

Collecting biological specimens in the Northern Territory with particular reference to terrestrial invertebrates: guidelines to current legislation and permits

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Abstract

Guidelines to current legislation and permits regarding the collection of biological material, particularly terrestrial invertebrates, in the Northern Territory (NT) under the *Territory Parks and Wildlife Conservation Act (TPWC Act)* and the Commonwealth *Environment Protection and Biodiversity Conservation Act (EPBC Act)* are provided. Definition of several terms under the NT Government *Act*, types of permits issued by the NT Parks and Wildlife Service, and various land management systems in the NT are outlined. Contrary to popular belief that all insects and invertebrates in the NT (estimated to range from 24 900 to 63 500 species for insects) are protected, only 48 species, from the Phyla Mollusca (31), Chelicerata (13) and Insecta (4), are currently listed as protected wildlife. Of the protected species, 35 are designated as threatened wildlife, of which five are also listed nationally under the *EPBC Act*. However, all native invertebrates that occur within the boundaries of national parks and other conservation areas managed by the NT Parks and Wildlife Service or Parks Australia are protected under the *TPWC Act* or *EPBC Act*, respectively. Relative merits of the current legislation and permit system are briefly discussed.

Introduction

The following notes are provided to clarify the current situation regarding the collection of, and/or conduct of research on, biological specimens (especially terrestrial invertebrates) in the Northern Territory (NT). In particular, guidelines to the permit process administered by the NT Parks and Wildlife Service (PWS) and legislation under the *Territory Parks and Wildlife Conservation Act (TPWC Act)* are provided, together with the definition of several terms under the *Act*, types of permits issued by both the NT PWS and Commonwealth Department of the Environment and Water Resources (DEWR), and various land management systems operating in the NT. While these notes are compiled primarily from the perspective of insects and allied forms, the principles currently apply equally well to vascular plants and

vertebrates in the NT. However, unlike invertebrates and plants, all vertebrates are protected in all areas of land in the NT, and research that involves their capture or collection requires ethics approval for the NT PWS permit process through the Charles Darwin University Animal Ethics Committee.

While some collectors are familiar with and have followed the permit process, it appears that there has been much misunderstanding in recent years of how the system works. Moreover, there appears to be a general misconception among entomologists operating outside the NT that all NT invertebrates are protected. As a result, some collectors have avoided working in the NT altogether, while others have almost certainly been breaking the law. This article has therefore been prepared partly in response to these matters; it is not necessarily intended to address or improve any inadequacies of the present system, but rather to provide an overview of the prevailing situation.

Territory Parks and Wildlife Conservation Act

Under the *TPIWC Act*, invertebrates (which of course include insects) are recognised as animals. As such they are subject to the broader definition of **wildlife** which, under the *Act*, includes both animals and plants that are indigenous to Australia, migratory animals that periodically or occasionally visit Australia or the Australian coastal sea, or animals and plants of a kind introduced into Australia directly or indirectly by Aborigines before 1788. In the NT, wildlife may be either 'protected' or 'unprotected'. Under section 43 of the *Act*, **protected wildlife** is defined as all wildlife that occurs in a park, reserve, sanctuary, wilderness zone or area of essential habitat, or wildlife that is a vertebrate that is indigenous to Australia, or the Regulations may prescribe species of wildlife that are protected wildlife, or the Minister for Parks and Wildlife may declare that a species of wildlife is protected wildlife. In the NT, the former category primarily concerns parks and reserves managed by the PWS for the conservation of biodiversity. Protected wildlife also includes 'threatened wildlife'. Under section 30 of the *Act*, **threatened wildlife** include those species for which their conservation status has been determined as either being Critically Endangered, Endangered or Vulnerable, and these taxa must be identified by the Minister by notice in the *Gazette*, the NT Government's official periodical publication. Currently, 48 species of invertebrates (from the Phyla Mollusca, Chelicerata and Insecta) are currently listed as protected wildlife, of which 35 are designated as threatened wildlife (Table 1). The remaining 13 species include the arachnids listed in Table 1, which were declared as protected wildlife under section 43(3) of the *Act* by the Minister in October 2003 (*Gazette No. G39*). The theraphosid spiders include three species in the NT: *Selenocosmia crassipes*, *S. stirlingi* and *Selenotholus foelschi*. The two genera of scorpions *Urodacus* and *Liocheles* are represented by 10 species, but others will almost certainly be found to occur in the NT. The species of scorpions currently recorded from within the boundaries of the NT are *Urodacus armatus*, *U. carinatus*, *U. centralis*, *U. excellens*, *U. giulianii*, *U. hoplurus*, *U. yaschenkoi*, *Liocheles australasiae*, *L. extensa* and *L. waigiensis* (Brown 2007).

Table 1. Terrestrial invertebrates currently listed as protected wildlife under the NT *Territory Parks and Wildlife Conservation Act*. Conservation status of threatened wildlife is as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable. Asterisk (*) designates those taxa also listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act*.

Mollusca: Gastropoda

Amphidromus cognatus (VU)
Basedowena squamulose (VU)
Bothriembryon spenceri (VU)
Dirutracia sublevata (VU)
Divellomelon hillieri (VU)
Granulomelon arcligerens (VU)
Granulomelon gilleni (VU)
Granulomelon grandituberculata (VU)
Mesodontrachia desmonda (EN)
Mesodontrachia fitzroyana (CR)*
Ordtrachia australis (EN)
Ordtrachia septentrionalis (EN)
Pillomena aemula (VU)
Prototrachia sedula (VU)
Semotrachia caupona (VU)
Semotrachia elleryi (VU)
Semotrachia emilia (VU)
Semotrachia esau (VU)
Semotrachia euzyga (EN)*
Semotrachia filixiana (VU)
Semotrachia huckittana (VU)

Semotrachia illarana (VU)
Semotrachia jessieana (VU)
Semotrachia jinkana (VU)
Semotrachia rossana (VU)
Semotrachia runutjirbana (VU)
Semotrachia winneckeana (VU)
Setobaudinia victoriana (VU)
Sinumelon bednalli (CR)*
Trochomorpha melvillensis (VU)
Vidumelon watti (VU)

Chelicerata: Arachnida

Theraphosidae (all indigenous species)
Urodacus (all indigenous species)
Liocheles (all indigenous species)

Insecta: Lepidoptera

Attacus wardi (EN)
Croitana aestiva (EN)*
Euploea alcatheae enastri (EN)*
Ogyris iphis doddi (EN)

It is important to clarify the distinction between protected and unprotected wildlife as this has significant ramifications in terms of current legislation, permit requirements and penalties. All native invertebrates which occur in national parks and other conservation areas (nature parks, conservation reserves, coastal reserves, historical reserves) are by default protected wildlife within the boundary of the park or reserve. Invertebrates designated as protected wildlife (Table 1), including all threatened taxa, are deemed to be protected wildlife both on and off all parks and reserves. Invertebrates which are not listed as threatened or protected wildlife under the *Act* or that occur outside parks and conservation areas (e.g. Aboriginal lands, Territory forest/timber reserves, defence lands, pastoral lands) constitute unprotected wildlife.

However, the situation is slightly more complicated. The collection of or interference with any invertebrate for scientific purposes is classed as a 'commercial purpose'. Under section 9 of the *TPWC Act*, **commercial purpose** means the keeping, breeding, displaying, moving or other dealing with or use of the animal or plant for the purposes of selling, trading or bartering with the animal or plant or of otherwise

earning a livelihood or making a profit. The *Act* goes on further to say that this "includes the use of animal or plant for scientific purposes." The *Act* does not define what constitutes a scientific purpose, but the general interpretation in the past has been that this implies a research activity leading to a scientific outcome, such as publication. In other words, even if the activity constitutes a scientific purpose without a commercial outcome, a permit is still required to take or interfere with invertebrates regardless of whether the species represent protected wildlife or unprotected wildlife. A permit is not required for general collecting of unprotected wildlife in which the activity does not constitute a scientific or commercial purpose. Additionally, a permit is not required if the scientific purpose does not involve the collecting of or interference with the wildlife, such as observational studies.

Permits issued by the Northern Territory Parks and Wildlife Service

In brief, there are several types of permits issued by the NT PWS under the *TPWC Act*, but rarely does one need to apply for more than two permits. The most important permits are as follows: (1) a permit is required to take or interfere with protected wildlife which, in the case of invertebrates, is all taxa indigenous to the NT if the activity is to occur within a park or reserve, or involves those taxa listed in Table 1 if the activity is to occur outside of a park or reserve; (2) a permit is required to take or interfere with wildlife (protected or unprotected) for commercial purposes, which includes scientific purposes, irrespective of location of the activity; (3) a permit is required to keep protected wildlife in the NT, including dead animals or parts thereof, which for invertebrates is those taxa listed in Table 1; and (4) a permit is required to import into, or export from the NT, protected wildlife. That is, an export permit is needed to take a protected invertebrate from the NT and move it interstate. Additionally, there are prohibited entrants permits, which are required to bring into, keep, and remove from the NT a 'prohibited entrant'. Under section 53 of the *Act*, a **prohibited entrant** is a species of invertebrate or plant that is not indigenous to the NT, and must be declared by the Minister (by notice in the *Gazette*) to be a prohibited entrant. The only invertebrates that are listed as prohibited entrants are all species of arachnids (i.e. spiders, scorpions, pseudoscorpions, harvestmen, mites, ticks etc) that are not indigenous to the Territory. These were declared by the Minister under section 53 of the *Act* in June 2002 (*Gazette No. G22*).

The permits most relevant to entomologists and invertebrate biologists residing in the NT are numbers (1), (2) and (3) listed above. Conversely, the permits most relevant to entomologists residing outside the NT are numbers (1), (2) and (4). Applications for these permits are relatively straightforward and are available from the Parks and Wildlife Service of the Northern Territory, PO Box 496, Palmerston, NT 0831 (or Ground Floor, Goyder Centre, 25 Chung Wah Terrace, Palmerston). Further information can be obtained from the following sources: telephone: (08) 8999 4795 / 8999 4814; facsimile: (08) 8999 4524; e-mail: pwpermits.nreta@nt.gov.au; website: <http://www.nt.gov.au/nreta/wildlife/permits/index.html> There is no fee to obtain

these permits, but the applicant needs to allow for up to two months for the permit to be processed. The permits are generally valid for a period of up to 12 months, after which a report must be submitted to the NT PWS summarising the results of the work undertaken.

Environment Protection and Biodiversity Conservation Act and permits issued by the Commonwealth Department of the Environment and Water Resources

Invertebrates which have been listed as threatened species under the Commonwealth *Environment Protection and Biodiversity Conservation Act (EPBC Act)* are protected nationally. There are currently five species of invertebrates in the NT that are affected by this legislation (Table 1). These are the butterflies Gove Crow *Euploea alcatheae enastri* and Desert Sand-skipper *Croizana aestiva*, both of which are listed as Endangered under the *EPBC Act*, and the three land snails *Mesodontrachia fitzroyana*, *Sinumelon bednalli* and *Semotrachia enzyga*, the first two of which are listed as Critically Endangered. *Euploea alcatheae enastri* was listed on 6 August 2003, while the four other species were listed on 18 August 2006. All five taxa are endemic to the NT and are listed as threatened species in the NT (Table 1). There are, however, proposals to align all threatened taxa endemic to the NT with the national list under the *EPBC Act*.

To collect nationally listed species when they occur on Commonwealth land, a permit is required from the DEWR, in addition to the permits issued by the NT PWS. The relevant permit under the *EPBC Act* is a "Permit to kill, injure, take, trade, keep or move a member of a listed threatened species or ecological community, a member of a listed migratory species, or a member of a listed marine species in or on a Commonwealth area". Applications for this type of permit are available from the Wildlife Conservation Branch, Department of the Environment and Water Resources, GPO Box 787, Canberra, ACT, 2601 (or John Gorton Building, King Edward Terrace, Parkes, ACT), or can be downloaded as a Microsoft Word file from <http://www.environment.gov.au/cpbc/permits/species/pubs/species-application-form.doc> Further information can be obtained via: telephone: (02) 6274 1111 / 6274 1907; facsimile: (02) 6274 1666; e-mail: epbcwild@environment.gov.au; or on the website: <http://www.environment.gov.au/biodiversity/threatened/index.html> A fee of \$100 is required for this permit and will only be issued by the Environment Minister if the activity contributes significantly to the conservation of the listed threatened species; or the specified activity is of particular significance to indigenous tradition, and will not adversely affect the survival or recovery in nature of the conservation status of the listed threatened species concerned; or the specified activity is necessary in order to control pathogens, and is conducted in a way that will, so far as is practicable, keep to a minimum any impact on the listed threatened species concerned. This permit does not cover taking or sending specimens out of Australia for which a separate export permit is required.

A DEWR permit is not required to collect nationally listed species when they occur on land other than that managed by the Commonwealth. However, the applicant must submit a referral to the DEWR in order to obtain approval to collect nationally listed species on non-Commonwealth lands.

Land management

It is important to emphasise that the permits outlined above do not provide permission to enter NT land. Land in the NT is managed by various landholders and permission must be sought well in advance to enter these lands, including Territory land (e.g. parks, reserves), Commonwealth land (e.g. national parks, defence land), and private land (e.g. pastoral, Aboriginal).

Parks and reserves

Areas of land managed by the NT PWS are divided into three main regions (Northern, Katherine, Southern), each of which comprises a number of districts. A copy of the application will be sent to the appropriate Chief District Ranger (CDR) for approval prior to a permit being issued. Once the permit has been issued, the applicant will need to contact the CDR to determine the exact times and areas to be visited in each park/reserve and to ensure that the proposed collecting activity does not conflict with park management. This is an important courtesy as it is required to ensure that collecting does not conflict with the day to day management operations or with sensitive areas (e.g. Aboriginal sacred sites). Depending on the circumstances, the applicant may also be required to meet the Senior District Ranger or Ranger-in-Charge of the park/reserve before commencing field work. If field work is to be undertaken at any of the Parks and Wildlife Service's jointly managed parks and reserves, approval must be obtained from the traditional owners. Generally, this approval is provided by the Board of Management for the park/reserve. The Boards of Management usually meet only bi-monthly or quarterly so it is essential that applications are submitted well in advance (2-4 months) of any proposed field work. Often a representative of the traditional owners will accompany collectors who may be required to meet any expenses and reimburse them for their time and expertise. Parks/reserves which fall into this category under the NT *Parks and Reserves (Framework for the Future) Act 2003* are: Nitmiluk (Katherine Gorge), Cobourg (Garig Gunak Barlu), Djukbinj, Barranyi and Tnorala National Parks/Conservation Reserves. In addition, Umbrawarra Gorge National Park and Tjuwaliyn (Douglas Hot Springs) Nature Park are to be jointly managed soon, and there are proposals to jointly manage the remaining parks within the next two years (see <http://www.dcm.nt.gov.au/dcm/parks/parks/index.shtml>).

Australian parks

The NT PWS permits do not provide permission to undertake research in national parks managed by the Commonwealth: Kakadu National Park and Uluru-Kata Tjuta

National Park. These two NT parks are jointly managed by traditional owners and Parks Australia from whom permits must be obtained under the *EPBC Act* to carry out research. If the research affects listed threatened species or ecological communities, then a second permit is required. As noted above, a fee of \$100 is required for this second permit and will be issued only if the activity contributes significantly to the conservation of the threatened species or ecological community. Parks Australia is insistent on traditional owner involvement in the research activity wherever possible. Contact details are as follows: Parks Australia, Department of the Environment and Water Resources, GPO Box 787, Canberra, ACT 2601 (telephone: (02) 6274 1673; facsimile: (02) 6274 2309; website: <http://www.environment.gov.au/parks/permits/index.html#apply> to download permit application forms for Uluru-Kata Tjuta and Kakadu National Parks). Alternatively, contact the Permits Officer, Kakadu National Park, PO Box 71, Jabiru, NT 0886 (phone: (08) 8938 1120; e-mail: Kakadunationalpark@environment.gov.au), or the Permits Officer, Uluru-Kata Tjuta National Park, PO Box 119, Yulara, NT 0872 (telephone: (08) 8956 1100, facsimile: (08) 8956 2064; e-mail: uluru.admin@environment.gov.au). Allow at least 2-3 months for the application to be processed.

Pastoral land

In the case of pastoral lands (leasehold land managed by graziers), the applicant will need to write to the landholder several weeks in advance and then follow up with a phone call just prior to field work to explain what is intended. The NT PWS permit application must be accompanied by proof that landholder permission has been granted (the signed landholder declaration in the application form) for the permit to be issued.

Aboriginal land

The NT PWS permits do not provide permission to enter Aboriginal land (private land managed by traditional owners). Those intending to visit or travel through Aboriginal land in the NT are legally required to have a permit. These permits are administered by the NT Land Councils on behalf of the traditional owners. Normally two permits are required, one to enter and remain on Aboriginal land and another to conduct research (special purpose permit). Application forms for these permits are obtained from the Northern Land Council for the northern and Katherine regions, Central Land Council for all areas south of Tennant Creek, Tiwi Land Council for Tiwi Islands (Bathurst, Melville), or Anindilyakwa Land Council for Groote Eylandt. Contact details for these land councils are given in Table 2. For research permits, it is generally advised to allow at least two months in advance for processing; if approval has been granted, the traditional owners will probably accompany the applicant and may expect payment for their time and expertise.

Table 2. Contact details for Aboriginal land councils in the Northern Territory.

Address	Phone/fax	E-mail	Website
Northern Land Council PO Box 42921, Casuarina, NT 0810	Ph: (08) 8920 5100 Fax: (08) 8945 2633	permits@nlc.org.au	http://www.nlc.org.au/html/permits.html
Central Land Council PO Box 3321, Alice Springs, NT 0871	Ph: (08) 8951 6211 Fax: (08) 8953 4343	permits@clc.org.au	http://www.clc.org.au/permits/
Tiwi Land Council PO Box 38545, Winnellie NT 0821	Ph: (08) 8981 4898 Fax: (08) 8981 4282		http://www.tiwilandcouncil.net.au/Visiting/TIWI-Visiting.htm
Anindilyakwa Land Council PO Box 172, Alyangula, Groote Eylandt, NT 0885	Ph: (08) 8987 6710 Ph: (08) 8987 6638 Fax: (08) 8987 6745 Fax: (08) 8987 6293		http://www.angurugu.nt.gov.au/home/our_community/visitor_information

Discussion

It is recommended that entomologists conducting research in the Northern Territory work through the permit process. Otherwise the penalties are fairly severe, particularly for offences relating to protected wildlife. Under section 66 of the *Act*, the penalty for restraining for any length of time by any means protected wildlife without authorisation, or to take protected wildlife out of the NT without authorisation, is 500 penalty units (\$55 000) or imprisonment for 5 years and, in the case of threatened wildlife, 1 000 penalty units (\$110 000) or imprisonment for 10 years.

The NT PWS permits are relatively easy to obtain, and the reporting requirements are fairly minimal. Permit holders are required to submit a report within 21 days of expiration of the permit. Any publications arising from the work must also be submitted. NT PWS now prefer reports to be submitted in digital form, although it is envisaged that in future a CD, providing specific fields to be completed, will be mailed to permit holders. The basic requirements include a summary of the species (and number) recorded or collected, the locations sampled (including site, description, habitat, coordinates), date(s), and methods used. Failure to submit a return will prevent the applicant from obtaining subsequent permits. The NT differs from permit systems operating in other states; for example, the model currently adopted in Queensland by the Entomological Society of Queensland in which access to collect invertebrate material from state lands (e.g. State Forests, Timber Reserves) and conservation areas (National Parks), and/or to collect protected species, are administered by a delegate of the society as the permit holder. There is limited provision to obtain a blanket permit to cover all parks and reserves in the NT, or parks and reserves within any of the three major regions of the NT; however, this may be improved in future. To obtain a blanket permit the applicant must either specify

each park to be sampled or request 'all parks and reserves in the NT' in the application form. The application will then be sent out to each CDR and joint management committee of all parks for approval so this will take some time to process.

In summary, the NT permit system might seem on first impression a complex bureaucratic process to many entomologists. A major weakness of the *TPIWC Act* appears to be the interpretation of 'commercial purpose', which I believe is ambiguous, as the *Act* does not define what constitutes 'scientific research' or 'scientific purpose'. There are, however, proposals to separate permits for scientific research, whether collection- or observation-based studies, from those for 'commercial purposes', so it remains to be seen if research on invertebrates will continued to be classed as a commercial activity. Be that as it may, the current system is designed to ensure the conservation of our biodiversity in the long term and ensure that landholders have a real input into the research activities carried out on their lands. Moreover, permits are a way of managing or monitoring research activity on lands managed by different landholders, and a mechanism whereby raw data concerning the identity and distribution of wildlife can be reported and centralised. Compared with vertebrates and vascular plants, the terrestrial invertebrate fauna of NT is poorly known – around 8 200 species of insects are currently recognised from the NT (Brown 2007), but the actual size of the insect fauna is estimated to range from 24 900 to 63 500 species (Appendix 1). Hence, there are great opportunities for discoveries of new species and new localities/range extensions of known species. It is therefore important to follow the system that is currently in place to take advantage of the opportunities that the NT has to offer.

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References

- Austin A.D., Yeates D.K., Cassis G., Fletcher M.J., La Salle J., Lawrence J.F., McQuillan P.B., Mound L.A., Bickel D.J., Gullan P.J., Hales D.F and Taylor G.S. (2004) Insects 'Down Under' – diversity, endemism and evolution of the Australian insect fauna: examples from select orders. *Australian Journal of Entomology* 43, 216-234.
- Braby M.F. (2004) *The Complete Field Guide to Butterflies of Australia*. CSIRO Publishing, Melbourne.
- Brown G.R. (2007) *The Insects of the Northern Territory*. CD-ROM. CBIT, University of Queensland (in press).

Northern Territory Government (2006). Animals of the NT, Department of Natural Resources, Environment and the Arts. <http://www.nt.gov.au/nreta/wildlife/animals/animalsnt/index.html> (accessed 02 March 2006)

Samways M.J. (1994) *Insect Conservation Biology*. Chapman and Hall, London.

Theischinger G. and Hawking J. (2006) *The Complete Field Guide to Dragonflies of Australia*. CSIRO Publishing, Melbourne.

Yeates D.K., Harvey M.S. and Austin A.D. (2003). New estimates for terrestrial arthropod species-richness in Australia. *Records of the South Australian Museum Monograph Series* 7, 231-241.



The Black-headed Skimmer *Crocotthemis nigrifrons*, a dragonfly (Odonata: Libellulidae). Fogg Dam, Northern Territory. (Don Franklin)

Appendix 1. Estimation of the number of terrestrial insect species in the Northern Territory.

Three estimates are provided below in an attempt to quantify the number of terrestrial insects in the NT. All estimates are based on various assumptions and extrapolations from other groups. Although the estimates vary greatly, they are of similar order of magnitude, and suggest the total insect fauna lies somewhere between 25 000 and 63 000 species. The third estimate, based on a crude determination of β -diversity (the turnover of species composition with distance), is probably too high because it is doubtful that most insect groups are represented in the NT by as much as one third of the Australian fauna (the two higher taxa used in the estimates frequently have widespread distributions within Australia due to their high dispersal ability, and consequently have a relatively high representation in the NT).

- (1) The number of non-marine vertebrates in the NT is approximately 960 species (Northern Territory Government 2006). Samways (1994) estimated that vertebrates comprise around 3%, and insects around 78%, globally of all animal species. Therefore, the estimated total number of terrestrial insects in the NT, based on the number of non-marine vertebrates in the NT, is 24 900 species:

$$\frac{960 \text{ NT vertebrates}}{0.03 \text{ world vertebrates}} \times 0.78 \text{ world insects} = 24\,900 \text{ species}$$

- (2) The number of described species of insects recorded from the NT is approximately 8 200 (Brown 2007). Austin *et al.* (2004) estimated that around 25% of Australian insects have been formally recorded and described. Therefore, the estimated total number of terrestrial insects in the NT, based on present knowledge of known species in the NT, is 32 800 species:

$$\frac{8\,200 \text{ NT described insects}}{0.25 \text{ Australian described insects}} = 32\,800 \text{ species}$$

- (3) The terrestrial Australian insect fauna is estimated to be around 205 000 species (Yeates *et al.* 2003). Two popular groups of insects that are relatively well-known taxonomically are the Odonata (dragonflies and damselflies) and the Hesperioidea and Papilionoidea of the Lepidoptera (butterflies). Both groups are represented in the NT by around 31% of the Australian fauna [dragonflies: 100 NT species out of 324 Australian species (Theischinger and Hawking 2006); butterflies: 135 NT species out of 434 Australian species (Braby 2004 and unpublished data)]. Assuming that other groups have a similar proportional representation to dragonflies and butterflies in the NT, the estimated total number of terrestrial insects in the NT is therefore 63 500 species:

$$205\,000 \text{ Australian insects} \times 0.31 \text{ NT} = 63\,500 \text{ species}$$