

TEMs Links



NOVEMBER 2003 VOLUME 4 ISSUE 3

CC's Corner

Dear All,

Another year is almost past and we are all consumed with final unit assessment, a busy time. This issue we are featuring thesis abstracts from recent MTEM completions, a diverse range of topics, ranging from lorikeet food sources to mine site rehabilitation in Nhulunbuy to sustainable harvest of wood products for artefact production in Maningrida. We had seven graduates from TEM courses at the October ceremony, pictures on page 3, congratulations to all!



In other news Penny Wurm, the CRC Education Project Leader will be promoting the TEM courses in Eastern Indonesia as part of an ACIAR (<http://www.aciar.gov.au/>) project looking at the impacts of fire and its use for sustainable land and forest management in Indonesia and Northern Australia. Penny's role is to promote the TEM program as a training option for land managers of eastern Indonesia. Study sites are located on the islands of Sumba and Flores, areas that are subjected to a seasonal climate and frequent fires. Fire frequency is increasing with the loss of tree cover and an increase of *Imperata* grasslands, providing fuel loads for grass fires in the dry season. The project is providing training (TEM) and management tools (satellite mapping, fire plans) to enable local people to better manage these fires. More details can be found at <http://fireindon.ntu.edu.au>.

Of interest to TEM students would be the recent announcement of a halt to further subdivision of the Daly region until a sustainable land use plan is developed. A Community Reference Group has been formed to develop the plan with community consultation, which is due to report in September 2004. The Group will be advised by an expert advisory group. More information is available at http://www.nt.gov.au/ocm/media_releases/20031109_dalyriverplan.shtml.

That's enough from me, hope you had a rewarding 2003 on the program and I look forward to doing it all again in 2004 !

Cheers,
Lindsay H
Course Co-ordinator

INSIDE THIS ISSUE:

Graduate Update

Higher Degrees in demand

Graduation 2003

Rangelands Biodiversity

MTEM Thesis Abstracts

- for 8 completed theses

Fire Website

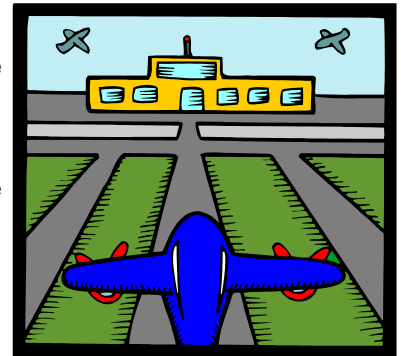
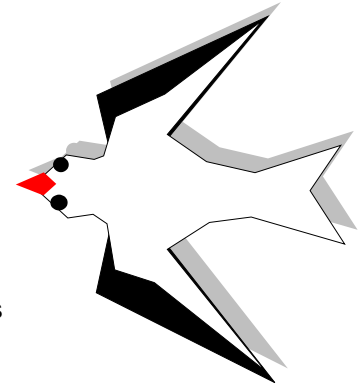
TEMS LINKS

- *Aims to keep students of the Graduate Certificate, Graduate Diploma and Masters of Tropical Environmental Management in touch with each other and with staff in the course*
- *Contributions from students and others are always welcome, and should be sent to*

TEMS Links
C/o Dr Lynda Prior
Faculty of EHS
NTU
Darwin NT 0909
Tel 08 0946 6563
Fax 08 8946 7107
Lynda.prior@ntu.edu.au

Graduate Update— Sally Weekes

I have just finished my six month contract as Shorebird Project Officer with NSW National Parks and Wildlife. In light of further development by Port Botany in Botany Bay, I had to identify important feeding and roosting sites of a small wading bird (Double-banded Plover) within the bay. We knew they used a site adjacent to the port during the day but their night-time sites were yet to be identified. As it turns out, they feed on the parallel runways at Sydney Airport which is just across the water from their daytime site. I just finished my first draft of the paper! As for the future - my boss is trying to get my contract extended for another six months over summer to work on another bird, the Little Tern, which comes to nest on a small sand spit within Botany Bay. It was by doing voluntary work on this bird that I got the Double-banded project - see it does pay off! After summer I am thinking about heading to New Zealand or Tasmania as I really want to work with albatross down on Heard Island and I think this will be a good stepping stone. After that - who knows. Sounds like I am a bit organised and maybe at the moment I am, but its only through having worked out what I don't what that I am getting closer to realising what I do want.



Employers Want Higher Degrees

About 609,000 Australians now hold graduate degrees, and this is likely to rise steeply in coming years. According to a recent article in Australian Financial Review (1st Nov 03), this growth in access to higher education will tend to devalue the standard degree, and as a consequence, employers are increasingly seeking people with additional qualifications such as Masters, PhDs, or even short intensive courses that focus on industry-specific management skills.

In Australia, the pressure for universities to increase their sources of non-government revenue has resulted in an increase in postgraduate offerings for domestic and overseas fee-paying students, and this has attracted increased student numbers. In 2002, 123,760 domestic students enrolled in postgraduate course-work degrees, up 10% from the previous year. Such postgraduate qualifications may be critical for gaining the attention of employers. Filomena Leonardi, a partner with an executive recruitment firm, says that in some finance sectors postgraduate qualifications are already mandatory. "It's difficult to give a hard and fast rule, but in any sector you generally look for whether a job applicant has done something other than a three or four year undergraduate degree and that can be a masters level, graduate diploma level or postgraduate level (qualification), but I think there is a trend towards looking for it", she said.

An incentive for TEM students to complete their degrees!!



Above: Siobhan Denniss (MTEM) with Higher Education Project Leader, Dr Penny Wurm.

Left: Sandy Pidsley (one of the first GCTEM graduates) with husband Don and TEM Course Coordinator, Dr Lindsay Hutley.

Graduation—October 2003

The Magnificent Seven.....

Owen Gale, Geraldine Lee, Sandy Pidsley, (these students were the very first to complete the Graduate Certificate) and Michelle Allnutt, Jane Barratt, Paul Davey, Siobhan Denniss (who all graduated with a Master of Tropical Environmental Management). Congratulations to you all, and best wishes for the future!



New biodiversity report released

(from 'Range Management Newsletter', Nov 03)

The report *Biodiversity monitoring in the rangelands: A way forward* by Anita Smyth, Craig James and grant Whiteman from CSIRO Sustainable Ecosystems has just been published.

This report aims to help people plan effective biodiversity monitoring in the rangelands. It is based on the outcomes of an expert technical workshop on the monitoring of biodiversity in Australia's rangelands that was held from 29 Oct to 1 Nov 2002 in Alice Springs, and builds on a previous report entitled *Developing an Analytical Framework for Monitoring Biodiversity in Australia's Rangelands* by John Woinarski.

This report includes:

- Consideration and review of recent, and most importantly, often unpublished research relevant to biodiversity monitoring in the rangelands;
- Development of a common 'state-of-the-art' view' and understanding of the complexity of biodiversity monitoring in the rangelands;
- Development of a shared view on the most appropriate 'sufficient and necessary' set of attributes and techniques for use now by different clients to monitor changes in biodiversity;
- Highlighting of the limitations of particular sets of attributes and techniques;
- Identification of interim guiding principles for rangeland biodiversity monitoring; and
- Identification of knowledge gaps and research needs.

This report is aimed largely at technical audiences and regional level groups, however, a future publication is planned aimed at land users. You can download a copy of the report from the Tropical Savannas CRC website www.savanna.ntu.edu.au/publications/books_reports/biodiversity_in_the_rangels.html



MTEM Theses



Did you know that copies of some of the best completed MTEM Theses are lodged in the Short Term Loan section of the CDU Library?

They are, however, a bit hard to find—they are in the Personal Copy collection. Numbers 534, 541, 579, 824, 825 are MTEM theses (lodged there by Penny Wurm).

To give you some idea of the variety of subjects tackled by past students, we are printing the abstracts of some of these theses in this edition of TEMSLinks.

(Illustrations are for decorative purposes only, and rarely depict the exact species studied!)

THESIS ABSTRACTS

Food sources of the Rainbow Lorikeet *Trichoglossus haematodus* in urban and remnant vegetation in Darwin, Northern Territory

Makoto Hasebe

Food sources of the Rainbow Lorikeet *Trichoglossus haematodus* were investigated in planted, naturally-occurring forest and woodland vegetation in Darwin, Northern Territory, for the 18 weeks from October 2002 to January 2003. During the study period, 1311 flocks and 7210 individuals were recorded to feed on 37 food plant species. Of the recorded flocks, 41.1% foraged at dry fruits, 40.4% at flowers, 14.3% at leaves, 3.7% at fleshy fruit, and 0.6% at bark. Mean flock size was 5.4, ranged between one and 30, and varied between foraging substrates, category of food plants and food plant species. Seeds of *Casuarina equisetifolia* were foraged at throughout the study period, whilst all other food species/types were temporarily foraged. The establishment of food plant species from a wide range of habitats caused high diversity of food plant species in

urban habitat. Higher diversity of planted food species provided more phenological reliability of food sources, while naturally-occurring species attracted more individuals. From the composition of foraging species, the urban area is likely to be an artificial riparian and monsoon habitat for Rainbow Lorikeets. Urban fringe environments should be preferred as a habitat, because they can forage at food sources of both planted and naturally-occurring species. Fruits of Mango *Mangifera indica* was one of major food plant species in October. To avoid Mango damage in orchards by Rainbow Lorikeets, I suggest planting *Eucalyptus camaldulensis* near Mango Orchard. Faeces and noise problems caused by a large number of roosting Rainbow Lorikeets well adapting to urban habitat may be justified by tourism



THESIS ABSTRACTS

Vegetation, Compositional and Structural Changes over 27 Years on the Revegetated Minesite, Nhulunbuy, NT.

Rachael Wedd

In September 2001 field work was undertaken at the Nabalco mine-site, Nhulunbuy, Northern Territory, as part of a collaborative effort between CSIRO Land and Water, Nabalco Pty Ltd and the Northern Territory University. This collaborative effort included research into landscape function analysis, soil quality and development and vegetation development.

This thesis is based on the state of vegetation in this rehabilitation scheme. Data was collected to determine the compositional and structural attrib-



utes of a number of revegetated sites, to determine which of these attributes could be useful as indicators of revegetation success and to then place successful re-establishment of species in a temporal context.

The lease agreement between Nabalco Pty Ltd and the traditional owners of the land requires that the mined land will be returned to a self-sustaining ecosystem similar in state to the surrounding unmined land. This re-

search supports Nabalco's claims that successful re-establishment of native species typical to that area is occurring.

Aboriginal Artefact Production in the Maningrida Region: Harvest Sustainability and Pest Control in the Carving Wood Industry

Anne Philips

The harvesting of native timbers for the production of wood carvings is important culturally and economically to members of the Maningrida community, north-central Arnhem Land, Northern Territory. This study was initiated in response to community concerns regarding the sustainability of native timber harvest and pest control within the artefact industry.

A total of 18 vine-thickets were surveyed within floodplain and coastal habitats and transects were used to assess the density, distribution, and stand structure of *Bombax ceiba*, a species regularly used for artefact production. The density of *B. ceiba* within coastal and floodplain vine-thickets was 114.6 stems/ha (± 46.0) and 125.7 stems/ha (± 37.9) respectively. Regional *B. ceiba* populations were estimated as 45,390 stems ($\pm 14,904$) within floodplain and 37,189 ($\pm 13,522$) within coastal habitats. Harvest intensity varied from 11-60% of adult *B. ceiba* in patches surveyed. Adult stems with diameter less than 40 cm contributed to 83.3% of harvested *B. ceiba*. From a total of 54 harvested *B. ceiba*, 79.6% had coppiced, indicating a significant regenerative capacity.



Wood borer infestation is causing lost revenue and impacting on Maningrida Arts and Culture (MAC) market expansion. Preliminary investigation identified *Sinoxylon anale*, and *Minthea sp.* to be present in MAC wood carvings. One or both types of wood borer were found to infest 24% of carvings surveyed. Suggested wood borer management options involve treatment of timber or wood carvings with Boracol 200RH®. Selection of borer resistant species with suitable carving properties would eliminate the need for chemical treatment.

The results of this study suggest that while the harvesting of *B. ceiba* currently is sustainable in the Maningrida region, some patches are subject to considerable harvest impact. A developing Arts and craft industry in the region may result in increased rates of *B. ceiba* harvest over time, possibly threatening future sustainability.

Broad and fine scale habitat associations of juvenile *Trochus niloticus* in Western Australia: implications for stock enhancement and assessment

Jamie Colquhoun

Information for restocking is needed on habitats of *Trochus niloticus* in Western Australia (W.A.). An investigation into the habitat preferences of trochus on reefs in Kig Sound W.A. was conducted, in two parts, on a macro-habitat and micro-habitat scale. Broad-scale surveys were done on four reefs in King Sound, W.A. Surveys along transects were used to examine the density and size distribution of juvenile (<50 mm) and adult (>50mm) trochus among 4 intertidal reef habitats: reef platform, patch reef, sand/seagrass, and rocky/boulder.

No single habitat was preferred exclusively by juvenile or adult trochus. A two-factor ANOVA showed that the distribution of juvenile trochus on these reefs was highly patchy at scales within habitats (predominantly), among habitats and among reefs. Trochus rarely occurred in habitats dominated by sand. Analyses suggest that greater sampling effort (15 to 30 transects) is

required to increase precision of abundance estimates to a level of 0.2 or 0.1.

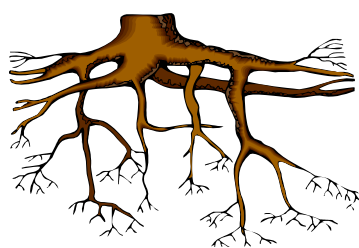
High densities of larger size classes in the rock habitat indicate its suitability for translocation of large juveniles. Higher abundances of smaller juveniles in the reef platform and patch reef habitats, occupying most reef area, indicate that both habitats are suitable for seeding of small juveniles.

Fine scale surveys were conducted on 3 reefs. Sampling rings (paired) were used to examine differences of percentage abiotic and biotic area cover around juvenile trochus and in random areas, among 2 intertidal habitats: reef and rock. Frequency distributions of juveniles (mouthparts) in contact with substrates and biota were calculated. Randomised block univariate and multivariate ANOVAs showed juveniles preferred different substratum and algae in different habitats but this was similar among reefs. Juvenile trochus were selecting micro-habitats within macro-habitats with substrates that offered refuges and abundant crustose algae. Juvenile and adult trochus broad-scale and fine-scale habitat preferences relate to preferred stock enhancement habitats and improved stock assessment methods.

The distribution of coarse and fine root biomass in a semi-arid savanna of northern Australia

Michelle Allnut

Root distribution of a semi-arid savanna located near Katherine in the Northern Territory was determined. Trenches were excavated between 8 pairs of *E. foelscheana* (F. Muell.) and fine and coarse roots were sampled vertically and horizontally along the trenches. The majority of the total root biomass was located close to the tree stems and in the top 0.5 m of the soil. Coarse roots were distributed as a function of distance from the nearest tree and size of the nearest tree (DBH). Fine roots were found to be most abundant in the first 30 cm of the soil, but there was no correlation between fine roots and distance from nearest tree stem or size



of nearest tree. Predicted total root biomass was 35.7 t DM ha⁻¹, which is carbon stock of 17.5 t C ha⁻¹. The vast majority (96%) of this was coarse roots, and the fine root biomass was 0.7 t C ha⁻¹. The destructive sampling of this study enabled the development of allometric relationships between the tree size (DBH) and root distribution. These relationships were used to predict carbon stocks at a regional scale. The area occupied by the same vegetation type as the study site (*E. foelscheana* and *E. tectifca* dominated savanna) is 49,811 km². Using the below-ground biomass density (17.5 t C ha⁻¹) and this area, a below-ground carbon storage of approximately 87 Mt C is calculated, a significant storage. This study contributes to research of national significance, because savannas may offer significant potential as a (tradable) carbon sink to offset greenhouse gas emissions (e.g. from fires); and managing carbon storage and cycling is an important aspect of maintaining healthy ecosystem function.

Variation in recovery of mangrove ecosystems to two different types of disturbance (artificial and natural) in Darwin Harbour – Northern Australia

John Guernier

As further development of the Darwin Harbour region is inevitable, and since there is wide spread acknowledgement of the importance of mangrove estuaries for the ecological integrity of inshore marine communities, this study into the response of mangrove communities to natural and artificial disturbance is of ecological and commercial importance. The aims of this survey were to assess the variation in response of mangrove communities to natural and artificial disturbance, to examine any potential relationships between flora and fauna in reaction to disturbance and to examine the impact of disturbance on biodiversity.

An artificially disturbed area was the focus of the survey at Ludmilla Creek. The artificial clearing was rectangular in shape and lay perpendicular to the main creek system, crossing two habitat types; areas of high inter-tidal flat and areas in and along small creek margins. A transect design was employed with impact and control sites fixed in both habitat types. There was a total of four impact sites, two in each of the habitats, and a total of eight control sites, four above or up-slope and four below or down slope of the impact sites. As with the impact sites, the control sites were evenly distributed between the habitat types. Abundance of adults, seedlings and saplings was recorded as well as DBH (diameter of trunk at breast height) of all adult mangroves. All mollusc species were recorded along with relative abundance. Sesarmid and fiddler crabs were also recorded and identified subject to my knowledge. After 47 years, recovery of the artificially disturbed site at Ludmilla Creek is arguably complete but there are still some marked differences in community composition. The most important of these was the significantly lower abundance of sesarmid crabs recorded at the impact sites. This observation has potentially important implications considering the key role of sesarmids in the function of mangrove forests.

Assessment into the response of community to natural disturbance was the focus of the survey at the Charles Darwin National Park site. In December 1974 Cyclone Tracy struck the Darwin area and significant damage was experienced by local mangrove communities in some areas. Design was based on the knowledge that obvious areas of

recovery and non-recovery were still apparent. Field work was undertaken in the three leading seaward zones, all typically dominated by pioneering species such as *Sonneratia alba* and *Rhizophora stylosa*.

Within each of the zones sampling took place in two recovery and two non-recovery areas. The same measurements as used at Ludmilla creek were deployed at the Charles Darwin site. The results showed that there were no marked differences between the recovery and non-recovery sites. However, one of the three zones surveyed had still not recovered after 24 years and showed no signs of doing so. A comparison of recent aerial photography with pre-Cyclone Tracy photography, clearly shows that where once the canopy was thick and not markedly different from adjacent zones, it is now depauperate with canopy cover at less than 10% (pers. Obs.). The results of this survey support this observation, with the abundance of trees, seedlings, saplings, fiddlers, molluscs and species richness all markedly lower in this zone. Interestingly, the abundance of sesarmids was not significantly lower in this zone.

There are several important points that have arisen from this survey. First, the level of recovery between communities appeared to vary considerably. Second, it is likely that there are a wide variety of factors responsible for the recolonisation and subsequent recovery of communities and that these are likely to vary between communities and disturbance types. Third, although recovery is in most cases quite rapid, after significant periods of time (47 years at Ludmilla creek and 24 years at Charles Darwin) there are still significant differences between the impact and control sites at Ludmilla Creek and between the zones at Charles Darwin. Finally, this survey has highlighted the need for further research into the biology of sesarmid crabs.



Modelling the influence of fire on survival of the Northern Brown Bandicoot (*Isoodon macrourus* Gould) in the tropical savannas of northern Australia using mark-recapture data

Guy Pardon

Approximately half of the species of Australian bandicoots (family Peramelidae) are extinct, rare or threatened and changed fire regimes in arid and semiarid Australia have been implicated as important agents in their decline. The Northern Brown Bandicoot (*Isoodon macrourus* Gould) is currently regarded as one of the most common Australian bandicoots, however recent studies at Kapalga, in Kakadu National Park, Northern Territory have shown that this species is prone to large fluctuations in abundance, apparently linked to the occurrence of intense fires.

This study examines the influence of four fire management regimes on the survival of the Northern Brown Bandicoot using mark-recapture data obtained during a landscape-scale fire experiment conducted at Kapalga, in Kakadu National Park, Northern Territory from 1989 to 1995. The analysis extends upon earlier work by performing a detailed examination of bandicoot survival, using information theoretic model selection methods.

Results indicate that fire regime is the most important determinant of bandicoot survival and that the relative importance of other influences such as gender, age, habitat type, time of year and rainfall are

minor in comparison. All fire treatments were noted to cause a decline in survival, indicating that none of the management approaches tested could be considered appropriate for this species.

Areas left unburnt, or burnt in the early dry season experienced the least overall decline. The bimonthly survival rate in unburnt areas dropped over the six years of the study from 0.756 (se 0.0312) in July-August 1989 to 0.5494 (se 0.0505) in March-April 1995. Similarly, early burnt areas dropped from 0.748 (se 0.042) to 0.589 (se 0.0884). The effects of late burns on bandicoot survival were quite severe, leading to a marked decline in bimonthly survival rates from 0.783 (se 0.066) to 0.187 (se 0.143) over the same period. The effect of multiple burns in early and late dry season was the most devastating, causing a rapid and almost complete collapse in bandicoot survival from 0.782 (se 0.056) to 0.058 (se 0.054).

The results demonstrate that this species is most sensitive to frequent and/or intense fires and least affected in areas experiencing low intensity or infrequent fires. The results highlight the importance of adaptive fire management, driven by monitoring of wildlife populations.



Spatial organisation and behaviour of *Chlamydosaurus kingii*: a preliminary assessment

Sarah Victoria (Sally) Weekes

A preliminary investigation was conducted on the spatial organisation and behaviour of adult male and female frillneck lizards, *Chlamydosaurus kingii*, during the dry season, which corresponds to their non-breeding season. The study was conducted in an urban park containing high densities of *C. kingii*. Radio-telemetry and a combination of scan and focus sampling were used to record location and behaviour (respectively) of individuals over four independent time periods. Lizards remained inactive during dry season months, perched in the canopy of trees and rarely changing location. As the dry season progressed, home ranges of male and female lizards increased. However, females remained perched in tree canopies while males increased the number of location changes per unit time and displayed a range of behaviours, particularly the larger individuals sampled. The results suggest that *C. kingii* employ a polygynous mating strategy. An understanding of the spatial organisation and mating system of a species is important to its conservation and management because these attributes help explain the distribution and regulation of a population. The next step will be further investigation into the spatial relationships between male and female *C. kingii*.



Fire website is hot spot

The North Australian Fire Information (NAFI) site, developed by the CRC, Ecobyte Systems and northern fire managers - the BFCNT, CYPDA and the KRFMP - has proved quite popular in the current fire season. Web log statistics show that in recent weeks around 10,000 maps of fire scars (areas of burnt country) and hotspots (actively burning fires) are requested each week. It is estimated that most of that number comes from multiple requests from more than 500 users - the sort of usage expected from actual fire managers.

Talking to the fire management groups it seems that the site is being extensively used by pastoralists in far north Queensland and in the Top End of the NT it is also being well used by the network of fire managers associated with the BFCNT. Usage in the Kimberley is lower - perhaps because web usage is generally less convenient in this region, and because land managers are already served by websites provided by WA DLI.

It has been reported as having helped save at least one homestead as well as other assets such as fencing from fire - but the key outcome is that it promises to help people manage landscapes more effectively.

The site is designed to complement two other interactive fire management websites - one provided by WA DLI for WA fire managers and one provided by Sentinel for fire fighters across Australia - both these organisations generously provide the NAFI site with hotspot data. The NAFI site is tailored to the needs of northern fire managers who need to know the location of fire as well as hotspots.

The NAFI site has been rapidly evolving due to feedback from users. Compared to its initial design, it now has more views of north Australian locations, it provides 1: 1 000 000 scale World Aeronautical Charts as a backdrop (courtesy of Airservices Australia), and it provides automatically updated fire weather information. Future developments include the provision of 1: 250 000 topographic maps as a backdrop and a refining of the way the site works to speed up service.

The site has recently featured on ABC radio, on commercial TV in Qld and in the NT's Sunday Territorian newspaper. NAFI site: <http://www.firenorth.org.au> For more information contact Peter Jacklyn on peter.jacklyn@cdu.edu.au

*This article has been taken from the electronic newsletter **Topical Savannas**. Why not subscribe? - it's free. Simply send an email to Julie Crough (Julie.crough@cdu.edu.au) or Peter Jacklyn (peter.jacklyn@cdu.edu.au)*



TEMS Links

Tropical Environmental Management Students' Newsletter

Vol 4 No 3 November 2003

If undelivered, return to L Prior, Tropical Savannas CRC, CDU, Darwin 0909

The Top End Native Plant Society meets on the third Thursday of each month at Marrara Christian School (corner of Amy Johnstone and Macmillans Rd). The meetings start at 7.45 and invited guest speakers provide insight into various aspects of Top End flora

Ecology Journal Club for Postgrad Students & Staff

An ecology "Journal Club" has started, and all postgrads and staff with an interest in Biology/GIS & Remote Sensing/ Environmental Management are encouraged to participate, if, as and when you wish.

Each week (Wednesdays at 3pm, running for between 30 min to 1 hour), a volunteer will select a scientific paper of interest to them for discussion by the group. Meetings are held in the Central Teaching Building (B24) at CDU.

If you would like to participate in the Journal club, email Barry Brook (barry.brook@cdu.edu.au) and he will add you to Journal Club mailing list.

The Northern Territory Field Naturalists Club meets on the second Wednesday of the month, at 7.45 pm in the FIRE seminar room (Bldg 30) here at CDU Casuarina. Guest speakers present informative talks on the flora and fauna of the region. There are also regular excursions. Contact Don Franklin: don.franklin@cdu.edu.au, phone 89466976 (w) or 89481293 (h)

Coming up:

- Dec. 10: "Mudskippers" (Prof. Toru Tokita and Dr. Helen Larson)
- Feb. 11: "The Sorghum fire cycle and wet season burning" (Greg Miles)

Job Vacancies

"NRMjobs" is a weekly email advertising opportunities in the environment, water and natural resource management field in Australia and New Zealand. Visit:

<http://www.nrmjobs.com.au/>