

Ultrastructure Examination of the Cuticular Spinning Nozzle
in the Spider *Nephila clavata*

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Even though, the orb-web spiders are capable of producing up to seven types of silk, the dragline silk from these spinning nozzle is the most predominant one in both sexes, and is an extremely strong biopolymer. The spinning nozzles and ducts of major ampullate gland from *Nephila clavata* were investigated to reveal the relationship between the fine structural characteristics and the mechanical properties of dragline silk fibers using various visualizing techniques of light and electron microscopes.

The major ampullate gland is composed of three functional parts - excretory duct, storage ampulla and convoluted tail regions. The spinning nozzle for dragline silk is connected to major ampullate gland via the excretory duct. The duct is basically composed of three superposed types of the layers which are inner cuticles, monolayered epithelial cells and peripheral connective cells. The electron lucent subcuticle of the duct, which has the functions of water removal and orientation of silk fibers during polymerization is well developed at the distal region near spinneret whereas, the endocuticle which has regular banding pattern is commonly distributed at the proximal of duct region.

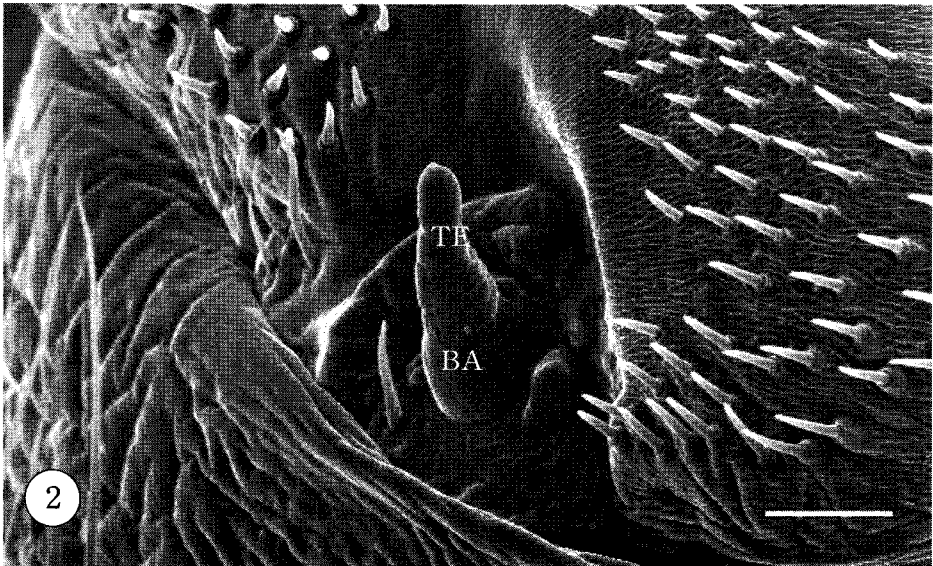
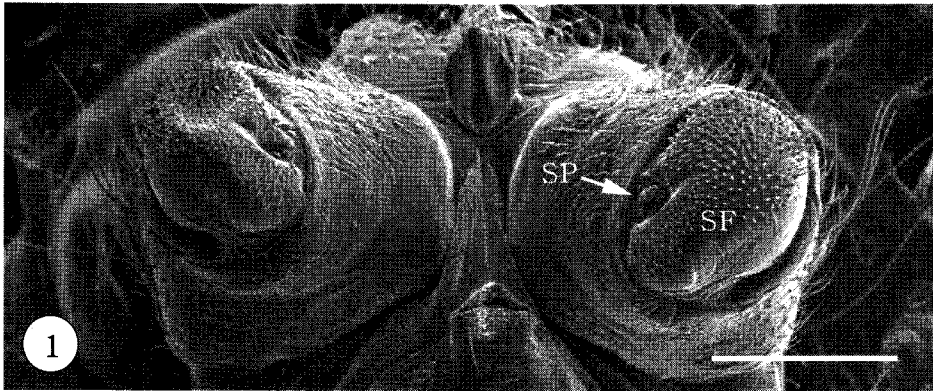


Fig. 1. Scanning electron micrograph of the anterior spinneret. The orb-web spider, *Nephila clavata*, produces dragline silks from the spigots (SP) of the ampullate gland. A pair of spigots is observed on the spinning field (SF). Scale bar = 500 μm

Fig. 2. Scanning electron micrograph of the spigot. A spigot are observed on the marginal region of the spinning field. The spigot is composed of the flexible basal segment (BA) and the elongated terminal segment (TE). The spigot is connected to internal ampullate silk gland via an excretory duct. Scale bar = 50 μm