariably the duct leading to the double spermatheca is longer than that leading to the single one.

Materials and Methods

Fresh specimens of Teleopsis spec. (Singapore) were available from a laboratory culture at the ZSM. All other species were studied from pinned museum specimens after maceration in KOH. The male external and the female internal genital organs were dissected under a Leica MZ 12 stereomicroscope and mounted on microscopic slides in polyvinylalcohol with an admixture of chlorazol black E. The dissections were studied and documented with a Zeiss Axioplan 2 compound microscope equipped with a drawing tube and a Zeiss AxioCam digital camera. The means (x), standard deviation (sd), standard error (se) and regression analysis were computed with MS Excel.

References

