Spermiogenesis and sperm structure in the crab *Uca tangeri* (Crustacea, Brachyura), with special reference to the acrosome differentiation

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**Summary.** Early spermatids of the crab *Uca tangeri* consists of the nucleus of granular chromatin and the cytoplasm, which contains a proacrosomal vesicle in close association with membrane lamellae. In the mid spermatids an invagination of the acrosomal vesicle membrane gives rise to the formation of the perforatorium, a spindle-shaped tubule which encloses tubular membranous structures. The pair of centrioles located at the base of the acrosome is not directly involved in perforatorial differentiation. The acrosomal vesicle shows a heterogeneous content composed of the operculum, the thickened ring, and three layers of different materials concentrically arranged around the perforatorium. During the late spermatid stage the nuclear profile differentiates numerous slender arms and the chromatin arranges into fibers. Membranous tubules from the cytoplasm become incorporated into the tubular structures of the perforatorium. The mature spermatozoon has the typical structure of the branchyuran sperm, with a complex acrosome, cupped by the nucleus, and a thin cytoplasmic band intervening between the former main elements. The centrioles are degenerate. The nuclear arms are unusually numerous (more than 20) and lack microtubules or microtubular derivatives.

**A. Introduction**

In Brachyura, the spermatozoon is a bizarre cell consisting mainly of an uncondensed nucleus with radial arms and a large acrosome. The fine structure of this sperm type is well known in various crab species from different families (Yasuzumi 1960; Langreth 1965, 1969; Pochon-Masson 1965, 1968; Brown 1966; Hinsch 1969, 1973, 1986, 1988; Reger 1970; Jamieson 1989a, b, 1990; Jamieson and Tudge 1990), but only a few accounts have dealt with the process of differentiation of the sperm cell (Moses 1960; Yasuzumi 1960; Langreth 1969; Reger 1970; Pearson and Walker 1975). The study of the origin and formation of the gamete constituents would help, however, to clarify some aspects of the sperm biology during fertilization, a process which shows interesting peculiarities in crabs (Brown 1966; Hinsch 1971; Goudeau 1982).

Comparative studies on sperm ultrastructure are considered to be useful in establishing phylogenetic relationships between different taxa in Brachyura (Hinsch 1973). Recently, Jamieson (1989a, b, 1990) and Jamieson and Tudge (1990) have used morphological features of the spermatozoa as phylogenetic criteria. This paper describes the spermiogenesis of the fiddler crab, *Uca tangeri*, and compares the sperm structure with previous data from other species of Brachyura. For nomenclature unification, the sperm constituents will be named according to the terminology employed by Jamieson (1989b, see Table 2).

**B. Materials and methods**

Adult male specimens of *Uca tangeri* (Eydoux, 1835) were collected from salt marshes in the San Pedro Canal (Puerto Real, Southern Spain). Small fragments of testicles and vas deferens were fixed in 2.5% glutaraldehyde in 0.1 M sodium cacodylate buffer (pH 7.2), supplemented with 3.5% sucrose, for 3 h at 4°C. After two rinses in cacodylate buffer for 30 min, the samples were post-fixed in 1% osmium tetroxide in 0.1 M cacodylate buffer, washed in distilled water, dehydrated in acetone, and embedded in Spurr. Thin sections were picked up on copper grids, stained with uranyl acetate and lead citrate, and viewed in a Jeol JEM 1200 EX microscope.

**C. Results**

1. **Early spermatids (Figs. 1–6)**

The early spermatids of *U. tangeri* are polarized cells measuring about 6 μm which possess a homogeneous, finely granular nucleus and a reduced cytoplasmic mass.