

Trichoptera, Ephemeroptera, Plecoptera and Odonata of the Jardine River area, Cape York Peninsula, Northern Queensland

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Abstract Two weeks collecting from streams in the Jardine River region during the wet season resulted in 93 taxa of aquatic insects comprising 71 species of Trichoptera (caddisflies), 9 species of Ephemeroptera (mayflies), 1 species of Plecoptera (stoneflies) and 12 species of Odonata (dragonflies). Forty-three taxa were identified as described species, whereas the remaining 40 taxa (all caddisflies and mayflies) are undescribed or new species. Most species have northern Australian affinities, but a small component has SE Asian or New Guinean affinities.

Introduction

Until the Cape York Peninsula Scientific Expedition (CYPSE) overrode the normal barriers to wet season collecting in early 1992, collecting of aquatic insects in far north-eastern Queensland had been limited to the dry season. Indeed, among the four groups this study concerns, only Odonata (Watson *et al.* 1991) and one species of stonefly (Theischinger 1984) had been recorded from north of the Iron Range (around 12°44'S).

This report presents the results of two weeks of collecting of caddisflies, mayflies, stoneflies and dragonflies from streams in the Jardine River region (JRR) in February 1992, and discusses systematic representation, trophic nature, and biogeographical relationships of the taxa collected. Brief comparisons are made between the Jardine River region fauna and the two other well known northern Australian aquatic faunas, those of Yuccabine Creek, in the Kirrama State Forest, 18°12'S 145°46'E (Benson & Pearson 1988; unpublished data), and the Alligator Rivers region (ARR), Northern Territory (Wells, unpublished OSS open file report); all three systems experience seasonal monsoon climates.

One of our aims was to compare the fauna of eastern flowing streams in the rainforest with western flowing streams in the sandy heathland. In the unusually dry "Wet Season" of 1992, all eastern flowing streams in the vicinity of the study area, the Heathlands Jardine River National Park ranger's base (see Figure 1 and Appendix 1 for details) and also the base for CYPSE, were dry. Western flowing streams were easily accessible and obviously permanently spring fed. Streams sampled were all low gradient systems and ranged from very large, deep, sandy bottomed rivers, through wide streams flowing over bedrock with large sand-based pools, streams with mostly sand bases interspersed with short rocky riffles and with some root material and log jams, to very small tributary streams and a stream without flow. The lack of suitable substrate generally makes this environment tough for both insect and collector.

Due to the particular interests of both authors, emphasis in this study was directed to Trichoptera which group was collected intensively. Assistance with identifications was sought from colleagues where appropriate.

In all, 71 species in the order Trichoptera, 9 in the Ephemeroptera, 12 in the Odonata and 1 in the Plecoptera were collected. Studies in the ARR (Wells, unpublished OSS open file report; Dostine & Wells, unpublished data) indicate that there the highest diversity of trichopteran species occurs at the 'end of wet'/ 'early dry'. Since in the CYPSE study only one additional species was collected in a light trap sample taken by M. Crossland in April, it is probably safe to assume that for the Trichoptera, the collections made during February are a fair representation of the fauna. Undoubtedly, though, future specialist collecting of the other groups will yield further taxa.

Methods

Sampling

Aquatic stages were collected using a variety of techniques including kick sampling (see Dean & Cartwright 1992), hand picking from rocks, cobbles, logs and macrophytes, washing and sorting of, and picking from, litter packs and naturally in these sandy streams by sieving the sand. Sites are shown in Figure 1. All are numbered and are described briefly in Appendix 1.

The sampling method employed at a particular site is indicated by abbreviations as follows: LT - light trapping of adults; HP - hand picking of immatures. The collecting effort varied with site: some, such as Cockatoo, Gunshot and Bertie Creeks and Dulhunty River were visited several times for both LT and HP. More distant sites such as Eliot and Canal Creeks were visited only once for LT and HP, North Alice Creek briefly for HP only, and Jardine and Wenlock Rivers were each light-trapped once by non-specialists.

Based on information received and previous experience in the ARR, we assumed that we would face hazards such as crocodiles, wild pigs, leeches, mosquitoes and sandflies. However, of these only mosquitoes were encountered. We avoided the crocodile infested Jardine and Wenlock Rivers by enlisting volunteers Grahame Byron, Don Blake and Dennis Black to light trap for us.

Immatures of some species were associated with adults by rearing from aquatic stages. Only immatures of stoneflies and dragonflies were collected, although many adult odonates were seen.

All material was collected and stored in 75% ethanol.

Taxonomy

Numerous species in three of the four orders are, as yet, undescribed. Unfortunately, publication of species descriptions on regional bases is often difficult and generally undesirable, and thus we may have to wait some time before names are available for new species; for the present, new species are simply coded.

Collections of odonates were limited, especially since no adults were taken for verification of immature identifications. Thus, although over 100 species are recorded for the Cape York Peninsula region (Watson *et al.* 1991), many of our specimens are identified only to genus.

Distribution and abundance

An assessment of the relative abundance and distribution of each taxon is included in the species lists (Appendices 2 and 3). The assessments are based solely on samples collected during February 1992 in the Jardine River area. The status of some taxa would undoubtedly alter if sampling intensity was increased at particular sites, and if it was carried out during other seasons. Categories adopted (based on Dean & Cartwright 1992) are:

Rare species	(R)	a total of 1-10 specimens from all sites.
Common species	(C)	a total of 11-50 specimens from all sites.
Abundant species	(A)	a total of >50 specimens from all sites.
Restricted distribution	(R)	recorded from 1 or 2 sites.
Limited distribution	(L)	recorded from 3 or 4 sites.
Widespread distribution	(W)	recorded from 5 or more sites.

Results and discussion

Species lists are appended (see Appendices 2 and 3). Presence or absence at a site is denoted by + or -; records are for light trap and hand collected specimens. Species diversity at sites and relative abundance and distribution of species are noted.

Being classed as *abundant* or as *widespread* (or both) is meaningful in the context of this study, but *rare* or *restricted* could be a function of being truly rare or restricted, or of seasonality, or a consequence of particular behaviour. Only a long term study could hope to distinguish between these factors. However, the data derived from this study generally support trends perceived in species elsewhere.

Similarly, it can be argued that species diversity is a direct function of effort expended at a site. Those streams given most attention were certainly those considered most likely to yield highest diversity. There is no obvious trend between diversity and perceived stream size.

Trichoptera (caddisflies) (for details see Appendix 2)

Ten families represented by a total of 25 genera and 71 species were collected. The dominant families are Hydroptilidae with 22 species, Leptoceridae with 21 and Ecnomidae with 11 species. These three families also dominated both the Alligator Rivers region (ARR) and Yuccabine Creek (YC) faunas. Otherwise the JRR fauna closely resembles the situation found in the caddisfly fauna of the ARR to the west, even in generic and specific composition, but is distinctly different especially in familial composition from the fauna of YC to the south (see Table 1).

Table 1: Comparison of Jardine River region (JRR) Trichoptera fauna with the faunas of the Alligator Rivers region (ARR) and Yuccabine Creek (YC). Family (F), genera (G), species(S).

FAMILY	JRR			ARR			YC		
	F	G	S	F	G	S	F	G	S
Hydrobiosidae		-	-		-	-		3	4
Philopotamidae		1	4		1	4		2	4
Polycentropodidae		3	4		2	2		3	5
Hyalopsychidae		1	1		-	-		-	-
Psychomyiidae		1	1		1	1		-	-
Ecnomidae		2	11		2	25		2	7
Hydropsychidae		3	5		2	5		5	6
Stenopsychidae		-	-		-	-		1	2
Glossosomatidae		-	-		-	-		1	2
Hydroptilidae		7	22		7	34		9	25
Helicopsychidae		1	1		1	2		1	1
Atriplectididae		-	-		-	-		1	1
Calamoceratidae		1	1		1	1		1	1
Calocidae		-	-		-	-		2	2
Philorheithridae		-	-		-	-		1	2
Odontoceridae		-	-		-	-		1	3
Leptoceridae		5	21		5	28		6	18
Total F:G:S	10	25	71	9	22	105	15	39	83

Differences between the JRR fauna and that of the ARR are that the JRR has an additional family, the Hyalopsychidae, and includes species in *Hyalopsyche*, *Polycentropus*, *Baliomorpha*, *Macrostemum*, *Setodes*, and *Acritoptila*, but lacks species in *Asmicridea*, *Leptorussa*, and *Orphninostrichia*. Absence of *Asmicridea* and *Orphninostrichia* is not surprising as these two genera are probably southern in origin, and the former is generally found in the upper reaches of rocky streams while the latter occurs on falls and cascades and these are lacking in the JRR.

The major difference between the faunas of the JRR and Yuccabine Creek is the scarcity of groups of southern origin in the JRR but the presence there of many with Oriental/New Guinean affinities or distributions. These include *Macrostemum*, *Baliomorpha*, the psychomyiid (*Tinodes radona*), *Oecetis* species, *Setodes*, several species of Hydroptilidae and *Hyalopsyche*.

In the Jardine River area fauna, fifteen species rate inclusion in the *abundant* category and 39 in the *rare* category. The site with the greatest diversity of species was Gunshot Creek (site 8) with 47 species, followed by Dulhunty River (site 13), with 36 species, and Bertie Creek near the Heathlands base (site 11) with 35 species.

Twenty-nine species fit the *widespread* category, and 28 *restricted*. The same qualifications apply here as in consideration of relative abundance (status).

Trophic representation includes scavenger/shredders in *Anisocentropus*, *Triplectides*, *Triaenodes*, some *Oecetis* and other leptocerids; scrapers in some hydroptilids, and the helicopsyhid; filterers/fine particle feeders in the Hydropsychidae and Philopotamidae; predators among the Ecnomidae, *Oecetis*, Hydroptilidae and Polycentropodidae. Generally, the filter feeders dominated in faster flowing areas and the scavenger/shredders in slower flowing and pool regions.

Prior to this study *Hyalopsyche disjuncta* was known only from two adult specimens. Immature stages of *Hyalopsyche* were unknown and the relationships of the genus were enigmatic. These problems have been resolved by the last minute, chance discovery of the larvae and pupae in their unusual niche - silk tubes on logs among trapped leaf packs in sand in the JRR (Wells & Cartwright 1993).

Ephemeroptera (mayflies) (for details see Appendix 3)

Nine taxa of mayflies representing at least nine species and probably eleven (the baetids and caenids were not separated to species), in nine genera and four families, were present in the samples. Sites with greatest diversity were Cockatoo Creek-McDonnell Creek junction (site 5) with eight taxa, Cockatoo Creek at Telegraph Crossing (site 4) with seven, Dulhunty River (site 13) and Bertie Creek (site 10), both at Telegraph Crossing, each with six. Five taxa rank as *abundant* and these and one other are rated as *widespread*. Only one species is named. Twenty-four species are recorded from the ARR (P. Suter, OSS unpublished open file report) and at least 16 from YC (Pearson *et al.* 1986).

Odonata (dragonflies) (for details see Appendix 3)

Twelve stream-dwelling odonate taxa were collected, representing twelve species in as many genera in six families. The sites with greatest diversity were similar to those for the Ephemeroptera, with Bertie Creek at Telegraph Crossing (site 10), six species, Cockatoo Creek-McDonnell Creek junction (site 5) and Bertie Creek near Heathlands base (site 11), five each. Two species rank as *abundant* and *widespread*. Twelve species were also recorded from YC (Pearson *et al.* 1986) out of a total 110 species recorded from Cape York Peninsula. Ninety-five species are recorded from the NT, most from the ARR, which has a greater range of stream and billabong habitats and has been collected more intensively than the JRR (Watson *et al.* 1991).

Plecoptera (stoneflies) (for details see Appendix 3)

Only one species of stonefly was collected and it is ranked as *common* but *limited* in occurrence. *Iliesoperla tropica* has been recorded elsewhere on Cape York Peninsula and other species in the genus are known from eastern Australia (Theischinger 1984). Stoneflies are absent from the ARR but 8 species are recorded from YC (Pearson *et al.* 1986).

Conclusion

In general terms, the aquatic fauna of the Jardine River region can be characterised as containing a large contingent of broadly tolerant and widespread northern Australian species and smaller components of New Guinean/SE Asian and North Queensland/eastern Australian taxa. Several of the New Guinean taxa extend as far south as the Yuccabine Creek, but the southern groups present in the Yuccabine Creek fauna are mostly absent from the JRR. Similarly, the relictual southern component that occurs in the specialised habitats of the ARR is absent from the JRR. Thus, the fauna of the JRR reflects the relative uniformity and harshness of the stream environment and the proximity of the area to New Guinea.

Acknowledgments

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Appendix 1

The study sites

The following 12 rivers and streams were sampled at 15 sites in total; a brief description of the general nature of the stream at each site is given. At only one site, that on the North Alice Creek, was there no flow. The sampling methods employed at a particular site are indicated by the abbreviations LT (light trapping of adults) and HP (hand-picking of immatures).

Site	Locality	Sampling Method	Habitat Description
1	Jardine River, Telegraph Crossing	LT	very wide, deep, sandy bottom
2	Eliot Creek, upstream of junction with Canal Creek and upstream of Eliot falls	LT, HP	width about 20 m, faster flowing sections 0.1-0.2 m deep, bedrock base interspersed with large, deep, sandy bottomed pools; in open forest
3	Canal Creek upstream of junction with Eliot Creek	LT, HP	width 12-15 m, in faster flowing sections 0.2-0.3 m deep, bedrock base interspersed with small waterfalls and deep sandy pools; open forested margins
4	Cockatoo Creek, Telegraph Crossing	LT, HP	width 12-15 m, short riffles with loose rock and bedrock base, 0.3-0.4 m deep between large sandy bottomed pools; open forested area
5	Cockatoo Creek-McDonnell Creek junction	LT, HP	site essentially as for Site 4
6	Cockatoo Creek upstream McDonnell Creek junction	HP	10-12 m wide, otherwise as for sites 4 and 5
7	McDonnell Creek 80 m upstream of Cockatoo Creek	HP	short riffles 4-5 m wide flowing over bedrock and some loose cobbles, large pools 12-15 m wide, greater than 1 m deep, with sandy bottom; open forested area
8	Gunshot Creek, Telegraph Crossing	LT, HP	width 3-4 m, bottom mostly sand with some short riffle sections flowing over bedrock and roots, long slow-flowing reaches with log jams; shaded by closed canopy forest
9	Cholmondeley Creek, Telegraph Crossing	LT, HP	about 4-5 m wide, mainly sandy bottomed pools and slower-flowing reaches, short riffles flowing over bedrock and root matter; in mostly shaded woodland area
10	Bertie Creek at Telegraph Crossing	LT, HP	7-8 m wide, fast flowing over bedrock, about 0.3 m deep, with large rock holes and pools with sandy bottoms; woodland area
11	Bertie Creek, 1 km SE Heathlands Homestead	LT, HP	3-4 m wide, 0.5 m deep, flowing over sandy substrate with some root material and log jams near margins; shaded by closed woodland. Samples also taken about 500 m upstream at junction of two main tributaries
12	Tributary of Bertie Creek, 250 m SW of Heathlands homestead	LT, HP	up to 1 m wide, up to 0.1 m deep, small sandy bottomed pools with some loose rocks and root matter; well shaded, in woodland
13	Dulhunty River, Telegraph Crossing	LT, HP	up to 15 m wide, flowing over bedrock, with large, deep, sandy-bottomed pools; open woodland
14	North Alice Creek, Telegraph Crossing	HP	no flow, intermittent large pools, up to 0.5 m deep, base of sand, gravel and silt
15	Wenlock River, Morton Telegraph Crossing	HP	very wide, deep, sandy bottom

Ranked arbitrarily on size, the site order (based on observed width, depth, low wet season flow, plus catchment size) was assessed as:

1 > 15 > 2 > 13 > 4 > 5 > 6 > 3 > 7 > 10 > 11 > 8 > 9 > 14 > 12.

Appendix 2

Trichoptera collected from 15 sites in the Jardine River area, Cape York Peninsula. Total number of species at sites and number of sites from which a species was collected (Tot) are given as well as an estimate of relative abundance (RA) and an indication of distribution (Dist) of each species. In RA, R = rare; C = common; A = abundant. In Dist, R = restricted; L = limited; W = widespread. Definitions of codes are given in the text.

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Tot	RA	Dist
PHILOPOTAMIDAE																		
<i>Chimarra uranka</i>	-	+	+	+	+	+	+	+	+	+	+	+	+	-	-	12	A	W
<i>Chimarra</i> sp.n.C	-	-	+	-	-	-	-	+	+	-	+	+	-	-	-	5	C	W
<i>Chimarra</i> sp.n.F	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1	A	R
<i>Chimarra</i> sp.n.G	-	+	+	-	-	-	-	-	-	-	-	-	+	-	-	3	R	L
HYDROPSYCHIDAE																		
<i>Cheumatopsyche</i> sp.11	-	+	+	+	+	+	+	+	+	+	-	-	+	-	-	10	A	W
<i>Cheumatopsyche</i> sp.12	-	+	+	+	+	+	+	+	+	+	+	+	+	-	-	12	A	W
<i>Cheumatopsyche</i> sp.21	-	-	-	-	-	-	+	+	+	-	+	+	-	-	-	5	A	W
<i>Macrostemum saundersi</i>	-	+	+	+	+	+	+	+	+	+	+	+	+	-	-	12	A	W
<i>Baliomorpha</i> sp. A	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	3	R	L
POLYCENTROPODIDAE																		
<i>Paranyctiophylax parvus</i>	-	+	-	-	-	-	-	+	-	-	+	+	-	-	-	4	R	L
<i>Paranyctiophylax</i> sp.n.A	-	-	+	+	-	-	-	-	-	-	+	+	+	+	+	7	R	W
<i>Polycentropus</i> sp.n.A	-	-	-	-	+	-	-	+	-	-	+	+	-	-	-	4	C	L
<i>Polyplectropus</i> sp.n.A	-	-	+	+	+	-	-	+	+	+	+	+	+	-	-	9	A	W
HYALOPSYCHIDAE																		
<i>Hyakopsyche disjuncta</i>	-	-	-	-	+	-	+	+	-	+	-	+	-	-	-	5	A	W
ECNOMIDAE																		
<i>Ecnomus digrutus</i>	-	+	-	-	-	+	+	+	+	-	-	-	-	-	-	5	R	W
<i>Ecnomus mirivud</i>	-	+	+	+	+	-	-	+	+	+	+	+	+	-	-	10	A	W
<i>Ecnomus pakadij</i>	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	3	R	L
<i>Ecnomus veratus</i>	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-	7	C	W
<i>Ecnomus woronan</i>	-	-	-	-	+	+	+	-	-	-	+	+	-	-	-	5	R	W
<i>Ecnomus</i> sp.	+	+	+	+	+	-	-	+	+	+	+	+	+	-	-			
<i>Ecnomina</i> sp.n.A	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	2	R	R
<i>Ecnomina</i> sp.n.B	-	-	-	-	-	-	-	+	+	-	+	+	-	-	-	4	R	L
<i>Ecnomina</i> sp.n.J (NT)	+	-	-	+	+	-	-	-	-	+	-	-	+	-	-	5	A	W
<i>Ecnomina</i> sp.n.K (NT)	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1	R	R
<i>Ecnomina</i> sp.n.B (NT)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1	R	R
<i>Ecnomina</i> sp.nr. krokale	-	+	+	-	-	-	-	-	-	-	-	-	+	-	-	3	A	L
<i>Ecnomina</i> sp.	-	-	-	-	-	-	-	+	+	-	+	+	+	-	+			
<i>Ecnomina</i> L sp. 9	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	2	A	R
<i>Ecnomina</i> L sp. 13	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	3	R	L
PSYCHOMYIIDAE																		
<i>Tinodes radona</i>	-	+	+	-	-	-	-	-	+	+	-	-	+	-	-	5	A	W
HELICOPSYCHIDAE																		
<i>Helicopsyche</i> sp.	-	-	-	+	-	-	+	+	+	+	+	+	-	-	-	7	A	W
CALAMOCERATIDAE																		
<i>Anisocentropus latifascia</i>	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	4	R	L
LEPTOCERIDAE																		
<i>Triplectides parvus</i>	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	3	R	L
<i>Triplectides</i> sp.	-	-	-	-	-	-	-	+	-	-	-	+	+	+	-			

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Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Tot	RA	Dist
<i>Trienodes</i> sp.n.PT-763	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	2	R	R
<i>Trienodes</i> sp.n.PT-764	-	-	-	-	-	-	-	+	-	-	+	-	+	-	-	3	C	L
<i>Trienodes</i> sp.n.PT-782	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1	R	R
<i>Trienodes</i> sp.n.PT-801	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	2	R	R
<i>Trienodes</i> spp.	-	-	-	-	-	-	-	+	+	-	+	+	-	-	-			
<i>Setodes bracteatus</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	2	R	R
<i>Leptocerus assimulans</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1	R	R
<i>Leptocerus</i> sp.	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-			
<i>Oecetis</i> sp. NT sp.A	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	1	R	R
<i>Oecetis</i> sp. NT sp.B	-	+	-	-	+	-	-	+	-	-	+	-	+	-	-	5	C	W
<i>Oecetis</i> sp. CY sp.A PT-458	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	2	C	R
<i>Oecetis parka</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1	R	R
<i>Oecetis</i> sp. NT sp.K	-	+	-	-	-	-	-	+	-	-	+	-	+	-	-	4	C	L
<i>Oecetis</i> sp. CY sp.10	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	1	R	R
<i>Oecetis oresbiosa</i>	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	1	R	R
<i>Oecetis</i> CY sp.B PT-434	-	+	-	-	-	-	-	+	+	-	+	-	+	-	-	5	C	W
<i>Oecetis laustra</i>	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	1	R	R
<i>Oecetis australis</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1	R	R
<i>Oecetis</i> CY sp.C	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	2	R	R
<i>Oecetis</i> CY sp.D PT-453	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	2	R	R
<i>Oecetis</i> CY sp.E PT-449	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1	R	R
<i>Oecetis aeoloptera</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1	R	R
HYDROPTILIDAE																		
<i>Hydroptila incertula</i>	-	-	-	+	+	-	-	+	+	+	-	+	+	-	-	7	A	W
<i>Oxyethira incana</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1	R	R
<i>Oxyethira plumosa</i>	+	-	-	+	+	-	-	+	+	-	-	-	+	-	-	6	C	W
<i>Oxyethira triangulata</i>	+	-	-	+	-	-	-	+	+	+	+	-	-	-	-	6	C	W
<i>Jabirichia dostinei</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	R	R
<i>Acritoptila</i> sp.n.A	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1	R	R
<i>Hellyethira cornuta</i>	-	-	-	+	+	-	-	+	+	+	-	-	+	-	-	6	A	W
<i>Hellyethira cubitans</i>	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	2	R	R
<i>Hellyethira forficata</i>	-	+	-	+	+	-	-	+	+	+	+	+	+	-	-	9	C	W
<i>Hellyethira kukensis</i>	-	-	-	+	+	-	-	+	-	-	+	+	-	-	-	5	C	W
<i>Hellyethira ramosa</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1	R	R
<i>Hellyethira vernoni</i>	-	-	-	+	+	-	-	+	+	-	+	-	-	-	-	6	C	W
<i>Hellyethira</i> sp.n.A	-	-	-	-	+	-	-	+	-	-	-	+	-	-	-	3	R	L
<i>Tricholeiochiton bifurcata</i>	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	2	R	L
<i>Orthotrichia exiqua</i>	-	+	+	+	+	-	-	+	-	-	+	+	+	-	-	8	C	W
<i>Orthotrichia gressitti</i>	-	-	-	+	+	-	-	+	-	-	+	+	+	-	-	6	C	W
<i>Orthotrichia kholoensis</i>	-	+	-	+	+	-	-	+	-	-	-	-	-	-	-	4	R	L
<i>Orthotrichia muscari</i>	+	-	-	-	+	-	-	+	-	-	+	-	+	-	-	5	C	W
<i>Orthotrichia stipa</i>	+	-	+	-	-	+	-	+	+	-	+	+	-	-	-	7	C	W
<i>Orthotrichia tyleri</i>	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	2	R	R
<i>Orthotrichia</i> sp.n.A	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	1	R	R
<i>Orthotrichia</i> sp.n.B	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	1	R	R
Total species	7	16	13	21	25	9	11	47	22	17	35	28	36	3	2			

Appendix 3

Ephemeroptera, Plecoptera and Odonata collected from 15 sites in the Jardine River area, Cape York Peninsula. Total number of species at sites and number of sites at which a species was collected (Tot) are given as well as an estimate of relative abundance (RA) and indication of distribution (Dist) of each species. See Appendix 2 and in the text for definitions of codes.

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Tot	RA	Dist
Ephemeroptera																		
LEPTOPHEBIIDAE																		
<i>Jappa</i> sp. B	-	+	+	+	+	-	+	-	-	+	-	-	+	-	-	7	A	W
<i>Ulmerophlebia</i> sp. 6	-	+	+	+	+	-	+	+	+	+	+	+	+	-	-	11	A	W
<i>Thraulus</i> sp. A	-	-	-	+	+	-	+	+	-	+	+	-	+	-	-	7	C	W
<i>Atalophlebia</i> sp. 2	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	9	A	W
<i>Koormonga</i> sp. 4	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	1	R	R
PROSOPISTOMATIDAE																		
<i>Prosopistoma sedlaceki</i>	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	2	R	R
BAETIDAE																		
Baetid species	-	+	+	+	+	-	+	+	+	+	+	+	+	+	-	12	A	W
CAENIDAE																		
<i>Tasmanocaenis</i> sp. A	-	-	-	+	+	-	-	-	-	-	-	-	-	+	-	3	?	?
Caenidae sp. A	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	2	?	?
Caenid species	+	+	+	+	-	-	-	+	+	+	-	+	+	-	+	10	A	W
Total taxa	1	4	5	7	8	0	5	5	4	6	4	5	6	2	1			
Plecoptera																		
<i>Iliesoperla ? tropica</i>	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	4	C	L
Odonata																		
LESTOIDEIDAE																		
<i>Lestoidea</i> sp. A	-	-	-	+	+	+	+	+	-	+	+	+	+	-	-	9	A	W
LIBELLULIDAE																		
<i>Nannophlebia</i> sp. A	-	+	-	-	+	-	+	+	-	+	+	+	+	-	-	8	A	W
GOMPHIDAE																		
<i>Austrogomphus</i> sp. A	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	1	R	R
<i>Antipodogomphus</i> sp. A	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	2	R	R
<i>Hemigomphus</i> sp. A	-	+	-	+	-	-	-	+	-	-	+	+	-	-	-	5	C	L
PROTONEURIDAE																		
<i>Nososticta</i> sp. A	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	2	R	R
CORDULIDAE																		
<i>Austrocordula refracta</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1	R	R
<i>Choristhema</i> sp. A	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	1	R	R
<i>Macromia cf viridescens</i>	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	1	R	R
<i>Hemicordula intermedia</i>	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	2	R	R
<i>Pantthemis membranulata</i>	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	2	R	R
COENAGRIONIDAE																		
<i>Pseudagrion</i> sp. A	-	-	-	-	-	-	-	-	-	+	+	-	+	-	-	3	R	L
Total taxa	0	2	0	2	5	1	3	4	1	6	5	4	4	0	0			

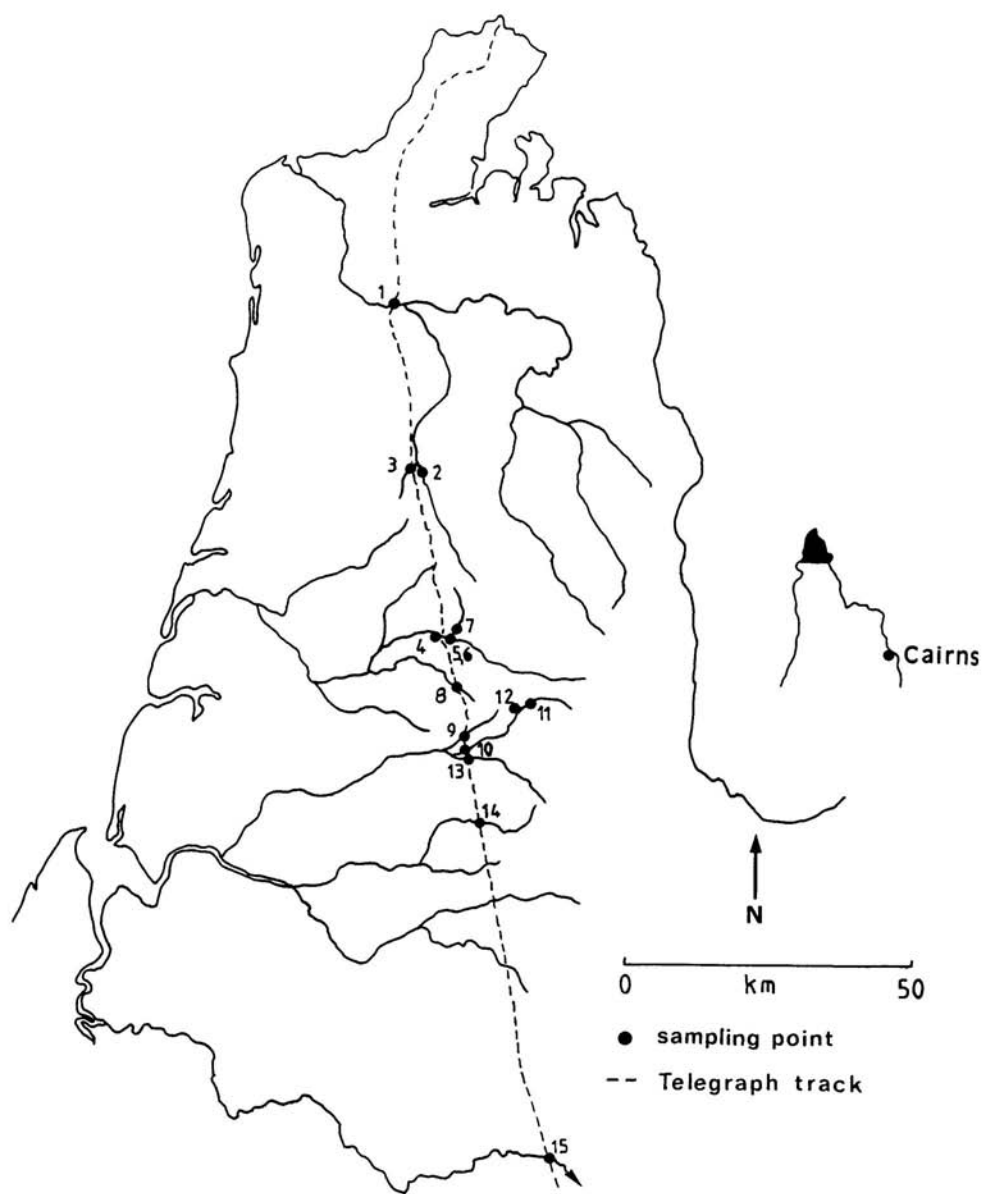


Figure 1. Map of collection sites.