Hispanothrips from Early Cretaceous Spanish amber, a new genus of the resurrected family Stenurothripidae (Insecta: Thysanoptera)

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Abstract. During a palaeontological excavation of amber at the site named San Just, in the Utrillas-Escucha area of Teruel Province, northeastern Spain, a rich fauna from the Albian (Early Cretaceous) was discovered. Among it, three specimens of Thysanoptera were found that are here attributed to the new genus Hispanothrips n. gen. in the family Stenurothripidae Bagnall 1923. Phylogenetic analyses were conducted that support the resurrection of the family Stenurothripidae and its replacement for Adiheterothripidae Shumsher 1946.


Keywords: New genus, Stenurothripidae, Adiheterothripidae, amber, Spain.

Mound & Marullo (1998) restricted the Stenurothripidae Bagnall 1923 to fossils known from the Early Cretaceous to the Cenozoic. In that view, the Stenurothripidae contain the Baltic amber genus Stenurothrips Bagnall 1914, plus the fossil genera added by Bhatti (1979): six of them described by zur Strassen (1973) from the Lebanese Early Cretaceous amber, viz. Exitelothrips, Neocomothrips, Progonothrips, Rhetinothrips, Scaphothrips, and Scudderothrips, and the Baltic amber genus Opadothrips described by Priesner (1924).

Schliephake (1990) characterized this family by nine-segmented antennae with segment IX sometimes sub-divided; antennal segments freely articulated; segments III and IV each with a broad-based, slightly conical sensillum; fore wing with microtrichia and two longitudinal veins ending very close to the wing apex, with usually three to four cross-veins; and a fore tarsus with a more or less well defined hamus at the apex. This description fits another family, the Adiheterothripidae Shumsher 1946, essentially based on the particular conical sensilla on antennal segments III and IV of the recent genus Adiheterothrips Ramakrishna 1928. This genus was later synonymized with Holarthrothrips Bagnall 1924 (Mound et al. 1980), but these last authors retained the family name Adiheterothripidae. It currently also contains the recent genera Oligothrips Moulton 1933, and Heratythrips Mound & Marullo 1998 (Mound & Marullo 1998).

In summary, several recent and fossil genera, plus the genus Holarthrothrips that contains recent and fossil species, possess the potential synapomorphy of conical sensilla on antennal segments III and IV (Mound & Morris 2004). Mound & Marullo (1998) put the recent genera in Adiheterothripidae and the fossil genera in Stenurothripidae, contrary to Bhatti (1979, 1986) and Schliephake (1990), who grouped them into the Stenurothripidae. Here we follow Bhatti (1989), who denounced that a ‘separate classification of the fossil forms had emerged’, placing fossils plus recent genera in the restored family Stenurothripidae in place of Adiheterothripidae. We also describe a new genus of Stenurothripidae from the Early Cretaceous San Just amber.

San Just amber has been discovered very recently (see Peñalver et al. 2007) and up to now arthropod orders found as inclusions are Acari, Araneae, Isoptera, Blattaria, Orthoptera, Neuroptera, Homoptera,
Cretaceous new genus of Stenurothripidae

Thysanoptera, Coleoptera, Hymenoptera, and Diptera. Two new species of dipterans of the genera Microphorites (Dolichopodidae: Microphorinae) and Litoleptis (Spaniidae) have been recently described (Arillo et al. 2008a, 2009), and a new species of the rare extant mite genus Ametroproctus of the family Ametroproctidae (Arillo et al. 2008b).

Material and methods

Study and preparation of the specimens

The three thrips specimens were found in 2007 during a palaeontological excavation at the site named San Just, Utrillas-Escucha area in Teruel Province (see Peñalver et al. 2006, 2007; Delclòs et al. 2007). This outcrop is located in the northern margin of the Aliaga sub-basin. This is one of the Mesozoic sub-basins described by Salas & Guimerà (1997) in the Maestrat Basin, northeastern Spain. The Maestrat Basin was dated as Late Oxfordian-Albian interval (Salas et al. 2001).

The material was prepared by removing the main part of surrounding amber in order to optimize visibility of the fossils. These were then mounted in Epoxy resin (EPO-TEK 301). Fossils were examined and measured using a binocular Olympus SZX9, an inverted compound microscope Olympus CK40, and direct microscope Leitz. All measurements are in μm; length tL = total length of antenna; length s.am = length of pronotal anteromarginal seta; length s.pa = length of posteroangular setae. Photographs were taken using a digital camera attached to an Olympus BX51 Microscope. Some images were reconstructed using the computer software Combine Z5.

Cladistic analyses

No phylogenetic analysis has ever been conducted that included fossil Stenurothripidae. Mound & Marullo (1998) hypothesized a paraphyletic Adiheterothripidae (sensu recent genera), after comparing the systematic positions of Holarthrothrips, Oligothrips, and Heratythrips with genera from families currently considered as ‘primitive’, i.e. Fauriellidae (Fauriella Hood 1937, Opisthotrips Hood 1937, Ropotamothrips Pelikan 1958, Parrellathrips Mound & Marullo 1998), and Merothripidae (Damerothrips Hood 1954). To determine whether Hispanothrips n. gen. may help to resolve this phylogeny, we added this fossil to their data set, but we also made major changes to their data matrix. Given that the structure of sensilla on the third and fourth antennal segments is crucial for the diagnosis of the Adiheterothripidae and/or Stenurothripidae, we paid particular attention to the coding of this character in the data set. We split the character of the sensillum on antennal segments III and IV into eight characters (see Tables 1 and 2). We considered that the two antennal segments should be treated separately because the presence of a type of sensillum on one segment does not imply the same situation on the other one, as is seen in Cycadothrips Mound 1991 (Aeolothripidae), which possesses inflated sensillia on the third segment and conical sensillia on the fourth. In addition, in order to be parsimonious, we also considered that sensilla different in form are not primary homologies (for example evolved from placoid to trichoid or the contrary) (Hallberg & Hansson 1999; Basibuyuk & Quicke 1999). Moreover, we considered that the sensilla of Damerothrips are not like those of Fauriellidae, following therefore Marullo (1998) who distinguished ‘inflated’ sensilla (we call them ‘placoid’ in Table 2) from flat transverse ones. Finally we added to the data set of Mound & Marullo (1998) a character of concentric micro-sculpture on the basal third of the metanotum.

Branch and bound searches were performed using PAUP* 4 beta 10 (Swofford 2001). The characters were considered as unordered to avoid the use of *a priori* hypotheses.

Figure 1
Female of Hispanothrips utrillensis n. gen., n. sp. (Stenurothripidae), holotype SJ-07-45. 1, Head in dorsal view and 2, Apex of the abdomen in ventral view. Note the absence of ocellar setae, surely lost prior the immersion in resin.
### Table 1. Data set (modified from Mound & Marullo 1998 as precised in the text).

<table>
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<th>Numbers</th>
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</tr>
<tr>
<td>Opisthothrips</td>
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</tr>
<tr>
<td>Hispanothrips n. gen.</td>
<td>001010101001000010000000010</td>
</tr>
</tbody>
</table>

### Table 2. Character states (modified from Mound & Marullo 1998 as precised in the text).

1. Tentorial bridge: 0-complete; 1-absent.
2. Number of antennal segments: 0–9; 1–9.
4. Sensilla on antennal segments III: 0-not conical; 1-conical.
5. Sensilla on antennal segments III: 0-not placoid; 1-placoid.
6. Sensilla on antennal segments IV: 0-not circumpolar porous band; 1-circumpolar porous band.
7. Sensilla on antennal segments IV: 0-simple transverse band; 1-not simple transverse band.
8. Sensilla on antennal segments IV: 0-not conical; 1-conical.
9. Sensilla on antennal segments IV: 0-not placoid; 1-placoid.
10. Sensilla on antennal segments IV: 0-not circumpolar porous band; 1-circumpolar porous band.
11. Maxillary palp segments: 0–3 present; 1–2 present.
12. Fore tarsal recurved hamus: 0-present; 1-absent.
14. Metanotal campaniform sensilla: 0–1 pair present near posterior; 1-absent.
15. Metanotal posterior setal pair: 0–present; 1-absent.
16. Fore wing second vein basal to cross vein: 0–with setae; 1-without setae.
17. Fore wing cross veins between costa and first vein: 0–2 visible; 1–0 visible.
18. Fore wing posterior fringe cilia: 0–straight; 1-undulating.
19. Median abdominal tergites with: 0–2 discal setae laterally; 1–1 discal seta laterally.
20. Tergite IV median setae: 0–wider apart than their length; 1-long and close together.
21. Tergite IV with marginal comb posterolaterally: 0–absent; 1–present but short; 2–present long and slender.
22. Pleurotergal sutures: 0–present; 1-absent.
23. Median sternites: 0–with no posteromarginal fringe; 1–with short posteromarginal fringe; 2–with long fringe.
24. Sternite VII marginal setae: 0–arising at margin; 1–one or more pairs in front of margin.
25. Sternite VII setae: 0–3 or more pairs; 1–2 pairs.
26. Sternite VIII: 0–present as paired lobes; 1-absent.
27. Ovipositor valves: 0–normal; 1–greatly reduced.
28. Metanotum with concentric sculpture at basal third: 0–absent; 1–present.
Results
Systematic paleontology
Family Stenurothripidae Bagnall 1923
(Adiheterothripidae n. syn.)
Genus Hispanothrips n. gen.

Type species. Hispanothrips utrillensis n. sp.

Diagnosis. Female characters only. Antenna nine-segmented, without a terminal style; segments freely articulated; segments III and IV elongate, cylindrical, each with one ‘two-segmented’ conical sensillum; no strong postero-ocular setae; metanotum micro-sculpture with a whorled pattern of lines in basal third; hind femora not strongly incrassate; fore tarsus with a claw-like process (hamus) at apex; a well-developed saw-like ovipositor, nearly straight or at least slightly turned downwards; tenth abdominal segment rather short, about 2.5× as long as segment 9; fore wing fringe cilia undulate; fore wing posterior vein not angulate at level of cross-vein between it and anterior vein; no strong setae on posterior vein basal to this cross-vein; wing narrow at apex.

Etymology. Named after Hispania, Latin name for Spain, and the typical suffix for thrips genera.

Hispanothrips utrillensis n. sp.
(Figs. 1–2, 5)

Material. Holotype SJ-07-45 (complete female, see fig. 5.1; it was found in an amber mass with other three syninclusions:

Figure 2
Details of the paratypes of Hispanothrips utrillensis n. gen., n. sp. (Stenurothripidae). 1, Ventral view of the left antenna of the paratype SJ-07-48; 2, Head in dorso-lateral and ventro-lateral views of the paratype SJ-07-49; 3, Fore tibia plus tarsus showing the hamus in SJ-07-49; 4, Fore wing of SJ-07-49 (basal part obscured; length actually is longer due to the inclined position of the wing during drawing).
an Araneae and two scelionid wasps), paratypes SJ-07-48 (complete female, see fig. 5.2) and SJ-07-49 (sex unknown, abdomen partly missing, see fig. 5.3), all as amber inclusions, stored at the Fundación Conjunto Paleontológico de Teruel-Dinópolis, Spain.

**Etymology.** Named after the town Utrillas, near where the material was collected.

**Age and outcrop.** Specimens were found in amber from grey-black claystones with abundant plant remains in the La Orden Member (Escucha Formation, Lower Cretaceous, Lower-Middle Albian), which correspond to fluvial deltas (see Querol et al. 1992). The outcrop of San Just is located in the municipality of Utrillas (Teruel Province, Spain).

**Description.** Antenna nine-segmented, segments annulate; sensilla of antennal segments III and IV conical with a broad base (so-called two-segmented sensilla sensu Shumsher 1946); tL 307; segments without projections, especially segments I and II; lengths of segments: I 35, II 40, III 43, IV 43, V 40, VI 33, VII 33, VIII 20, IX 20; head without a long interantennal projection, 75 long, 168 wide (measured in holotype; 100 and 190 in paratype SJ-07-48, respectively), and dorsally with transverse striate sculpture, reticulate ventrally; ocelli present, disposed in triangle; three pairs of interocellar setae I, II, and III present, rather long, clearly visible in specimen SJ-07-49 (fig. 2.2), pair III very close to posterior ocelli; no strong posteroocular setae; maxillary palps three-segmented and labial palps two-segmented (visible in SJ-07-49; fig. 2.2).

Pronotum broadly rectangular (fig. 1.1), 115 long, 225 wide, with anterior margin 185 wide measured in holotype (150, 240 and 190 in paratype SJ-07-48, respectively); pronotum and mesonotum with transverse striate sculpture on surface (fig. 5.6); three pairs of very long posteroangular setae (figs. 1.1 & 2.2), s.pa 83 (largest); three rather long lateral setae, but shorter than the posteroangular setae, s.am 22; eight or nine postero-marginal setae (in paratypes SJ-07-48 and SJ-07-45 respectively). Metanotum with a whorled pattern of sculpture lines in basal third (fig. 5.6).

Fore wing narrow at apex (fig. 2.4 and fig. 5.9), 740 long, 70 wide at cross-vein in holotype (830 long, 75 wide at cross-vein in SJ-07-48; 70 wide at cross-vein in SJ-07-49), with microtrichia; clavus with paired setiform processes at tip and at least three setae on vein; fringe cilia undulate, which is clearly not due to taphonomic bias (fig. 5.8); two main longitudinal veins, one cross-vein between them at basal third inclined towards wing apex (fig. 5.8); one clearly visible cross-vein slightly (plus possibly another one in a more distal position) between anterior vein and anterior wing margin, plus maybe one cross-vein between posterior vein and posterior wing margin; posterior vein not angulate at level of cross-vein between it and anterior vein; longitudinal veins both setose, anterior vein with 13 setae (in both paratypes), posterior vein with seven setae (in the paratype SJ-07-49; in paratype SJ-07-49 there are seven in one wing and nine in the other one) and no strong setae basal of cross-vein; posterior vein ending 90 basal of wing apex, anterior vein ending very close to wing apex.

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**Figure 3**
Consensus cladograms for recent Holarthrothrips, Oligothrips, and Heratythrips, and with genera from families considered as primitive, i.e. Fauriellidae (Fauriella Hood 1937, Opisthothrips Hood 1937, Ropotamothrips Pelikan 1958, Parrellathrips Mound & Marullo 1998), and Merothripidae (Damerothrips Hood 1954).

1. Based on matrix data from Mound & Marullo (1998) except that characters are unordered, and 2, from Mound & Marullo (1998), i.e. obtained after successive weighting and with ordered character states.
Hind wing circa 665 long, 50 wide (both measured in holotype), with microtrichia on membrane and fringe undulate, and narrow but with two long longitudinal veins, which do not reach wing apex.

Fore tarsus with a distal hamus (fig. 2.2 and fig. 5.7); no tooth on inner margin of fore tibia; tarsi two-segmented; mid leg 250 long (femur 100 long, 40 wide; tibia 95 long, 35 wide; tarsi 35 long and arrolium 20 long); hind leg 330 (femur 125 long, 46 wide; tibia 147 long, 25 wide; tarsi 28 long and arrolium 29 long), all measured in holotype.

Abdomen with apex slender (fig. 1.2); latero-tergites and latero-sternites present on segments II to VII; length of sternites IX 73, X 200; segment X with 9–10 pairs of long and strong setae (largest pair 158 long); segment IX with 3–4 pairs of strong setae, shorter than those of segment X; abdominal sternites with 2–3 pairs of fine postero-marginal setae and fine transverse striate sculpture; sclerotized ovipositor nearly straight or slightly curved downwards, 240 long (measured in holotype).

Cladistic analyses

We performed first a branch-and-bound search based on the exact matrix data from Mound & Marullo (1998) except that we based it on unordered characters (unlike Mound & Marullo 1998) and found one most parsimonious cladogram (see fig. 3.1, length 31, consistency index (CI) = 0.74; homoplasy index (HI) = 0.25; retention index (RI) = 0.66; CI excluding uninformative characters = 0.66), instead of the three obtained by the previous authors. Our result differs in the position of Heterothrips from that of the single tree that they retained after successive weighting (fig. 3.2).

The second branch-and-bound search was based on our new hypotheses using 28 unordered characters for 10 taxa, including the fossil Hispanothrips n. gen. (see Tables 1 and 2). It yielded nineteen equally most parsimonious cladograms with a length of 43, consistency index (CI) = 0.70; homoplasy index (HI) = 0.30; retention index (RI) = 0.66; CI excluding uninformative characters = 0.59. A strict consensus cladogram was obtained (see fig. 4.1). With the matrix data established as indicated in Material and Methods, the family Fauriellidae appeared as monophyletic in the consensus tree, but other genera remained unresolved in a clade that comprises Oligothrips, Holarthrothrips, Heratythrips, Heterothrips, and Hispanothrips n. gen.

In a third step, we made a branch-and-bound search excluding the characters that Mound & Marullo (1998) considered as homoplasic, i.e. characters 1, 15, 16, 23, 24, 25. We then obtained eight equally most parsimonious cladograms with a length of 30,
consistency index (CI) = 0.77; homoplasy index (HI) = 0.23; retention index (RI) = 0.73; CI excluding uninformative characters = 0.65. A strict consensus cladogram was obtained (see fig. 4.2). Exclusion of the character ‘23’ alone yielded seven equally most parsimonious cladograms (length of 40, consistency index (CI) = 0.7; homoplasy index (HI) = 0.3; retention index (RI) = 0.6757; CI excluding uninformative characters = 0.5862), with exactly the same topology for their strict consensus. The fossil genera Hispanothrips is placed unambiguously within the clade comprising the recent adiheterothripid genera Holarthrothrips, Oligothrips, and Heratythrips, but all in an unresolved quadritomy. The heterothripid Heterothrips is the sister group of this clade.

In a fourth step, we used the same complete data set (Table 1) but we modified the states of character ‘23’ (postero-marginal fringe of median abdominal sternites). Without more precise details about structure and origin of the postero-marginal fringe of sternites, we tested the hypothesis of only two states, ‘presence’ versus ‘absence’, instead of three states, viz. ‘absent’, ‘present long and slender’ and ‘present but short or absent’. We obtained three equally most parsimonious cladograms (length of 41, consistency index (CI) = 0.7073; homoplasy index (HI) = 0.2927; retention index (RI) = 0.6842; CI excluding uninformative characters = 0.6). A strict consensus cladogram was obtained (see fig. 4.3). Again the families Fauriellidae and Adiheterothripidae (sensu recent genera) both appeared monophyletic in the consensus tree. The fossil genus Hispanothrips is placed unambiguously within the clad comprising the recent adiheterothripid genera Holarthrothrips, Oligothrips, and Heratythrips. Again, the Heterothripidae Heterothrips is placed as sister group of this clade.

Discussion

The three fossil specimens can be attributed to the same species because they have very similar habitus and share identical antennal ornamentation, wing pattern, and body chaetotaxy, even if specimen SJ-07-49 is incomplete. We attribute these specimens to the Stenurothripidae given that Hispanothrips n. gen. shares with this family its main diagnostic characters, as given previously (Shumsher 1946; Schliephake 1990).

We regroup the recent genera of Adiheterothripidae and the fossil genera of Stenurothripidae because they all share the characters cited just above (see in introduction that hamus is more or less well developed), especially the conical antennal sensilla on segment III and IV which is a potential apomorphy of the family (Mound & Morris 2004). We therefore follow Bhatti (1989) who resurrected the family name Stenurothripidae. Mound & Morris (2004) separated the two families, as one recent and the other one extinct, because, without making the revision of the fossil taxa, they consider that the ‘fossil specimens are too poorly preserved to exhibit anything other than silhouette character states’ (which is far from being exact for some fossils), and in addition because Cycadothrips has similar conical sensilla on segment 4 only, ‘suggesting that the structure is plesiomorphic’ (which is perhaps rather a homoplasy). In the internet site of Mound (2008, Thrips of the World Checklist), all the fossil genera currently included in Stenurothripidae are classified in the family Adiheterothripidae. However, Stenurothripidae Bagnall 1923 has seniority over Adiheterothripidae Shumsher 1946, at least provisionally, until a revision of the fossil taxa and a more complete study of the structure of the sensilla on antennal segments III and IV can be made.

Our phylogenetic studies reveal another hypothesis of relationships than was proposed by Mound & Marullo (1998). Under our hypotheses, the recent genera Holarthrothrips, Oligothrips, and Heratythrips constitute a clade and Hispanothrips n. gen. is unambiguously placed within this clade, despite the fact that many characters are not visible on this fossil. This monophyletic taxon supports the grouping of fossil and recent genera, and the synonymy of the two families Adiheterothripidae and Stenurothripidae. However, this clade exists only with the coding of the sensorial characters of antennal segments III and IV as we proposed above (compare figure 3.2 extracted from Mound & Marullo 1998), and with the exclusion or modification of known homoplastic characters. The presence of ‘two-segmented’ sensilla (as defined above) on antennal segment III and IV, as is seen in the recent Holarthrothrips and Oligothrips, could then be an apomorphy of interest to characterize the Stenurothripidae (Moulton 1933; Shumsher 1946; Bhatti 1986), but it has been neglected by the more recent authors. Such ‘two-segmented’ sensilla are present in Hispanothrips n. gen., but it remains to verify its presence in the other fossil Stenurothripidae and in the other recent genus Heratythrips. Given the importance of the sensoria on antennal segments III and IV, more studies should concern the microscopic structure of sensilla and their homologies in thrips. It is particularly of interest in future studies to compare the detailed structure of the sensilla of fauriellids and those of merothrips because their distinction supports the
Figure 5
*Hispanothrips utrillensis* n. gen., n. sp. (Stenurothripidae); 1. Dorsal habitus of the holotype SJ-07-45; 2. Ventral habitus of the paratype SJ-07-48; 3. Dorsal habitus of the paratype SJ-07-49; 4. Detail of the left antenna of the paratype SJ-07-48 (arrows indicate the conical sensilla in segments III and IV); 5. Detail of the left antenna of the holotype SJ-07-45 (arrows indicate the conical sensilla in segments III and IV); 6. Pro- meso- and metanotum (below in the picture) of the holotype SJ-07-45 (metanotum shows a whorled pattern of sculpture lines in basal third); 7. Fore tibia plus tarsus showing the hamus (arrow) in SJ-07-49; 8. Transverse veins and undulate posteromarginal fringe cilia (arrow) of the fore wing in the paratype SJ-07-49; 9. Distal half of the fore wing of the paratype SJ-07-49 showing the end of the longitudinal veins and their setae (posterior margin at the right). Images 1–4 scale bars = 0.2 mm, images 5–9 scale bars = 0.1 mm. Images 5, 8 and 9 were made with integrated consecutive pictures taken at successive focal planes.
clade Fauriellidae which does not exist if one considers that they are identical (Mound & Marullo 1998).

Lastly we have to compare *Hisp纳入othrips* n. gen. to the genera in the Stenurothripidae. According to Schliephake (1990), affinities of *Hisp纳入othrips* n. gen. with the genera *Oligothrips* and *Holarthrothrips* would be excluded for its undulate fringe. Schliephake (1990) noted that the recent genera bear straight fringe whereas fossils bear wavy fringe. *Hisp纳入othrips* n. gen. supports this observation. However, we note that *Hisp纳入othrips* n. gen. shares with *Holarthrothrips* the concentric sculpture lines of the metanotum, a character that has been observed for *Cycadothrips*, and some Heterothripidae (Moritz 2006). The presence of a hamus on the fore tarsus excludes affinities with other genera, except *Neocomothrips*, *Opadothrips*, and *Stenurothrips* (and *Heratythrips*, see Mound & Marullo 1998). The Baltic amber *Stenurothrips* has a very long tenth abdominal segment (Stannard 1956), unlike in *Hisp纳入othrips* n. gen. The Lebanese amber *Neocomothrips* has a distinctly angulate posterior vein at the level of the cross-vein between it and anterior vein and several strong setae on posterior vein basal of this cross-vein, unlike *Hisp纳入othrips* n. gen. In *Hisp纳入othrips* n. gen., the absence of strong postero-ocular setae and a broad wing at apex exclude affinities with the Baltic amber *Opadothrips* (Priesner 1924).

Nowadays, Stenurothripidae is considered a ‘relic’ family, and some evidence point toward this hypothesis. Indeed, the distribution of recent Stenurothripidae is geographically disjunct, with *Holarthrothrips* being an Old World genus, whereas *Oligothrips* and *Heratythrips* are both from the western coast of North America (Mound & Marullo 1998). Similar situations occur in other relic groups (Mecoptera: Meropoeidae in the recent of North America and Australia and in the Triassic and Jurassic of Central Asia and China) (Hong & Li 2007; Sun et al. 2007). Moreover, these thrips genera contain just a few species each living on a few plants: *Phoenix dactylifera* for *Holarthrothrips*, and *Arctostaphylos* for *Oligothrips* (Mound & Marullo 1998). These are palm and ericaceous plants belonging to families whose histories go back to the Cretaceous (Bremer 2000; Schönenberger & Friis 2001).

Herein, by adding the new genus *Hisp纳入othrips*, we confirm that the family Stenurothripidae was frequent and diverse in the fossil record (Zherikhin 2002; Schliephake internet site 2007). Moreover, as the Early Cretaceous Stenurothripidae were not only present in Lebanon but also in Spain, it appears that this family was broadly distributed. Because at that time these lands were rather distant, separated by the Tethys, such broad distribution in the Early Cretaceous may suggest that this family appeared quite earlier, perhaps on Pangaea during the Jurassic. Primitive but definite thrips from the middle Triassic (Grimaldi et al. 2004) supports the possibility of such antiquity for Stenurothripidae.

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References


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