I would like to continue receiving the Marine Parks issues of *Tropical Topics*.

STAMP

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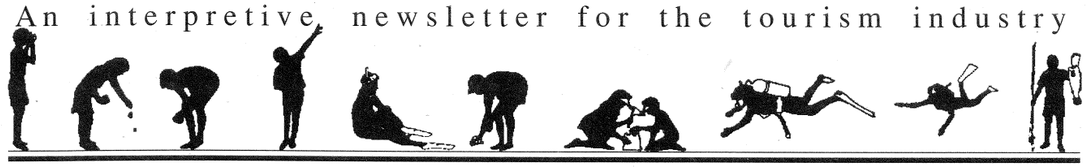
Tropical Topics

An interpretive newsletter for the tourism industry



Migratory waders and other shorebirds No. 38 September/October 1996

Notes from the Editor

IMPORTANT

Unfortunately, due to funding constraints, there are to be no more Wet Tropics (green) *Tropical Topics*. However, the Marine Parks (blue) issues will continue to be produced at the current rate of four per year. Not all recipients of the newsletter will want to receive only those dealing with the Great Barrier Reef, so the mailing list will have to be revised.

IF YOU WISH TO REMAIN ON THE MAILING LIST AND CONTINUE RECEIVING THE MARINE PARKS ISSUES OF *TROPICAL TOPICS* YOU MUST RETURN A COPY OF YOUR MAILING LABEL TO US.

Simply photocopy, or cut out, the back page of this *Tropical Topics*, fold with the return address outermost, add a stamp and post. If you receive bulk copies of *Tropical Topics* in an envelope please copy the **EXACT** details of the mailing label on to the blank area at the bottom of the back page of one of your newsletters before posting it to us. **PLEASE DO NOT TELEPHONE** — only the return of an exact copy of your mailing label will ensure that you remain on the mailing list. Please do this as soon as possible — the number of returned labels will determine how many copies of the newsletter are printed. Latecomers will miss out.

The editor would like to thank Keith Fisher (RAOU, North Queensland Group) and John Cornelius (DoE) for their help with this issue.

The first migrants

Long before any Europeans began to suspect the existence of Australia, a large group of migrants, born in the northern hemisphere, regularly headed Downunda to take advantage of the southern summer.

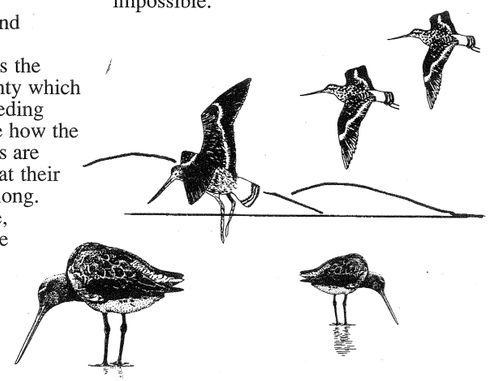
In past centuries the sudden disappearances and appearances of barn swallows led Europeans to conclude that they spent the winter at the bottom of ponds. This was taken so seriously that an eighteenth century German scientist, J.L. Frisch, tied threads coloured with a water-soluble dye to their legs. When the birds reappeared in spring with the colour still visible on the threads, he concluded that they had not been underwater!

The truth — that these little birds fly thousands of kilometres between Europe and Africa — is scarcely less astonishing. We now know that millions of birds, worldwide, perform similar miracles but how they do it is still a bit of mystery. It is suspected that they use a combination of stars, the sun, visible landforms and the earth's magnetic field to help them make the journey.

Birds make these incredible trips to take advantage of short-lived abundances of food. Larval and hatching insects, available in quantities in Arctic regions as the ground thaws, provide a bounty which supports many species at breeding time. It is difficult to imagine how the birds know these food sources are available, but it is thought that their journeys were not always so long. At the end of the last Ice Age, about 10 000 years ago, as the world began to warm, they may have started flying the short distances from the edge of one ice cap to the other. As the earth warmed and the ice retreated the distances became further and further until journeys of thousands of kilometres were involved.

About two million shorebirds migrate from Siberian and Alaskan breeding grounds to Australia, and back, each year. Starting to arrive here in late August, the ultimate goal of many is southern Australia and they are seen in the north only in passing. Others, however, opt to 'overwinter' (the northern winter) along the coast and stay put until about March.

Researchers are still trying to work out the birds' routes, a new system of colour flagging their legs now yielding more information. However, one thing is certain. If these spectacular journeys, involving large numbers of birds, are to continue, urgent action has to be taken to preserve the wetlands on which they depend. Without them, our migrating birds could well find the journey impossible.

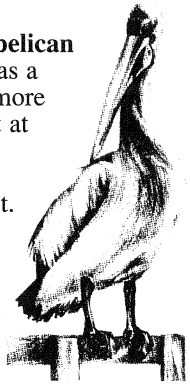


Marine Parks

GREAT BARRIER REEF MARINE PARK AUTHORITY
QUEENSLAND GOVERNMENT
Department of Environment

Some other shore and waterbirds

The **black-necked stork** — Australia's only stork — strides through shallow fresh or saltwater jabbing at prey, or stands and stalks like a very large heron. The name jabiru is Portuguese and was also given to different species of storks in South Africa and South America.



The **Australian pelican** is sometimes regarded as a seabird but is actually more common inland, except at times of drought when more of these nomadic birds make for the coast. Flocks commonly co-operate to drive fish into shallow water where they are scooped up in enormous bills. Breeding pelicans are extremely sensitive to disturbance, the entire colony sometimes deserting. Please do not approach nesting pelicans.

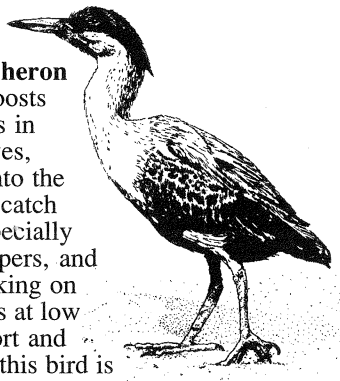
Cormorants of a number of species frequent bodies of both fresh and salt water. They pursue fish underwater, propelling themselves with large webbed feet, using wings for braking and turning and grabbing prey with a hooked bill. A special muscle adjusts the lenses of the eyes for underwater vision and nostrils are sealed, the bird breathing, like a gannet, through valves at the corner of the mouth. Like pelicans, groups of hundreds sometimes herd fish.

The **little pied cormorant** is one of the most commonly seen.

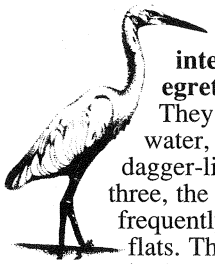
Ospreys (left), **white-bellied sea-eagles** and **brahminy kites** are rather different from the other birds mentioned here but are a common feature of beaches and islands. Ospreys and sea eagles swoop on fish and sea snakes, catching them in their talons. The larger sea eagles also take other prey such as nestlings and sometimes rob ospreys and terns of their prey. Brahminy kites are capable of killing only small animals such as frogs and crabs, and feed mainly on dead animals washed up on the beach.

A number of **herons** are found in both fresh and saltwater situations, some appearing at the coast only during times of drought, others frequenting mangroves and islands. Herons typically hunt by stalking or standing still and darting forward when prey is sighted. Herons have a specially articulated sixth vertebra which enables them to strike with lightening speed.

The **pied heron** is found only in the tropics and, along with the most common Australian heron, the **white-faced**, can be seen on freshwater and saltwater swampy areas, grassland and mudflats.

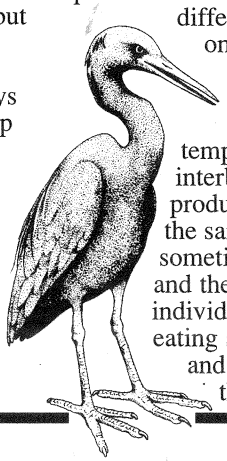


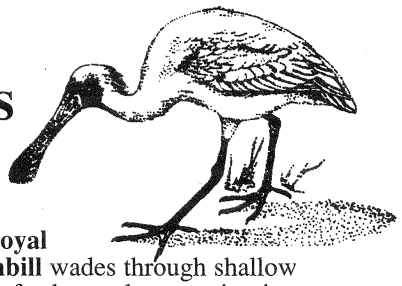
The **striated heron** (right) roosts and nests in mangroves, diving into the water to catch prey, especially mudskippers, and also stalking on mud flats at low tide. Short and stumpy, this bird is very bittern-like but is not nocturnal.



Great, intermediate and **little egrets** are entirely white. They feed by wading in water, spearing fish with dagger-like bills. Of the three, the little egret most frequently forages on mud flats. The cattle egret arrived in Australia earlier this century, part of the worldwide expansion of this species because of its association with grazing animals and the insects they attract and disturb.

The **eastern reef egret** (below) is an almost exclusively coastal and island heron which feeds on reefs and rock platforms. This bird comes in two different forms, a pure white one which predominates in the tropics and a grey form which is more numerous in temperate zones. The two interbreed, sometimes producing both types from the same brood. Reef egrets sometimes take tern nestlings and there are reports of individuals on Green Island eating silvereyes (small birds) and rats which they were thought to have killed.





The **royal spoonbill** wades through shallow water, fresh or salt, sweeping its sensitive, partially open broad-tipped bill from side to side. Once detected, food such as fish and crustaceans is snapped up, the latter crushed by knobs at the base of the bill.

Australian white (sacred) and **straw-necked ibises** are often seen with spoonbills, wading and probing in shallow water, but also feed extensively on pastures where they are considered very beneficial to farmers because of the numbers of grasshoppers, locusts and other insects they consume. Ibises sometimes feed on mudflats and mangroves but prefer freshwater areas. Highly nomadic, they sometimes turn up in large numbers and disappear when, for example, rains bring water to inland areas.

Defining a wetland

Wetlands are areas of permanent or temporary shallow open water including areas of marine water not exceeding a depth of six metres at low tide. This applies to almost four percent of Queensland where 39 wetland types include about 400 000ha of mangroves, more than 600 000ha of saline coastal flats and almost 300 000ha of intertidal flats.*

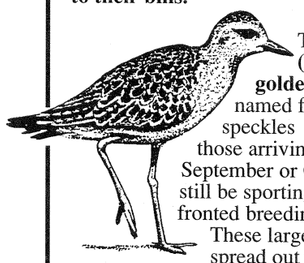
Many people do not take a sympathetic view of many wetlands, particularly coastal ones which are seen as the home of mosquitoes, crocs and bad smells. All too often they are used as dumping grounds for rubbish or filled and reclaimed for purposes perceived as more useful to humans such as agriculture, housing and so on. The benefits of natural wetlands, however, are probably as numerous as they are unappreciated. Acting as 'kidneys' they filter out urban pollutants and trap sediments. They give protection from floods, storm surges, storms and cyclones and reduce erosion. They are natural fire breaks and also support wildlife which helps control insect pests on farms. They are also of spiritual significance to Aboriginal people who gather substantial amounts of food from them. Wetlands are used for recreational boating and fishing and the most scenic attract a valuable tourism industry. Not least they provide breeding grounds for fish; in 1988, calculated from the catch of marketable fish, the mangroves of Moreton Bay were valued at $8 380 per hectare.

* DoE figures

Waders in Australia

Waders belong to the order Charadriiformes, all of which feed on ground or water and nest and mainly roost on the ground. Most also migrate, but some never leave Australian shores.

Plovers are represented in Australia by a number of species, both migratory and resident (see below). Plovers tend to have a thickened end to their bills.



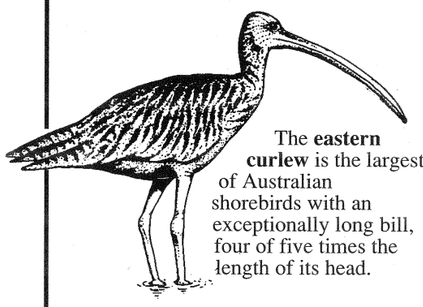
The **Pacific (lesser) golden plover** is named for its yellow speckles although those arriving in September or October may still be sporting their black-fronted breeding plumage. These large plovers spread out to feed but sometimes gather in roosting groups of hundreds.

The **grey plover** is quite similar but is stockier and lacks the golden speckles. It is also less common.

The **lesser sand (Mongolian) plover** is a small bird which feeds quietly and even stealthily in a typical stop-start plover style.

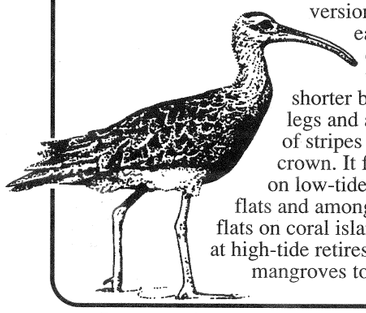
The **greater (large) sand plover** is similar to, but larger and less common on the east coast, than the lesser sand plover with which it is often seen.

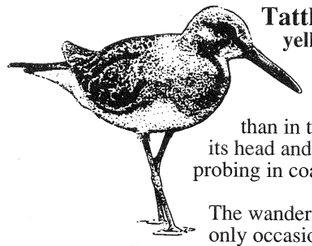
Curlews are among the easiest waders to recognise because of their very long downcurved bills and their characteristic fluting calls.



The **eastern curlew** is the largest of Australian shorebirds with an exceptionally long bill, four of five times the length of its head.

The **whimbrel** is a smaller version of the eastern curlew with a shorter bill and legs and a pair of stripes on the crown. It forages on low-tide mud flats and among reef flats on coral islands but at high-tide retires to mangroves to roost.



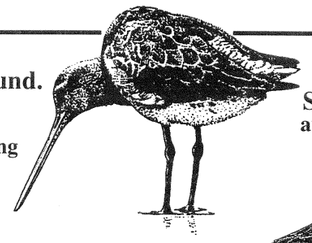


Tattlers are plump grey waders with yellow legs.

The grey-tailed tattler is more common in northern Australia than in the south. It walks quickly, bobbing its head and wagging its tail up and down while probing in coastal mudflats for food.

The wandering tattler is almost identical but is only occasionally seen. It is confined to the east coast of Australia, usually on rocky outcrops, headlands and Great Barrier Reef islands.

Godwits are large waders with long two-toned bills. These are much longer in the females which commonly feed in deeper water.



The bar-tailed godwit is particularly common, especially in the north, tens of thousands arriving on the beaches of the north west and spreading out along the coast. This godwit has an upward tilt to the end of its bill.

The black-tailed godwit is rarer in Australia as a whole, but common along northern coast spots such as Trinity Inlet. It feeds in deeper water, sometimes immersing its entire head.

Avoiding competition

The familiar waders of Australian summers lead a double life. In the northern hemisphere not only do they sport more colourful breeding plumage but species rarely seen far from water in Australia are to found lurking in dry heath, even mountain tops, eating berries and insects. Once on their breeding grounds they also become relatively anti-social, a density of 50 per square kilometre being considered quite high.

This, of course, reduces competition for nesting sites and food supplies as more young waders come on the scene. Then, when the time comes to move south, the adult birds commonly fly first, thus avoiding competing with the kids. Similarly, species with the same feeding habits migrate in successive waves, replacing each other at the staging areas instead of arriving together.

Even so, it is hard to imagine how the sometimes huge numbers of waders found together can get enough to eat. Known to consume over half their body weight in food in one day, migrating shorebirds need to be able to store energy, in the form of body fat, for their extraordinary journeys as well as for the demanding activities of moulting and breeding. Many feed by day and by night. However, despite the need for such large amounts of food, flocks appear to be peacefully busy with few squabbles over resources.

It has been observed that while some species are content to feed in groups others are more solitary. Birds in flocks may exchange information about food sources and are less vulnerable to predators. On the other hand, those which feed singly avoid the problem of having their prey, such as crabs, disturbed by others and dive for cover.

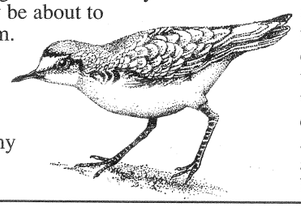
Different wader species appear to utilise different feeding zones. A study in Victoria showed the majority of red-necked stints feeding on wet mud, curlew sandpipers in shallow water and sharp-tailed sandpipers at the water's edge. The story is similar elsewhere. Wading birds can only feed in water of a depth proportional to the lengths of their legs and bills so physical variations lead to different species complementing each other instead of competing in a given area. Even where different species consume the same prey, it has been found that they have a tendency to chose different sizes. In addition, females of some species have longer bills, thus further reducing competition, this time between the sexes.

The lemming connection

The number of waders migrating to Australia is intimately linked to the numbers of furry rodents in the Arctic — lemmings. These 'animated mars bars' as they are sometimes called, go through a three-year boom/bust cycle. When their populations explode they provide abundant food for predators such as Arctic foxes and birds of prey. In those years waders have above-average breeding success because their normal predators are distracted. However, the next year, when lemming populations crash, increased predator populations turn on the next tastiest thing — waders. The following year sees a balance return with lemmings on the increase.

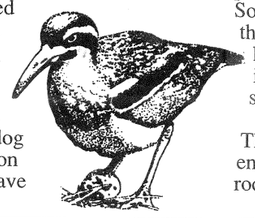
Some resident waders

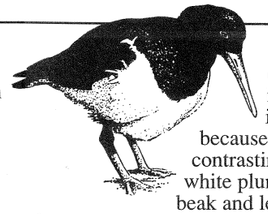
The **red-capped plover** is one of the waders which has made the evolutionary choice not to cross the globe in search of food. However, it is nomadic, movements up to 830km having been recorded for some birds. It is commonly seen dashing at insects and other prey on coasts and tidal inlets as well as inland waters. Eggs, which are laid in a scrape on the ground, are extremely well camouflaged. To distract potential predators the parents may pretend to be injured, their convincing act luring the intruder away from the eggs. Be careful if you see this — you may be about to step on them. Four-wheel drive vehicles on beaches destroy many nests.



The **bush stone-curlew (thick-knee)** remains hidden by day, its ghastly wailing making it all too obvious at night. Although technically a wader, it frequents woodlands and grasslands at the coast, inland and on islands feeding largely on insects .

The much rarer **beach stone-curlew** is more coastal, living on northern Australian beaches, islands, mangroves and reefs where it is able to crush crabs and other hard-shelled invertebrates with its relatively heavy bill. Although once common, this bird is now threatened and it is thought that the total population could now be less than 1000. Four-wheel drive vehicles crushing nests, cat, dog and feral pig predation and egg collecting have been blamed.



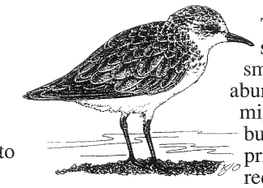


The **pied oystercatcher** is easy to identify because of its contrasting black and white plumage and red beak and legs. It frequents sand beaches, mud flats and estuaries probing largely for molluscs.

Oystercatchers apparently learn from their parents one of two ways to open bivalves. Some force their chisel-like bills between the shells and, cutting the muscles which hold the animal inside to the shell, pull it out. Others hammer one side until it smashes and remove the insides.

The **sooty oystercatcher**, which is entirely black, is found more often on rocky or stony shores and on coral reefs.

Sandpipers form a very large group among the waders.

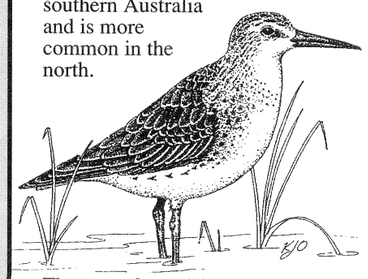


The **red-necked stint** is one of the smallest and most abundant of the migrating waders — but we are not privileged to view the red neck which gives it its name. That is reserved for breeding time although it may be seen in those preparing to depart in March and April. With plump bodies and short legs, these sandpipers dash about jabbing and probing at prey. In flight they wheel in tight flocks.

The **curlew sandpiper** is a medium-sized sandpiper, named for its downcurved bill. It often wades in relatively deep water, up to its belly. Once it has arrived it usually stays in one place while renewing flight feathers.

It is thought that Australia hosts most of the world's population of **sharp-tailed sandpipers** during the non-breeding season. This species has noticeably pointed tail feathers.

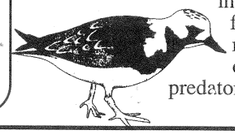
The **terek sandpiper** has a distinctively upturned beak, bright orange legs and partly webbed feet. It is a particularly active bird, dashing around and bobbing like a wind-up toy. It rarely goes as far as southern Australia and is more common in the north.



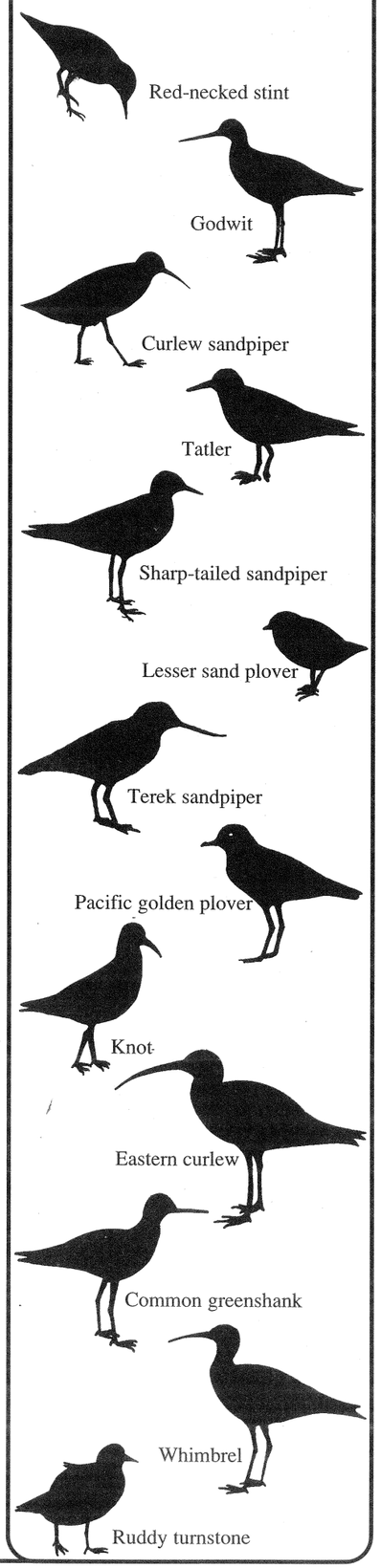
The **great knot** (above) is the largest sandpiper. Resembling the similarly stout and gregarious red knot, it feeds by drilling rapidly into mudflats. Both knots seem to fly almost non-stop to Australia, arriving in the north-west and the Gulf of Carpentaria in huge numbers. Only the great knot, however, is seen on the north-east coast in any numbers.

The **common greenshank** is a large sandpiper with long greenish legs and a very slightly upturned bill. It pecks at insects, probes for worms and molluscs or sweeps its bill from side to side to catch fish.

The **ruddy turnstone** runs busily around the beach on its short legs using its small sharp beak to turn over seaweed and stones in search of hidden prey and snatching at insects, worms, small fish and even seeds or rubbish. It also breaks open shellfish and is a predator of seabird eggs.



Silhouettes on the shore



Illustrations are not to scale

Previously used common names are given in brackets

Questions & Answers

Q Creepers and vines mostly wind upwards anticlockwise. Is this only in the southern hemisphere?

A Twining seems to be genetic and not related to hemisphere. The following section is from E.E. Hegarty 'Vine-host Interactions' in *The Biology of Vines* (Eds. F.E. Putz and H.A. Mooney) Cambridge University Press (1991).

About 95 percent of twiners invariably coil to the right and the direction is usually maintained throughout genera and families. Dioscorea *is a major exception in that some of its many species twine to the left and some to the right. At least 20 species have been reported to twine unreliably in either direction.*

Another section from the same book, the 'Biomechanical Studies of Vines' by F.E. Putz and N.M. Holbrook, states that the actual mechanism causing twining is still under investigation. Apparently early work suggested that a pattern of differential growth across the cross-section of the stem caused it to curve. More recent studies at the cellular level, however, suggest that periodic changes in the rigidity of cells due to uptake of water may be the cause. Cells on opposite sides of the stem may have different capabilities for absorbing water osmotically. This may result in changes in volume and shapes of the cells during each revolution of the stem. Studies are now being carried out into how the cells in the plant organise this.

While twining seems to be chiefly genetically controlled, and is possibly hormonal, gravity and light may also play a part.

In *Tropical Topics* 31 the question of how fish are killed by traditional fish poisons was addressed. Some more information on the question has recently come to light.

As mentioned previously, the active constituent of most of the plants used as fish poisons (by being broken up and put into a body of water) is saponin. Apparently saponins are much more toxic to cold-blooded animals, such as fish (and snails), than to warm-blooded animals. The toxin acts on the respiratory organs of fish but does not make them inedible. Saponins bind to food and thus pass through the digestive system. They are also destroyed by stomach enzymes. However, saponins break down red blood cells so if the gastrointestinal tract has been injured and saponins are thus absorbed they can cause poisoning. Similarly, a saponin injected into the bloodstream could be fatal.

Acknowledgments to Associate Professor Betsy R. Jakes, Dean of Science at JCU Townsville for the information in this section.

ENVIROFAIR '96

Eco-friendly music
Stalls: internet to worm farms
Terrific food and drinks
Fun kids' activities
Evening bush dance (7pm)
Huge (recycling) garage sale
School art competition
Auction
Street theatre
Yoga demonstrations
When: Sun. 6 October, 10am til late
Where: Norman Park, Gordonvale

Tourist talk

ENGLISH	GERMAN	JAPANESE	
wader	Limikolen	shokin rui no tori	渉禽類の鳥
wetland	Feuchtgebiet	shi chi	湿地
mudflat	Schlickfläche	higata	干潟
to migrate	wandern, ziehen	wataru	渡る
to fly	fliegen	tobu	飛ぶ
Arctic	Polarkreis	hokkyoku ken	北極圏
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Facts and stats

North-west Australia is recognised as one of the top regions in the world for waders with up to three-quarters of a million, consisting of 50 species, congregating on shores near Broome. However, aerial surveys of the north-east, between Cairns and Arnhem Land, suggest that similar numbers may use this area; 250 000 were counted in summer (over 60 percent in south-east Gulf of Carpentaria) but this is certainly an underestimate as many were hidden by mangroves.

Most Australian trans-equatorial migrants are waders but two species of swift, four terns, a cuckoo, a wagtail and a reed warbler also make the journey.

In Trinity Inlet 60-75 per cent of the summer wader population is made up of just five particularly numerous species — the red-necked stint, whimbrel, lesser sand plover, bar-tailed godwit and great knot. Sharp-tailed sandpiper and tattler species are also numerous at times.

In Europe, a red knot has been counted taking 980 gastropods in 20 minutes. Studies in the Waddenzee, a popular wader site in Holland, estimate that the 500,000 waders found there take, in one year, almost 40 thousand million shellfish, several thousand million worms and a hundred million crabs.

Ciconiiformes — herons, ibises and cranes — are long-legged and often wade but nest and roost off the ground.

Double-banded plovers do not cross the equator but move east in June-August to breed in New Zealand, returning in mid- to late summer. Most are found in eastern and southern Australia, only a few finding their way to FNQ.

The arctic tern is a champion migrant. Born in the Arctic, it flies through Europe and Africa to Antarctica where it circles the entire continent before heading north again. It sees more sunlight than any other animal.

A shearwater was taken from its nest in Wales, flown 5100km by plane to Boston, USA, and released. Twelve and a half days later it was back in its burrow.

The little curlew is known as the fire-bird by the local people in its Arctic breeding grounds, because of its preference for recently burnt areas.

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Out and About

WANTED

Waterwatch recruits on the Daintree River
People living along the Daintree and its tributaries are invited to become Waterwatch volunteers. A growing number of people, nation-wide, are collecting and testing water from local areas and helping to build up a national database on the condition of our water. This is an excellent indicator of the health of our environment. Funds from the Daintree Rescue Program have become available to expand membership along the Daintree River. If you would like to be involved, call Nicola Wright at Department of Natural Resources, Mareeba, on (070) 92 8555.

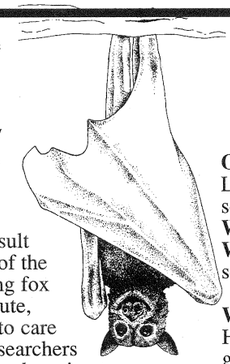
NATURAL RESOURCES

Drive carefully
along Aeroglen Drive in Cairns and along the Gillies Highway, near Lake Barrine. In each of these areas a cassowary has been coming out on to the road and is in danger of being run over. On the Gillies Highway, in particular, drivers who stop to look at the cassowary on a stretch of road with a 100km/h speed limit are also in danger.

The birds have been attracted to these dangerous situations by people feeding them. This practice is not only hazardous for the cassowaries but is thought to be a major contributing cause for cassowary attacks on people. A recent study of 144 attacks on humans found that in 78 percent of cases the bird was demanding food. In remote areas cassowaries keep their distance from people. However, once they have become accustomed to associating people with food handouts they become much bolder.

It has been reported that a number of tour operators are feeding the cassowaries from buses. This is not only dangerous for the birds and for humans but is also illegal. The deliberate feeding of a dangerous animal can attract a fine of $1500.

With cassowary numbers declining, please consider the welfare of these very special wet tropics residents and don't kill them with 'kindness'.



Foster homes are needed for **baby flying foxes**.
Each spring hundreds of baby spectacled flying foxes from our wet tropical rainforests are orphaned as a result of tick paralysis of the mother bat. Flying fox babies are very cute, intelligent, easy to care for and, some researchers believe, related to the primate group of animals. The baby bats require care for about four months and then must be returned to release cages on the Tablelands, where food is made available until they assimilate back into wild populations.

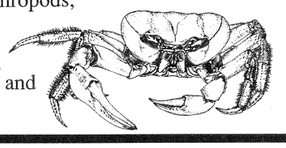
If you would like to help take care of one or more of these amazing animals over the next few months, please ring one of the following people: Sandy Needham 97 7212, Judy Stephens 97 6760 or Ann Johnson 97 6731.

Paul and the Rainforest is a children's book with an emphasis on insects local to FNQ. With a simple text and photographs by Stan Breeden, it is published by Steve Parish and is available at bookshops and some post offices.

Some **new insects** have been turning up, discovered by Jack and Sue Hasenpusch of the Australian Insect Farm in Innisfail.

One of the most exciting was actually found by the couple's nine-year-old son. The Mt Lewis monster, as they call it, is an impressively thorny katydid which, when sent to CSIRO for identification, turned out to be not just a new species but also a new genus. It may well be an ancient Gondwanic relic, just like the Mt Windsor stag beetle, *Sphaenognathus*, mentioned in *Tropical Topics* 37.

In *Tropical Topics* 36 it was incorrectly stated that **crustaceans** had been separated from the phylum Arthropoda. This was apparently suggested — but arguments against the move prevailed so crustaceans are still arthropods, along with insects, spiders and so on.



LANDCARE AUSTRALIA

Cairns Urban Landcare Walks and Talks

Off the Grid — Energy Efficiency
Learn how to be energy wise and visit some energy-efficient houses.
When: Sat. 12 October, 9.00am
Where: Outside the (only) petrol/service station in Kuranda.

Whirring Wings
How to create your own rainforest garden and attract birds, insects and butterflies; walk around a lovely Brinsmead garden.
When: Sat. 2 November, 9.00am
Where: 3 Duane Close, Brinsmead

What Goes Around, Comes Around
Review of water quality issues in Cairns and what you can do about it.
When: Sat. 23 November, 9.00 am
Where: Lily Creek Bridge, Greenslopes St

Inlets and Industries — Where to from here?
Take a boat/canoe trip up the inlet and learn about best landcare practice for industry.
When: Sat. 7 December, 9.00am
Where: Cairns Yacht Club

Fees for all walks/talks: $5 adult; $3 concessions; children free.
Further details: Melissa on 32 1746.

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Great Barrier Reef: Science, Use and Management
When: 25-29 November
Where: James Cook University, Townsville
This conference will review and report on contemporary scientific research and future initiatives in a range of human use, management and ecological issues.
Australian organisations are invited to promote relevant GBR marine and coastal information, including computer data bases, publications, web sites, CD Roms and GIS-related systems at the conference.
For more information contact Jan Crossland, conference secretary at GBRMPA, PO Box 1379, Townsville, Qld 4810; Tel: (077) 50 0723; Fax: (077) 72 6093; email: jan_crossland@gbrmpa.gov.au