HOW CAN I MATE WITHOUT AN APPENDIX MASCULINA? THE CASE OF SPHAEROMA TEREBRANS BATE, 1866 (ISOPODA, SPHAEROMATIDAE)

BY
GIUSEPPE MESSANA
CNR-Istituto per lo Studio degli Ecosistemi, Via Madonna del Piano, I-50019 Sesto Fiorentino, Firenze, Italy

ABSTRACT
Several hours mating behaviour of the woodborer isopod, Sphaeroma terebrans were recorded using a video camera. S. terebrans, the only species in the genus to lack an appendix masculina, has a peculiar way of mating that is completely different from that in other Isopoda. Instead of introducing the sperm into the genital opening of the female, the male releases it into the water current created by the beating of the female pleopods. The origin of this adaptation is discussed.

INTRODUCTION
Isopods colonize almost every environment on earth, from deep seas to desert mountains. Their long evolutionary history, the first fossil dating from the Carboniferous (Schram, 1986), has led to great morphological variety. Despite such a wide diversity of morphotypes, the species share a common character: a copulatory organ, constituted by a modified endopod of the male pleopod II (Brusca & Wilson, 1991). The appendix masculina (= male stylet) is used to transfer sperm to the female during mating. It may be very simple, as in most marine isopods,
or a very complex structure, as in several Asellota (cf. Magniez & Henry, 1970; Wilson, 1991).

The Sphaeromatidae are marine and intertidal isopods widely distributed throughout the world, from the intertidal to a depth of a little more than 1000 m. They have also colonized freshwater and subterranean ecosystems. Some species practise mate guarding (Ridley, 1983; Shuster, 1991; Jormalainen & Shuster, 1999). The males usually possess a simple appendix masculina of variable length.

The species *Sphaeroma terebrans* Bate, 1866 is a woodborer distributed in tropical and subtropical areas. It shows a preference, at least in the Philippines and Kenya, for the aerial roots of unexposed mangrove woods (pers. obs.), especially of the genus *Rhizophora*, but it can be found in any kind of live and rotting wood. It excavates burrows that have almost the same diameter as its body. Females remain within their burrow, apparently throughout their life, where they take care of their offspring (Messana et al., 1994; Thiel, 1999; 2001).

Unlike all other species of the genus, *S. terebrans* lacks an appendix masculina (Harrison & Holdich, 1984; Harrison & Ellis, 1991). The absence of an appendix masculina, the apparent absence of males in open waters, and the fact that *S. terebrans* practises precopulatory mate guarding (pers. obs.) prompted investigation of its mating behaviour.

**MATERIALS AND METHODS**

Aerial roots of *Rhizophora* with evident *Sphaeroma* burrows were collected in Mtwapa Creek (Mombasa, Kenya) and brought to the Kenyan Marine and Freshwater Research Institute (K.M.F.R.I.) in Mombasa. Pieces of root were cut longitudinally with adequate care, to expose the *Sphaeroma* holes, and were then covered with microscope slides to permit video recording without unduly disturbing the specimens. The treated pieces of root were suspended along the walls of an aquarium where seawater was kept running (fig. 1). Males were marked with a white spot on the pleotelson. The behaviour of several individuals of the species from the Kenyan mangrove forest was observed through a video camera with macro lenses in the K.M.F.R.I. laboratory in Mombasa and later in the laboratory of the Centro di Studio per la Faunistica ed Ecologia Tropicali of the CNR in Florence, Italy.

**RESULTS**

Females of *Sphaeroma terebrans* spend most of the time in their burrows, which are rarely abandoned once dug. They actively and continuously dig in the