

*A new species of Parapanteles Ashmead,
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Microgastrinae) parasitic on Charaxes
athamas (Drury) (Lepidoptera:
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A new species of *Parapanteles* Ashmead, 1900 (Hymenoptera: Braconidae: Microgastrinae) parasitic on *Charaxes atamas* (Drury) (Lepidoptera: Nymphalidae) in India

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Abstract A new species of gregarious endoparasitoid, *Parapanteles atamasae* n. sp. (Hymenoptera: Braconidae), parasitising caterpillars of *Charaxes atamas* (Drury) (Lepidoptera: Nymphalidae) on the host plant *Senegalia catechu* (= *Acacia catechu*) (L.f.) Hurter & Mabb., is described from Maharashtra, India. Diagnostic characters of the new species include: propodeum with areola $0.93\times$ longer than wide, legs yellow, hind tibia $4.30\times$ as long as ovipositor, ovipositor sheaths exerted, first metasomal tergal plate $1.24\times$ longer than wide, with coarse sculpture merging with longitudinal striations at $3/4$ of the apical region. This is the first time a species of the family Nymphalidae Rafinesque is recorded in association with *Parapanteles* Ashmead, 1900. A key to the Indian species of *Parapanteles* based on females is also provided.

Introduction

The diversity of parasitic wasps and their host interactions is equally interesting as well as

challenging. With every new discovery the complexities involved in food webs demand more explanations. The genus *Parapanteles* Ashmead, 1900 is recorded from a large number of lepidopteran families across the globe: Arctiidae Leach, Gelechiidae Stainton, Geometridae Leach, Limacodidae Duponchel, Lasiocampidae Harris, Noctuidae Latreille, Nolidae Hampson, Notodontidae Stephens, and Saturniidae Boisduval (Valerio et al., 2009). Host families recorded for species of *Parapanteles* in India include Geometridae and Riodinidae (Akhtar et al., 2010; Gupta et al., 2013). Three species, *P. shivranginii* Sathe & Ingawale, 1989, *P. sireeshae* Ahmad & Akhtar, 2010, and *P. echeriae* Gupta, Pereira & Churi, 2013 have been reported from the Indian region.

In this study, species description of the gregarious parasitoid *Parapanteles atamasae* n. sp. is provided and the first instance of parasitic wasp-host link between *Parapanteles* spp. and species of the Nymphalidae, namely *Charaxes* (= *Polyura*) *atamas* (Drury), is illustrated. A key to the Indian species of *Parapanteles* based on females is also provided.

Materials and methods

The specimens examined have been collected and reared in Mumbai, Maharashtra, India. Parasitised caterpillars were collected on 15.ii.2012 on the plant host *Senegalia catechu* (L.f.) Hurter & Mabb. and later reared in laboratory on the same plant host. Types are

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deposited in the National Bureau of Agriculturally Important Insects (NBAII), Bangalore and Bombay Natural History Society (BNHS), Mumbai. Additional specimens are also deposited in BNHS, Mumbai. External morphology terminology follows Valerio et al. (2009). Nixon (1965), Valerio et al. (2009), Yu et al. (2005) and Gupta et al. (2013) were consulted for reference studies. The measurements are in millimetres and are given as the range for paratypes, followed by the measurements of the holotype in parentheses. The parasitoid images were taken using Leica M 205 A stereozoom microscope with Leica DC 420 inbuilt camera using automontage software (version 3.8). Images of the lepidopteran host were captured using Canon EOS 1000D camera & Canon EF 75–300 mm lens. The slide mounted specimens were photographed using Leica DFC 425 camera attached to Leica DMLB compound microscope; the images were further processed using Adobe Photoshop.

***Parapanteles athamasae* n. sp.**

Type-host: *Charaxes athamas* (Drury) (Lepidoptera: Nymphalidae).

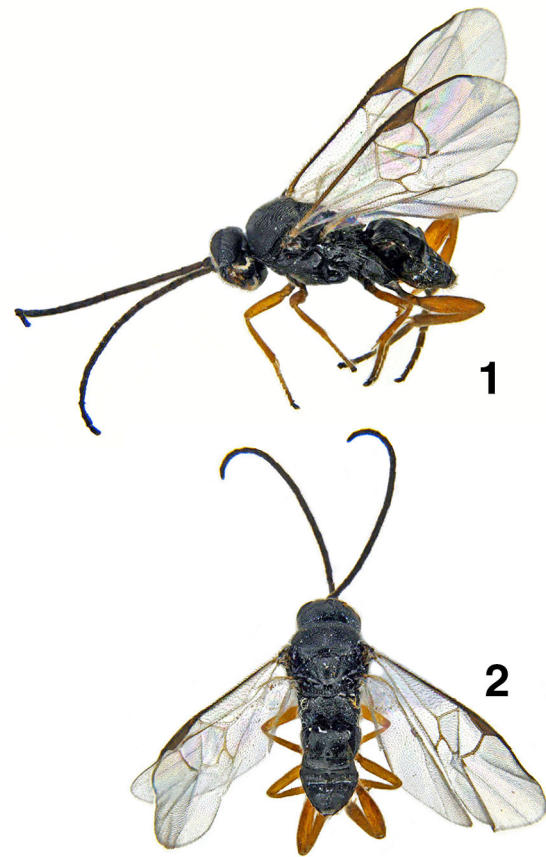
Type-locality: Mumbai, Maharashtra, India (18.9750°N, 72.8258°E).

Type-material: Holotype, one female on card, 15.ii.2012, ex larvae of *Charaxes athamas* (Drury) (Lepidoptera: Nymphalidae) (Fig. 15) on host plant *Senegalia catechu*, leg. Sachin Chorge (NBAII/Bra/Mic/Para/101212-A). Paratypes, five females and three males on card, with same data as holotype [four females and two males (NBAII /Bra/Mic/Para/101212-B); one female (BNHS 300) and one male (BNHS 301)].

Etymology: This species is named after the caterpillar host *Charaxes athamas* (Drury).

Description (Figs. 1–14)

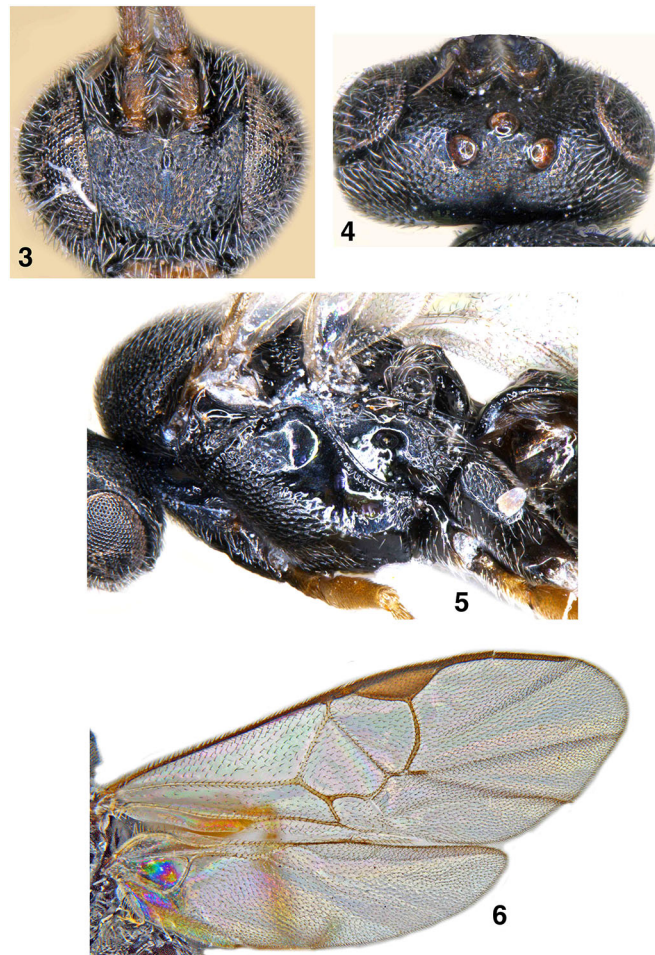
Female [Measurements based on four paratypes (range) and the holotype (in parentheses).] Body length 1.92–1.95 (1.99, lateral view, Fig. 1.). Propodeum with areola $0.92\text{--}0.93\times$ longer than wide; anterior diagonal carinae of propodeum shallowly meeting anterior margin of propodeum. Legs yellow; hind tibia $4.28\text{--}4.30\times$ longer than ovipositor.



Figs. 1–2 *Parapanteles athamasae* n. sp. 1, Holotype female, lateral view; 2, Paratype female, dorsal view

Ovipositor sheaths short, curved and setose; gently decurved, projecting beyond apex of metasoma (exerted part 0.16). First metasomal tergal plate $1.23\text{--}1.24\times$ longer than wide, with coarse sculpture at apical $3/4$ th region merging with longitudinal carinae (except smooth central portion on the apical margin); basal $1/4$ th region smooth, bulged on sides, widest pre-apically; 2nd tergum wider than long; shorter than 3rd tergum medially. Mesopleuron smooth, shiny in diagonal apical half (basal half punctate) (Fig. 5). Metapleuron generally smooth except for very shallow punctures posteriorly and at extreme apex, anterior pit deep. Hind coxae shiny, with shallow punctures.

Colour. Black. Head black; scape brown-black, shiny, ventrally brown; pedicel black; flagellar segments black; ocelli brown; palpi testaceous. Legs yellow (except black coxae and brown trochanters). Hind femur yellow; hind tibia yellow with brown



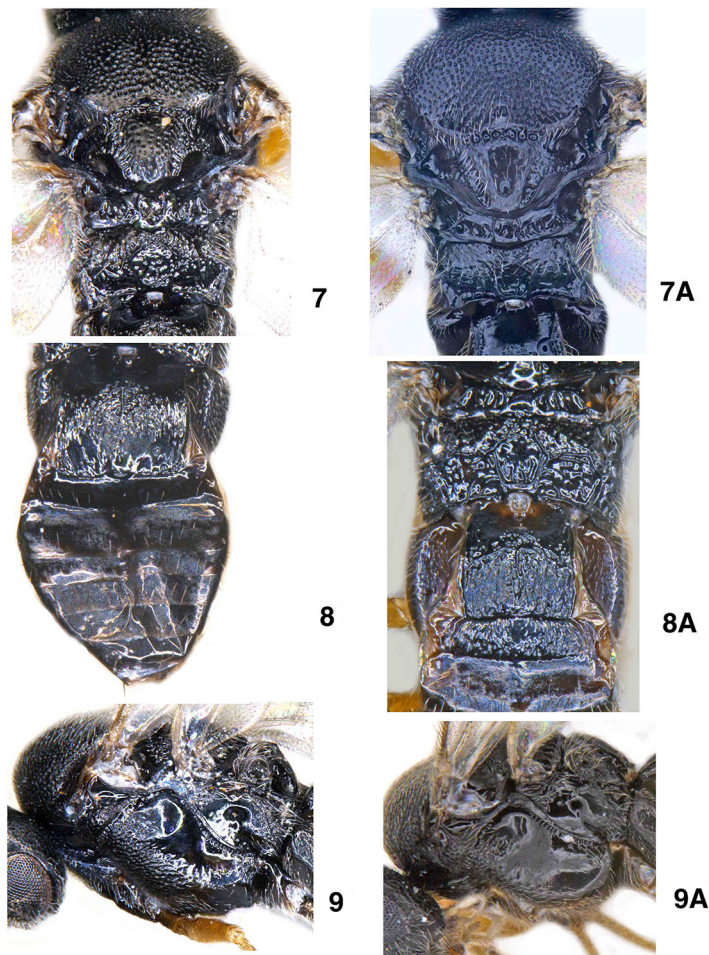
Figs. 3–6 *Parapanteles athamasae* n. sp. Paratype female. 3, Head (untreated); 4, Vertex; 5, Mesosoma; 6, Wings

infuscation at apical tip; hind tibial spur pale-white; hind tarsi with brown infuscation. Apex of all tarsi and tarsal claws blackish-brown. Veins C+SC+R and metacarpus (R1) dark brown; pterostigma brown. Mesosoma and metasoma black. Wings hyaline, fore wing veins translucent except pterostigma brown; vein (RS+M)a, m-cu, 1 M and M+CU testaceous; veins 1r, 2RS and 2 M brown and concolorous with pterostigma; hind wing veins translucent. Tegulae black.

Head. Head width 0.57–0.59 (0.59); compound eye height 0.26–0.27 (0.27); intertentorial pit distance 0.12–0.13 (0.13); width of face at dorsal clypeal edge 0.29–0.30 (0.30); clypeus width 0.03–0.04 (0.04); basal width of mandible 0.03–0.04 (0.04); ratio vertex width/distance between anterior ocelli and edge of torulus 3.78–3.80 (3.81); first flagellomere 0.19–0.20 (0.19) long, 0.04–0.05 (0.05) wide; second

flagellomere 0.17–0.18 (0.18) long, 0.04–0.05 (0.05) wide; third flagellomere 0.17–0.18 (0.17) long, 0.04–0.05 (0.05) wide; terminal flagellomere 0.08–0.09 (0.09) long, 0.02–0.03 (0.03) wide; penultimate flagellomere 0.06–0.07 (0.07) long, 0.03 (0.03) wide; terminal flagellomere length/width 3.0; malar space height/basal width of mandible 2.75–2.77; ocello-ocular distance/lateral ocelli distance 2.0–2.2; inter-ocular distance 0.09–0.10 (0.10); face width at upper edge of posterior ocelli 0.40–0.42 (0.42). Eyes densely setose. Scape shiny, with shallow punctures. Face rough, rugose, with shallow, closely placed punctations (Fig. 3); vertex dull, with shallow punctations and pilosity (Fig. 4); clypeus densely setose.

Mesosoma (Figs. 7, 11). Mesosoma length 0.90–0.92 (0.92); mesosoma length/width 1.07–1.09 (1.09). Mesonotum with coarse, well-separated



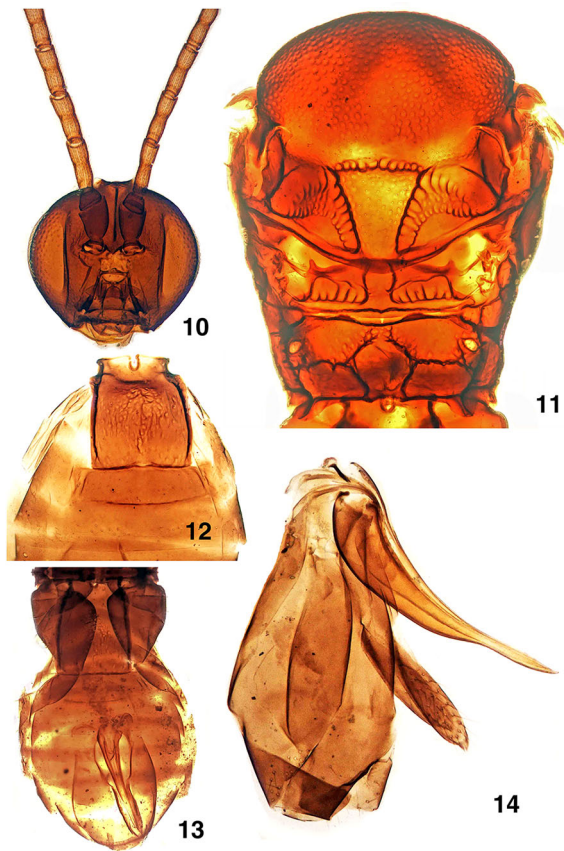
Figs. 7–9 *Parapanteles athamasae* n. sp. Female. 7, Mesosoma; 8, Metasoma; 9, Mesopleuron. 7A–9A. *Parapanteles echeriae* Gupta, Pereira & Churi, 2013. Female. 7A, Mesosoma; 8A, Metasoma; 9A, Mesopleuron

punctations, punctations not merging into longitudinal striations towards posterior margin; scuto-scutellar groove distinctly crenulate, with 12 deep costulae; scutellum with shallow punctations, with costulate sculpture laterally which becomes narrower and elongated towards posterior edge; posterior band of scutellum polished; metanotum subrectangular; propodeum with wide areola (not as clearly distinct as in *Apanteles*); areola opens anteriorly, anterior margins not easily discernible; costulae complete; propodeum with irregular rough rugulose sculpture in basal half including anterior areola, long setae in basal half except areola; costulae fairly smooth and shiny; spiracles large and oval. Propodeum areola $0.93\times$

longer than wide. Hind tibia $0.67\text{--}0.69$ (0.69) long; ovipositor sheath $0.15\text{--}0.17$ (0.16) long.

Wings (Fig. 6). Fore wing: pterostigma length/height $1.73\text{--}1.75$ (1.73); $1r = 0.18\text{--}0.18$ (0.19); $2Rs = 1.29\text{--}1.30$ (1.30); $1RS$ length $0.05\text{--}0.06$ (0.06); $1CUa$ length/ $1CUb$ length $0.92\text{--}0.94$ (0.94); $RS+Ma$ length $0.35\text{--}0.36$ (0.36); $M+CU$ length $0.78\text{--}0.80$ (0.80). Hind wing: $1M$ length $0.30\text{--}0.31$ (0.32); $1M$ length/ $M+CU$ length $1.01\text{--}1.03$ (1.03); length $1r\text{--}m$ /length $cu\text{--}a$ $0.39\text{--}0.40$ (0.40); $1A$ length $0.24\text{--}0.25$ (0.26). Hind wing slightly concave, basal one third with long setae, remaining margin with small setae.

Metasoma (Figs. 8, 13). Metasoma median length $0.84\text{--}0.87$ (0.86); first tergum length $0.39\text{--}0.40$ (0.41),



Figs. 10–14 *Parapanteles athamasae* n. sp. Female (KOH treated). 10, Head; 11, Mesosoma; 12, Metasoma (first three tergites); 13, Metasoma; 14, Ovipositor

basal width 0.21–0.22 (0.22), apical width 0.32–0.33 (0.33), median width 0.32–0.33 (0.33), first tergum length/apical width 1.22–1.24 (1.24); second tergum median length 0.08–0.09 (0.09), apical width 0.37–0.38 (0.39); third tergum median length 0.12–0.13 (0.13). First metasomal tergal plate 1.24× longer than wide, widest preapically. Apical 3/4th region with coarse rugulose sculpture; second tergum wider than long; third tergum much wider than second. Second tergite smooth, shiny. Ovipositor sheaths projecting beyond apex of metasoma (not visible in dorsal view). Hind tibia 4.30× longer than ovipositor. Ovipositor short, thick in lateral view, gently curved, apical attenuation long; ovipositor sheaths hairy throughout; hypopygium short, sclerotized, without pleats (Fig. 14). Hind basitarsus 0.93× exerted portion of ovipositor.

Male. Similar to female but smaller in size, 1.73–1.82.

Remarks

Parapanteles athamasae n. sp. can be distinguished from the other Indian species in having yellow coloured legs, black tegulae, hind tibia 4.30× as long as ovipositor, veins 1r and 2RS joining at an angle, and propodeal areola 0.93× longer than wide. The new species is similar to *P. echeriae* Gupta, Pereira & Churi, 2013 in having yellow-coloured legs and black tegulae but differs in the following characters: propodeal areola 0.92–0.93× as long as wide (vs 1.20×); hind tibia 4.28–4.30× as long as ovipositor (vs 2.10×); veins 1r and 2RS of fore wing merging at an angle (vs merging in a smooth curve). *Parapanteles athamasae* n. sp. is also similar to *P. sireeshaae* Ahmad & Akhtar, 2010 in the character of fore wing veins 1r and 2RS meeting at an angle but differs in having propodeal areola 0.92–0.93× as long as wide (vs c.1.5×) and in the colour of the hind legs (hind femur yellow, hind tibia yellow with brown infuscation at apical tip, hind tibial spur pale-white, hind tarsi with brown infuscation (vs dark brown) (Table 1).

Both parasitised (Fig. 15) and unparasitised host caterpillars (Figs. 17, 18) are provided to show the exact location of cocoons beneath the caterpillar host. The photos of unparasitised caterpillars and adult butterfly are provided for aiding identification of the hosts of *P. athamasae* n. sp. A key to the Indian species of *Parapanteles* is provided below.

Key to the Indian species of *Parapanteles* Ashmead, 1900 based on females

- 1a Metasoma completely black; T1 with coarse sculpture, merging into longitudinal striations; body length ≤ 2 mm 2
- 1b First two metasomal segments yellow; T1 smooth, tapering at apex; body length > 2 mm 4
- 2a Hind legs dark brown, hind femur and hind tibia dark brown, hind tibia yellow in 1/4th basal region; tegulae pale yellow; parasitoid of *Hyposidra successaria* Walker *P. sireeshaae* Ahmad & Akhtar, 2010

Table 1 Comparative data for *Parapanteles athamasae* n. sp. and *Parapanteles echeriae* Gupta, Pereira & Churi, 2013

Species	<i>Parapanteles athamasae</i> n. sp.	<i>Parapanteles echeriae</i> Gupta, Pereira & Churi, 2013
Host caterpillar	<i>Charaxes athamas</i> (Drury) (Nymphalidae)	<i>Abisara echeria</i> Stoll (Riodinidae)
Cocoon	gregarious	gregarious
Female body length (holotype; mm)	1.99	1.93
Vein 1r meeting 2RS	1r and 2RS joining at an angle	1r and 2RS merging in a smooth curve
Hind tibia/ exerted ovipositor length ratio	4.3 (0.69/0.16)	2.1 (0.61/0.29)
Number of costulae in scuto-scutellar groove	12	8
Mesopleuron	smooth and shiny in diagonal apical half; posterior half punctate	smooth and nitid (except at extreme anterior end), posteriorly largely smooth and nitid
Areola	0.93–1.02× longer than wide	1.2–1.3× longer than wide
First metasoma terga	Apical half with coarse rugulose sculpture merging into longitudinal carinae	Apical half comparatively smooth
Second tergum	smooth	coarsely sculptured and with longitudinal striations
Ratio of 1r and 2Rs vein of fore wing	1.73	merged in a curve
T2/T3 (median length)	0.69	0.72

Abbreviations: 1r, first abscissa of radius vein in fore wing; 2RS, transverse cubitus vein in fore wing; T2, second tergite; T3, third tergite

2b Hind legs yellow except dark brown or black coxae and trochanters; tegulae dark brown or black 3

**Figs. 15–18** *Charaxes athamas* (Drury). 15, Parasitised caterpillar with cocoon mass beneath; 16, Adult butterfly; 17–18, Healthy caterpillars

- 3a Propodeal areola 1.2× as long as wide; hind tibia 2.10× as long as ovipositor; veins 1r and 2RS of fore wing merging in a smooth curve; parasitoid of *Abisara echeria* Stoll *P. echeriae* Gupta, Pereira & Churi, 2013
- 3b Propodeal areola 0.93× longer than wide; hind tibia 4.30× as long as ovipositor, veins 1r and 2RS joining at an angle; parasitoid of *Charaxes athamas* (Drury) *P. athamasae* n. sp.
- 4 Propodeal areola conspicuous, opens at anterior edge; anterior diagonal carina of propodeum not meeting anterior margin of propodeum; first two metasomal segments yellow; T1 smooth and tapering at apex; hind tibia yellow; body length 3.4–3.8 mm (based on the original description; types missing) *P. shivranginii* Sathe & Ingawale, 1989

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References

- Akhtar, M. S., Ahmad, Z., & Ramamurthy, V. V. (2010). Description of two new species of Microgastrini (Hymenoptera: Braconidae) from India. *Zootaxa*, 2608, 57–62.
- Gupta, A., Pereira, B., & Churi, P. V. (2013). A new species of *Parapanteles* Ashmead (Hymenoptera: Braconidae) from India reared from *Abisara echeria* Stoll (Lepidoptera: Riodinidae) with key to the Indian *Parapanteles* species. *Zootaxa*, 3709, 363–370.
- Nixon, G. E. J. (1965). A reclassification of the tribe Microgasterini (Hymenoptera: Braconidae). *Bulletin of the British Museum (Natural History). Entomology Supplement*, 2, 1–284.
- Valerio, A. A., Whitfield, J. B., & Janzen, D. H. (2009). Review of world *Parapanteles* Ashmead (Hymenoptera: Braconidae: Microgastrinae), with description of fourteen new Neotropical species and the first description of the final instar larvae. *Zootaxa*, 2084, 1–49.
- Yu, D. S., Van Achterberg K., & Horstmann, K. (2005) World Ichneumonoidea 2004. Taxonomy, Biology, Morphology and Distribution. CD/DVD. Taxapad, Vancouver, Canada.