The immature stages and phylogeny of *Imparipecten* Freeman, an Australian endemic genus of wood-mining chironomid (Diptera)

Peter S. CRANSTON and Rod HARDWICK:

1 CSIRO Division of Entomology, GPO Box 1700, ACT 2601, Australia.
2 Australian Water Technologies (AWT), Ensight, P.O. Box 73, West Ryde, NSW 2114, Australia.

Abstract

The Australian endemic genus *Imparipecten* Freeman 1961 is revised, with descriptions newly provided for the immature stages. The single species, *Imparipecten pictipes* Freeman 1961, which mines immersed wood as a larva, is found in lotic waters in eastern Australia from northern New South Wales to Tasmania. A postulated phylogenetic relationship to *Endochironomus* and *Tribelos* (Freeman, 1961), is refuted by the female genitalia, the morphology of the immature stages and by parsimony analysis of combined life history data. The best substantiated phylogenetic hypothesis has *Imparipecten* lying within a grouping that includes *Paratendipes*, *Conochironomus* and *Skusella* - a monophyletic grouping defined by the possession of a larval six-segmented antenna with Lauterborn organs alternate on the second and third segments.

Introduction

Most genera of Chironomidae distributed in the Holarctic (Nearctic plus Palaearctic) region are known in all life history stages, thanks to the many studies that are summarised in Wiederholm (1983, 1986, 1989). In the other zoogeographic regions the situation is less favourable. Aside from genera that occur also in the Holarctic region, rather few life histories of southern hemisphere endemic taxa are known. Amongst the poorly-known taxa was *Imparipecten*, an Australian endemic genus described briefly by Freeman (1961). *Imparipecten pictipes* Freeman, the sole species, was known from both sexes of adults. The only subsequent citations of the taxon are in Sæther (1977), who keyed and speculated on the phylogenetic placement based on the original description of the female, and Cranston and Martin, (1989) who listed the taxon in the regional catalogue.

Interest in the Australian chironomid fauna of immersed wood led us independently to discover a large, blood-red larva that mined in submerged soft wood and belonged to no described larval taxon. Successful rearing allowed us to recognise the adult identity as *Imparipecten pictipes* Freeman, which was confirmed by reexamination of the types.

We take this opportunity to describe the immature stages and female genitalia, expand descriptions of both sexes of adults, re-examine the phylogenetic placement, and discuss the distribution and ecology of the taxon.

Methods and Materials

Larvae have been collected from immersed wood, generally of soft to very soft texture, from a variety of lotic water bodies. Individual larvae were collected by gently prizing open the wood, generally with fingers or with a scalpel over a white dish. Extracted larvae were reared either individually in cotton-wool stoppered 12 x 50 mm tubes in small volumes of water from the collecting sites, or in bulk in large-mouthed 500 ml plastic containers. Both were maintained at close to ambient temperatures, which varied from 21°C to 33°C.

Microscope slide preparation involved clearing where necessary with 10% KOH, neutralisation and initiation of dehydration with glacial acetic acid, then mounting from propan-2-ol (isopropanol) into Euparal.

Morphological terminology follows Sæther (1980) except where we adopt Langton’s (1994) suggested use of taenia (adjective taeniate) for “filamentous” or “lamelliform” (LS) pupal setae. Locality data are cited in a north to south sequence and all data are entered into the ANIC database.

Abbreviations

B.R. - Bristle ratio: Length of longest seta of Ta1 : Minimum width of ta1
B.V. - Beinverhältnisse: Combined length Fe + Ta + Ti1 : Combined lengths ta2-4.
Fe - Femur.
Le - Larval exuviae.
Le/Pe/m(f) - Reared adult male (female), with associated larval and pupal exuviae.
L.R. - Leg Ratio: Tarsomere 1 length: Tibia length
Pe - Pupal exuviae.
S.V. - Schenkel-Scheine Verhältnisse: Ratio of Fe + Ti : Ta1.
Ta1-5 - Tarsomeres 1-5.
Ti - Tibia
V.R. - Venarum Ratio: length of Cu1 : length of M

Institutions

ANIC - Australian National Insect Collection, CSIRO Division of Entomology, Canberra, ACT 2601, Australia
BMNH - Department of Entomology, Natural History Museum, Cromwell Road, London SW7 5BD, UK
MV - Museum of Victoria, 71 Victoria Crescent, Abbotsford, Victoria 3067, Australia
WES - Water EcoScience (ex Victoria State Water Laboratory), Ricketts Road, Mt Waverley, Victoria 3149, Australia

*Imparipecten* Freeman

*Imparipecten* Freeman, 1961: 703

Type species: *Imparipecten pictipes* Freeman, 1961: 703, by original description and monotypy.

Diagnosis

In both sexes of adult, the shape of the mid- and hind tibial spurs are diagnostic, as is the very close approximation of wing vein R_{2+3} to R_{1}. The pupa is less readily separable from other
taxa that possess a coarsely-branched thoracic horn, uninterrupted hook row on tergite II and tergites without point patches. However, the presence of frontal setae without cephalic tubercles, combined with the single curved hook on posteralateral corner of segment VIII and four taeniately lateral setae on each of segments V-VIII, is distinctive. The larva is recognisable amongst those genera with six-segmented antennae with large Lauterborn organs placed alternately on the apices of antennal segments 2 and 3, by the all-dark mentum, pale outer mandibular tooth, and the structure of the mentum. The mentum shape, which resembles that of many species of *Polyplepidium* with tall paired median teeth, very small first laterals, taller second lateral and thereafter evenly decreasing in size, is unknown in the generic grouping.

**Generic description**

**Adult**

Medium-sized species, with body length to 5mm, wing length to 2.7mm. Wing slightly infuscate in anterior half; thorax brown with vitae undifferentiated, scutellum pale; legs banded.

Antenna. Male with 13 flagellomeres, Antennal Ratio 1.5-2.0. Female with 6 flagellomeres (Fig. 4), Antennal Ratio c. 0.35.

Head. Eye bare, with strong dorsomedial parallel-sided extension about 8 ommatidia long; male eyes separated medially by about width of 5-6 ommatidia, female by 8 ommatidia. Temporal setae uniserial; clypeals dense. Frontal tubercles absent. Palp 5 segmented, segment 1 scarcely developed, 2 short, 3 to 5 elongate; segment 3 with 1 subapical sensilla.

Thorax (Figs. 2, 3). Antepronotal lobes well developed, tapering somewhat anteriorly, medially separated by broadly-“U”-shaped median notch, without setae. Scutum not overreaching antepronotum; profile of scutum gently rounded. Acrostichals uni-biserial starting at anterior margin, dorsocentrals overreaching antepronotum; profile of scutum gently rounded. "U"-shaped median notch, without setae. Scutum not overreaching antepronotum; profile of scutum gently rounded. Acrostichals uni-biserial starting at anterior margin, dorsocentrals overreaching antepronotum; profile of scutum gently rounded.

Wing (Fig. 1). Membrane without setae, with moderate punctuation. Anal lobe shallowly rounded. Costa ending at apex of R₄+₅, close to wing apex; R₂₄₃ running very close to R₁; virtually fused until ending at proximal 1/5 between R₁ and R₄+₅; FCu distal to RM, Venarum Ratio 1.05-1.2. R₁ and R₄+₅ setose in both sexes. Squama sparsely setose.

Leg. Apex of fore tibia with rounded flat scale, bearing triangular spur (Fig. 5). Mid and hind tibiae apically with two narrowly separated combs together occupying more than 2/3 of circumference, inner (shorter) comb of mid-leg lacking spur, with small spur on hind leg; outer comb of mid and hindleg distinctly projecting relative to inner comb, bearing short, straight spur near lateral end of spur (Fig. 6). Fore leg ratio c. 1.3. Pulvilli well developed, over half length of claw. Few uniserial sensilla chaetica on base of hind tarsomere 2. Foreleg without beard, mid and hind legs densely setose, with beard ratio c. 6.

Abdomen. Tergites I-III with bare mediolateral areas, otherwise with irregularly scattered setae. Tergite VIII not anteriorly tapered.

Hyopusgium (Fig. 7). Anal tergite bands strong, medially separated to form incomplete V-shape delimiting area with numerous median anal tergite setae; few shorter apical anal tergite setae on posterior margin of tergite. Anal point parallel-sided, somewhat dilated subapically, with bluntly rounded apex. Superior volsella with swollen setose, microtrichiose base and smooth digitiform apical part, lacking setae. Median volsella absent. Inferior volsella parallel-sided, ventrally microtrichiose and lacking setae, dorsally with setae but lacking microtrichia, without any pronouncedly longer (sub)apical seta(e). Gonostylius elongate. Sternapodeme bluntly rounded anteriorly, without oral projections. Phallapodeme elongate, narrow.

Female genitalic (Figs. 8-10). Notum long and thin, with short thin pale rami. Gonocoxapodeme curved, weakly sclerotised and with faint median fusion. Coxosternapodeme IX strongly sclerotised and curved. Gonapophysis VIII divided into quite narrow, elongate dorsomesal lobe, continuous with inner contour of vagina, microtrichiose except hyaline medially (Fig. 9), and large ventrolateral lobe lying lateral to and medially overlapping dorsomesal lobe, densely microtrichiose basally and medially (Fig. 10); apodeme lobe small, weakly sclerotised, without microtrichia. Labia separate, hyaline, without microtrichia. Gonocoxite large but not extended, with numerous setae. Tergite IX large, undivided. Postgenital plate large, microtrichiose. Seminal capsules round, pale, seminal ducts straight and apparently fusing before opening into four-lobed spermathecal eminence. Cerci well developed.

**Pupa**

Medium-sized, up to 7mm long. Thorax, cephalic area and anterior abdominal segments brown, remainder of abdomen paler brown, apophyses weakly darkened.

Cephalaorthorax. Frontal setae present, cephalic tubercles absent (Fig. 11). Frontal apotome wrinkled, without frontal warts. Thoracic horn coarsely plumose with about 50 granular branches; basal ring (Fig. 12) well developed, oval, with 1 roundish tracheal bundle. Median suture moderately rugose, with some linearly arranged spines close to suture. Prealar tubercle absent.

One median and 2 lateral antepronotal setae; 2 fine precorneaals; dorsocentral (dc)₂ midway between dc₁ and approximated dc₃ and dc₄, all subequal and stout.

Abdomen (Fig. 14). Tergite I bare. II-VI with more or less subquadrate area of spinules, broader anteriorly but otherwise differentiated only by slightly stronger spinules in the anterior sector, VII-VIII with small antero-lateral spinule area. Anal segment bare. Tergite II hook row continuous, 50% tergite width. Conjunctive III/IV and IV/V with wide spine band. Stermites II-VIII with fine spinules, more retracted to anterior area on posterior sternites. Pleura bare except spine on posteraleralteral of V and VI. Pedes spuri A on IV-VI; pedes spuri B moderately developed on segment II. Posteraleralateral of segment VIII with one curved hook (Fig. 13). Apophyses moderately developed.

Setation. Segment I with 2D, 1V and without L setae; II-VII with 5D, 3V; 3L on II-IV, V-VIII with 4 taeniately setae; VIII with 1D, 2V setae. 1 pair of O setae on tergites and sternites II-VIII. Anal lobe with uniserial fringe of 50+ taeniately setae, with narrow taeniately dorsal setae displaced more posteriorly than usual. Genital sac of male not reaching apex of anal lobes, female genital sac shorter than anterior anal lobes.

**Larva** (4th instar)

Large, red coloured, up to 12mm long, with ventral head length up to 850µm. Head capsule with reticulate pattern, evenly golden coloured with dark brown to black mentum, mandibular teeth and occipital margin.

Dorsal surface of head (Fig. 18). Frontal apotome reticulate, anterior half parallel-sided, without frontal pit; 2 median and 3 lateral labral sclerites.

Antenna (Fig. 16) with 6 segments, segments 2-6 subequal, 4 slightly narrowed basally. Lauterborn organs moderately developed, alternate on apices of segments 2 and 3, style subapical on segment 3. Ring organ in basal third of segment 1, seta absent. Blade extending to near apex of antenna.

Labrum (Fig. 19). SI broad based, densely plumose; SII well developed arising from short pedestals, finely plumose apically;
SIII simple, short, strongly retracted posterior to level of very small SIV a, just anterior to level of very small SIV a. 6 chaetae, innermost broad and plumose, more lateral chaetae narrower and apically finely branched. Seta praemandibularis long and simple. Labral lamellae broad, comb-like undivided. Pecten epipharyngis of three broad scales, each with 6-10 apically rounded teeth. 8-10 apically tapered, simple or apically finely branched chaetulae laterales, chaetulae basales apparently absent. Premandible with 2 teeth and strong brush.

**Mandible (Fig. 17).** Weak, dark, dorsal tooth present, moderately developed apical tooth and 3 inner teeth. Pecten mandibularis fine, sparse, not extending to apical mandibular tooth. Seta subdentalis inserted on ventral surface, somewhat sickle-shaped and extending to innermost mandibular teeth. Mola and inner margin weakly notched. Seta interna inserted on dorsal surface, plumose, 4-5 branched.

**Mentum (Fig. 15).** With ventromental component of six teeth, the median large, first outer smaller, next large and partly fused at base with first of five dorsomental six teeth; dorsomental teeth on an even slope and evenly decreasing in size laterally; all teeth similarly dark brown/black, without any paler median teeth. Ventromental plates separated medially the width of the ventromentum. Ventromental plate elongate fan-shaped, with curved anterior margin; striae relatively evenly spread across the plate, present as basally disrupted ridges running anteriorly into band of regularly spaced lappets; each stria ending with a spine just posterior to plate margin; saubapical spines strongest laterally. Setae submenti simple.

**Abdomen.** Lateral and ventral tubules absent. Anterior parapods with dense claws, elongate ones simple and fine, shorter ones with inner serrations; posterior parapod claws simple. Procercus pale, small, wider than high, with 7-8 subequal anal setae.

---

**Imparipecten pictipes** Freeman, 1961: 703 Chironomidae “sp. MV151E” “Conochironomus SRV 112”

Species description, as Freeman (1961) and generic description with the following predominantly colour and mensural features (in µm unless stated otherwise):

**Adult male (n=5)**

Body length 4.7-6.3 mm, wing length 2.4-3.4 mm. Colour: thorax dark brown with yellow anteprotonum and humeral / anterior anepisternal area; abdomen pale with dark anterior third on tergites II-V; legs with fore femora pale, with dark apex, fore tibia dark chocolate brown, fore tarsomere 1 dark brown with median white band, remaining fore tarsomeres chocolate brown; mid and hind femora and tibiae yellow, with darkened “knees” (apical femora and basal tibia); mid and hind tibiae pale medially, darker apically, mid and hind tarsomere 1 white in basal half, dark apically, remaining tarsomeres mid-brown, except for white basal half of hind-tarsomere 3.

Head. With 11-13 uniserial temporal setae, 22-32 clypeals.


Wing with V.R. 1.03-1.15. Vein setation: R with 26-32, R1 26-33, R4+5 36-51; squama with 7-14.

**Leg lengths (in µm) and proportions:**

<table>
<thead>
<tr>
<th></th>
<th>Fe</th>
<th>Ti</th>
<th>Ta1</th>
<th>Ta2</th>
<th>Ta3</th>
<th>Ta4</th>
<th>Ta5</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIII</td>
<td>1260-1800</td>
<td>1370-1870</td>
<td>920-1225</td>
<td>575-770</td>
<td>470-650</td>
<td>245-325</td>
<td>110-145</td>
</tr>
</tbody>
</table>

Sensilla chaetica absent.

**Hypopygium (Fig. 7).** Dorsal tergite IX setae 14-26, bounded laterally by tergal bands, posterolateral setae 9-14 extending onto ventral surface of tergite IX.

**Adult female (n=3)**

Body length 6.1-6.8 mm, wing length 3.3-4.0 mm, colour as male except abdomen more unicolorous brown.

**Leg lengths (in µm) and proportions:**

<table>
<thead>
<tr>
<th></th>
<th>Fe</th>
<th>Ti</th>
<th>Ta1</th>
<th>Ta2</th>
<th>Ta3</th>
<th>Ta4</th>
<th>Ta5</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>1600-1630</td>
<td>1510-1550</td>
<td>1835-1870</td>
<td>1010-1080</td>
<td>935-1010</td>
<td>830-900</td>
<td>325-360</td>
</tr>
<tr>
<td>PII</td>
<td>1610-1620</td>
<td>1510-1520</td>
<td>760-790</td>
<td>485-540</td>
<td>360-390</td>
<td>180</td>
<td>110-115</td>
</tr>
<tr>
<td>PIII</td>
<td>1720-1730</td>
<td>1730-1870</td>
<td>1250-1260</td>
<td>760-810</td>
<td>605-650</td>
<td>290-305</td>
<td>140-145</td>
</tr>
</tbody>
</table>

Head. With 12-15 uniserial temporal setae, 32-46 clypeals.

Antenna with apical flagellomere 205-240 long, basal 5 flagellomeres 535-570 long, Antennal Ratio 0.38-0.45. Palp segment 2-5 lengths: 70-85, 290-310, 310-330, 400-535.


Pupa (n=5)


Material examined (all ANIC unless stated otherwise):
Holotype, m, pinned, Australia, Tasmania, Burnie, 1.i.1923 (Tonnior).
Paratypes: Australia, New South Wales, 1f, pinned, 30°13'S 152°54'E, E. Dorrigo, Lowanna, 30.1.1923 (Health Dept.); 1m, slide, [Royal] National Park, 28.ii.1922 (Health Dept.), 1f, pinned, same locality, 2.iv.1925 (Mackerras); 1m, slide, Palm Creek, Royal National Park, 14.xi.1960 (Colless); Australian Capital Territory, 3f (1 slide), 1m (damaged) pinned, 35°20'S 148°56'E, Cotter River, 29.iii.1930 (Tonnior); 1f, pinned, 35°20'S 148°52'E, Blundell's, 7.i.1930 (Tonnior); 1f, 1m (damaged), pinned, same data as holotype.

Non-type material (all slide mounted in Euparal):
New South Wales: 2L, 28°35.30'S 153°10.00'E, Terania Creek, ex-loggs, 9.i.1994 (Hardwick) (AWT); 3L, 33°39.15'E 150°39.45'E, "N-451", Lynches Creek, ex-loggs, 9.vi.1993, (Hardwick) (AWT); 2Le/Pf, same data except 4.xi.1993; same data except Le/Pem, 9.vi.1993 (ANIC); 2L, 34°04'S 150°42'E, Kowmung River, Cedar Crossing, "E130", 14.ii.1994; 1L (3rd i), same data, x, 1994 (Hardwick) (AWT); 2L, 34°11.30'S 150°42.30S, Nepean River, Douglas Park Bridge, "N89", ex-log, 13.i.1994 (Hardwick) (AWT); 5L, 34°03.30'S 150°42.30'E, Nepean River, Cowpasture Bridge, "N90", ex-log, 13.1.1994 (Hardwick) (AWT); 4L, 34°12.15'S 150°37.45'E, Nepean River, Maldon Bridge, "N91", ex-loggs, 18.x.1992 (Hardwick) (AWT), 1 to BMNH); 1L (3rd i) 34°25.40'S 150°31.30'E, Chain of Ponds Creek, "E6981", ex-loggs, 26.xii.1992 (Hardwick) (AWT); 1 Le/Pem, 1Le/Pf, 1Pem, 37°16'S 149°40'E, Mt Imlay area, Imlay Creek, 13.i.1994 (Craston).
Victoria: 1Le/Pm, 1m, 36°48.4'S 146°51'E, Buckland River, 6.xi.1990 (Cook) (to BMNH), 3Pe, same data except 6.x.1991 (Cook, Cranston & Nielsen) (1 to BMNH), 1m, same data except 1.vii.1991 (Cook); 1L, 38°10'i3' 146°23'E, Jacobs Creek, 6.vii.1982, ex-log (Robinson) (MV); 3L, 38°39.3'S 143°32'E, Beech Forest, Little Aire Creek, 19.iii.1991 (Mitchell & Johnston) (WES); 3L, 38°38'S 146°18'E, Agnes Falls, Agnes River, 13.iii.1991 (Rankin & Lidston) (WES); 5L, 38°33.3'S 146°41'E, Yarram, Tarra River, 21.x.1991 (Mitchell) (WES); 1L, 37°30'S 148°10'E, Buchan, Buchan River, 15.xi.1991 (Mitchell) (WES); 15L, 37°24.3'S 148°22'E, Jackson Crossing, Rodger River, 10.iv.1991 (Butcher), 3L, same data except 19.xi.1991 (Mitchell) (WES); 2L, 37°18.5'S 148°28'E, Deddick Track, Roger River, 14.iv.1991 (Butcher) (WES); 2L, 36°50.5'S 146°37'E, Matong North, Rose River, 5.vi.1990 (Butcher & Sant) (WES); 3L, 36°44.4'S 146°57'E, Bright, Ovens River, 5.vi.1990 (Butcher & Sant) (WES); 5L, 36°37.3'S 146°15'E, Greta South, 15 Mile Creek, 6.vi.1990 (Butcher & Sant) (WES); 23L, 36°34.8'S 140-145 146°43'E, Myrtleford, Ovens River, 9.v.1991 (Butcher) (WES).

Tasmania: 41°35'S 146°37'E, nr Deloraine, Meander R., ex-log, 5.iii.1994 (Hardwick) (AWT).

Systematics

Freeman (1961:703), in his description of Imparipenic, stated that "superficially, this genus is very similar to the subgenus Endochironomus and to Tribelos Townes, but the formation of the tubial combs and the close approximation of veins R_1 and R_2+3 suggest that a separate genus is to be preferred". Indeed, using the key to adult males of genera of Chironominae (Craston et al., 1989), Imparipenic keys unambiguously to Tribelos. The female of Imparipenic is keyed in Sæther (1977), and a phylogenetic proximity to Tribelos postulated. However, the inclusion of imparipenic in Sæther (1977) appears to be based upon Freeman's original description of the species and the female genitalia were not examined. Actually the female will not key to Tribelos in Sæther (1977) because of the flagellomere number, and if this is ignored Tribelos is still excluded based on the female genitalia morphology described here: the dorsomesal lobe is small, and the ventrolateral lobe large and elongate mesally. The apparent fusion of the spermathecal ducts near to the vagina is unusual in the Chironomini. Tracing the features of Imparipenic through the scheme of phylogenetic arrangement of Sæther (1977) is difficult because of conflicts in some multi-character trends (eg #41/42, 47/48), and all characters are in the purported plesiomorph state for trends 43 and 44.

The pupa of Imparipenic fails to key in Langton (1991), due to, amongst other features, the number and distribution of the taenidial lateral (LS) setae. The four taenidial lateral setae present on each of segments V-VIII also precludes generic allocation in Wiederholm (1986), in which key the absence of female genitalia were not examined. Actually the female will not key to Tribelos in Sæther (1977) because of the flagellomere number, and if this is ignored Tribelos is still excluded based on the female genitalia morphology described here: the dorsomesal lobe is small, and the ventrolateral lobe large and elongate mesally. The apparent fusion of the spermathecal ducts near to the vagina is unusual in the Chironomini. Tracing the features of Imparipenic through the scheme of phylogenetic arrangement of Sæther (1977) is difficult because of conflicts in some multi-character trends (eg #41/42, 47/48), and all characters are in the purported plesiomorph state for trends 43 and 44.

The pupa of Imparipenic fails to key in Langton (1991), due to, amongst other features, the number and distribution of the taenidial lateral (LS) setae. The four taenidial lateral setae present on each of segments V-VIII also precludes generic allocation in Wiederholm (1986), in which key the absence of cephalic tubercles also prevents placement. This is so, whether or not the tergal armament is considered to include an anterior transverse band of stronger spines. However, it is evident from the pupal morphology that there is no close relationship to Tribelos or any other genera in the Endochironomus grouping.

The larva unambiguously keys to the grouping of genera with six-segmented antennae and well-developed alternate Lauternborn organs - a monophyletic grouping (Cranston and Hare, in press) that does not include Tribelos, Endochironomus or relatives. Imparipenic differs from any of the included genera in details of the pigmentation and number of teeth comprising the differentiated ventromentum (median part of the mentum) and in the pigmentation of the mandibular teeth.
Data matrices comprising character states scored from all life history stages of 50 genera of Chironomini have been combined and analysed using the criterion of parsimony, following the rationale of Cranston (1995), with Pseudochironomus and Rietitia (Pseudochironomini) selected as outgroup. Imparipecten is identified as sister to the taxon Tendipedini genus A of Roback 1966, a taxon whose full description is in preparation (Cranston and Nolte, in prep.). These two are closely related to Conochironomus Freeman (Cranston and Hare, in press) and Skusella Freeman and more distantly to the genera centred on Stictochironomus and Paratendipes.

An as-yet-unresolved question concerns the status of Imparipecten - being monotypic naturally it is monophyletic, but the possibility of the creation of a paraphyletic residual amongst the larger group to which it belongs is unaddressed. The phylogenetic analysis referred to above treats pre-existing genera as terminal taxa, thereby presuming their monophyly, an assumption which is not fully substantiated. The problem can be addressed only by treating species as terminal taxa, which is an exercise in progress. The status of species allocated to Skusella and Paratendipes and those that cannot be allocated to pre-existing genera are fundamental to the resolution of the higher classification of this grouping.

Ecology

All larval Imparipecten pictipes examined have their guts filled with distinctive wood fibres. Many specimens have been obtained from “snag” (stranded immersed wood) habitats studied as part of aquatic environmental surveys. Our own studies suggest that several different kinds of wood are used but the texture is predominantly soft (“punky”) presumably following protracted immersion. The larvae are true wood-miners, forming excavated galleries in the wood and rarely living in natural crevices, for example, beneath loose bark. In wood of the optimal texture (that which can be prized apart with the fingers alone) larval numbers may reach >10 per 10cm length of wood of 2-3 cm diameter. Mature larvae of I. pictipes could be handled and reared rather easily in the laboratory without the usual high mortality encountered in many other wood-mining chironomids - successful pupation did not necessarily require a gallery within in the wood. Mature larvae have been found throughout the year and there is little evidence of any seasonality in emergence either from pupal exuvial or the few adult collections.

Imparipecten pictipes is present in pristine upper reaches of permanently flowing waters, but tolerates moderately impacted and slower-flowing lowland reaches of larger rivers such as the Nepean and Ovens. No larvae have been collected from wood in standing waters. The distribution (Fig. xx) ranges from northern New South Wales to the Victorian alps at elevations of over 1,000m and to lower elevations in the south-east of the mainland and Tasmania.

Acknowledgments

We are grateful to Rhonda Butcher (Water EcoScience), Richard Marchant (Museum of Victoria) and Dave Robinson (Victoria Environment Protection Authority) for distributional information for Imparipecten. Wendy Lee added all data to the ANIC database.

References


Figs. 1-6. *Imparipecten pictipes*, adult. 1, male wing; 2, thorax, anterior view; 3, thorax, lateral view; 4, female antenna; 5, anterior tibial apex; 6, combs of posterior tibia.
Figs. 7-10. *Imparipecten pictipes*, adult genitalia. 7-9, female genitalia, 7, male hypopygium, right side internal; female, 8 ventral, left side internal, 9, dorsomesal lobe of gonapophysis VIII, 10, ventrolateral lobe.
Figs. 11-14 *Imparipecten pictipes*, pupa. 11, cephalic area; 12, base of thoracic horn; 13, posterolateral corner of segment VIII; 14, abdominal tergites.
Figs. 15-18 *Imparipecten pictipes*, larva. 15, mentum; 16, antenna; 17, mandible; 18 dorsal surface of head.
Fig. 19. *Imparipecten pictipes*, larva. SEM of anterior labrum and epipharynx.