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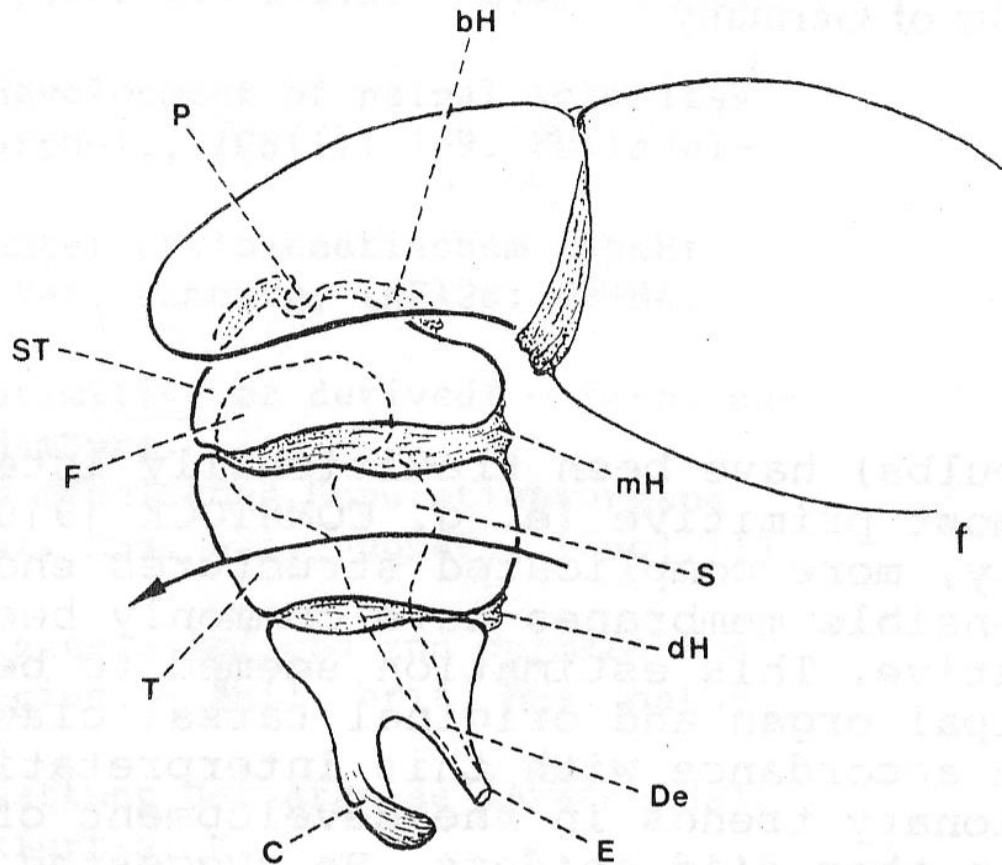
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EVOLUTIONARY AND TAXONOMIC IMPLICATIONS OF THE GROUND SPIDERS' (ARANEAE, GNAPHOSIDAE) MALE PALPAL ORGAN MORPHOLOGY

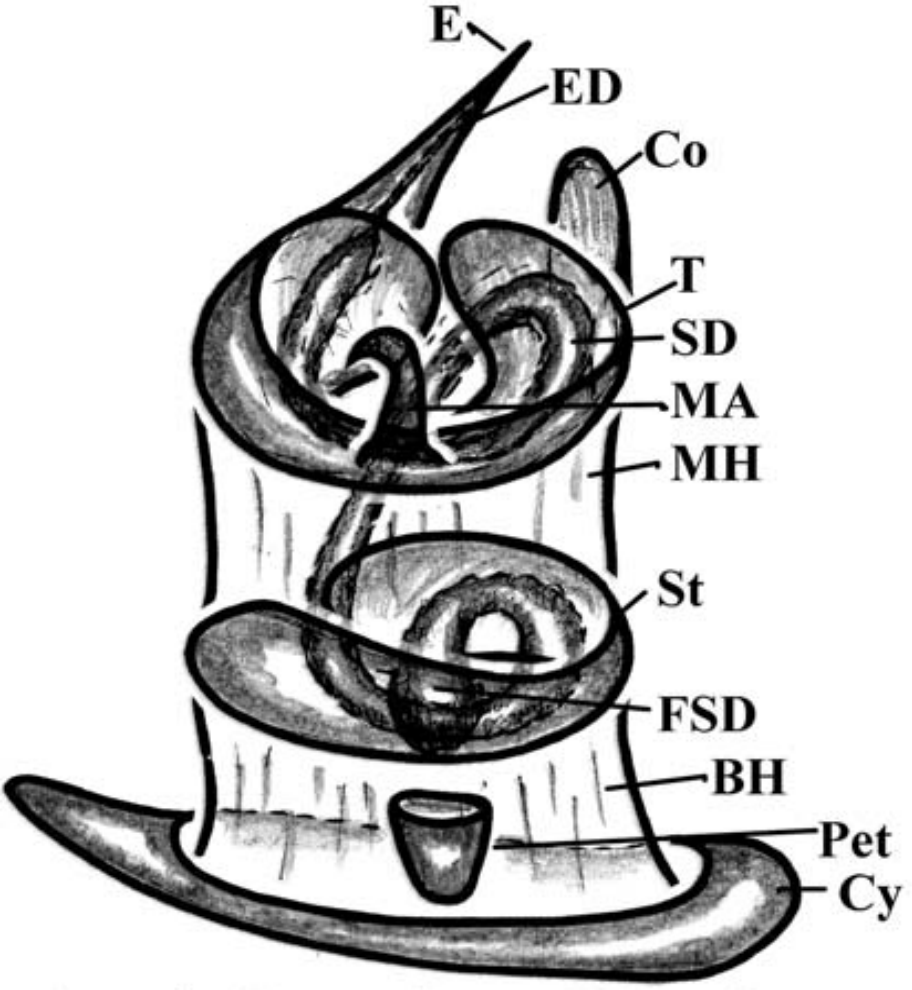
The most primitive palpal organ (Kraus, 1978; 1984) has certain ancestral components:

1. **Basal hematodocha (I)**
2. **Sclerite I** (Comstock's subtegulum).
3. **Median hematodocha (II)**
4. **Sclerite II** (Comstock's tegulum).
5. **Distal hematodocha (III)**
6. **Sclerite III** (Comstock's conductor, embolus).

This type of male palp corresponds by construction to the palpal organ of *Zelandia*, which may be regarded as a plesiomorphic state.



- BH – basal hematodocha; C – conductor; De – ductus ejaculatorius; dH – distal hematodocha; E – embolus; F – fundus of spermophor; mH - median hematodocha; P – petiolus; S – spermophor; ST – subtegulum; T – tegulum.



27 ground spiders' genera (Araneae, Gnaphosidae) were studied.

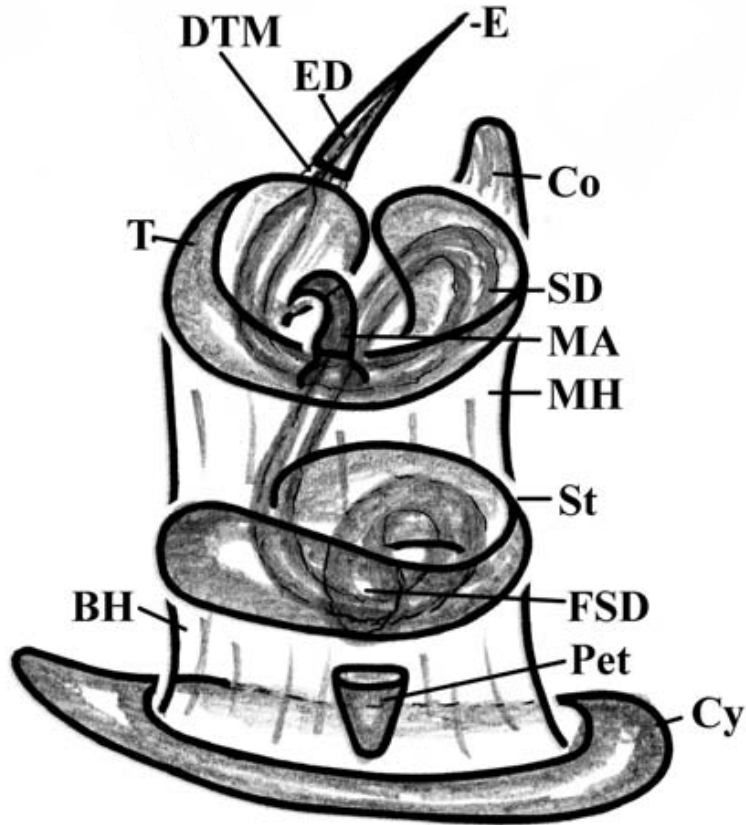
There are three basic groundplans of male bulb construction:

1. *Gnaphosa/Drassodes*,
2. *Zelanda*, and
3. *Zelotes/Encoptarthria* types.

Gnaphosa type of male bulb is the simplest organized male organ between ground spiders. It characterizes by fusion of the proximal end of the embolus with the distal part of the tegulum. The apical part of the bulb doesn't bear any additional sclerites.

Drassodes type of male bulb groundplan.

BH – basal hematodocha; Co – conductor; Cy – cymbium; E – embolus; ED – ejaculatory duct; FSD – fundus of the sperm duct; MA – median apophysis; MH – median hematodocha; Pet – petioles; SD – sperm duct; St – subtegulum; T – tegulum.



Zelanda type has:

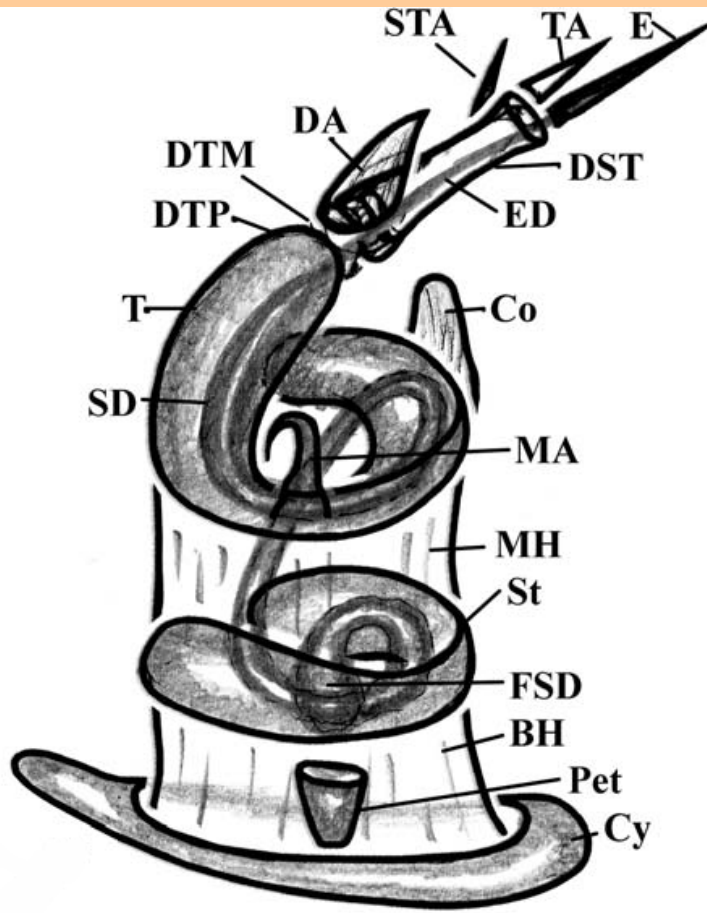
1. Three basic sclerites (Subtegulum, Tegulum, and Embolus), bind through

2. Three membranes - hematodochae

Embolus of spiders of this group is tubular, often elongated and is attached to the tegulum by tubular membrane. This membrane increases motility of embolus. Apical division may have additional sclerites.

Zelanda type of male bulb groundplan.

BH – basal hematodocha; Co – conductor; Cy – cymbium; E – embolus; DTM – distal tubular membrane; ED – ejaculatory duct; FSD – fundus of the sperm duct; MA – median apophysis; MH – median hematodocha; Pet – petioles; SD – sperm duct; St – subtegulum; T – tegulum.

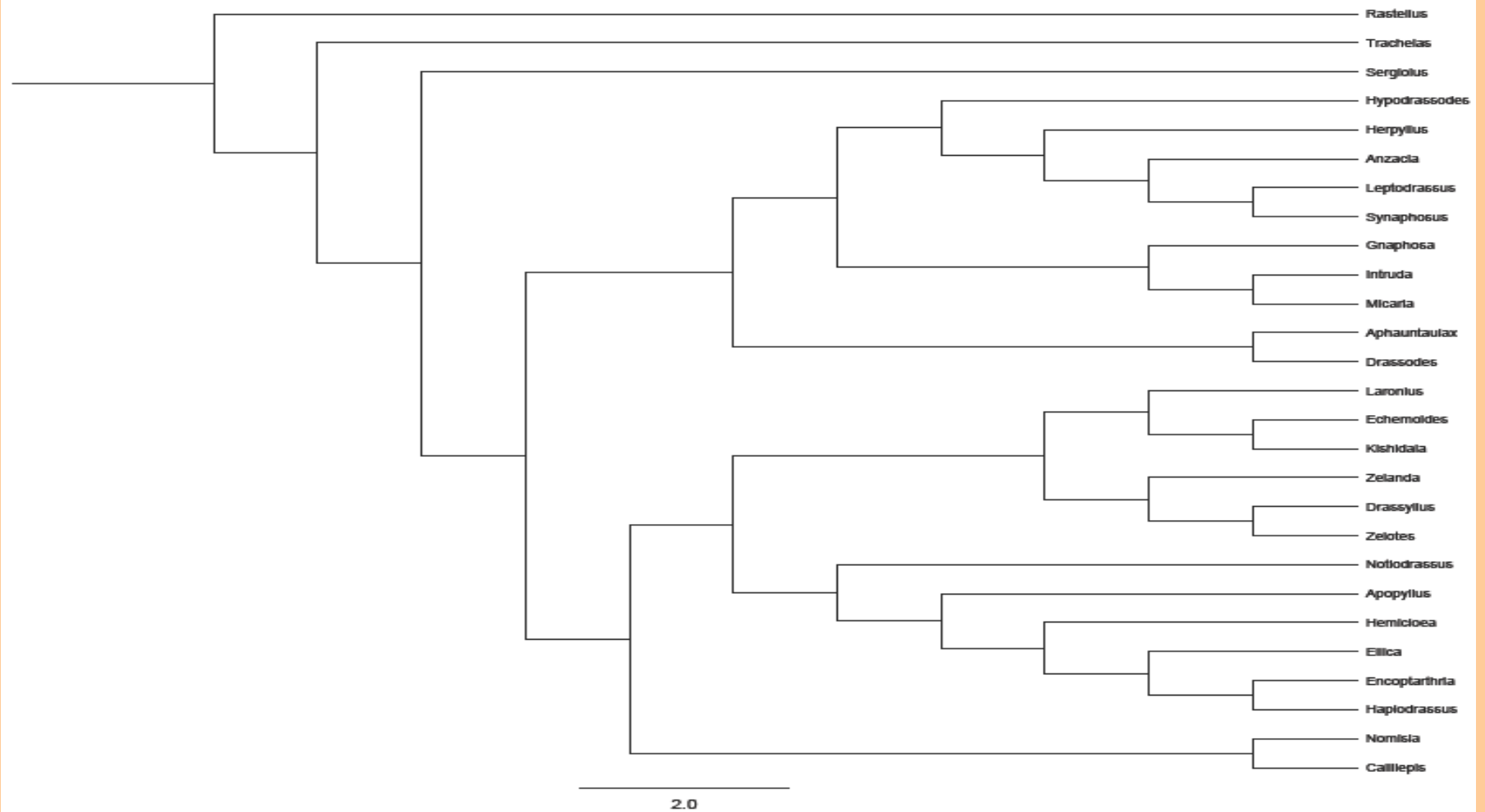


Encoptarthria type is the most complex. Its apical division has additional sclerite:
1. Intercalary sclerite (*Zelotes*), or
2. Distal sclerotized tube
(Encoptarthria)

On the border between distal end of the tegulum and proximal side of the distal sclerotized tube rests distal apophysis. Subterminal and terminal apophyses reside on the distal side of the distal sclerotized tube.

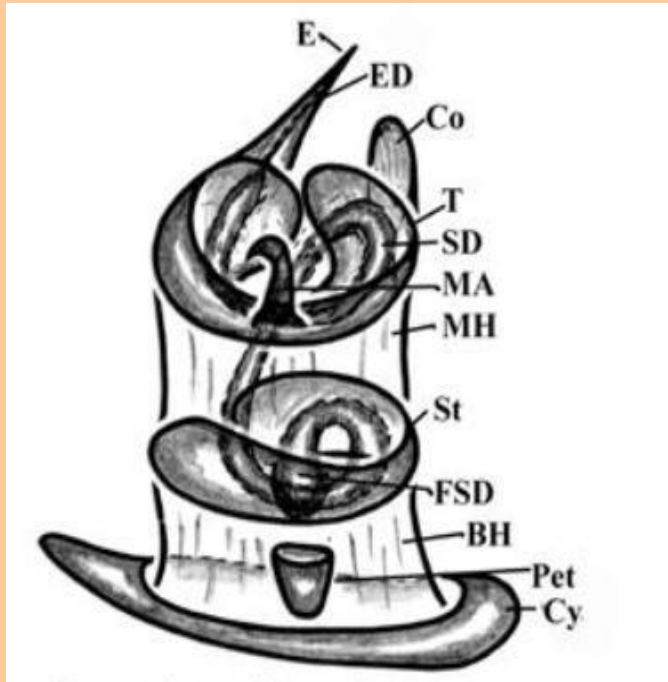
Encoptarthria type of male bulb groundplan.

BH – basal hematodocha; Co – conductor; Cy – cymbium; DA – distal apophysis; DST – distal sclerotized tube; DTM – distal tubular membrane; DTP – distal tegular projection; E – embolus; ED – ejaculatory duct; FSD – fundus of the sperm duct; MA – median apophysis; MH – median hematodocha; Pet – petioles; SD – sperm duct; St – subtegulum; STA – subterminal apophysis; T – tegulum; TA – terminal apophysis.

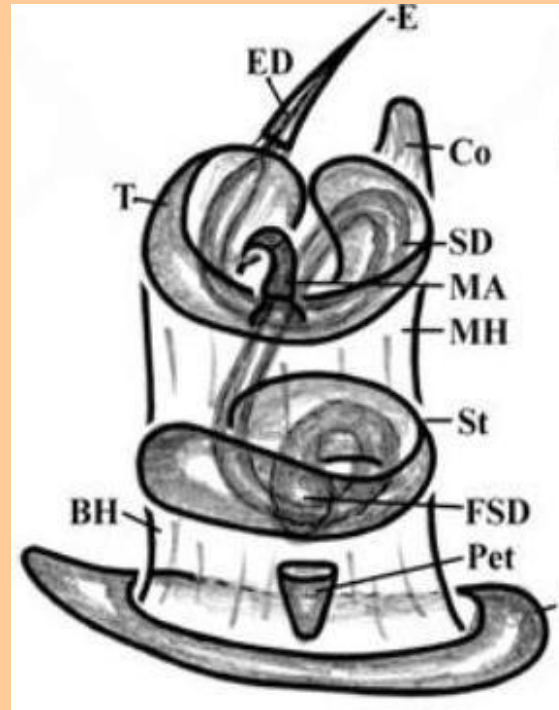
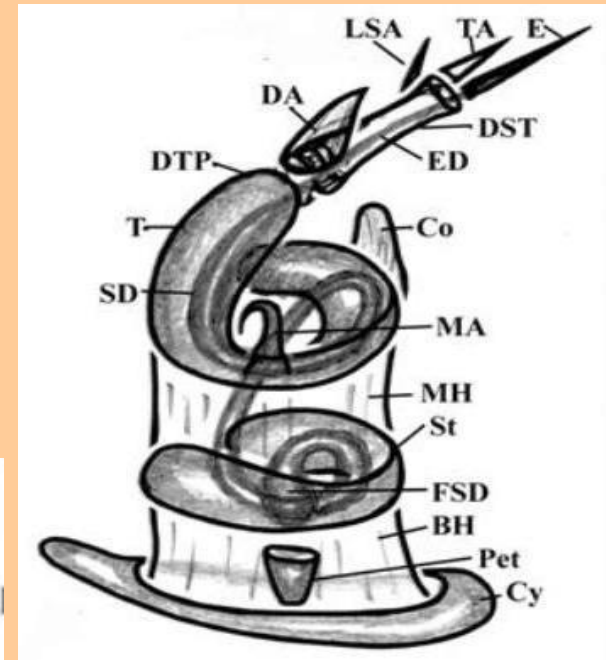


- Plesiomorphic tripartite organization of male bulb tends to develop into secondary simplified bulb with fused middle and apical divisions
- Development of additional sclerites takes place independent in different gnaphosid groups

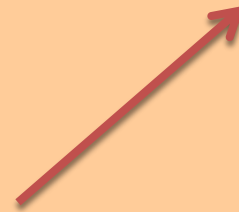
Intruda, Anzacia, Gnaphosa
and *Drassodes* male palp
ground plan



Encoptarthria male palp
ground plan



Zelanda male palp ground plan



- **The large sclerites (the subtegulum, tegulum and embolus) appear to be homologous in all spiders. If this is true, then we can conclude that *Sergiolus* and *Zelanda* has the plesiomorphic palp organization.**
- **The complexity of the palp organization found in *Encoptarthria* and *Zelotes*, probably, is a result of the unique specialization of these spiders that characterizes all morphological aspects of this group.**
- **Palps found in the *Gnaphosa*, *Drassodes* and *Intruda*, probably, represent progressive development of the male bulb, leading toward fusion of the embolus with the distal end of the tegulum. This pathway, in all likelihood, represents a general trend of the gnaphosid spiders evolution.**
- **The same trend was found by O. Kraus for other spiders [for example, *Castianeira* (Corinnidae)] and represent a phenomenon of parallel evolution.**

Acknowledgements

Zelanda erebus (Foster, 1979)



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Thanks for your attention