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## PHYLOGENETIC RELATIONSHIPS AND TRIBAL PLACEMENT OF *ODETTEA* BAUDON (COLEOPTERA: BUPRESTIDAE)

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**ABSTRACT.** The monotypic buprestid genus *Odettea* Baudon is briefly discussed in relationship to previous placements. Following the discussion of the results of a cladistic analysis, we propose that *Odettea* be transferred from the subtribe Nothomorphina Cobos to Polycestina Lacordaire. We suggest that Agaeocerina Nelson be transferred from Thrincopygini LeConte to Buprestini and Polycestina from Buprestini to Polycestini Lacordaire (= Thrincopygini). Photographs of male and female *Odettea laosensis* Baudon and two cladograms are presented.

Key words: Coleoptera, Buprestidae, Nothomorphina, Polycestina, *Odettea*, Laos, Thailand.

### Introduction

The buprestid genus *Odettea* Baudon (1966) was defined for a single species, *O. laosensis* Baudon, from Laos. Because of comments regarding his impression of a relationship with *Anthaxia* Eschscholtz (Baudon, 1966), the genus was placed next to *Anthaxia* in the higher taxon catalogue of Bellamy (1985). A recent paper by Toyama (1994) proposed moving *Odettea* to the tribe Nothomorphini (Cobos, 1955); Toyama was apparently unaware of the recent work of Hołyński (1993) downgrading that taxon to subtribal level. Since Hołyński has presented us with a complete classification for the first time since Kerremans' *Essai* (1893) and yet his work is still mostly untested and highly controversial, the opportunity to apply a contemporary method towards a more empirical prediction of relationship was one that we could not ignore.

### Materials and Methods

The small series examined in this study is now deposited in three collections: National Museum, Prague, Czech Republic (NMPC); Transvaal Museum, Pretoria, South Africa (TMSA) and R. L. Westcott collection, Salem, Oregon, U.S.A. (RLWE).

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Cladistic analysis was done with the phylogenetic software program Hennig86, version 1.5 (Farris, 1988), applying several different calculation options and the *a posteriori* successive weighting procedure. The Hennig86 weighting procedure operates by calculating weights from the best fits of the character states on the most parsimonious cladograms using rescaled consistencies, i.e., the products of the character states consistency (CI) and retention (RI) indices. These routines are alternated and repeated on successively produced cladograms until they no longer change. Neither the taxa nor the characters were considered ordered.

### Genus *Odettea* Baudon

*Odettea* Baudon, 1966: 60; Bellamy, 1985: 420; Toyama, 1994: 334. Type species: *Odettea laosensis* Baudon (original monotypy).

*Description:* A detailed description of the type species was given by Baudon (1966) and more recently both the genus and species were redescribed by Toyama (1994). These descriptions are quite adequate and are not repeated here.

*Morphology:* The following characters were examined in detail to see how they compared and what predictions they might suggest.

**Antennae:** Antennae of *Odettea* have sensory sensillae generally distributed on both "faces" of the serrate antennomeres, a condition found in many of the more "primitive" taxa of the family. This character state is present in *Nothomorpha* Saunders and *Polycestina* Cobos suggesting a relationship between these groups. In addition, this is the general condition within *Polycestina* Cobos (*sensu* 1980), contrary to many conditions found in Buprestini, suggesting that Holyński's (1993) placement of this subtribe within the Buprestini, separated from the more traditional arrangement with groups now classified into tribes Thrincopygini LeConte and Tyndarini Cobos, is mistaken and should be reversed.

**Wing venation:** The study of metathoracic wing venation in buprestids often allows a suggestion of placement that external morphology cannot clearly support. Many contemporary discussions of wing venation follow the system used by Good (1925), but this has been improved upon by the recent concepts of Kukalová-Peck & Lawrence (1993). In comparison to the illustrations of the wings of *Nothomorpha*, *Nothomorphoides* Holm and *Acmaeoderoides* Van Dyke by Holm (1986) and a selection of polycestine genera by Holm (1982) shows that the wing of *Odettea* is more similar to the latter group than to the former. Main features of importance here are the presence of a clearly indicated radial cell in *Odettea*, present in all polycestines, partially atrophied in *Nothomorpha*, and absent in *Nothomorphoides* and *Acmaeoderoides*. Additionally, the radial cross-veins present in *Odettea* and the polycestines are absent in *Nothomorpha*, *Nothomorphoides* and *Acmaeoderoides*. Lastly, the presence of the anal posterior (AP<sub>3+4</sub>) in *Odettea* was not indicated in Holm's (1982) polycestine illustrations, but is present in *Polycesta californica* Le-

Conte, *Xyroscelis crocata* (Gory & Laporte) and *Polyctesis magnifica* Waterhouse, whereas it is missing in *Nothomorpha*.

**Sexual dimorphism/dichromatism:** The presence of sexual difference in colour or form is generally judged an apomorphic feature. In *Odettea*, the very different colours and patterns of male (Fig. 1) and female (Fig. 2) could have caused a multiple description, as has happened in other genera before. No species of *Nothomorpha*, *Nothomorphoides* or *Acmaeoderoides* show any marked dimorphism in form or colour, however certain polycestines do have notably different colours and patterns. For example, the southern African species *Polycestina quatuordecimmaculata* (Fåhraeus) finds the males smaller with a colour pattern of red or orange elytral spots, and the females are larger and have the elytral colour cream-colored. On the other hand, males of the Madagascan *Madecacesta gaudroni* Descarpentries have a smaller, more slender form and a coloration of broad deep red fasciae and spots on the pronotum and elytra, whereas the female is more robust, with the integument deep iridescent green and with narrow cream-colored fasciae and spots.

**Biology:** *Nothomorpha* and its relatives are flower visitors during the warmer parts of the day in spring in southwestern Africa (*Nothomorpha*) or southwestern North America (*Acmaeoderoides*). Polycestines in general do not visit flowers, but are almost always found at rest or flying about dead twigs and branches, seeking mates or ovipositing. From the sparse records, *Odettea* shows traits common to both groups, having been collected from flowers (Toyama 1994) but reared by one of us (Bílý) from dead branches.

**Remarks:** The original placement of *Odettea* by Baudon (1966) near *Anthaxia* Eschscholtz is clearly incorrect. Toyama's (1994) suggestion of relationship with *Nothomorpha* is more plausible but differs intuitively from our perception, hence the cladistic analysis presented below.

### ***Odettea laosensis* Baudon**

*Odettea laosensis* Baudon, 1966: 60; Toyama, 1994: 335.

**Specimens examined:** NW THAILAND: Mae Hong Son, Ben Si Leng, 3 ♂, 4 ♀, 1-7.V.1992, S. Bílý coll., ex larva (NMPC, RLWE, TMSA)

**Remarks:** Toyama (1994) recorded two male specimens from Mae Sa, near Chiang Mai, collected on flowers. Baudon (1966) recorded the female holotype from Laos, Tha Ngon, collected from wood exposed to the sun in the forest.

### **Cladistic analysis**

Because of difficulties associated with extracting genitalia and wings, and for conformity to characters utilized by Hołyński, only a suite of external characters were coded (Table 2) for those taxa listed in Table 1 to construct the character state matrix (Table 3) used for the cladistic analysis. Taxa from

six of the eight subtribes Holyński (1993) placed in the tribe Thrincopygini were examined; *Perucola* Théry (subtribe Perucolina) was not available for study. The inclusion in this tribe of the subtribe Agaocerina (the Neotropical genera *Agaeocera* Saunders, *Mixochlorus* Waterhouse *sensu* Holyński) is preposterous as these taxa deserve placement near other Neotropical relatives (i.e., *Pelecopselaphus* and *Chrysesthes*, both Solier). Taxa from all five subtribes of Tyndarini were included. In addition, to help define polarity and allow the possibility for a more empirical result, one or two taxa each from the tribes Acmaeoderini, Anthaxiina and Polycestina were included (see Table 1). *Trachykele* Marseul (subtribe Trachykelina of Anthaxiini) was selected as the working outgroup because of earlier comments by Holyński (1988) where he stated about *Trachykele*, and *Nascio* Laporte & Gory (Nascionina), "both these subtribes seem to represent relatively little modified offsprings of the ancient stock, ancestral to all the Buprestinae", and because all remaining taxa had putative apomorphic character states in common with others of the included taxa. Similar analyses for some of these taxa have recently been reported (Bellamy & Williams, 1995; Bellamy & Westcott, 1996).

Because of the size of the character state matrix (Table 3), the implicit enumeration (*ie*) command did not terminate. Therefore, following recent comments by Griswold (1993) and Doyen (1993), the data were analyzed using the *h*; *bb*; and *m\**; *bb\**; options and both sets of calculations were subjected to the a posteriori successive weighting, *xs w*, routine. The *m\**; *bb\**; *xs w*; option calculated 14 equally parsimonious cladograms of 241 steps (CI 70 RI 74); slightly shorter than the 12 cladograms of 241 steps (CI 69 RI 73) produced by the *h*; *bb*; option. A consensus tree (*nelsen*) was calculated, but was rejected as it simply represents an average of the 14 trees and is therefore the least informative.

We have chosen to present two trees, 12 and 13, of the original 14 following comments on choosing among equally parsimonious cladograms by Carpenter (1988). These two trees present the major differences among these 14 trees, i.e., the branching and pairing of taxa in the three basal clades. In both cases and with the other 12 trees, *Odettea* branches between the *Xyroscelis* Saunders clade and that which leads to *Polycestina* and *Madecacesta*, while *Nothomorpha* branches in concert with *Ptosima* Solier and *Sponsor* Laporte & Gory.

### Conclusions

The monotypic genus *Odettea* should be transferred to the subtribe Polycestina from the Nothomorpha as placed by Toyama (1994), without reference to the new higher classification scheme presented by Holyński (1993). The data and cladograms would support the erection of a new subtribe for *Odettea*, but we feel that until the higher classification of the family is better defined, it would be premature to add such a taxon. The Polycestina do not belong within the Buprestini, but should rather be re-evaluated at the tribal

level, and taking priority over Thincopygini in the classification of Hołyński (1993).

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**Table 1. Taxa examined to construct character state matrix.****BUPRESTINAE** Leach**Anthaxiini** Gory & Laporte

Trachykelina Holynski

*Trachykele blondeli* Marseul

Anthaxiina Gory &amp; Laporte

*Anthaxia (Haplanthaxia) vientianensis* Baudon**Acmaeoderini** Kerremans

Acmaeoderina Kerremans

*Acmaeodera gentilis* Péringuey

Polycestina Lacordaire

*Madecacesta gaudroni* Descarpentries*Odettea laosensis* Baudon*Polycestina quatuordecimmaculata* (Fåhraeus)**Buprestini** Leach

Buprestina Leach

*Cypriacis (Himalobuprestis) costipennis* Fairmaire

Chrysochroina Laporte

*Philocteanus rubroaureus* (Degeer)**Thrincopygini** LeConte

Nothomorphina Cobos

*Nothomorpha verrucosa* (Gory & Laporte)

Xyroschelina Cobos

*Xyroschelis crocata* (Gory & Laporte)

Paratrachydina Cobos

*Sponsor raffrayii* Théry

Ptosimina Kerremans

*Ptosima undecimmaculata* Herbst

Mastogeniina LeConte &amp; Horn

*Ankareus natalensis* Bellamy

Thrincopygina

*Thrincopyge alacris* LeConte

Polyctesina Cobos

*Polyctesis magnifica* Waterhouse**Tyndarini** Cobos

Acherusina Cobos

*Acherusia piliventris* Saunders

Tyndarina

*Tyndaris (Paratyndaris) olneyae* Skinner

Tylaucheniina Cobos

*Tylauchenia crassicollis* (Laporte & Gory)

Prospherina Cobos

*Prospheres aurantiopicta* Laporte & Gory

Astraeina Cobos

*Astraeus* (s. str.) *crassus* van de Poll

Bulina Bellamy

*Bulis bivittata* (Fabricius)

**Table 2. Characters and character states examined:**

0 = plesiomorphic; 1, 2, 3, etc = apomorphic.

1. Frontoververtex: evenly convex or slightly depressed (0), swollen between eyes (1).
2. Eyes: small, not 'touching' pronotal margin (0), large, 'touching' pronotal margin (1).
3. Mandibles: robust, coarsely punctate laterally (0), slender, sparsely or impunctate laterally (1).
4. Anteclypeus: visible (0), not visible (1).
5. Antenna: serrate from antennomere 3 or 4 (0), 4 expanded distally (1), serrate from 5 (2), serrate from 6 (3).
6. Last antennomere: truncate (0), oblong, rounded (1).
7. Pronotum: irregular, with several large depressions (0), disk entire, flat to convex (1), with single median depression (2).
8. Pronotum, widest portion: median (0), base (1).
9. Pronotal basal foveae: present, deep (0), present, shallow or feebly indicated (1), absent (2).
10. Pronotal basal foveae: one medial, two lateral (0), only two lateral (1), only one medial (2)
11. Pronotal basal margin: more or less entire, transverse (0), strongly biarcuate on either side of median posteriorly produced lobe (1).
12. Pronotal basal margin: no marginal carinae, only apical teeth (0), longitudinal carinae, apical teeth (1), entire (2).
13. Pronotal lateral carina: partial, not reaching apical margin (0), entire (1).
14. Epipleural lobe: absent (0), present (1), secondarily lost with suite of elytral adaptations (1)
15. Epipleural lobe: carinate (0), entire (1).
16. Epipleural lobe covering metepisternum: completely (0), partially (1).
17. Elytra: not fused (0), fused (1).
18. Elytral surface: punctate or rugose (0), costate with interstitial punctures (1), carinate (2).
19. Elytral surface: more or less even (0), with pronounced sinuous carina (1).
20. Elytral punctures: without setae (0), with single seta projecting (1).
21. Elytral sutural margin, at least apically: entire (0), subserrate or serrate (1).
22. Elytral lateral margin, at least apically: entire (0), subserrate or serrate (1).
23. Pygidium: apex hidden beneath elytral apex (0), projecting well beyond elytral apex (1).
24. Prosternum, anterior margin: more or less entire, not projecting forward (0), strongly projecting medioanteriorly to partially hide mouthparts (1).
25. Prosternal disc: medially gibbose (0), entire, even (1).
26. Sternal cavity: within mesosternal margins (0), projecting into base of metasternum (1).
27. Last visible sternum: apex truncate or broadly rounded (0), apically strongly attenuate (1), with apical spine or peg (2).
28. Tibiae: round in x-section (0), explanate (1).
29. Metacoxal plate, lateroapical margin: evenly rounded (0), emarginate (1), with acute tooth (2).
30. Tarsal pulvilli: on four basal tarsomeres (0), only on tarsomeres 3 & 4 (1).
31. Tarsal claws: simple, base slender (0), simple, base swollen (1), appendiculate (2).
32. Ovipositor: elongate (0), very short (1).
33. Ovipositor: glabrous or sparsely setose (0), heavily setose (1).
34. Sexual dichromatism: absent (0), feebly present (1), strongly present (2).

**Table 3. Character state matrix:  
plesiomorphic = 0, apomorphic = 1, 2, etc., data absent = -.**

Taxon	Characters and states																																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34					
<i>Acherusia</i>	0	1	1	1	3	1	1	1	2	-	1	2	1	1	1	1	0	1	0	0	0	1	0	0	1	0	0	1	0	2	0	0	0	1	0	0	0		
<i>Acmaeodera</i>	0	1	1	0	2	1	1	0	2	1	0	0	1	2	-	1	1	0	1	-	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0			
<i>Ankareus</i>	0	1	1	1	2	0	1	0	2	-	0	0	2	1	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0			
<i>Anthaxia</i>	0	1	1	1	0	0	1	1	2	-	0	2	0	1	0	1	0	0	0	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1		
<i>Astraeus</i>	0	1	1	0	0	0	1	1	2	-	1	1	2	1	0	1	0	1	0	1	0	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0			
<i>Bulis</i>	0	0	0	0	0	1	1	1	2	-	1	2	0	1	1	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0			
<i>Cypriacis</i>	0	0	0	0	1	1	0	2	-	0	2	0	1	0	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0			
<i>Madecacesta</i>	0	0	0	1	0	1	1	0	1	2	0	2	0	1	1	1	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	1	1	0	0	0	2		
<i>Nothomorpha</i>	0	1	1	0	2	0	0	0	0	0	0	1	1	0	0	0	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	2	0	1	0	0		
<i>Odettea</i>	0	0	0	1	0	1	2	0	1	0	0	1	1	1	1	1	0	1	0	0	1	1	0	0	1	1	0	0	1	0	0	0	0	0	1	0	0	2	
<i>Philocteanus</i>	0	1	0	1	0	0	1	1	2	-	0	2	0	1	0	1	0	0	0	1	0	1	0	0	1	0	1	0	0	1	1	0	0	0	0	1	0	0	
<i>Polycestina</i>	0	0	0	1	0	1	2	0	1	2	0	2	1	1	1	1	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	1	1	1	0	0	1	
<i>Polyctesis</i>	0	1	0	0	0	1	0	1	0	0	1	1	1	0	1	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0
<i>Prospheres</i>	0	1	0	0	0	1	1	1	0	0	1	2	0	1	1	1	0	1	0	0	0	1	0	0	1	0	0	1	0	1	0	0	0	1	0	0	0	0	
<i>Ptosima</i>	0	0	0	1	0	1	0	1	0	0	0	2	1	1	0	0	0	0	1	1	1	0	0	0	1	1	0	0	1	0	0	0	1	0	2	0	0	0	
<i>Sponsor</i>	0	1	1	0	0	0	1	1	1	-	0	0	2	1	1	0	0	1	0	1	1	1	0	0	1	1	1	0	0	1	0	0	1	0	2	0	0	0	
<i>Thrincopyge</i>	0	0	0	1	2	0	1	0	1	1	1	1	2	1	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	
<i>Trachykele</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Tylauchenia</i>	0	1	0	0	3	1	1	0	2	-	1	2	1	1	1	0	1	0	0	0	1	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	
<i>Tyndaris</i>	0	0	1	1	3	1	1	1	0	-	1	1	2	1	1	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	0	1	0	0	0	0	
<i>Xyroscelis</i>	1	0	0	1	0	1	1	0	1	0	0	0	1	1	1	1	0	2	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	1	0	0	

**Table 4. Number of changes of state, consistency index and retention index values for 34 characters used in the Hennig86 analysis.**

Tree : length 241, ci 70, ri 74

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Steps	1	5	5	5	8	5	5	4	8	2	3	8	10	3	4	3	1
CI	100	20	20	20	37	20	40	50	25	100	66	25	20	66	25	33	100
RI	100	55	42	55	66	50	0	75	40	100	85	57	20	0	40	50	100

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
	5	1	5	3	5	1	1	1	3	2	1	3	1	7	0	0	5
	40	100	20	33	20	100	100	100	33	100	100	66	100	28	100	100	40
	50	100	42	50	33	100	100	100	60	100	100	75	100	16	100	100	25

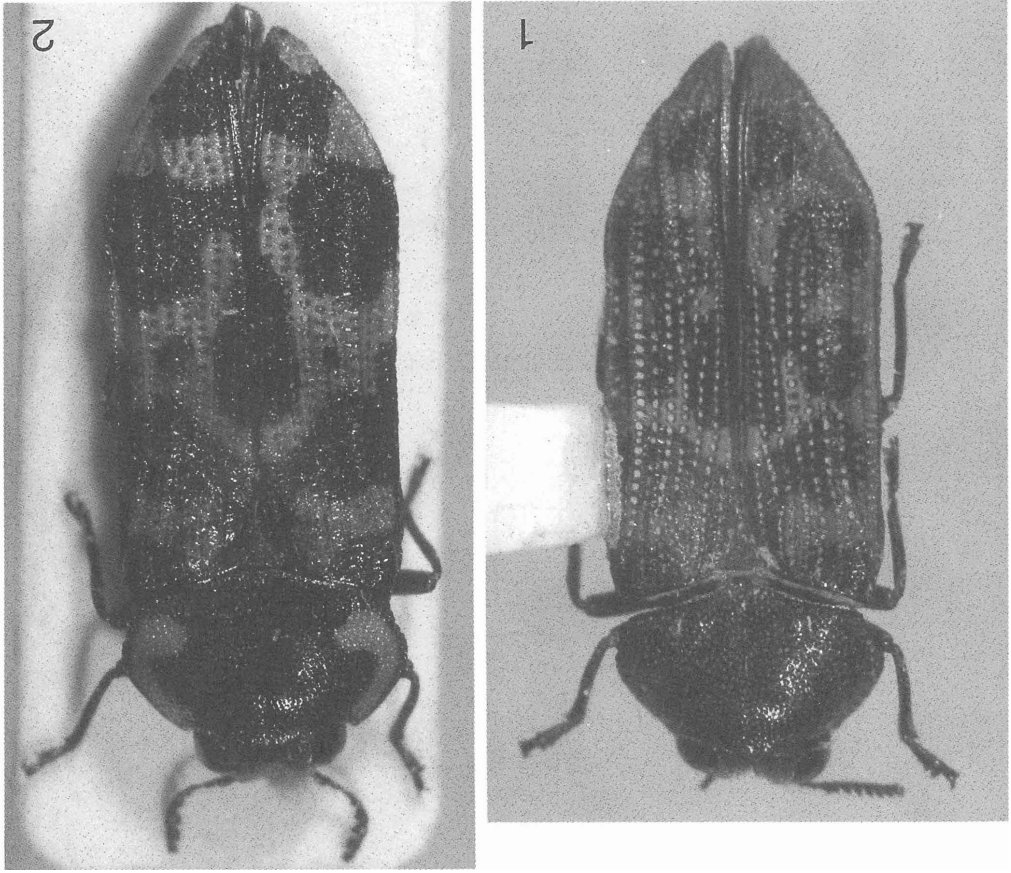


Fig. 1. *Odettea laosensis* Baudon, male, dorsal aspect. Fig. 2. *Odettea laosensis* Baudon, female, dorsal aspect.

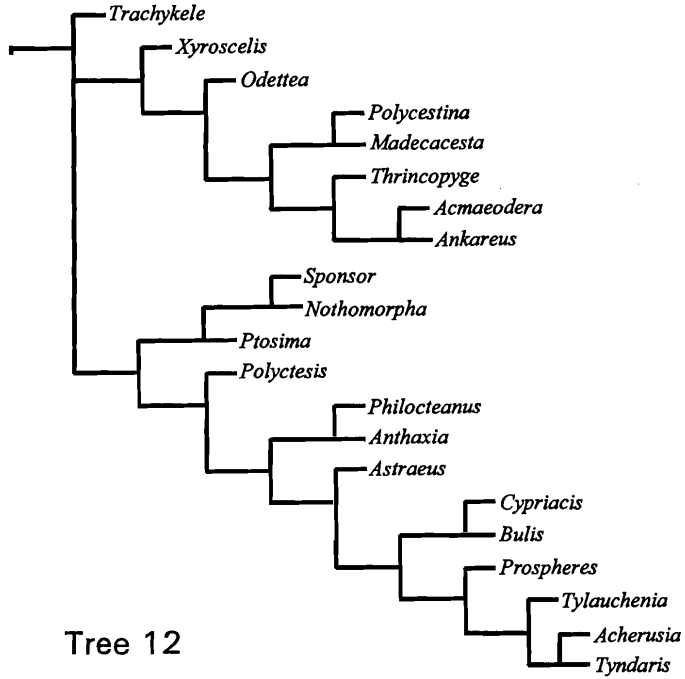


Fig. 3. Tree 12 of 14 equally parsimonious cladograms of the relationships for *Odettea* (length 241, CI 70, RI 74).

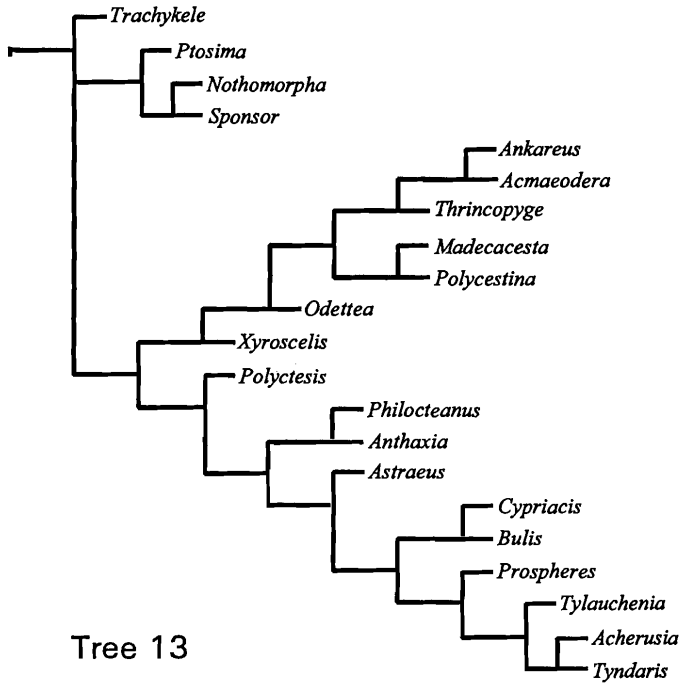


Fig. 4. Tree 13 of 14 equally parsimonious cladograms of the relationships for *Odettea* (length 241, CI 70, RI 74).