



## INTRODUCTION

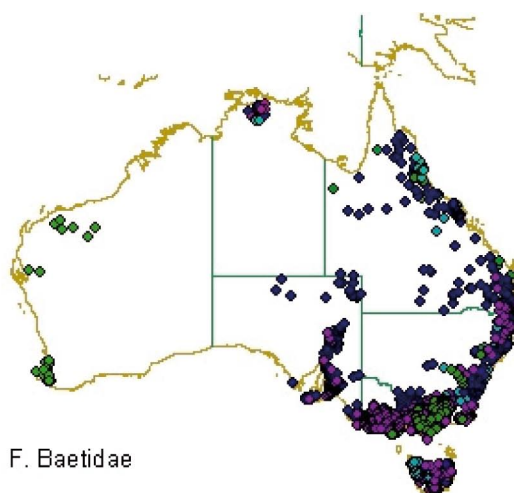
Rapid Bioassessment (RAP) methods have been used in Australia to detect and track changes in the health of freshwater bodies. Applying RAP, the national sampling programs (Monitoring River Health Initiative — MRHI and First National Assessment of River Health — FNARH) generally identified aquatic macroinvertebrates to family level only.

It is well known that family level identification has limitations, being adequate to detect major disturbances, but insensitive to more subtle changes. One reason for this is that many of the aquatic macroinvertebrates families are Australia-wide in distribution and, importantly, the often species within each family have widely varying ecological tolerances. Subtle changes can only be detected at species level. This limits the ability to predict effects of environmental change such as global warming, impacts of different land uses, or water extraction. Family-level identification is insufficient, too, to allow detection of taxa that have limited distributions, meriting assignment of conservation status as threatened or endangered.

Data and samples collected systematically and from a wide range of localities under the MRHI and FNARH programmes provided excellent raw material for examination of species and habitat occurrence Australia-wide, and we thank the various State and Territory agencies for providing access to this material.

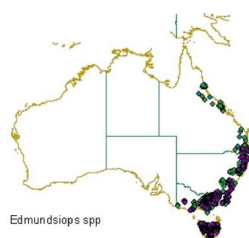
Agencies used the same RAP protocols, but inconsistencies exist between them in taxa identified. We targeted four orders of insects, three of which, Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies), collectively designated 'EPT', are well documented as providing, alone, a useful measure of stream water quality. Odonata were included as these tend to be easily observed and their taxonomy in Australia is probably more stable than that of many groups.

Below, clearly illustrating the limitations of family-level studies, are maps of one of the mayfly families, the Baetidae, at three levels: for family, with the genera colour-coded; for the six genera within the family; and, finally, for the six species within the genus *Offadens*. Visit the treatments for each order for further examples.

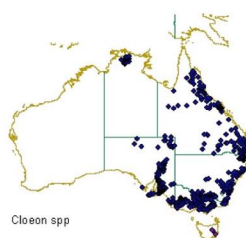


F. Baetidae

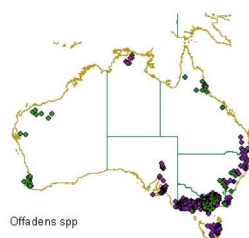
Distribution of the Family Baetidae in Australia.



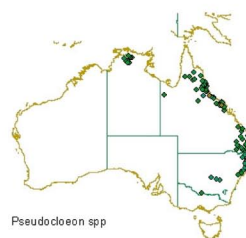
Edmundsiops spp



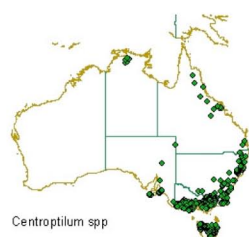
Cloeon spp



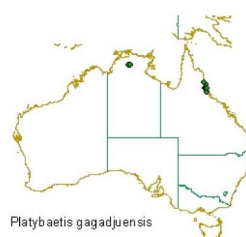
Offadens spp



Pseudocloeon spp

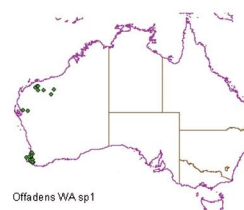
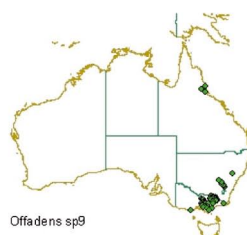
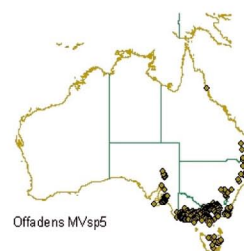
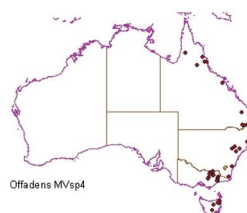
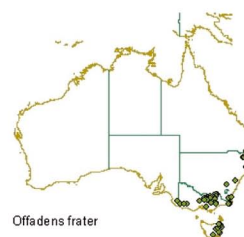
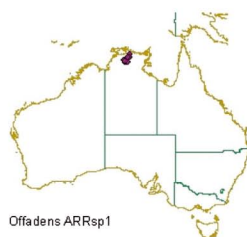


Centroptilum spp



Platybaetis gagadjuensis

Distribution of the six baetid genera.  
(Note that all genera except the monospecific *Platybaetis* are widespread).



Distribution of the six species of the genus *Offadens* in Australia.  
(Note that it is not until individual species are examined that the restricted nature of the distributions is apparent. Thus species-level consideration increases the ability to detect localised or major environmental changes.)

The aims of this study were to;

1. address this limitation of the Family-level identification by identifying selected species from the four major Orders of Aquatic Insects, the Ephemeroptera (Mayflies), Plecoptera (Stoneflies), Trichoptera (Caddisflies) and Odonata (Dragon- and Damselflies) and
2. associate each species with the ecological data to develop an ecological/habitat profile for each species. A trial study on the Queensland mayflies ((Suter *et al.* 2002)) was used as a template for this Australia-wide study.

Over 20,000 macroinvertebrate samples from all Australian States and Territories from the Monitoring River Health Initiative (MRHI) and First National Assessment of River Health (FNARH) were examined. These samples came from over 5000 locations. All samples were collected using the River Bioassessment protocol (Davies 1994) with samples taken in spring and autumn. Associated with each sample was a series of environmental parameters (Davies 1994). A list of these parameters is given



in [Table 1](#). The mean, median and range of each parameter are presented for each species recorded from five or more locations.

There are obvious limitations to the data, but it is considered valuable to present the distributions and habitat data even with these limitations as they still are the best available information. It is recognised that these values will be influenced by the timing of sampling (autumn and spring) and do not cover the possible extremes of conditions. As samples were taken with a hand-held sweep net these data are also limited to streams under 1m in depth. In addition, because all habitats were not sampled it is likely that some species are under-represented in this collection and therefore the distribution patterns may not be the same as have been recorded previously. There was also variation in the quality of the data from different States with some parameters provided in categories rather than actual measurements; and the units for parameters sometimes varied (e.g. 'Distance from source' was recorded in km or metres, nutrients in mg/L or gm/L). All measures were converted to a single unit type in the analyses. There was also variation in the samples provided by States for examination and consequently some areas are poorly represented in the samples. Only mature specimens were identified and this too may have limited the distributional data. For example, many of the samples from the Northern Territory were dominated by juvenile specimens that could not be identified below Family level. Material from South Australia was identified by SA Water staff and some Tasmanian material was identified by staff from DPIE Tasmania. Most material provided was from the fast-flowing, shallow riffle habitat and the edge habitat along the banks of the streams. There were also numerous samples from pools, pool rocks, aquatic plants (macrophytes) and logs that had no associated sample parameters. However, within these limits it was considered valuable to present these distribution data and provide an indication of the habitats occupied by each species from the reliably identified material and sample data.

Each sample was sorted and the selected species were identified using (Tillyard 1933; Hynes 1978, 1989; Hynes and Bunn 1984; Suter and Bishop 1990; Suter 1993, 1997, 1999a, 1999b, 2000; Suter 2001; Dean and Suter 1996; Cartwright 1997; Yule 1997; Campbell and Hubbard 1998; Cartwright 1998; Hawking and Theischinger 1999; Dean 1997, 1999a, 1999b, 1999c; Lugo-Ortiz *et al.* 1999; Theischinger 2000, 2001, 2002; Cartwright 2002; Suter and Pearson 2001; Dean and Suter 2004). Some of the species included have not been identified formally and are given a unique number, usually an Australian Voucher (AV) number (e.g. *Coloburiscoides* spAV1) or a Museum of Victoria (NMV) number (e.g. *Offadens* MVsp5).

A distribution map for each species was prepared using Global Map Data Australia 1M (Auslig 2001) and for each species the altitude frequency, distance from source frequency, mean substrate particle size, stream width-frequency, depth-frequency, alkalinity frequency and conductivity frequency graphs were plotted. The ecological profile was determined using the habitat parameters. These profiles are presented as printable individual fact sheets for each species.