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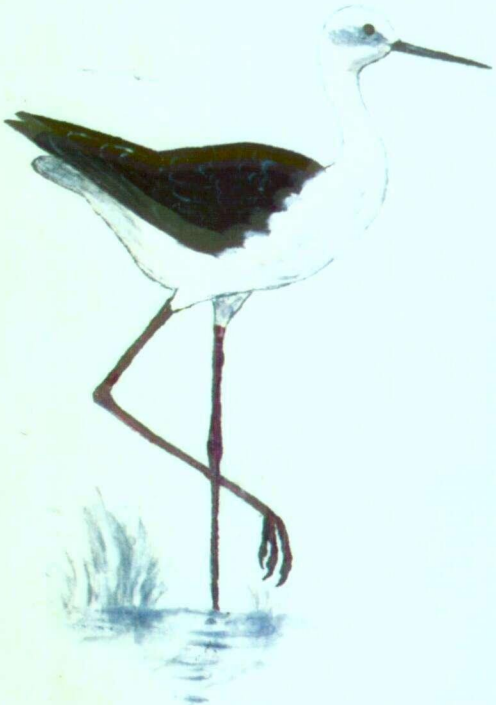
WADERS IN SRI LANKA

A GUIDE TO THEIR IDENTIFICATION AND STUDY

P. N. DAYAWANSA AND MAYURI R. WIJESINGHE



NATIONAL SCIENCE FOUNDATION

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FOREWORD

The Man and Biosphere (MAB) National Committee which steers Sri Lanka's contribution to UNESCO's worldwide programme on the conservation and wise use of the biosphere has readily agreed to publish "A Guide to the Study of Waders in Sri Lanka" by Dr P N Dayawansa and Dr Mayuri Wijesinghe, senior lecturers in the University of Colombo.

Sri Lanka's MAB National Committee is appointed by the Ministry in charge of Science and Technology and functions under the aegis of the National Science Foundation. It has been functioning for nearly three decades, and throughout this period it has actively pursued its identified role of enhancing knowledge and promoting awareness of the varied ecosystems in the country and the species of which they are composed. This has been done primarily by promoting research and bringing out publications on the biodiversity of the country.

Sri Lanka has a rich diversity of avian fauna, comprising indigenous as well as migrant species. In fact Sri Lanka's wetlands form an important outpost for birds migrating to the tropics from northern latitudes during the winter season. The present field guide on the shorebirds in Sri Lanka is a valuable contribution towards educating the bird-lover as well as the general public on this interesting assemblage of avian species that inhabit our wetlands. It contains a wealth of information presented in a clear and lucid style to guide the uninitiated. The textual information supported by excellent colour illustrations should greatly facilitate identification of the different species and hence evoke interest among the public in their study.

The efforts of Ms Anusha Amarasinghe, Director Scientific Affairs, in bringing out the publication are much appreciated.

Prof. Eric Karunanayaka
Chairman
National Science Foundation

December 2001

PREFACE

At one time or another, we have all been drawn by the fascination of wetlands. Although relatively simple habitats with limited flora and lacking in great contrasts of height, they are wide and uncluttered, quiet and tranquil, yet bursting with life. Thus, for a naturalist or student the wetlands may offer some of the most challenging habitats. Wetlands are extremely productive and support very large numbers of birds that undoubtedly enhance the beauty of these habitats.

Waders or shore birds are the most important group of wetland birds that are vital for the smooth functioning of these ecosystems. Sadly, however, to the aspiring ornithologist, waders are an infuriating, confusing group of small dull coloured birds. This has frequently resulted in the general lack of interest in them. We have dedicated this booklet solely to the wading birds in the hope of making people more aware of their beauty and importance.

Whatever the interests and expertise, one of the first objectives when one faces the diversity of birds is to name individual specimens, and this can be a difficult but rewarding occupation. This booklet has been designed as an annotated field guide covering the waders that are observed in the wetlands of Sri Lanka. It provides information on their distribution and habitats, feeding behaviour, and songs and plumage patterns that could be used for identification purposes. The descriptions are greatly enhanced by the color plates of 52 of the more common species. Some basic tips on the methods of studying their food preferences and foraging habits are also given. It is, however, no more than an introduction to a complex subject.

The booklet aims to enable the serious student, the occasional visitor, and perhaps, above all, the amateur naturalist, who enjoy watching and identifying birds to satisfy their curiosity, to know what bird they are watching and what birds they could expect to see in a wetland. The inclusion of the ecological aspects no doubt improves the book's value to both the beginner and experienced ornithologist. If the book in anyway adds to the interest and pleasure of those visiting the wetlands, our objectives will have been met.

P. N. Dayawansa
Mayuri R. Wijesinghe
Department of Zoology, University of Colombo
11 September 2001

1. ABOUT WADERS....

Waders are a group of birds that are undoubtedly most interesting. They are among the greatest avian travellers, their migration spanning the globe. Waders have the amazing ability to fly long distances, and they display a variety of fascinating shapes, sizes, plumage patterns and colours. Many even undergo complete changes in appearance between their breeding and non-breeding seasons. Their manner of feeding varies enormously, while their displays and courtship involve some of the most amazing and unique demonstrations of flight and vocalization.

Why are they called "Waders"?

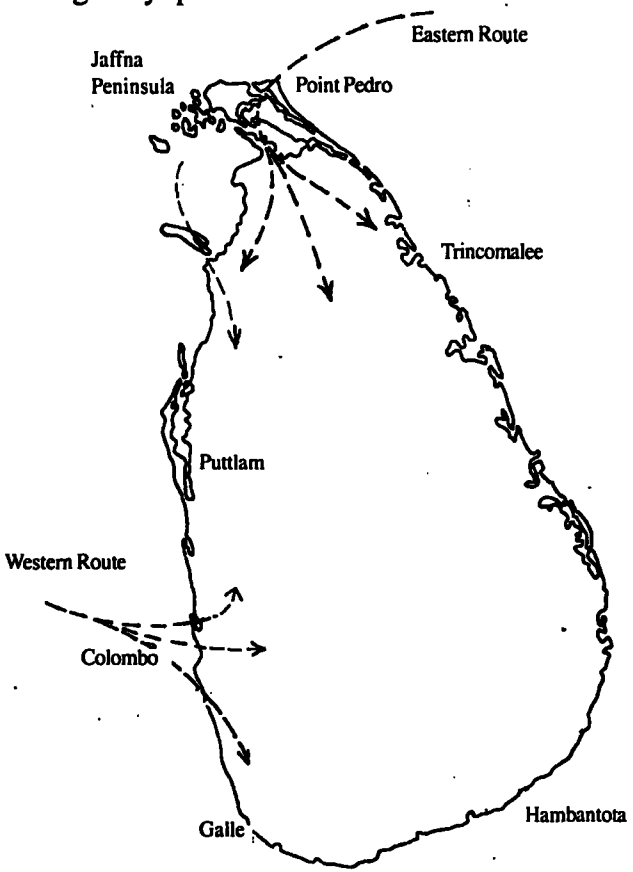
"Waders" or "Shorebirds" are loosely used terms to describe a group of small to medium sized birds, gregarious in nature, and living at the edge of the water, i.e. waders usually occupy the interphase zones or the lap areas of a water body. The lap area of a water body can generally be described as the area of the water body that extends to about 10 m on either side of the shoreline. Within this interphase zone, some wader species like to occupy the shore while others may prefer to go in to slightly deeper waters.

Waders occupy shoreline interphase for feeding and resting.

Scientifically speaking, waders are included in the order Charadriiformes which consists of 13 families distributed throughout the world.

Which time of the year is best to observe them?

Most wader species are migratory. They breed in temperate regions during the summer when food in these areas is abundant but disappear "somewhere" when winter is approaching and food becomes scarce. This is when they migrate to the tropical regions where the climate is much warmer and there is food to eat at all times. These species are thus named "migratory species".



Major migratory routes of waders

Migration

Migration can be defined as the seasonal movement of organisms between two geographical locations, usually between their breeding and non-breeding sites. The various routes along which the shorebirds fly during their annual migration are grouped into pathways called flyways and two flyways have been identified within the Indian subcontinent. Most birds arriving in Sri Lanka during the northern winters usually enter the island along the two flyways.

We are lucky that many wader species have chosen Sri Lanka as their final destination point, where they settle down for a few months to have a good feed. They usually arrive around mid August of a particular year and remain in the island until about May of the following year when it is time for them to return once again to their native lands in order to breed.

Some wader species, however, are different because they do not migrate, but live in tropical countries throughout the year. Species such as the well known Red-wattled lapwing can be found in Sri Lanka at all times, i.e. both during their breeding and non-breeding seasons. These species are hence called "resident species". Of the 45 species of shorebirds that have been regularly recorded from Sri Lanka, only 11 are known to be resident species.

In their migration, some species might miss their way and end up at the wrong destination, i.e. they do not migrate to Sri Lanka habitually but may accidentally appear in a particular year. These species are called "vagrant species". Other individuals that migrate to our country turn lazy and sometimes hesitate to return to their homelands. These individuals which remain in the island are called "summer loiterers".

Where can waders be found?

Thousands of wading birds migrate to Sri Lanka annually and use our wetland habitats as their feeding grounds. Waders most often inhabit wetlands that are associated with coastal habitats such as lagoons, estuaries and salt-marshes. A few species, however, also occur in freshwater habitats. Some of the wetlands in Sri Lanka where you could observe wader birds are listed in Appendix 1.

> ***A common resident wader (Chapter 3 Plate 5)***
> *The Red-wattled Lapwing (Vanellus indicus) is one of Sri Lanka's commonest wader species, distributed throughout the island in both freshwater and coastal marshes. They even occur in the middle of cities, in playgrounds and parks. Its call may be heard ringing aloud, sounding like "did-you-do-it". Its relative Vanellus malabaricus is different from this species, and is recognized by its yellow wattle. It is hence known as the Yellow - wattled Lapwing. This species, unlike the common Red-wattled Lapwing, is much rarer and restricted to the drier areas of the island.*

Are they well protected?

We live in an age of rapid changes. One result of this has been the devastation of much of the wildlife habitats that once supported large numbers of animals and plants. Wetland habitats in particular are now severely threatened as a result of land reclamation for industrialization, urban development and agricultural expansion, and pollution. It is therefore not surprising that many wetland species, including the waders, have suffered a decline in their numbers over the past few decades. This is indeed a global problem. So there is much to be concerned about.

Waders migrating from the northern part of the world, that is from the temperate countries, are now comparatively well conserved in their native habitats as their numbers are regularly monitored and extensive studies relating to their ecology are frequently carried out, enabling successful conservation and management of these species.

In Sri Lanka, as in many other tropical countries, effective management is hampered by the fact that information on the wader species is lacking. We still have quite a lot to learn about these fascinating birds if we are to conserve them. It is fortunate, however, that there is an Act of Parliament, which gives protection to most species of our animals and plants including the waders. This is the Fauna and Flora Protection Ordinance. Many problems arise when wetland habitats are altered or destroyed, with catastrophic consequences to the fauna that take refuge in them. For this reason, a number of wetland ecosystems have now been declared as National Parks or Sanctuaries thereby giving added protection to the inhabitants of these habitats. One of our wetlands, the Bundala National Park, has also been declared a Wetland of International Importance, under the Ramsar Convention.

The Fauna and Flora Protection Ordinance *is a legislative enactment to prohibit actions that result in the destruction of animal and plant life in natural habitats.*

The Ramsar Convention *is a Convention on wetlands, signed by countries in the Iranian City of Ramsar in 1971. It provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. Parties are required to designate at least one wetland for inclusion in the List of Wetlands of International Importance and to promote its conservation. The Ramsar Convention has been ratified by 116 countries, and there are over1000 wetland sites declared under the Convention. In Sri Lanka, only one wetland site, the Bundala National Park, has been declared a wetland of International Importance under this Convention, at present.*

Aims of this booklet

This booklet attempts to widen interest in waders. It is meant to provide birdwatchers, students and researchers with a guide to the identity of the wader species found in our wetlands and also to help them study some of the more interesting aspects of wader ecology. Conservation of waders has now become an important issue requiring the help and support of as many people as possible. It is therefore hoped that this booklet would generate and sustain the concern needed for the conservation of these beautiful, fascinating, and yet threatened creatures, to ensure their return to our island every year.

2. LEARNING TO IDENTIFY WADERS

Knowing the identity of a bird definitely gives added pleasure when watching birds. Identification of birds is a skill which demands careful observation, detailed study and some experience.

Waders all share several common and easily observable characteristics in morphology and behaviour. They generally –

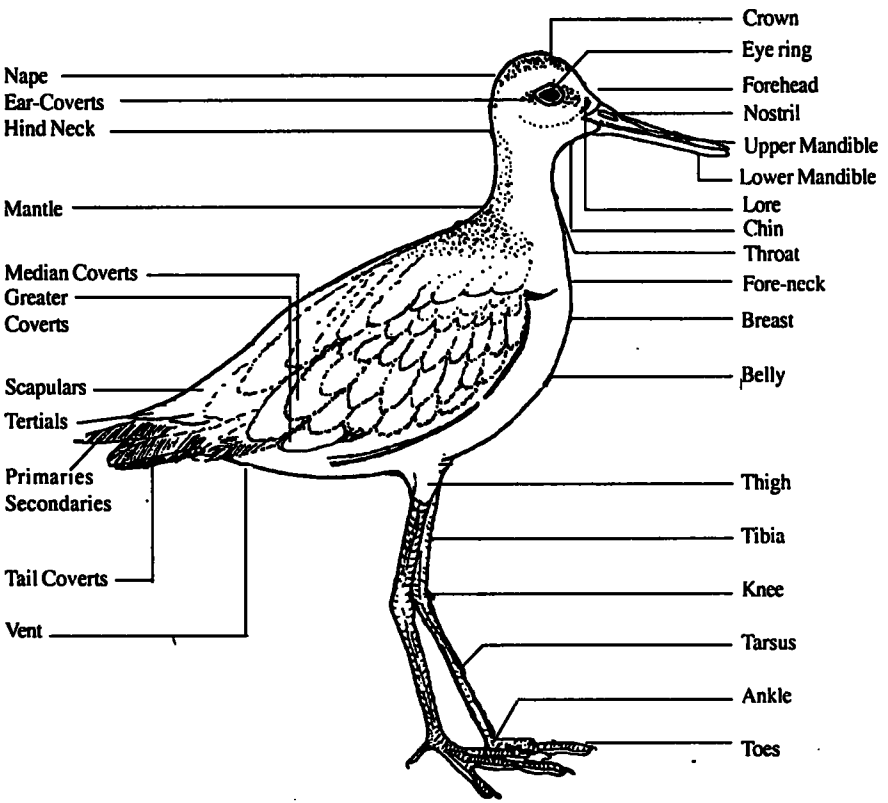
- have long or longish necks
- have long bills
- have long legs
- are migratory
- forage and roost in flocks

Detailed features however vary greatly from species to species. As a large number of them occupy any given habitat, each species during the course of evolution has evolved in different ways to exploit the variety of microhabitats within their shared habitat. Species may thus differ from one another with respect to the length of the bill and legs, body shape and colour, to suit them to the specialized foraging niche they occupy.

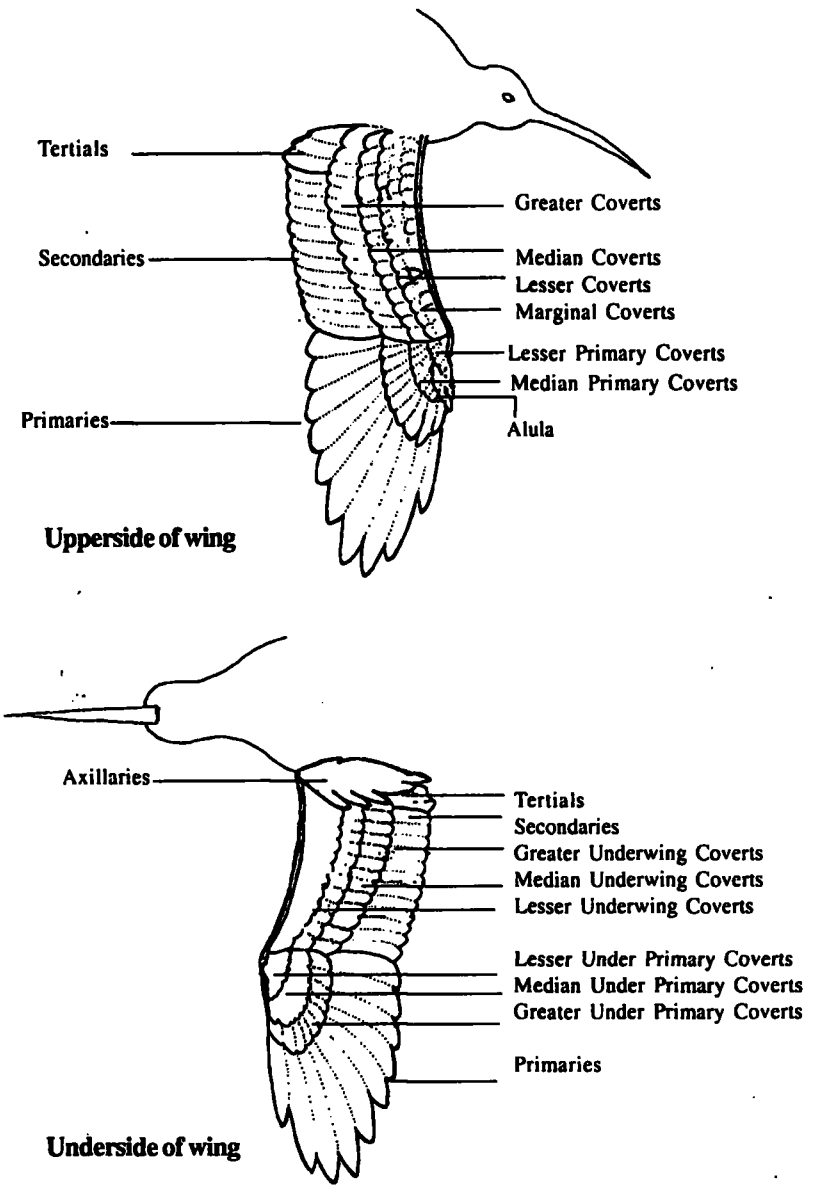
The pictures of the waders provided in this booklet and in many other field guides will help you to identify species. But it's worth spelling out a few crucial points.

To be able to identify a wader species correctly, it is necessary first to familiarize yourself with the general topography of a wader bird. This is illustrated in page 16.

Having familiarized yourself with this diagram you could make use of the different terms used in it to describe the shape and colour of the various parts of the birds you observe. When attempting to identify a wader for the first time, there are certain aspects that shoud be taken note of. This will make the identification process much easier.



Basic topography of a wader



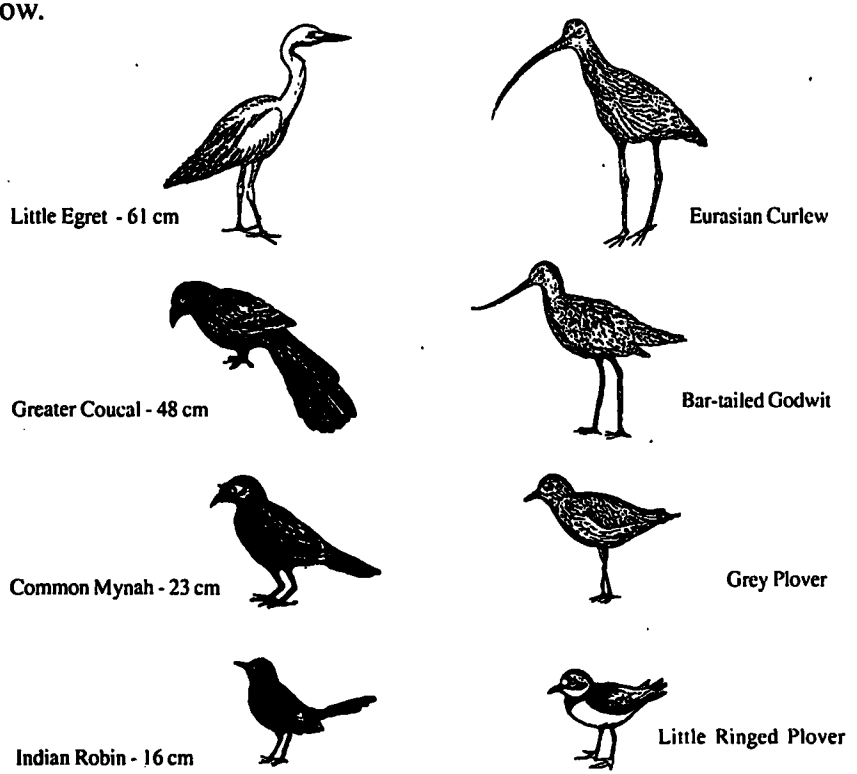
Topography of the upperwing and underwing in flight

FACTS TO NOTE!

Size and Shape

Size

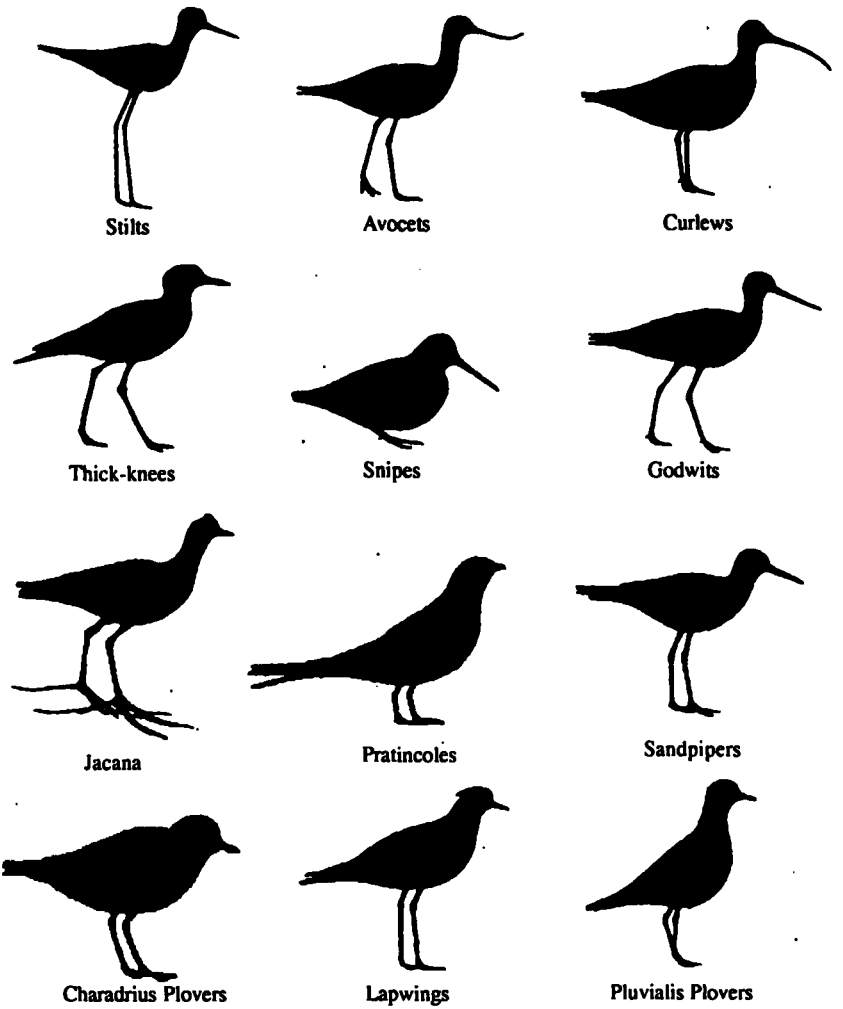
Attempt to judge the relative size of the bird against the size of another particular species familiar to you. This need not always be a wader. Even a common garden bird that is encountered every day may be suitable. Accurately assessing the size of a bird is quite a difficult task. So, it is sufficient to note down the relative size of the bird. For example the black-winged stilt may be described as being similar in size to the house crow.



Relative size of common garden birds and waders for comparison

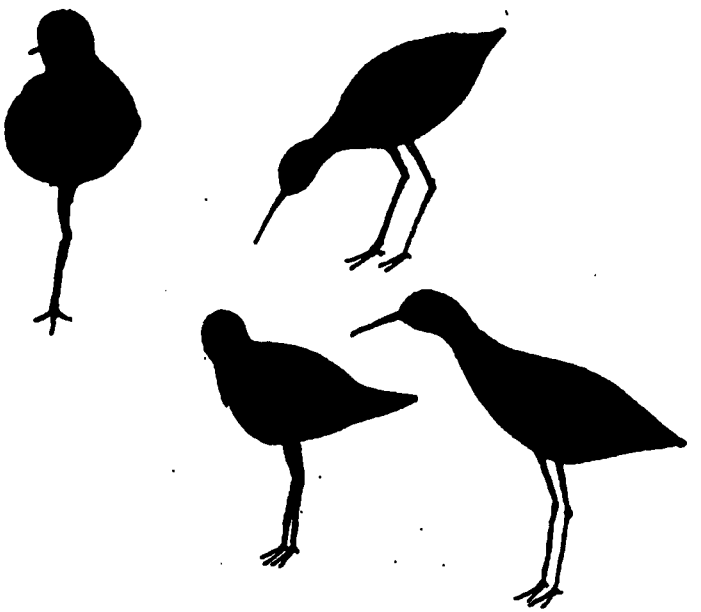
Shape

Body shape: Most groups of waders have characteristic body shapes. For instance all stilts will share a common body shape that will differ from that of the lapwings. Therefore, drawing a rough sketch of the bird's outline will greatly help in identification of the group to which the bird species you see belongs. This will at least narrow down your list to a single group of birds. So, it is worth the effort.



Body shapes of some groups of waders

A single bird may adopt different postures that might give a misleading picture of the bird's body shape. This has to be kept in mind when attempting to identify the bird using its shape.



Different postures adopted by redshank

The shape of the body and different body parts such as the bill, legs, wings, etc. are also very important identification features. Sketching these parts is thus recommended.

Bill shape: The shape of the bill and its length are two of the most distinctive field marks for wader identification. The bill may be described as being long and upcurved, long and straight, stout, long and decurved, etc. The length of the bill should be noted in relation to the length of the head. The following sketches will help.

Thick-knee
Robust and powerful

Eastern Curlew
Long, decurved

Black-tailed Godwit
Long, straight

Bar-tailed Godwit
Long, slightly upcurved

Avocet
Long, thin, upcurved

Redshank
Medium, straight

Terek Sandpiper
Medium upcurved

Whimbrel
Medium, decurved

Black-winged Stilt
Medium, thin, straight

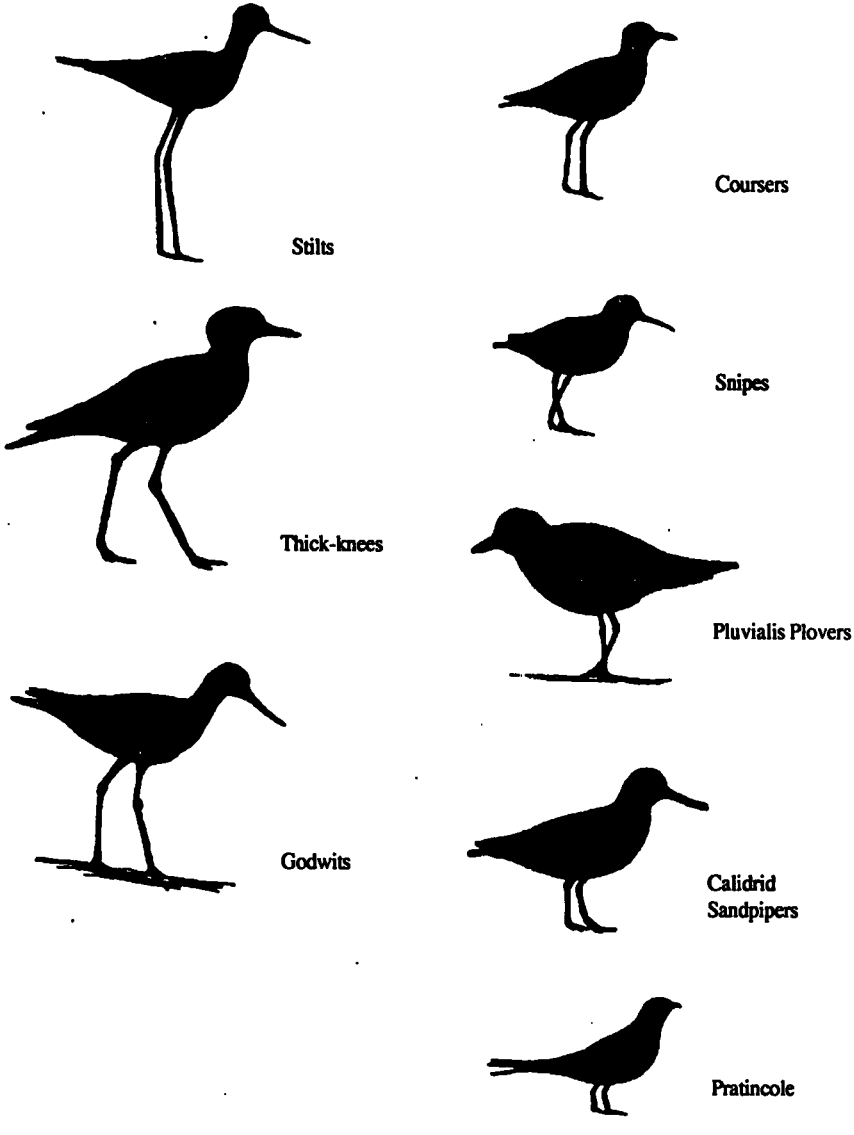
Long-toed Stint
Short, decurved

Ruddy Turnstone
Short, thick, sharp

Pratincole
Short, decurved, sharp

Diversity of bill shapes

Leg length: This should be noted in relation to the body height and recorded as relatively short or long, extends beyond tail during flight, and so on.



Variety of leg lengths

Wing shape: Usually the shape of the wings is a feature that characterizes different groups of waders. The wings may be round or pointed. So, carefully observe the bird in flight and outline the shape of the wings as follows.

Red-wattled Lapwing

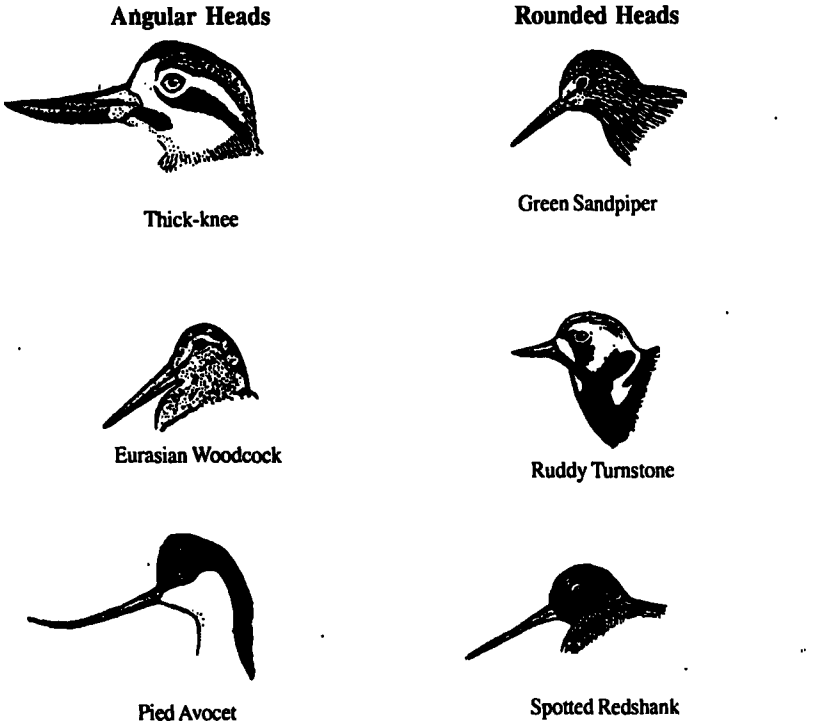
Great Snipe

Green Sandpiper

Eurasian Oystercatcher

Diversity of wing shapes

Head shape: The shape of the head also differs among the waders. Some species may have rounded heads while others may have an angularly shaped head. This is illustrated in page 24.



Variety of head shapes

Accessories

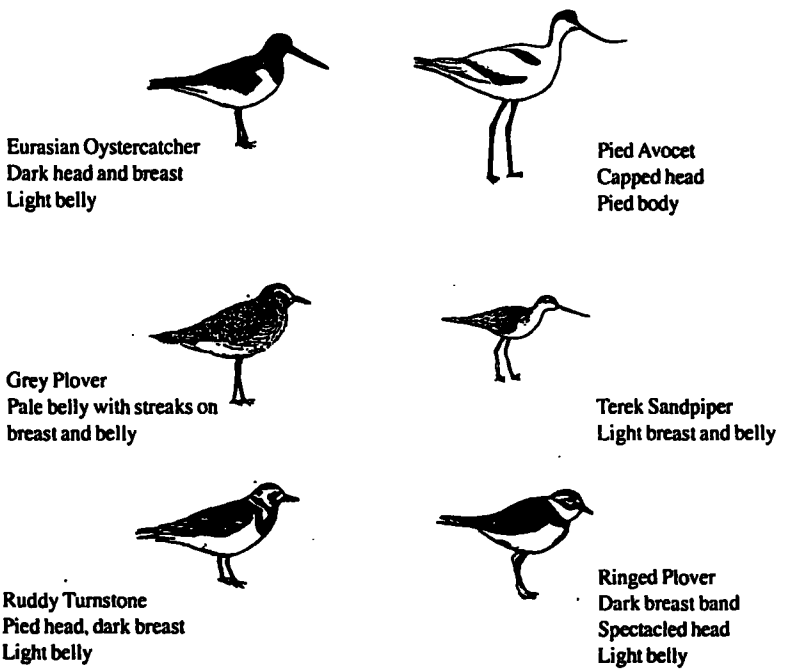
Not all waders possess accessory structures on their heads and therefore such structures will be of added importance in identifying a particular species. Some species bear structures such as wattles and crests on their heads. Accessory structures seen in waders are sketched below for your reference.

Accessory structures on head

Colours and patterns

Waders are most colourful during their breeding season as they use glamorous plumage patterns and colours to attract their mates. Unfortunately, however, in Sri Lanka we do not have the opportunity of observing them in their bright plumage as they migrate to Sri Lanka during their non-breeding season. It is difficult to tell species apart using colours during the non-breeding season, as most species appear drab in their dull brownish or grey plumage.

Colours observed in waders when they are in Sri Lanka may seem boring, but patterns on their body can be of interest. Most wader species have plumage patterns on their wings and tail that are highly characteristic and are therefore useful for identification even during the non-breeding season. What may be noted are the back rump feathers, tail patterns, upper-wing patterns, under-wing patterns, body patterns, etc. along with their colours. The colour of the bill and legs should also be taken note of.



Variety of body patterns

Behaviour

Waders are extremely interesting to watch. This is because many species have peculiar foraging and courtship behaviour patterns, body movements and flight patterns. Of course here in Sri Lanka we will not have a chance of viewing some of the most spectacular displays that occur during courtship of some species.

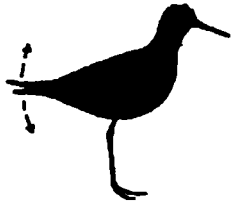
For resident species that breed in the island, however, even the courtship behaviour patterns may be useful for identification.

The foraging behaviour of these birds on the other hand is very important to us, as this is the most commonly observed behavioural pattern displayed by waders in their non-breeding foraging grounds. Tail **bobbing** by *Tringa* sandpipers, **spin swimming** by palaropes, **stitching** (rapid trial probing) by snipes, total **submerging** of head by female bar-tailed godwits and **'stop-run-stop-pick'** by plovers are some characteristic behavioural patterns that can be noted while foraging.

It is worth noting, however, that the foraging behaviour of a species may change depending on the space available, food items being taken, and the presence or absence of other species.

Habitat

The occurrence of some bird species is restricted by habitat preferences. These habitats include mudflats, salt marshes, lagoons, estuaries and freshwater marshes. Even within a broad habitat type the specific microhabitat of a bird could be described in terms of vegetation or the type of substrate in the area occupied by the bird. For example reeds, grasses and algal mats can be used to describe the vegetation, while the terms sandy, muddy, rocky, etc. can be used to describe the substrate. If you observe a bird in a fresh water marsh walking on a lotus leaf this most definitely has to be a Jacana. Jacanas never live close to the seashore or walk on a sandy substrate. Therefore noting down the specific habitats and microhabitats of species can be of immense help.

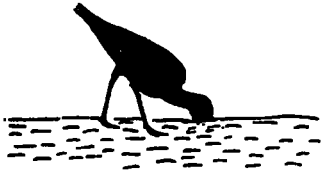


Tail bobbing
Tringa sandpipers

Turn over stones
Ruddy Turnstone

Spinning
Phalaropes

Wing flicking
Tringa sandpipers



Head submerging
Bar-tailed Godwit

Stitching
Snipes

Stop - Run - Stop - Pick
Foraging Plovers

Some behavioural patterns useful in identification

Calls

Most waders are noisy birds, particularly when they first take off. Listen to the sounds they make. Many have very peculiar diagnostic calls that can easily be heard in the open areas they inhabit. To learn how to distinguish these calls may take a while, but it is an excellent clue to the identity of a bird. For instance the characteristic call of a Red-wattled Lapwing may be written down as ***did-you-do-it.***

SOME TIPS FOR EASY LEARNING IN THE FIELD

For a start, it is advisable to select a large wader species for study, one that is easily observable. Initially, select, from within a flock, one bird that is nearest to you. Thereafter, spend a little time watching it. Study and notice everything you can about it and write down as many details as possible. For effective study certain essential items are needed.

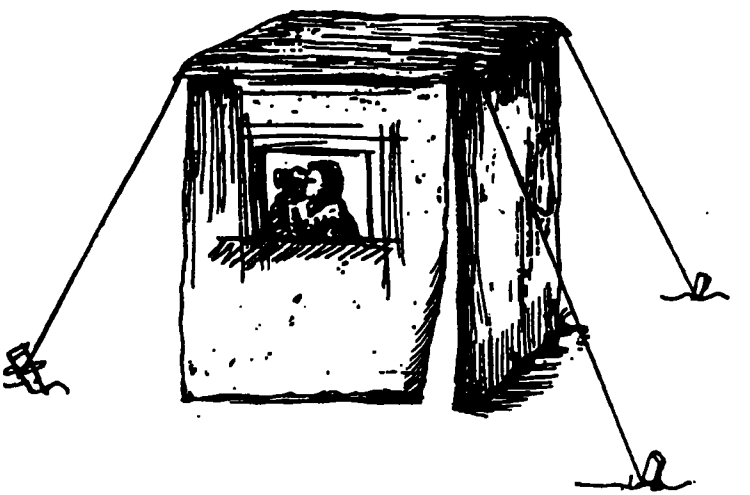
CHECKLIST OF ESSENTIAL ITEMS

* A **binocular** or a **spotting scope** to spot the waders. This enables one to view the bird from a distance without causing any disturbance.
* A pocket-sized **notebook**, preferably with a hard cover, and a **pencil** to take down descriptions and sketches on the spot. This method of observation will help to critically examine the bird rather than merely browsing through a field guide. Field notes are accurate and thus scientifically valid. Try not to rely on your memory but rather jot it down. A pencil is recommended as notes written in ink tend to get smudged or erased when wet.
* A **field guide** to help the identification of species observed. A list of field guides you could use in addition to this has been given in the section "Further reading".

Waders are found generally in open areas. Approaching to see them clearly is thus difficult.

Use of binoculars or spotting scopes however will help overcome this difficulty.

A useful way to approach the waders is to make use of a blind or hide. This will allow observation of waders with as little disturbance as possible. Select a natural blind at the site (a rock, bush, harboured canoe), or construct an artificial shelter using light weight nylon or canvas material or even use a parked vehicle (if available). Allow the animals to habituate to the blind or hide.



A simple canvas shelter will make an ideal cover for wader watching

REMEMBER .....

* Always wear a dull colour to blend with the surroundings.
* Adopt a sitting posture rather than an upright posture.
* Be silent.
* Avoid sudden movement as it scares the birds away.

NOW TEST YOUR SKILLS

* When you visit a wetland, you may encounter several species of waders.

* Observe birds carefully from a distance with a pair of binoculars or spotting scope. Take time and don't be in a hurry.

PATIENCE IS THE KEY FOR A GOOD STUDY!

RECORDING FIELD OBSERVATIONS

* Once you are confident about a bird's identification, you may add it on to your checklist (Appendix 2) right away.

* However, if the bird cannot be identified immediately, then record all the noticeable features of the bird in the field note book. Draw appropriate sketches. Ideally a page from a field notebook should contain the following information.

Data sheet

Record No. :..... Location : .....

Date :...../...../..... Time : .....hrs

Weather condition :..... Tide : high / low

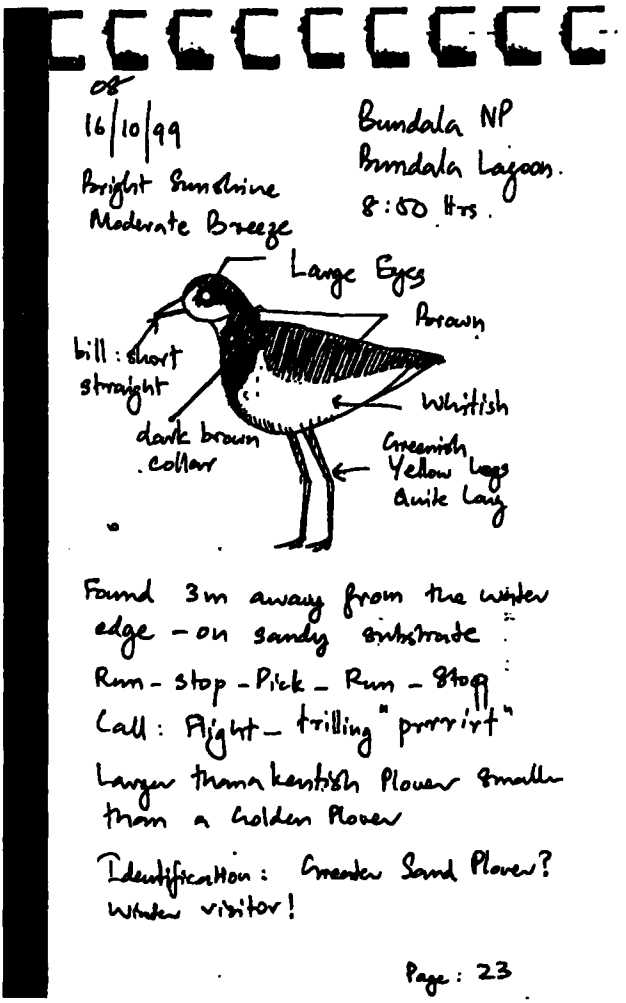
Sketch of bird
Indicate colours, shape,
accessory structures.

Size :
Behaviour :

Call :
Special notes :

* Concentrate on the details of the bird. All other information could be filled in afterwards.

SAMPLE DATA SHEET FROM A FIELD NOTE BOOK



* Now, look up the field guide and attempt to identify the bird observed using the features and sketches that have been noted down. Easy isn't it?

* Once a bird has been identified accurately, include it in the checklist.

DO NOT BE AFRAID OF MAKING MISTAKES!

3. A GUIDE TO THE WADER FAMILIES IN SRI LANKA

The classification followed in this booklet is based on the recent publications by Sibley and Monroe (1990 & 1993) and Inskipp *et al.*(1996). Waders are included in the Order Charadriiformes which consists of 337 species in 13 families, distributed worldwide (Perrins, 1990). Forty-five wader species in nine families occur in Sri Lanka (Kotagama and Fernando, 1995). The two largest families are the Scolophacidae to which the sandpipers, snipes and their allies belong and the Charadriidae which include the lapwings and plovers.

This section provides you with information on the nine wader families found in Sri Lanka along with one or two of the most distinguishable features. Colour plates are also provided under each family for easy identification. Most of these species are migrants while some are breeding residents.

Certain other species that occasionally inhabit our wetlands have also been listed separately.

WADER FAMILIES

PLATE 1

(1) Jacanidae (Jacanas)

The most striking feature of these waders is their extremely long toes and claws, which enable them to walk on floating vegetation. This feature alone will enable the identification of the jacana, as only one species is found in Sri Lanka. During breeding, the adult is quite unmistakable with a long, drooping dark brown tail, a dark brown body and a contrasting white wing panel. The non-breeding adult has a much shorter tail.

Pheasant-tailed Jacana *Hydrophasianus chirurgus* *30-50cm*

Very common; breeding resident; weed covered water in low country.

(2) Rostratulidae (Painted Snipes)

These birds are active mostly at dawn, at dusk and during the night. They have a highly intricate plumage pattern. In shape, they resemble the snipes but have a shorter bill. The painted snipes usually inhabit thickly vegetated fresh water marshes. Only one species is found in Sri Lanka.

Greater Painted-Snipe *Rostratula benghalensis* *25cm*

Rare; breeding resident; low country and lower hills; swamps, marshes and undisturbed paddy fields.

(3) Dromadidae (Crab Plover)

Only one species is found in Sri Lanka and worldwide and it is unmistakable due to its large size, massive bill, and black and white plumage. It inhabits

large intertidal sandflats, where crabs are abundant, and as crabs form the main part of the diet, it is called the crab plover.

Crab Plover *Dromas ardeola* *38-41cm*
Very rare; probably a breeding resident; beaches, estuaries and lagoons of North and Northwest coasts, occasionally in the South.

(4) Haematopodidae (Oystercatchers)

These are large stocky birds with a distinctive pied plumage, red or orange bill and pink legs. They are found mainly on the seacoast. Only one species migrates to Sri Lanka.

Eurasian Oystercatcher *Haematopus ostralegus* *40-46cm*
Very rare; migrant; reefs, sand bars and lagoons of dry zone coast.

(5) Recurvirostridae (Stilts and Avocets)

These waders have a slender appearance and a pied plumage. The Avocet has a distinctive upturned bill whilst the Stilt has a straight needle-thin bill. Stilts can be recognized by their thin, extremely long legs.

Black-winged Stilt *Himantopus himantopus* *35-50cm*
Extremely long, fleshy coloured legs.
Very common; resident; wet and dry lowlands.

Pied Avocet *Recurvirostra avosetta* *42-45cm*
Upturned long thin black bill.
Rare; migrant; coastal marshes and tidal flats of dry zone.

PLATE 1

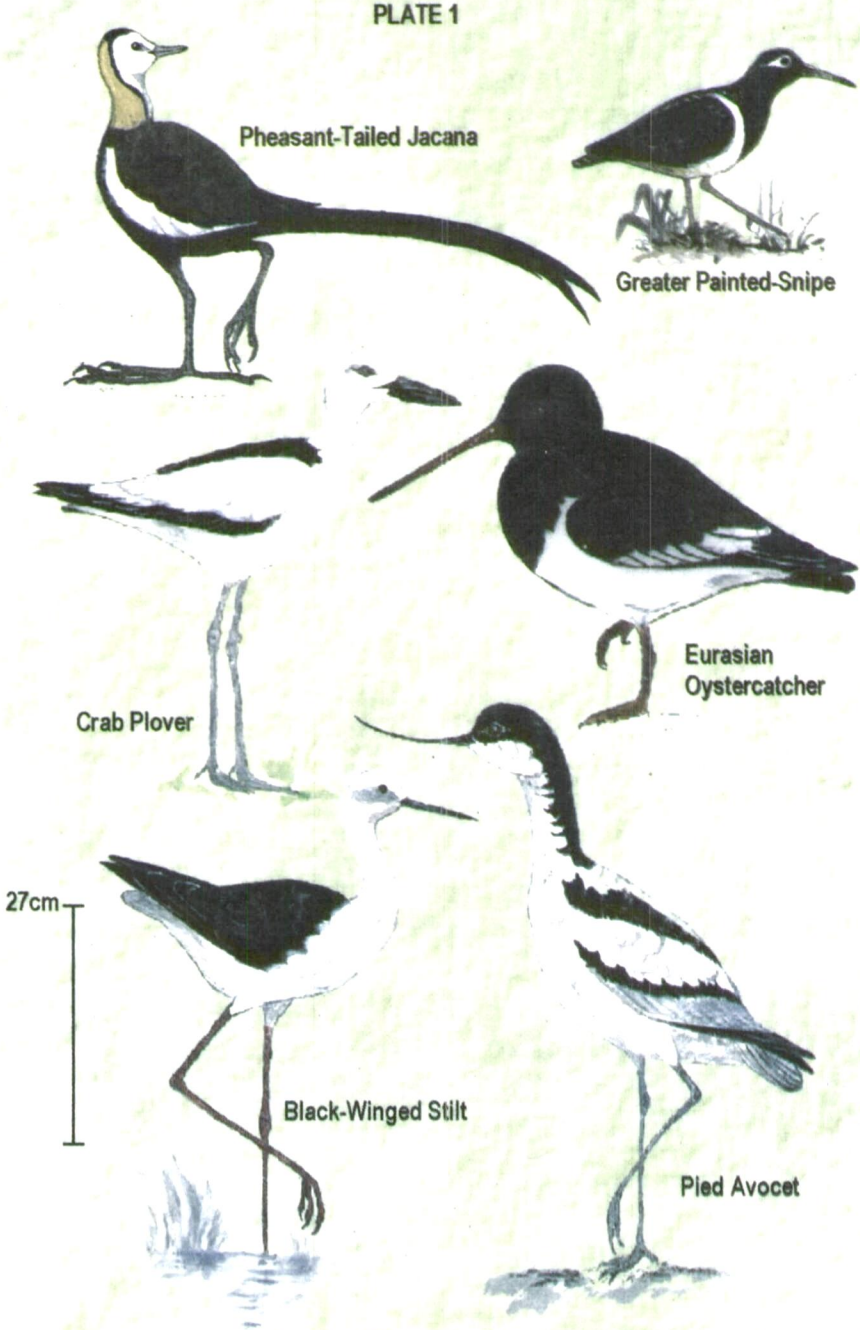

Pheasant-Tailed Jacana
Greater Painted-Snipe
Eurasian Oystercatcher
Crab Plover
27cm
Black-Winged Stilt
Pied Avocet

PLATE 2

(6) Scolophacidae (Sandpipers, Snipes and allies)

Scolophacidae is the largest and the most diverse group of waders. Most species belonging to this family have thin, straight or curved bills, and specialized feeding habits. They usually probe the sediment.

Eurasian Woodcock *Scolopax rusticola* *33-35cm*
Stout; long bill; barred crown; barred under-parts.
Very rare; migrant; wetzone lowlands to wetlands of hill country.

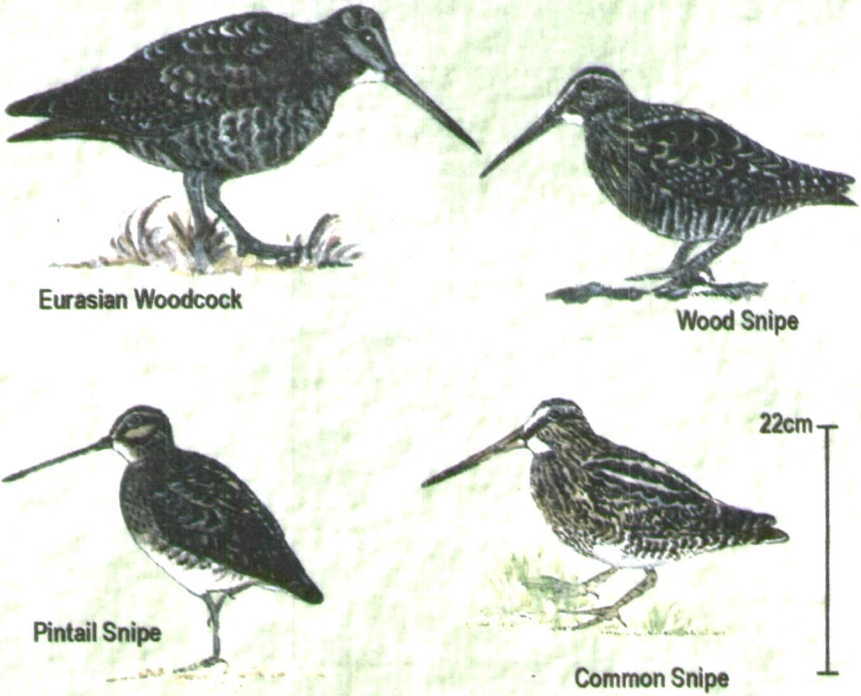
Wood Snipe *Gallinago nemoricola* *28-32cm*
Dark brown in colour; dark brown bars on entire under parts.
Very rare; migrant; wetlands of hill country.

Pintail Snipe *Gallinago sternura* *25-27cm*
Very narrow white band on rear edge of secondaries.
Common; migrant; lowland paddy fields and swamps, less common in hill country.

Common Snipe *Gallinago gallinago* *25-27cm*
Long straight bill; striped crown and mantle.
Rare; migrant; swamps, paddy fields and tank edges in lowlands.

Jack Snipe *Lymnocryptes minimus* *17-19cm*
Smaller than the common snipe; bill shorter; centre crown dark; pointed tail.
Rare; migrant; swamps and paddy fields in lowlands, occasionally in the hill country.

PLATE 2


Eurasian Woodcock
Wood Snipe
Pintail Snipe
22cm
Common Snipe
Jack Snipe
Ruddy Turnstone
Ruff

Ruff *Philomachus pugnax* *20-23cm*

Upper parts of wing with distinctly flaked appearance.
Rare; migrant; fresh water marshes, paddy fields and salterns mainly in the Southeast dry zone, occasionally in the wet zone.

Ruddy Turnstone *Arenaria interpres* *23cm*

Short, conical, black bill; short yellowish red legs; lever-like action when feeding.
Very common; migrant; common in coasts, lagoons and estuaries of dry zone; prefers rocky or stony areas

PLATE 3

Black-tailed Godwit *Limosa limosa* *36-44cm*

Very long bill; bold white rump and wing stripe; broad black tail band.
Common; migrant; occasional summer loiterer; lagoons, estuaries and tank edges of dry lowands.

Bar-tailed Godwit *Limosa laponica* *37-41cm*

Long slightly upturned bill; barred greyish tail; no wing-stripe.
Very rare; migrant; dry zone coastal areas.

Whimbrel *Numenius phaeopus* *40-46cm*

Decurved bill; broad stripes on crown; smaller than curlew.
Rare; migrant; coastal areas of low lands, more common in dry zone

Eurasian Curlew *Numenius arquata* *50-60cm*

Very long decurved bill; no bold stripes on crown.
Common; migrant; lowlands, more common in the North.

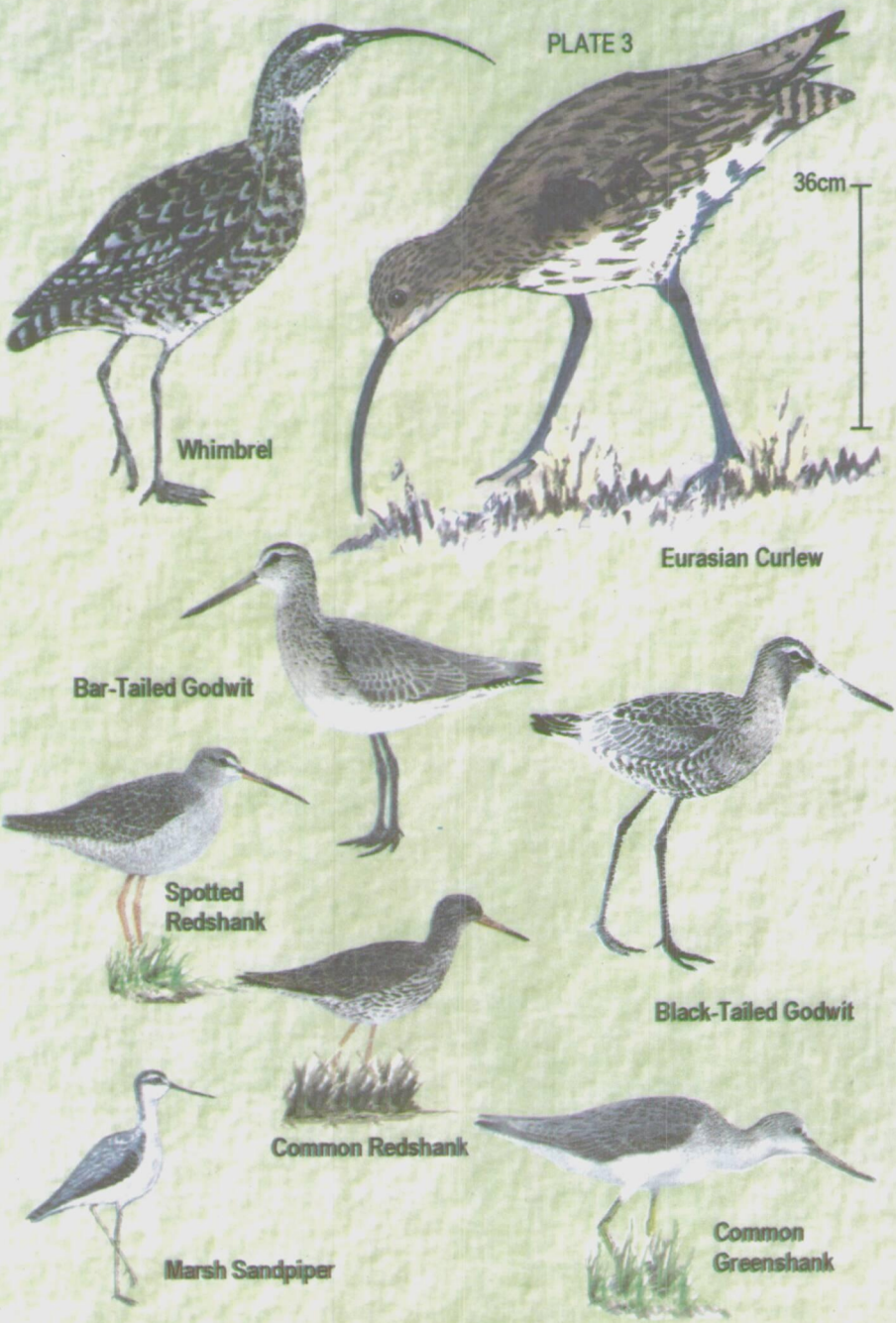


PLATE 3
36cm
Whimbrel
Eurasian Curlew
Bar-Tailed Godwit
Spotted
Redshank
Black-Tailed Godwit
Common Redshank
Marsh Sandpiper
Common
Greenshank

Spotted Redshank *Tringa erythropus* *29-32cm*
Much paler, thinner and longer billed than the Common

Redshank; dark red legs.
Rare; migrant; tanks and lagoons of dry zone lowlands.

Common Redshank *Tringa totanus* 27-29cm
Orange-red legs; short bill with reddish base.
Very common; migrant; common in coastal areas of dry zone, less common in wet zone.

Marsh Sandpiper *Tringa stagnatilis* *22-25cm*
Like tiny delicate greenshank; very long legs; needle-like bill; white upper back extends to shoulder.
Very common; migrant; lagoons, coastal areas, occasionally in tank edges of dry lowlands.

Common Greenshank *Tringa nebularia* *30-34cm*
Greenish legs; white rump and back; pale head.
Common; migrant; common in coast and tanks of dry zone, occasionally in wet zone.

PLATE 4

Green Sandpiper *Tringa ochropus* *21-24cm*
Dark above; with a squarish white rump; dark legs.
Rare; migrant; rivers and freshwater pools near trees.

Wood Sandpiper *Tringa glareola* *18-21cm*
Slender form; paler and browner than green sandpiper; legs yellowish.
Very common; migrant; rare summer loiterer; common in lowland marshes and paddy fields preferring fresh water, less common in the hills.

Terek Sandpiper *Xenus cinereus* *25cm*

Slender, upturned black bill with yellow base; legs reddish-yellow.

Rare; migrant; lagoons and estuaries of dry zone.

Common Sandpiper *Actitis hypoleucos* *20cm*

Brown breast patch and white shoulder mark; tail bobbing.

Very common; migrant; rare summer loiterer.

Sanderling *Calidris alba* *20cm*

White in appearance, black patch at base of closed wing; bill and legs black. Rare; migrant; all coastal areas.

Little Stint *Calidris minuta* *15cm*

Short black bill and legs.

Very common; migrant; dry zone tidal lagoons, mudflats and tank edges, less common in wet zone.

Temminck's Stint *Calidris temminckii* *15cm*

Legs greenish yellow; brownish grey breast; white outer tail feathers.

Rare; migrant; dry zone creeks and wet muddy coastal areas where there is cover.

Long-toed Stint *Calidris subminuta* *16cm*

Crown streaked in black; yellowish green legs.

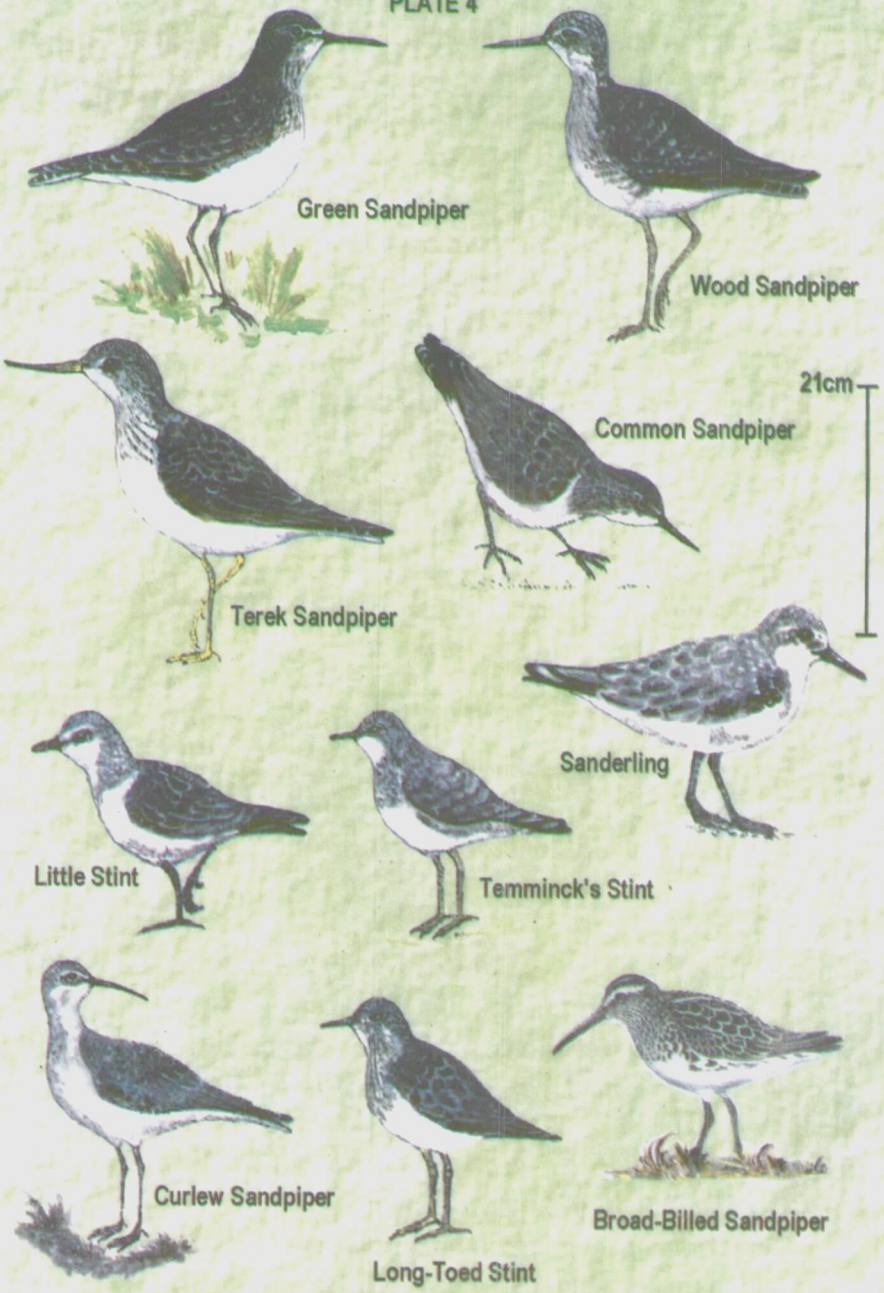
Rare; migrant; occasional summer loiterer; paddy fields, marshes and other wet lands near dry zone coast, especially in the North.

Curlew Sandpiper *Calidris ferruginea* *18-23cm*

Decurved black bill; relatively short legs.

Very common; migrant; common in lagoons, mudflats and salterns in dry zone coast, occasionally in wet zone.

PLATE 4


Green Sandpiper
Wood Sandpiper
21cm
Common Sandpiper
Terek Sandpiper
Sanderling
Little Stint
Temminck's Stint
Curlew Sandpiper
Long-Toed Stint
Broad-Billed Sandpiper

Broad-billed Sandpiper *Limicola falcinellus* *16-18cm*

Faint dark streaks on neck; underparts white; blackish shoulder patch.

Very rare; migrant; dry zone coasts.

PLATE 5

(7) Burhinidae - Stone Curlews (Thick-knees)

Stone Curlews are large and generally brown and cryptically patterned with yellow and black bills; large yellow eyes; legs with thick knee joints, hence its name.

Eurasian Thick-knee *Burhinus oedicnemus* *40-44cm*

White wing band.

Common; breeding resident; mainly on coasts and scrubby areas of dry zone, rarely in wet zone.

Great Thick-knee *Burhinus recurvirostris* *49-54cm*

Large heavy bill.

Common; breeding resident; coasts, lagoons, estuaries and tank edges of dry lowlands.

(8) Glareolidae (Coursers and Pratincoles)

The coursers are long legged fast running and well camouflaged birds. They are mainly nocturnal. The pratincoles have long wings and short bills and feed by aerial hunting of insects.

Indian Courser *Cursorius coromandelicus* *23cm*

Reddish-brown and sandy-brown with black under parts.

Rare; breeding resident; arid coastal areas of North and Northwest, occasionally in Southeast.

Oriental Pratincole *Glareola maldivarum* *23-24cm*

Tern-like, forked tail.

Rare; breeding resident; coastal areas and tank edges in dry lowlands.

Small Pratincole *Glareola lactea* *16-19cm*

Square cut tail.

Rare; breeding resident; dry lowlands, mainly in arid coastal areas.

(9) Charadriidae (Lapwings and Plovers)

This is a large group consisting of waders with compact and thick necks, short thick bills and large eyes. They hunt in a characteristic *run - pause - run - dip* manner.

Yellow -wattled Lapwing *Vanellus malabaricus* *26-28cm*

Yellow wattle near eye.

Common; breeding resident; arid areas, dry paddy fields and stony pastures of dry lowlands; occupies drier habitats than the Red wattled- lapwing.

Red-wattled Lapwing *Vanellus indicus* *32-35cm*

Red wattle near eye.

Very common; breeding resident; tank edges, fallow paddy fields and open land not far from water in the lowlands and lower hills.

PLATE 5

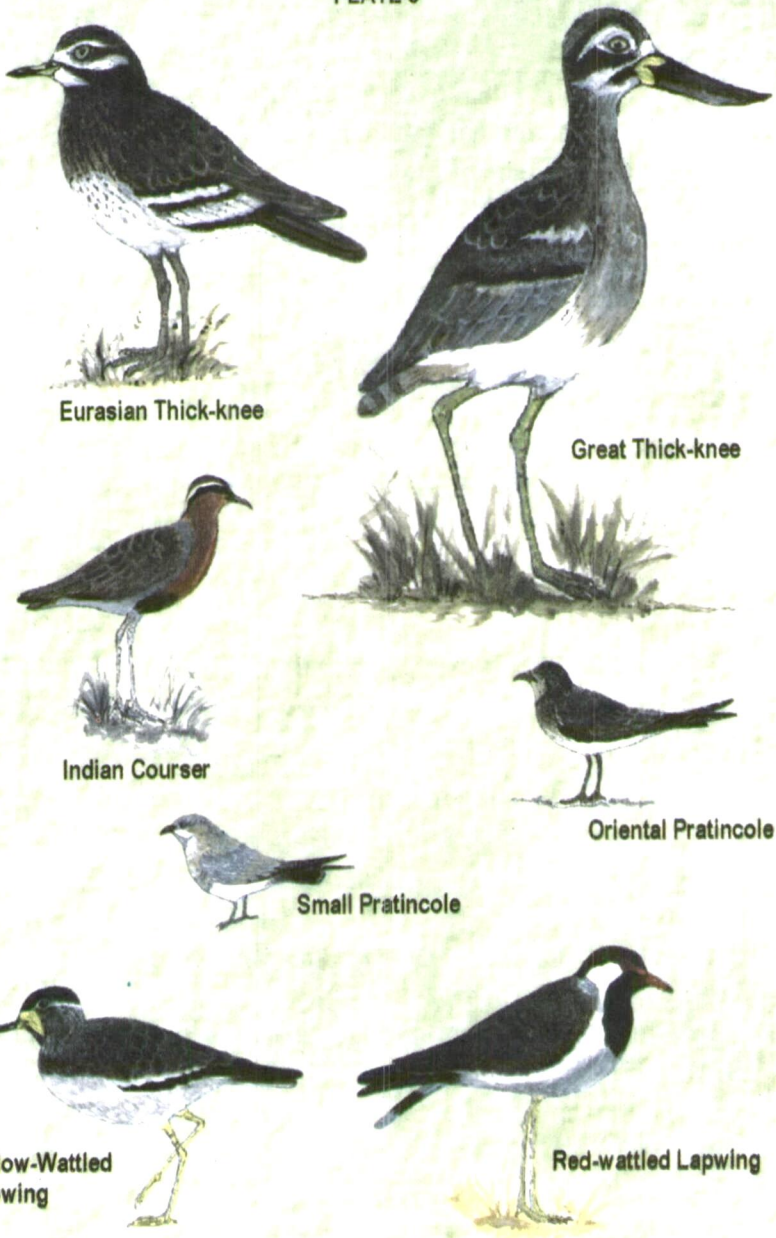

Eurasian Thick-knee
Great Thick-knee
24cm
Indian Courser
Oriental Pratincole
Small Pratincole
Yellow-Wattled Lapwing
Red-wattled Lapwing

PLATE 6

Pacific Golden Plover *Pluvialis fulva* *23-26cm*

Less stout than Grey Plover; golden brown upper back.
Very common; migrant; mudflats, lagoons and tank edges and fallow paddy fields of lowlands.

Grey plover *Pluvialis squatarola* *27-30cm*

Stout; grey upper back.
Common; migrant; coasts, lagoons and estuaries of lowlands.

Little Ringed Plover *Charadrius dubius* *14-17cm*

Black ring around throat; flesh coloured legs.
Common; residents supplemented by a small migrant population; open pastures, mudflats, drying paddy fields and tank edges of dry zone.

Kentish Plover *Charadrius alexandrinus* *15-17cm*

Black on sides of breast only; black legs; unbroken supercilium.
Very common; resident population supplemented by slightly larger migrants; beaches, salterns, lagoons, tank edges of dry lowlands.

Lesser Sand Plover *Charadrius mongolus* *19-21cm*

Legs dark brown or dark grey.
Common; migrant; shores, mudflats, salt marshes and open pasture.

Caspian Plover *Charadrius asiaticus* *18-20cm*

Bill very much thinner than that of the Greater Sand Plover; entire breast greyish brown.
Rare; migrant; marshes, mudflats, coastal areas of dry lowlands.

Greater Sand Plover *Charadrius leschenaultii* *22-25cm*

White supercillium; grey mottling on sides of breast; heavy bill.
Common; migrant; mainly coastal on shores, lagoons and estuaries of dry zone, occasionally in wet zone.

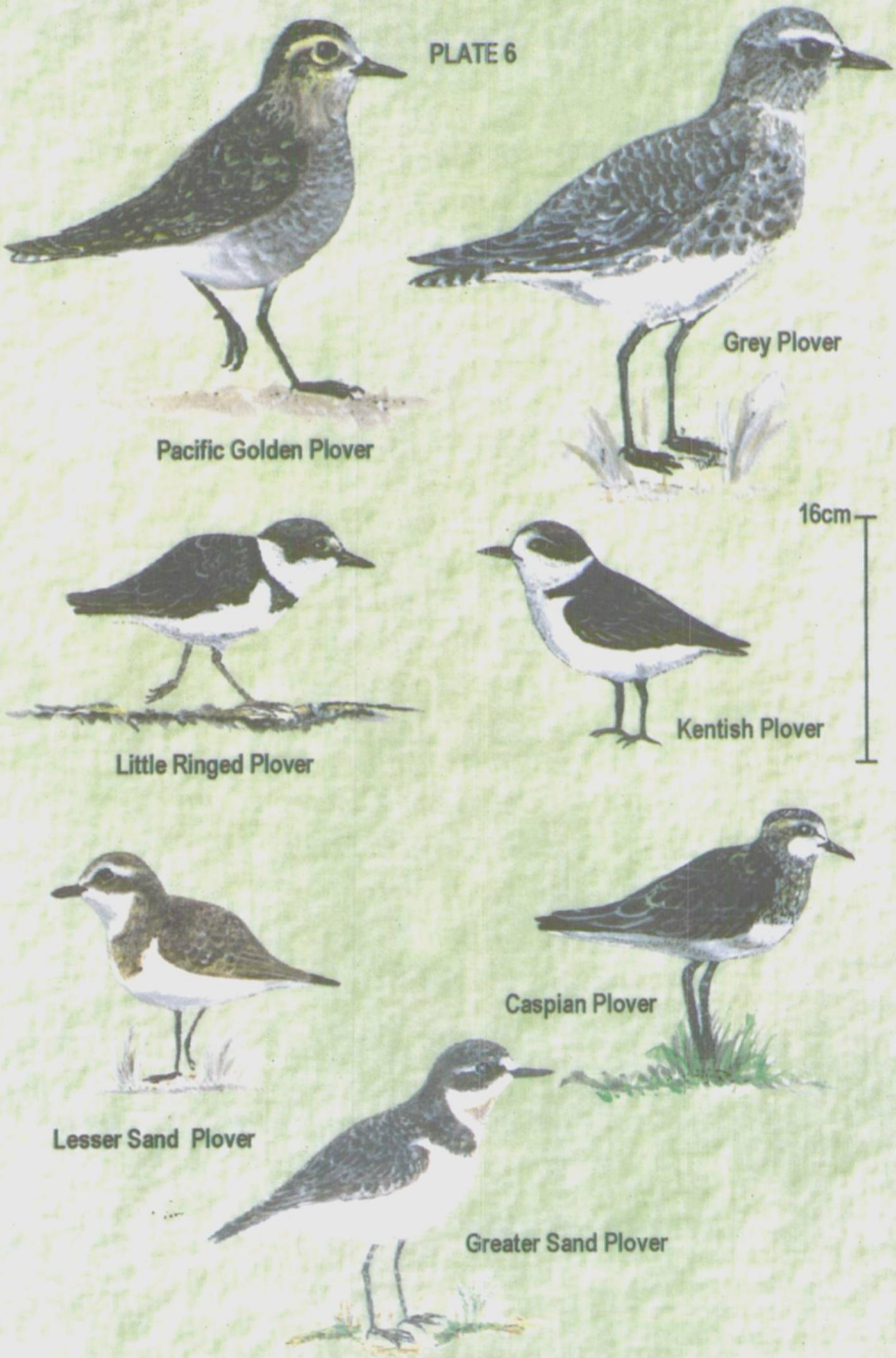


PLATE 6
Pacific Golden Plover
Grey Plover
16cm
Little Ringed Plover
Kentish Plover
Caspian Plover
Lesser Sand Plover
Greater Sand Plover

OCCASIONAL SPECIES (VAGRANTS)

Common Ringed Plover	*Charadrius hiaticula*
Long-billed Plover	*Charadrius placidus*
Oriental Plover	*Charadrius veridus*
Sociable Lapwing	*Vanellus gregarius*
Swinhoe's Snipe	*Gallinago megala*
Great Snipe	*Gallinago media*
Slender-billed Curlew	*Numenius tenuirostris*
Asiatic Dowitcher	*Limnodromus semipalmatus*
Great Knot	*Calidris tenuirostris*
Red Knot	*Calidris canutis*
White-rumped Sandpiper	*Calidris fuscicollis*
Sharp-tailed Sandpiper	*Calidris acuminata*
Dunlin	*Calidris alpina*
Rufous-necked Stint	*Calidris ruficollis*
Buff-breasted Sandpiper	*Tryngites subruficollis*
Spoon-billed Sandpiper	*Eurynorhynchus pygmeus*
Nordmann's Greenshank	*Tringa guttifer*
Red-necked Phalarope	*Phalaropus lobatus*
Collard Pratincole	*Glareola pratincola*

4. COUNTING WADERS

Carrying out wader counts is very interesting. It is important too because knowing the number of waders inhabiting a particular wetland would tell us how good the wetland is for these birds. This will also give us some indication of the stability of the wader populations the wetland supports. Using information on abundance, it would be possible to determine if the numbers of a particular species have dwindled over the years. Thus regular counts of waders form an integral part of wader studies.

Counting waders is usually done by looking at individual habitats, such as a particular salt marsh or a lagoon. When counting, maximum accuracy and precision should be aimed for. Sometimes this is best achieved by counting the birds individually. This method is known as a Census. Sometimes, however, wetlands are inhabited by large flocks of wader birds and counting every bird can be a bit of a problem. This is when you use estimates. Now we will explain how these counts are carried out.

> ***Accuracy** is how well the achieved couont represents the actual population size. For instance, if tye population size of Little Stints in a particular area is 480 the count that you obtain should be as close as possible to this number for it to be accurate.*
> ***Precision** is the consistency of repeated counts. If you count the Little Stints in an area five times, the number that you get each time should be more or less the same.*

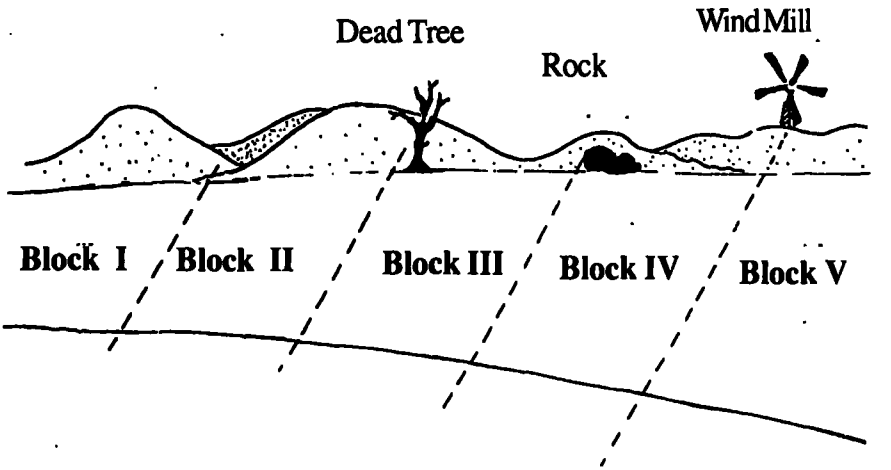
PROCEEDING WITH A CENSUS

Bird by bird counts (or census) are usually made if the numbers are small, the movements of birds are limited, or if the birds are scattered over a small and open area such as a mudflat where the identification of individual birds is easy.

Given below are the steps that should be followed at the selected wetland.

* First draw a map to mark the outline of the wetland.

* Mark out a block of the wetland on the sketch using a prominent landmark such as a rock, a palm tree or a lighthouse. Using a compass for this demarcation would facilitate the task and make it more accurate. For a start, a rough sketch would be sufficient.



* Then select the wader species of interest to you, or if you are just keen to learn the procedure select a species you are familiar with (easily identifiable by you).

* Concentrate on one block in the sketch at a time.

NOW, START THE COUNT

* Using the binocular or spotting scope and a tally counter (if available), take a count of the number of individuals of the selected species within the marked area (block). This should be done as quickly as possible to avoid any errors that may occur due to the movement of individuals from one area to another.

* Move along the bank and mark out another block as done previously and proceed with the count.

* Do this until the entire wetland has been covered.

* Now, total the counts of the different blocks in order to ascertain the population size of this species in the area concerned.

* Any birds which fly away from a counted area to an uncounted area or vice versa should be noted separately and the total should be adjusted accordingly.

* Ideally, the consistency of the counts should be checked by repeating the census a few times each day and on several consecutive days. The counts obtained on these occasions should not vary greatly.

* **Record the data as follows.**

Date : ——/——/—— Time : ——— hrs

Location : ——————— Species : ——————

Block No.	1	2	3	4	5	.....n	Total
Count							

* Counts can be made by a single observer or by several persons. In the latter case, by pooling the data you will be able to calculate the mean (average) which would be a better and a more accurate representation of the true population size of the species in the wetland than if the count was made by a single individual.

ESTIMATING

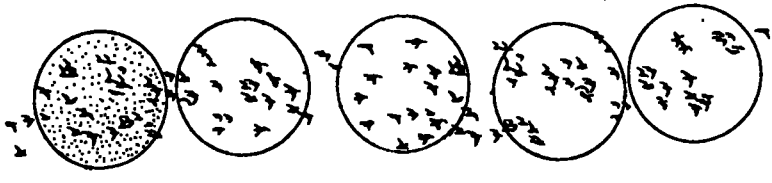
Estimates are usually carried out if the number of birds is fairly high, when they are continually in flight, or if they are tightly packed so that identification of individual birds becomes difficult. The simplest way of estimating the population size of a species is to use the cluster method.

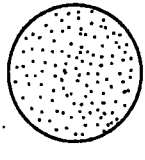
*Here a small group of birds (a cluster) is considered at a time.

*Take an approximate count of the number of individuals within that cluster.

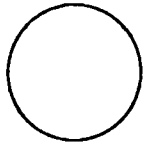
* Now, using the first cluster as a single unit, count the number of equivalent clusters included within the entire flock.

* Once this is done you can calculate the total number of birds within the flock to get an estimate of the population





Cluster of known number of birds



Cluster uncounted

Estimated flock size = (No. in a single cluster x No. of clusters)

5. FEEDING

Waders are hunters, and plants are generally not part of their diet. During the day they set about to stalk their prey that swarm about their habitats. Waders that migrate to Sri Lanka primarily occupy our wetlands especially those associated with the sea. These wetlands serve as ideal feeding grounds because they are rich in the prey types that waders like to feed on. So if you visit one of these wetlands it would be common to see a large number of waders busily feeding on the shore or in the shallow part of the water.

Feeding should be of great interest to us because it is the main type of behaviour shown by waders in their feeding grounds during the non-breeding season. Proper feeding is vital for these birds to maintain their body weight and to build up enough energy reserves and muscular strength needed to undertake the long journeys back to their homelands.

It is very interesting to study the foraging habits of waders as they display highly diverse foraging patterns. The study of behaviour, especially those related to feeding, is also important for wader identification as some groups or families of waders have very distinctive foraging actions. This would also provide us with information that is useful to determine the productivity of the wetlands and their potential to support the numerous wader species that depend upon them for food.

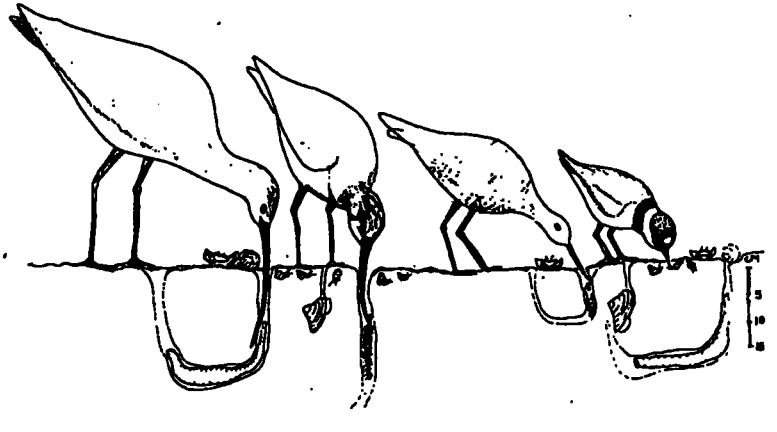
The study of the foraging ecology of waders basically involves answering three questions

(i) What adaptations do they have for feeding (feeding specializations)?
(ii) How do they feed (feeding techniques)?
(iii) What do they feed on (preferred prey items)?

FEEDING SPECIALIZATIONS

Wetlands in temperate regions afford the waders with a highly abundant but seasonally variable source of food. In contrast to this, wetlands in tropical countries like Sri Lanka provide the waders with a more constant but a less abundant source of food. Finding food is not easy, as birds gathering in large numbers must compete with each other for the food they like to eat in their feeding grounds. Efficient foraging specializations and mechanisms are therefore necessary to enable the birds to get as much food as easily as they could, within a short period of time.

For this reason, different wader species have evolved different morphological specializations which enable them to exploit the food resources efficiently and reduce competition at their feeding grounds. They have bills of various lengths that help them to probe sediment to varying depths in search of food. These range from short bills in plovers that feed at or near the surface, to long bills in godwits and curlews that can even reach deep burrowing prey. Each species thus avoids competition for the limited food resources by being adapted to exploit only a particular range of prey types. The following diagram illustrates this well.



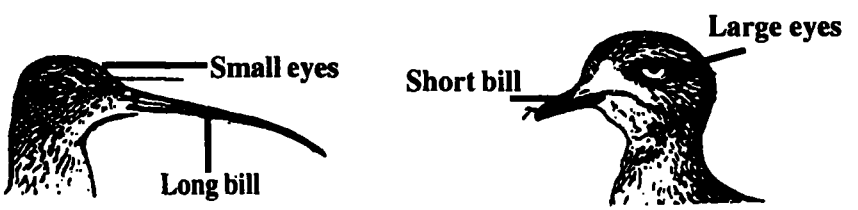
Exploiting different items of prey

Waders use different sensory methods to locate prey, namely, visual, tactile or a combination of both. Visual foragers are characterized by their short bills and large eyes. Plovers and lapwings are good examples of waders that use sight to hunt. What these birds look for is movement, the sure sign of a meaty meal "on the hoof". They have acute eyesight to detect cues such as protruding limbs of burrowing crustaceans or the moving tentacles of molluscs. Those using sight form loose flocks where the nearest neighbour distance is quite large. If visual foragers are packed too tightly together this will cause disturbance and that would scare away the prey and prevent them from emerging.

Here are a few examples of waders that use sight to catch prey

* The Stone Curlew, a visual forager, has large eyes and acute hearing that enables it to catch flying moths and other nocturnal insects.
* The Terek Sandpiper is comparatively short legged and feeds on insects and other invertebrates by walking with its head held low which makes the detection of the prey easier.
* The Collared Pratincole that is active at dawn and dusk uses its visual sense to feed like a swallow, catching flying insects in the air by leaping and dashing while walking.

TACTILE FORAGER **VISUAL FORAGER**



Curlew **Thick Knee**

Characteristics of typical tactile foragers and visual foragers

Some waders don't use sight but simply use touch to detect their prey. Tactile foragers are generally characterized by long bills and relatively small eyes. Their long bills have pressure receptors concentrated on their bill tips that detect pressure changes caused by the movement of concealed prey. The curlews and godwits are able to locate prey beneath the surface by performing light touches at the surface.

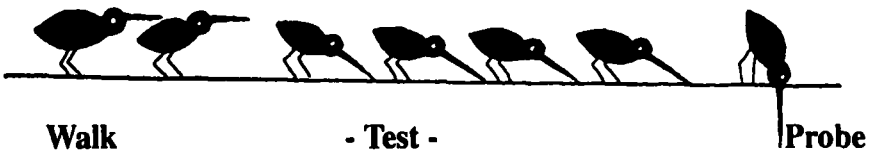
Several waders, however, are more adventurous and use a combination of both visual and tactile sense to locate their prey. An example of such a wader is the Redshank, which uses visual sense when foraging in exposed sediment but opts to use tactile sense when feeding in puddles of muddy water where vision is impeded.

FEEDING TECHNIQUES

Foraging behaviour consists of a number of specific actions that are also termed events. For instance, the large eyed shorebirds such as the plovers feed by first standing still, watching for any signs of movement of prey. Once a prey item is spotted, it takes quick paces and picks out the prey by a dipping action. This sequence of events carried out by the plovers can be written down as follows.

Stop - Run - Stop - Pick foraging

Some waders such as the curlews and godwits have small eyes and long bills and they are tactile feeders that frequently test the sediment for prey by performing trial probes. Once a prey item is detected they perform a deep probe and capture their prey. This could be described as follows.



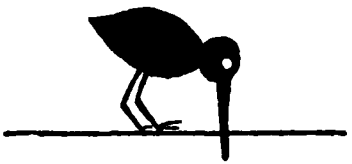
Walk - Test - Probe foraging

Still others may display even more fascinating feeding patterns. The Turnstone has been aptly named because of its peculiar manner of feeding. It often feeds by overturning stones and other debris in search of hidden prey.

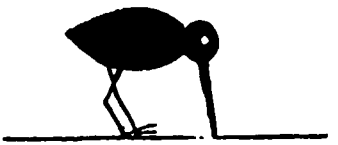
Some waders use interesting tactics to trick their prey. **Foot pattering** or **foot trembling** is used by plovers to bring invertebrates to the surface by mimicking the wave action of the incoming tide. So, if you are observing waders in a wetland where there is wave action make a special effort to observe these plovers.

Some of the common foraging actions shown by waders are described below.

Probe	- Inserting the bill deep into the sediment (more than 50 per cent of its total length is inserted)
Trial Probe (Test)	- Light touching of the sediment with the tip of the bill
Jab	- Less than half of the bill is inserted into the sediment
Peck	- Taking the prey from just beneath the sediment
Pick	- Taking the prey from the surface of the sediment
Swishing	- Foraging in soft mud or water by performing rapid sideway movements of the bill

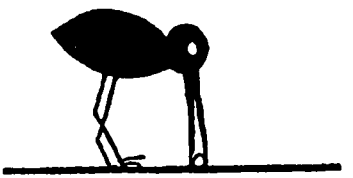


Pecking

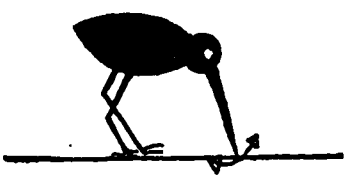


Trial Probing (Testing)

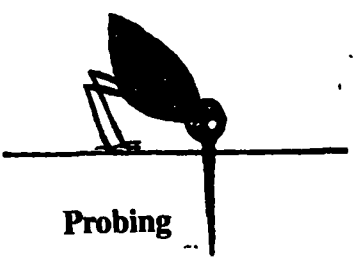
Jabbing



Picking



Swishing



Probing

Common foraging actions shown by waders

Now try this out!

* Select a particular bird (focal animal) from among the waders present. It would be better if it is possible to use a spotting scope or a binocular. However, approaching the wader close enough to obtain a good view, or if it's a large sized species (such as the Curlew) that could be observed from a distance, using the unaided eyes will be fine.

* Spend a little while merely observing the bird and note the different foraging actions it performs. Now jot down these actions.

* Having identified the different actions the bird performs and once you are familiar with each of them make a note of the time and start the observations.

* Record the frequency of each foraging event i.e. the number of times each action is performed, using tally marks. If there are only two types of events then make use of two tally counters to record the frequency of each event.

* Note down the frequency of the different actions performed within a stipulated time period.
  Carry out the observations for about an hour or till the bird that is observed moves away from the view. If tired of watching it however, stop! But it is important to note down the time when you ceased the observations.

Use a data sheet to record the observations. An example is given below.

A sample data sheet to record foraging behaviour Date : ...../...../..... Wetland : ..... Species:	
Time : Start ..... hrs	End..... hrs
Foraging Pattern	
Event	**Frequency**
Picks	
Jabs	
Pecks	
Paces	
Probes	
Trial probes	
(insert any other)	

WHAT WADERS EAT

In general, a wader's menu has a high content of crustaceans (crabs and shrimps), bivalves, gastropods and polychaetes, probably because these tend to live in the same habitats as the waders do. Some waders also feed on a variety of coastal insects, both adults and larval forms. In addition to invertebrates, small fish and amphibians also contribute to the waders' diet. Besides animal prey, waders occasionally feed on berries, seeds and other plant material (e.g. grasses) when normal food is scarce. Plant material has been found in the guts of curlews, godwits and plovers. Some waders are opportunistic feeders, for instance the turnstones which usually feed on invertebrates, have been found to feed even on carrion.

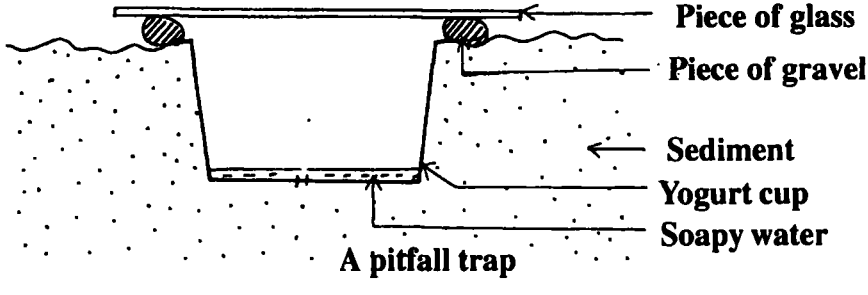
Judging from these facts it may seem as if the waders have a pretty extensive diet. But this is not so, at least when it comes to a particular species. As stated earlier, in order to reduce competition in their shared feeding grounds, waders have partitioned their food resources efficiently. That is feeding preferences are often species specific. Some species may prefer to feed on polychaete worms while another species may show no interest in them. Waders are also quite good at judging the size of prey and thus are able to restrict themselves to the range of prey sizes they are able to handle. Small sized wader species usually feed on small prey items while larger species may be able to handle prey of a larger size.

Many people interested in wader ecology have tried to find out what exactly each species feeds on. Prey items of birds can often be recognized as they are being taken, simply by observing their feeding techniques through the binocular or telescope. Identification is also facilitated by the examination of the sediment in the areas in which the birds feed. Trapping methods such as pitfall traps buried in the sediment and hand nets used in water can also be employed for the collection of prey items. In addition, the preferred prey items of waders can also be determined by examining the contents of their regurgitated pellets.

It is indeed great to be able to know the diet of each species. There are a few simple methods that you could follow. What you need is only some determination and patience.

Sediment analysis

Sediment samples could be collected using a soil corer. An ordinary PVC pipe with a diameter of around 8 cm would be sufficient for this purpose. The sediment should be collected (down to a depth of about 10 cm) into polythene bags, labelled, and frozen if not analysed immediately. Subsequently, the sediment should be emptied onto a sieve and washed under a tap using a continuous jet of water. The remnants on the sieve could be examined using a hand lens or under a light microscope, or preserved in 70% alcohol or 10% formalin for later analysis. The number of intact invertebrates should then be counted.



A pitfall trap

Trapping

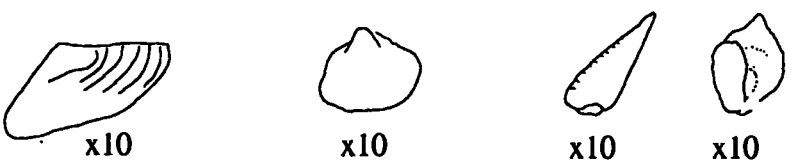
As waders usually prey upon live animals we could also get an idea of their diet by trapping some of the animals ourselves. Invertebrates, inhabiting the exposed areas of the wetland, could be sampled with **pitfall traps**. The construction of a pitfall trap is easy. An empty yogurt cup firmly embedded in the sediment and covered with a piece of scrap glass or cardboard elevated by a few pebbles (as illustrated above) will serve as a pitfall trap. The yogurt cup should contain some soapy water to prevent the captured animals from escaping. The traps should be kept for at least four hours before collection. At the time of collection, the invertebrates should be picked using forceps

(for collection of hard-bodied invertebrates) or brushes (for collection of soft-bodied invertebrates). The invertebrates can be preserved in 70% alcohol or 10% formalin and microscopically identified later.

Puddles and shallow water can be sampled using **hand nets** of a small mesh size (less than 1 mm). Fish and invertebrates that swim about could be trapped in this manner.

Pellet analysis

Waders often vomit out hard matter, such as molluscan shells that they cannot digest easily, as dry pellets. This vomiting out process is called regurgitation. These pellets can be commonly found at their roosting sites but could also sometimes be seen in areas where they feed. Identification of hard parts in regurgitated pellets of waders directly indicate what the birds have been eating. The pellets should therefore be collected, sun dried or preserved in 70% alcohol and examined under a microscope. The commonly found components in pellets of waders are illustrated.



Shells of bivalve molluscs

Shells of gastropod molluscs

Chela of decapod crustaceans

Second antenna of amphipod crustaceans

Antenna of crustaceans or insects

Elytra of coleopterans

Common contents of pellets

The types of invertebrates present in a wader's diet can broadly be categorized into molluscs, polychaete worms, crustaceans, insects and insect larvae. These should be recorded in your notebook. Further subdivisions of the above categories, for instance molluscs into gastropods and bivalves, or crustaceans into crabs and shrimps, can also be attempted. We have provided sketches of the common prey items of waders.

Gastropod Molluscs

x7

x10

Cerithium spp. *Nautica* spp.

Bivalved Molluscs

x3

x3

Orbicularia spp. *Anadara* spp.

Crustaceans

x4

x5

Gammarus spp. *Corophium* spp.

Penaeus spp. *Macrophalmus* spp.

Common prey items of waders

6. ORNITHOLOGICAL SOCIETIES

Anyone seriously interested in waders – or birds for that matter – is well advised to join an ornithological society. Two of the most popular societies in Sri Lanka are;

The Field Ornithology Group of Sri Lanka (FOGSL)
Department of Zoology,
University of Colombo,
Colombo 03.

Ceylon Bird Club
39, Chatham Street,
Colombo 01.

Details regarding these societies can be obtained by contacting them directly.

Everything from amateur bird observations to active research and conservation is catered for, with regular meetings and publications sent out to members. It's a place where you could share your interests and participate in the conservation efforts, for which volunteers are welcomed most readily.

7. FURTHER READING

Books devoted to waders tend to be few, especially in Sri Lanka. Many Sri Lankan Field Guides, however, are good for identification purposes because they provide you with descriptions and pictures of the waders that are found in Sri Lanka. If you need to do any further reading on the ecological aspects of these birds you may have to visit a library or a good book shop. The following list may be of some help in tracking down the information you need.

Books on the birds of Sri Lanka

Harrison, J. (1999). *A field guide to the birds of Sri Lanka.* Oxford University Press, Oxford.

Kotagama, S. W. and Fernando, J.M.P (1995). *A field guide to the birds of Sri Lanka.* Sri Lanka Wildlife Heritage Trust, Colombo.

Other books that give information on wader identification and ecology

Burger, J. and Olla, B. L. (1984). *Behaviour of Marine Animals, Volume 6: Shorebirds; Migration and Foraging Behaviour.* Plenum Press, London.

Cramp, S. and Simmons, K. E. L. (1983). *Handbook of the birds of Europe, the Middle East and North Africa.* Oxford University Press, Oxford.

Hammond, N. and Pearson, B. (1994). *Hamlyn Bird Behaviour Guides: Waders.* Hamlyn.

Hayman, P., Marchant, J. and Prater, T. (1991). *Shorebirds: An Identification Guide*, Christopher Helm, London.

Howes, J. (1989). *Shorebird studies Manual*, Asian Wetland Bureau Publication No. 55, Kuala Lumpur.

Inskipp, T., Lindsey, N. and Duckworth, W. (1996). *An annonated checklist of birds of the oriental region*. Oriental Bird Club, Sandy.

Perrins, C.M. (1990). *The illustrated Encyclopaedia of birds. The International Council for Bird Preservation.* Marshall Editions Developments Ltd., U.K.

Sibley, C. G. and Monroe, B. L. (1990). *Distribution and Taxonomy of Birds of the World.* Yale University Press, Yale.

Sibley, C. G. and Monroe, B. L. (1993). Supplement to the *Distribution and Taxonomy of Birds of the World.* Yale University Press, Yale.

Appendix 1

Some wetlands in Sri Lanka that are important for waders

Wetlands in the Ruhuna (Yala) National Park
Lagoons and Estuaries in the Bundala National Park
Palatupana Maha Lewaya
Maha Lewaya and Karagan Lewaya
Lunama Lagoon and Kalamatiya Lagoon
Malala Lewaya and Koholankala Lewaya
Wirawila, Tissa, Debara and Yoda Tanks
Minneriya Tank
Mahaweli Ganga Flood Plain System
Wetlands in the Wilpattu National Park
Negombo Lagoon
Mundel Lake
Puttalam Lagoon
Muthurajawela Swamp
Bellanwila-Attidiya Marsh

Appendix 2
Compiling my own checklist of waders

Species	Wetland									
Pheasant-tailed Jacana										
Greater Painted-Snipe										
Crab Plover										
Eurasian Oystercatcher										
Eurasian Woodcock										
Wood Snipe										
Common Snipe										
Jack Snipe										
Black-tailed Godwit										
Bar-tailed Godwit										
Whimbrel										
Eurasian Curlew										
Spotted Redshank										
Common Redshank										
Marsh Sandpiper										
Common Greenshank										
Green Sandpipiper										
Wood Sandpiper										
Terek Sandpiper										
Common Sandpiper										
Ruddy Turnstone										
Sanderling										
Little Stint										
Temminck`s Stint										
Long-toed Stint										
Great Thick-Knee										
Indian Courser										
Oriental Pratincole										
Curlew Sandpiper										
Broad-billed Sandpiper										
Ruff										
Black-winged Stilt										
Pied Avocet										

Small Pratincole										
Pacific Golden Plover										
Grey plover										
Little Ringed Plover										
Kentish Plover										
Lesser Sand Plover										
Caspian Plover										
Greater Sand Plover										
Yellow-wattled Lapwing										
Red-wattled Lapwing										
Common Ringed Plover										
Long-billed Plover										
Oriental Plover										
Sociable Lapwing										
Swinhoe's Snipe										
Great Snipe										
Slender-billed Curlew										
Asiatic Dowitcher										
Great Knot										
Red Knot										
White-rumped Sandpiper										
Sharp-tailed Sandpiper										
Dunlin										
Rufous-necked Stint										
Buff-breasted Sandpiper										
Spoon-billed Sandpiper										
Nordmann's Greenshank										
Red-necked Phalarope										
Collard Pratincole										