

Order CHARADRIIFORMES

A large, diverse assemblage of small to medium-large (12–75 cm long) limicoline, pratincoline, aquatic or terrestrial birds. Cosmopolitan from Arctic to Antarctic regions; in all sorts of maritime, freshwater and open terrestrial habitats (including deserts) with a few (woodcocks and snipes) even using dense forests. Once known as Limicolae or Laro-limicolae (e.g. Mayr & Amadon 1951); colloquially, the assemblage (excluding alcids, skuas, gulls, terns and skimmers) is often referred to as waders (especially in Britain) or shorebirds (especially in North America).

About 350 species in 19 families, though taxonomic treatments vary. Following families recognized (mostly based on recent reviews of Order [Sibley *et al.* 1988; Sibley & Ahlquist 1990; Sibley & Monroe 1990]):

Thinocoridae	seedsnipes; four species, S. America.
Pedionomidae	Plains-wanderer; monotypic, Aust.
Scolopacidae	sandpipers, snipes and allies; c. 85 species, cosmopolitan.
Rostratulidae	painted snipes; two species, s. America and Old World.
Jacanidae	jacanas; seven species, pantropical.
Chionididae	sheathbills; two species, Antarctica and subantarctic islands.
Burhinidae	thick-knees, stone-curlews; nine species, widespread in Old World and two in Neotropics.
Haematopodidae	oystercatchers; c. 11 species, worldwide in tropics and temperate regions.
Recurvirostridae	avocets and stilts; about seven species, worldwide in tropical and temperate regions.
Ibidiorhynchidae	Ibisbill; monotypic, central Asia.
Charadriidae	plovers and lapwings; c. 60 species, cosmopolitan.
Pluvianellidae	Magellanic Plover; monotypic, S. America.
Dromadidae	Crab Plover; monotypic, Arabian region.
Glareolidae	pratinoles, coursers, and Egyptian Plover; c. 15 species, widespread in Old World.
Stercorariidae	skuas and jaegers; about seven species, mostly in Arctic and Antarctic regions.
Rhynchopidae	skimmers; three species, pantropical.
Laridae	gulls; c. 47 species, cosmopolitan.
Sternidae	terns; c. 42 species, cosmopolitan.
Alcidae	auks; c. 20 species, Arctic and temperate regions of n. hemisphere.

Apparently monophyletic. Pteroclididae (sandgrouse) probably sister-group of Charadriiformes (e.g. Fjeldså 1976, 1977; Sibley & Ahlquist 1990; BWP), though whether best placed within Charadriiformes or in separate order is debated. Flamingoes (Phoenicopteridae) and divers (Gaviidae) have also been treated as Charadriiformes (Olson & Feduccia 1981; Fjeldså 1976, 1977) but DNA–DNA hybridization studies (Sibley & Ahlquist 1990) inconsistent with these theories. Affinities to other orders still controversial; DNA–DNA hybridization has suggested closest links are to large waterbirds, such as storks, herons and allies, Pelicaniformes, Procellariiformes, penguins, grebes, divers (Gaviidae) and also Falconiformes. All these were combined in huge order Ciconiiformes by Sibley & Ahlquist (1990).

Taxonomy and relationships reviewed in Sibley & Ahlquist (1990), Christian *et al.* (1992) and BWP (and references therein). Recent reviews have included: patterning of downy young (Jehl 1968; Fjeldså 1976, 1977), osteology (Strauch 1978; Mickevitch & Parenti 1980; Olson & Steadman 1981), DNA–DNA hybridization (Sibley *et al.* 1988, Sibley & Ahlquist 1990) and electrophoresis of tissue proteins (Christian *et al.* 1992). The studies of allozymes, DNA–DNA hybridization and the most recent osteological study of the entire order (Strauch 1978) have agreed in finding two or three well-knit, monophyletic assemblages within the Charadriiformes: scolopacids and allies (Thinocoridae, Pedionomidae, Scolopacidae, Rostratulidae, Jacanidae) and charadriids and allies (Chionididae, Burhinidae, Haematopodidae, Recurvirostridae, Ibidiorhynchidae, Charadriidae, Pluvianellidae, Dromadidae, Glareolidae, Stercorariidae, Rhynchopidae, Laridae, Sternidae, Alcidae); Strauch (1978) treated Alcidae as separate lineage, but skeletons may be so highly modified for foot-propelled diving that they do not reflect relations well (Sibley & Ahlquist 1990); gulls and allies have also been regarded as a separate lineage (Christian *et al.* 1992) or as allied to charadriids (e.g. Sibley & Ahlquist 1990). Further relationships within the Order discussed in introductions to families.

Because the Order comprises so many species and adaptations are so diverse, few characters shared by all species; those that are shared are mostly anatomical features of the skull, e.g. most or all have schizorhinal nostrils, schizognathous palates, well-developed vomer, lachrymals fused with ectethemoid and pre-frontal bones, well-developed supra-orbital grooves; see Olson & Steadman (1981) for more information on osteological characters. Wings usually have 11 primaries, with p10 longest and p11 minute; 15–24 secondaries; diastataxic except in *Scolopax minor*, as far as is known. Usually 12 tail-feathers. Necks usually rather long with 15–16 cervical vertebrae. Oil-gland bilobed and tufted. Syrinx, tracheo-bronchial; two carotids (type A-1 of Glenny 1955); caeca present. Legs usually rather long; hind toe small or lacking in most but all toes greatly elongated in Jacanidae. Feathers with small thin afterfeathers. Normally two moults annually: complete post-

breeding and partial pre-breeding; some jacanas and alcids have flightless periods when moulting remiges. Young, downy, usually with intricate cryptic patterns on upperparts of three chief types: pebbly, spotted and striped, matching characters of habitat (Fjeldså 1976, 1977): precocial, nidifugous usually, self-feeding or not depending greatly on parents.

Thirteen families recorded in HANZAB region, with 54 species breeding, 41 occurring as regular non-breeding migrants and c. 38 as accidentals or probable accidentals. Scolopacidae, Stercorariidae, Laridae and Sternidae will be dealt with in Volume 3 of HANZAB.

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Family LARIDAE skuas, jaegers, gulls and terns

A large assemblage of small to very large charadriiform seabirds. We recognize four subfamilies within the Laridae following Mayr & Amadon (1951), AOU (1983).¹

Stercorariinae Skuas and jaegers; about six species; cosmopolitan.

Larinae Gulls; c. 47 species; cosmopolitan.

Sterninae Terns; c. 42 species; cosmopolitan.

Rynchopinae Skimmers; three extralimital species, pan-tropical.

Taxonomic rank given to above groups varies greatly. Considered four families within suborder Lari (e.g. Campbell & Lack 1985; BWP), or four tribes within subfamily Larinae (e.g. Sibley *et al.* 1988; Sibley & Ahlquist 1990; Sibley & Monroe 1990). Others have divided Lari into three families (Stercorariidae, Laridae and Rynchopidae) with gulls and terns usually considered subfamilies within Laridae (e.g. Wetmore 1960; Judin 1965; Hackett 1989; Peters). Moynihan (1959) divided the group into two subfamilies, Stercorariinae, containing the skuas, and Larinae, containing gulls, terns and skimmers in three tribes. Study of skeletal and external morphology of suborder 'Lari' (our Laridae) was mostly unable to cluster gulls and terns satisfactorily and found group surprisingly uniform (Schnell 1970a,b). Despite lack of agreement on taxonomic ranking of above groups, monophyly of Laridae is not in doubt. Studies of biochemistry (Christian *et al.* 1992), DNA–DNA hybridization (Sibley & Ahlquist 1990), downy young (Fjeldså 1977) and skeletal morphology (Strauch 1978; Mickevich & Parenti 1980; Chu 1995) generally agree in finding close relation with Glareolidae (pratincoles) and Dromadidae (Crab Plover *Dromas ardeola*). DNA–DNA hybridization suggests Alcidae (auks) also closely related (Sibley & Ahlquist 1990), though this contradicted by studies of skeletal morphology (e.g. Strauch 1978; Chu 1995).

Body-form varies greatly, from small and slender in some gulls and terns, to robust and thickset in skuas, jaegers, some gulls and a few terns. Differences in size between sexes slight; males usually larger but females larger than males in Stercorariinae. Wings usually long, narrow and pointed, but broader and more rounded in some; 11 primaries; p10 longest, p11 minute; 17–24 secondaries. Tail has 12 rectrices; shape varies: in Stercorariinae, central rectrices project beyond rest of tail and greatly elongated in adult breeding plumages of *Stercorarius*; in most Sterninae and Rynchopinae, outer rectrices elongated and tail forked; in Larinae, usually square. Bill, varies, though usually rather short and stout, with prominent gonydeal angle; rather fine in some Larinae and Sterninae; tip pointed in Sterninae, decurved in strong hook in Stercorariinae. Bill highly modified for unique foraging methods in Rynchopinae (Zusi 1962). Lack cere, except in Stercorariinae. Nostrils schizorhinal and perforate, with no median septum. Legs, short and stout; attached near centre of body; tibiae partly bare; tarsi, short and typically scutellate in front. Four toes; hindtoe, short, raised, sometimes rudimentary or absent; front toes, fully webbed (webs somewhat incised in some). Claws, moderately long, strong, laterally compressed. Caeca ranges from large (Stercorariinae) to poorly developed (Rynchopinae, Sterninae). Supra-orbital salt-glands well developed.

Plumages mainly browns, black, white and greys. Colours of bare parts often striking and often showing marked variation with both season and age. Adults moult twice annually: (1) a post-breeding (pre-basic) moult to non-breeding plumage, which is complete (with apparent exception of *Larus sabini*); and (2) a pre-breeding (pre-alternate) moult to breeding plumage, which is almost always partial (but see *Larus pipixcan* and *L. sabini*); some terns also undergo one or two pre-supplemental moults of inner primaries. Primaries moult outwards.

Hatch in natal down, which is replaced by juvenile plumage; downy young precocial but more dependent on

¹ This treatment differs from the arrangement presented in the introduction to the Charadriiformes in Volume 2 of HANZAB (p. 648), where these four subfamilies were listed as families. Recent major studies in avian classification (particularly by Sibley and co-workers) and the publication of a revised species list of Aust. birds (Christidis & Boles 1994) since the preparation and publication of Volume 2, have brought much rearrangement. In this and subsequent volumes of HANZAB, taxonomy, nomenclature and arrangements of species follow Christidis & Boles (1994) (though they do not present subfamilial taxonomy). Their sequence of families of Charadriiformes occurring in HANZAB region is: Pedionomidae, Scolopacidae, Rostratulidae, Jacanidae, Chionidae, Burhinidae, Haematopodidae, Recurvirostridae, Charadriidae, Glareolidae and

Laridae. However, work on Volume 2 was too advanced to follow their sequence and taxonomy fully. The Scolopacidae are out of place in the arrangement of subfamilies in Volumes 2 and 3; other families follow the order of Christidis & Boles (1994).

Plate 23

Oriental Pratincole *Glareola maldivarum* (page 366)

1 Adult breeding; 2 Adult non-breeding; 3 Juvenile;
4, 5 Adult

Australian Pratincole *Stiltia isabella* (page 373)

6 Adult; 7 Downy young; 8 Juvenile;
9 First immature non-breeding;
10, 11 Adult

parental feeding than other Charadriiformes. Post-juvenile (first pre-basic) moult complete or partial, varying within and between families; moults of subadults complicated and vary between subfamilies (see subfamily accounts). Generally slow to mature, attaining adult plumage when 2–4 years old and first breeding at 2–4 years (smaller gulls and terns) to 4–9 years (many skuas and larger gulls and terns); some may breed in first year (e.g. *Sterna albifrons*).

Inhabit wide range of marine and freshwater habitats from Tropics to polar regions; many species strongly migratory, especially those breeding at high latitudes, e.g. South Polar Skua *Catharacta maccormicki* and Arctic Tern *Sterna paradisaea*, which migrate between polar regions. Most nest in terrestrial colonies near water (see subfamily accounts); some species highly pelagic in non-breeding season. Use wide range of foraging methods (see subfamilies; for discussion of feeding methods, see General Introduction).

See subfamily accounts for summaries of social organization and breeding.

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Subfamily STERNINAE terns and noddies

Cosmopolitan group of seabirds, with narrow pointed wings and long pointed bills, ranging in size from Little *Sterna albifrons* (20–28 cm) to Caspian Terns *Sterna caspia* (up to 55 cm). Mostly smaller, slimmer and longer-tailed than gulls (Larinae) and more aerial. About 42 species in six genera.

GENUS	NUMBER OF SPECIES
<i>Sterna</i>	Sea terns (including commic terns); c. 32 species; 17 in HANZAB region (15 breeding, 2 non-breeding migrants; 1 species not acceptably recorded)
<i>Chlidonias</i>	Marsh terns; 3 species; all recorded HANZAB region (1 breeding, 1 non-breeding, 1 accidental)
<i>Phaetusa</i>	Monotypic; Large-billed Tern <i>P. simplex</i> ; extralimital in South America; often combined in <i>Sterna</i>
<i>Anous</i>	Dark noddies; 3 species; all breed HANZAB region
<i>Procelsterna</i>	1 (possibly 2) species; Grey Ternlet <i>P. albivitta</i> breeds HANZAB region (second taxa extralimital)
<i>Gygis</i>	Monotypic; White Tern <i>G. alba</i> ; breed HANZAB region
<i>Larosterna</i>	Monotypic; Inca Tern <i>L. inca</i> ; extralimital in South America

Studies of osteology (Strauch 1978; Mickevich & Parenti 1980; Chu 1995), behaviour (Moynihan 1959), DNA–DNA hybridization (Sibley & Ahlquist 1990) and allozymes (Christian *et al.* 1992) have generally suggested that terns more closely related to gulls than to other Laridae; monophyly of the Sterninae appears not to be in doubt, and sometimes considered a full family (e.g. BWP).

Number of genera recognized varies. Moynihan (1959) recognized only three: *Sterna* (including *Chlidonias* and *Phaetusa*), *Larosterna*, and *Anous* (including *Procelsterna* and *Gygis*). Others have recognized as many as ten (e.g. Peters) or 12 (e.g. Wolters 1975) genera. Gull-billed Tern *S. nilotica* often placed in monotypic genus *Gelochelidon*; large terns with erectile crests (e.g. *S. bergii*, *S. bengalensis*) sometimes placed in *Thalasseus*; Caspian Tern *S. caspia* sometimes placed in monotypic genus *Hydroprogne*, or in *Thalasseus*. *Anous*, *Procelsterna* and *Gygis* sometimes treated as tribe Anousini (noddies). Our arrangement follows Christidis & Boles (1994) and Sibley & Monroe (1990), except that Black-fronted Tern *S. albostrata* placed in *Sterna* rather than *Chlidonias* (following Mees 1977; Lalas & Heather 1980; NZCL; see that account). Monophyly of genus *Sterna* as recognized here has been challenged by electrophoretic study of Hackett (1989).

Body-form gull-like, but slimmer and more elongate than gulls except in largest species. Males usually slightly larger than females, especially in length and depth of bill. Necks short. Wings, long and pointed, narrower than in gulls; when wing folded, primaries project well beyond tertials (tips of 5–6 outer primaries usually exposed) and often beyond tip of tail. About 18–24 secondaries; ulnar part of wing shorter than in gulls. Flight musculature differs from gulls by lack of expansor secundarium (except in *Anous*). Tail, long in most species, with 12 rectrices: most have deeply forked tail, with t6 often elongated as tail-streamer; *Chlidonias* has short tail, only shallowly forked; tail of noddies forked, but with t3 or t4 longest in *Anous* and t5 longest in *Procelsterna* and *Gygis*. Bill, straight, with simple rhamphotheca and no cere; slender and rather long in most species, heavier in larger species, especially *Phaetusa*, short and thick in *S. nilotica*; tip pointed, not hooked. Legs, short or very short; tarsi rather weak; scutellate. Three front toes fully webbed, though webs deeply incised in *Chlidonias*; hindtoe reduced or vestigial, raised. Swim less readily than gulls, and have less well developed oil-gland (vestigial in *S. fuscata*). Supra-orbital salt-glands well developed. Down occurs on both pterygiae and apteria.

Sexes similar in plumage. Adult *Sterna* and *Phaetusa* usually uniform light grey above and white or pale grey below (with evanescent pink flush in some species), usually with contrasting black markings on head (often in form of cap) and tip of wing; some browner above (e.g. *S. fuscata*, *S. anaethetus*). *Chlidonias*, *Larosterna* and *Anous* mostly dark grey, dark brown or black above and below; *Procelsterna*, uniform ash-grey; *Gygis*, all white. Irides normally dark brown. Bill, legs and feet of most, yellow, orange, red or black. *Phaetusa*, *Chlidonias* and most *Sterna* show seasonal change in plumage: in non-breeding plumage, black caps reduced or flecked with white, many develop dark cubital bars, fork of tail usually less deep (and tail often slightly darker), underparts of grey-bellied species become paler, and bill and feet often become darker; *Chlidonias* also develop paler upperparts. No seasonal change in appearance of noddies. Adults typically have two moults per cycle: a complete post-breeding (pre-basic) moult to non-breeding plumage; and a partial pre-breeding (pre-alternate) moult to breeding plumage (which involves at least head, neck and some of body, and often all of body, tail and varying number of inner primaries). Primaries moult outwards. Moult of remiges, especially primaries, protracted in most; post-breeding (pre-basic) moult of primaries continues long after moult of body finished, and often overlaps with start of pre-breeding (pre-alternate) moult. Species moulting inner primaries in pre-breeding (pre-alternate) moult can thus have two concurrently active waves of moult in primaries. In some species (e.g. *S. albifrons* and some *Chlidonias*) there is often a third wave, as innermost primaries replaced a third time in a pre-supplemental moult. In two small pale tropical species (*Gygis alba* and *Sterna*

sumatrana), primaries replaced in staffelmauser, which is interrupted only when breeding; pre-alternate moults possibly lost in these species. Breeding and moult seldom overlap, except for some pre-basic moult of feathers of head when raising chicks (usually in larger or migratory species); in migratory species, most or all moult of remiges occurs in non-breeding areas and post-breeding moult (if started) is suspended during migration. In several species of oceanic terns nesting in Tropics, annual cycles last for less than 1 year, with duration between breeding events possibly dependent on time needed to complete moult (e.g. Ashmole 1962, 1963, 1968).

Downy young, precocial or semi-precocial; semi-nidifugous in most; nidicolous in *Gygis*, *Anous*. Natal down, ramose and woolly in most species, but long, straight, silky and very soft in *Chlidonias* (perhaps an adaptation to rather wet nesting sites). In some *Sterna* (e.g. *S. dougallii*), terminal barbs of down cling together to cause spiny appearance, especially on upperparts; down also very short in some (e.g. *S. albifrons*, *S. nereis*). Ground-colour of down ranges from white to grey or buff (rich orange-buff in *Chlidonias*), though dark, like adults, in some *Anous*. Dark markings on upperparts complex and diffuse: *Chlidonias* have bold black blotches; others varyingly streaked or speckled dark brown or black above, without distinct pattern except for three radiating lines on crown in many. Some species virtually unmarked above (e.g. *S. caspia*, *S. nilotica*). Some variation in colour and patterning of down (especially ground-colour) appears to be geographical (e.g. down of tropical populations of *S. dougallii* usually paler than in temperate populations) but also much individual variation, and siblings from the same clutch often look totally different (see Fjeldså 1977 for more information on downy young). Juvenile plumages typically differ from non-breeding adults in having buff or blackish tips or bars on much of upperparts and upperwing; tail generally darker than in adult, often with dark subterminal markings; many species have much individual variation in upperparts, and darkness of ground-colour and width of dark barring usually correlated. Juvenile plumages rather unusual in *S. virgata*, *S. vittata* and *S. fuscata*; see species accounts for details. In *Anous*, *Gygis* and *Procelsterna*, juvenile plumage similar to adult.

Sequence of moults from juvenile to adult plumage, complex. When recognizable traces of juvenile plumage have been lost, distinction of immatures from adults depends mainly on moult and wear of primaries. However, this of little use for ageing species in which timing of breeding and moulting vary (a frequent occurrence in Tropics) and subadult moults of such species (including all noddies) poorly known. Following generalizations based on species of *Sterna* and *Chlidonias* with regular cycles. **POST-JUVENILE (FIRST PRE-BASIC) MOULT** usually complete, with head and body finished several months before last outer primaries; in some species, birds can arrest moult when a few very worn outer primaries remain. In several species of medium-sized *Sterna* from s. hemisphere (*striata*, *albostrata*, *vittata* and *virgata*), post-juvenile moult appears to be partial, moulting almost no remiges or rectrices (though interpretation complicated because, unlike most juvenile terns, first post-breeding [second pre-basic] moult of head and body coincides with first moult of primaries, much as in typical gulls [D.J. James]); these species (and possibly *S. hirundinacea*) have several other unusual features in common, including heavily marked juvenile plumages, little sexual dimorphism in length of wing, and only one moult of primaries and (apparently) rectrices per cycle. They may represent a radiation from a single s. hemisphere ancestor (D.J. James). Whether first pre-basic moult partial or complete, most terns superficially resemble adult non-breeding when 3–7 months old, except for retained juvenile remiges (which are still moulting). When 9–12 months old, at least some perform partial **FIRST PRE-BREEDING (FIRST PRE-ALTERNATE) MOULT**, often starting before post-juvenile moult finished; some attain traces of breeding plumage (especially on crown and cubital bar) but in most there is probably no change in appearance. Resultant first immature non-breeding (first alternate) plumage superficially like adult non-breeding and, in species with regular cycles, held when adults in full breeding plumage.¹ When c. 1 year old, complete **FIRST IMMATURE POST-BREEDING (SECOND PRE-BASIC) MOULT** brings on plumage almost identical to adult non-breeding; this retained for much of second year, so most immatures retain non-breeding appearance from c. 5 months to c. 21 months old. Partial **SECOND PRE-BREEDING (SECOND PRE-ALTERNATE) MOULT** near end of second year is first moult to bring on extensive breeding plumage. In many species, second immature breeding plumage may differ from adult breeding in having a few non-breeding-like feathers in crown, cubital bar, tail or underparts; however, reliability of these ageing characters undermined in some species by similar variation in very small number of adults. Subsequent moults, as adults.

Mostly marine, inshore; some frequent both littoral and freshwater habitats; some markedly pelagic. Carnivorous; some only or mainly take fish (e.g. Black-naped Tern *S. sumatrana*, White-fronted Tern *S. striata*); other HANZAB species take mixture of fish, molluscs, crustaceans and insects; some freshwater species also take small vertebrates, such as mice or frogs (e.g. Whiskered Tern *C. hybridus* and Gull-billed Tern *S. nilotica*). Mostly diurnal but some nocturnal or crepuscular. Forage singly, in small groups or in mixed species feeding flocks, usually with other terns or seabirds, such as shearwaters. Feed mainly by surface plunging, occasionally shallow plunging; and by dipping (contact and non-contact). Also feed by hawking for insects over land and water; gleaning food while walking on ground or in shallow water; and kleptoparasitism.

¹ In Arctic Terns, the first alternate plumage was once mistaken as a separate species and named *Sterna portlandica* (Ridgway 1874), and the second alternate plumage was mistaken as another, *Sterna pikei* (Lawrence 1853). These taxonomic treatments have long since been discarded, but the terms 'portlandica plumage' and 'pikei plumage' still confusingly and incorrectly used for homologous plumages in many terns.

Highly gregarious when feeding, roosting and breeding, and will mob predators at colonies. Monogamous, with pair-bonds tending to persist from year to year. Birds may breed as early as 1 year old, but usually not till 3–4 and even older. Can live for many years. Normally breed in colonies, which can number up to tens of thousands. Nesting densities vary with species and habitat, and in large colonies of some *Sterna*, distances between nests can be a body-length. Nesting territories used for courtship and pair-formation, courtship feeding, copulation, and nesting. Fidelity to nesting site between years high in some species, though other species move between colonies or shift site of colonies altogether (Campbell & Lack 1985). At colonies, social flights, called MASS FLIGHTS, DREADS, PANICS, or UPFLIGHTS, common. In these displays, some or all members of a colony take flight and fly round in dense flock. Many authors use the terms interchangeably. Others distinguish between Mass Flights and Dreads: In Dreads, birds take off and fly low over colony for some distance without calling, then fly upwards calling loudly; Dreads an escape response but may also be used to help synchronize breeding. In Mass Flights, all birds take off and fly upwards, calling loudly from outset; Mass Flights most common before laying and are used to help synchronize breeding cycles of individuals; resurgence of Mass Flights occurs when chicks being fed, mostly by non-breeding birds visiting colony, at least some of which are preparing to breed in the next breeding season (K. Hulsman). The distinction is often not clear in published descriptions of flock behaviour. Vocal at breeding colonies; calls raucous.

In *Sterna* and allied genera, displays usually elaborate and similar between species. Aerial flights and some ground displays persist after laying. In GROUND DISPLAYS, which often involve more than two birds, birds drop wings, raise tails and stretch necks upwards. Aerial displays occur in and round colonies. In HIGH FLIGHTS, several birds ascend rapidly to 100 m or more, with some birds displaying as they descend. Zigzagging flights common and especially spectacular in Crested Tern, even after nesting has finished (Gibson 1956). A male carrying a fish will execute noisy LOW FLIGHT through colony, which often stimulates others to join in. FISH-OFFERING CEREMONIES involve one bird flying round, calling loudly, usually with fish held crosswise in bill; usually, another joins it, flying in front of first. Fish not transferred on wing, but may be passed on ground, accompanied by strutting.

Noddies (*Anous*, *Procelsterna* and *Gygis*) have different displays to sea terns. Similarities include ground displays before and during incubation, which involve birds dropping wings so that tips on or close to ground. In courtship display at nest-site, male bobs head slightly and caresses head and neck of female with bill; male courtship-feeds female, and birds call and touch bills. In aggressive territorial displays, male raises feathers of crown slightly, gives rattling call, then thrusts stiffened neck forward and bows. In all displays, orange tongue, pale crown and markings round eyes prominent (Woodward 1972).

Within Sterninae, both sexes share nest duties. Chicks semi-precocial and, if undisturbed, semi-nidifugous (most species) or nidicolous (*Anous*, *Gygis*); older chicks occasionally form crèches in some *Sterna*. Food given in bill (most species) or by regurgitation (e.g. *S. fuscata*, *Anous*). Parental feeding continues after fledging, sometimes for several months and, sometimes, after dispersal from colonies (Campbell & Lack 1985; BWP).

Breeding seasonal, though some tropical terns, notably Bridled *S. anaethetus* and Sooty *S. fuscata* Terns, breed at sub-annual intervals depending on local conditions; at some sites, breeding of population may be continuous (King & Buckley 1985; King *et al.* 1992; BWP). Usually breed in colonies on offshore islands or on headlands; also on or round terrestrial wetlands or in coastal habitats, such as sand dunes, beaches and on islands and sandspits in estuaries; some species nest on cliffs (e.g. Grey Ternlet *P. albigitta*); Black-fronted Terns nest in shingle beds in streams; Whiskered Terns in vegetation in freshwater swamps; occasionally nest on man-made structures, such as jetties and wrecked ships (HASB; Aust. NRS). Will nest with other species of terns. Ground-nesting birds make unlined or poorly lined scrape in sand or gravel, sometimes under vegetation or in crevice of rock; most noddies nest in trees and bushes, and build bulky nests out of plant material, though many Common Noddies *A. stolidus* nest on ground; Whiskered Terns build mounds or platforms of vegetation; White Terns make no nest, laying egg on bare branch or leaf of a tree (Fjeldså 1977; HASB; Aust. NRS). Ground-colour of eggs varies from cream or stone-grey to greenish stone, buff or light brown, with markings of black or dark brown, occasionally dark purple (HASB). Clutch-size, 1–3; most species breeding temperate zones average two eggs per clutch, most in tropical areas only one. Incubation period ranges from 19 to 36 days; species that lay 2–3 eggs per clutch incubate for shorter periods, mostly between 19 and 23 days, while those that usually lay one egg incubate for longer, from 28 to 36 days. Both sexes incubate. Adults defecate away from nest. Both sexes feed young, mostly bill to bill or by dropping item beside chick, though noddies, *Procelsterna* and some tropical *Sterna* fed by regurgitation. Young of ground-nesting species leave nest within 1 week of hatching but may remain near nest for a few more days; usually seek shelter in nearby cover, though some species form crèches (Hulsman 1977; HASB); young of tree-nesting species usually remain in nest till able to fly (but see *Gygis alba*). Most species dependent on parents for food for up to 4 months after fledging. Age of first breeding, usually 3–4 years, some species at 2 years (BWP).

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Sterna albifrons Little Tern

COLOUR PLATE FACING PAGE 672

Sterna albifrons Pallas, 1764, in Vroeg's *Cat. Oiseaux Adumbr.*: 6 — Maasland, Holland.*Albifrons* refers to the white patch on the forehead (Latin *albus*, white, and *frons*, forehead).

OTHER ENGLISH NAMES White-shafted Ternlet, Black-lored Tern, Sea-swallow, Least Tern.

POLYTYPIC Subspecies *sinensis* Gmelin, 1789, se. and e. Asia, E from Sri Lanka to New Guinea and n. and e. Aust. Extralimitally: nominate *albifrons* breeds Europe and North Africa, E to central Asia, including Pakistan and n. India; subspecies *guineae* Bannerman, 1931, w. and central Africa.

FIELD IDENTIFICATION Length 20–28 cm; wingspan 45–55 cm; weight c. 50 g. Smallest tern in HANZAB region. Very small, slender sea tern, with bill about as long as head but deep at base; small head with sloping forehead; very narrow wings; moderately long and deeply forked tail, with tip falling short of wing-tips at rest; and moderately long slender legs. Very similar in size and shape to Fairy Tern *Sterna nereis*. Much smaller and slimmer than commic terns and Black-naped Tern *Sterna sumatrana*. Adult in breeding plumage easily identified by diagnostic patterns of head and bill. Non-breeding plumages have distinctive combination of white forehead and crown, narrow black band from eye to nape, blackish cubital bar, and wholly black bill. Sexes alike. Seasonal variation. Juvenile distinct. First immature separable.

Description **Adult breeding** Crown, nape, upper ear-coverts and tapering line from eye to bill, black, with triangular white patch on forehead tapering to point above rear of eye. Rest of head and neck, white. Saddle and tertials, light grey, with narrow white scapular and tertial crescents. Rump and tail, white, contrasting strongly with grey saddle. At rest, folded wing, light grey, as saddle, with thin tapering white line along upper edge of folded primaries, petering out just short of wing-tip, and thin black strip along bottom of primaries; outer primaries, darker, grey-black. In flight: upperwing appears light grey, with narrow white trailing-edge to secondaries and inner primaries, and narrow grey-black strip or wedge on leading-edge of outerwing, contrasting strongly with paler-grey rest of primaries. Underparts, white; remiges, except dark outer primaries, translucent. Bill, bright yellow, with small black tip. Iris, black-brown. Legs and feet, bright orange. **Adult non-breeding** Differ from adult breeding by: Anterior lores, forehead and crown, white, with varying grey wash and fine black streaking or spotting on rear-crown at border with dark nape; well-defined narrow black band extends from large patch in front of eye, through ear-coverts to nape. Rump and tail, light grey, with narrow white sides; tail shorter, less deeply forked, with tips of long outermost rectrices falling well short of wing-tips at rest. Upperwing has narrow black cubital bar (sometimes concealed at rest) and outer primaries always obviously darker. Bill, black. Legs and feet, dull orange-brown to brown-black. **Juvenile** Similar to adult non-breeding, but differing by: In fresh plumage, dark band on head, narrower and duller, brown-black; white of anterior lores, forehead and crown, washed brown (not grey); and forehead and crown finely streaked and spotted darker. Saddle and tertials, light grey, with narrow white scaling and bold, narrow brown-black U-shaped marks. Rump, light grey, slightly paler than upperparts, grading to grey-white uppertail-coverts. Tail, light grey, with

white sides and thin broken brown-black subterminal tail-band. At rest, folded wing, light grey, with narrow white fringes and narrow dark U-shaped marks on coverts (sometimes almost absent) and narrow grey-black cubital bar extending narrowly round carpal (often concealed); folded primaries slightly darker, silvery grey, with thin tapering white line along upper edge, petering out just short of wing-tip. In flight, upperwing: light grey, with narrow grey-black cubital bar; dusky grey outer primaries, coverts and alula, which form dusky leading-edge to wing; dark-grey secondary bar; and narrow white trailing-edge to secondaries, tapering onto inner primaries. From below, remiges, except dusky outer primaries, translucent. In fresh plumage, cap, saddle, tertials, rump, tail, secondary coverts and sides of breast washed buff. Bill, dark brown, with diffuse dull-black tip and base; soon becomes dull black with dirty-brown base and cutting edges. Legs and feet, dirty orange. **Transition to first immature** Post-juvenile moult protracted, gradually attaining first immature non-breeding plumage. At first, retain juvenile tertials, wing and tail, and bill, legs and feet as adult non-breeding. Later, similar to adult non-breeding but contrasting dark strip or wedge on outerwing extends farther forwards to carpal joint. **First immature non-breeding** Inseparable from adult non-breeding. **First immature breeding** At least some develop pattern of head intermediate between that of adult non-breeding and breeding; bill becomes dull brownish-yellow at base and along cutting edges and legs and feet become brighter, brown-orange.

Similar species Often confused with **Fairy Tern** (only Aust. and NZ subspecies discussed), which is slightly bigger and bulkier, looking broader from head-on and fuller-chested in profile; with slightly longer heavier bill; bigger, more rounded head; proportionately slightly shorter and thicker legs; and, in flight, slightly broader wings. In **ADULT PLUMAGES**, Fairy differs by: (1) in Aust., upperparts, paler-grey (in NZ, upperparts similar in colour to upperparts of Little Tern); paler rump and tail contrast less with rest of upperparts; (2) thicker tapering white line along upper edge of folded primaries; and (3) outer primaries always much paler and greyer and contrasting less with rest of upperwing. In **ADULT BREEDING PLUMAGE**, further distinguished by: (1) squarer white patch on forehead, extending back in rounded notch to just in front of and above eye; lores, white except for large black patch in front of eye (not normally seen in Little); (2) bill, bright yellow-orange. In **ADULT NON-BREEDING** plumage, Fairy further distinguished by (1) yellow-orange bill, with diffuse blackish subterminal band and black band at base of bill; (2) white on crown covered with thicker, messier black blotching, and black half-cap appears broader; and (3) no blackish cubital bar. In **JUVENILE**

plumage, Fairy best distinguished by paler appearance above (especially rump); contrasting white or greyish-white secondaries without obvious dark secondary bar; paler, greyer and less contrasting cubital bar; broader and less convex dark U-shaped marks on saddle and inner coverts of upperwing; and thicker white upper edge to folded primaries. In **FIRST IMMATURE NON-BREEDING** plumage best distinguished by (1) dirty-orange bill, with dusky basal and subterminal bands; (2) in Aust., paler-grey upperparts, often appearing whitish, especially when worn (Little has more grey-and-white appearance); and (3) retained juvenile upperwing before start of wing-moult. Voice also helpful: calls of Fairy very similar but generally lower-pitched, more nasal and trisyllabic (q.v.); apparently lack call equivalent to simple *kik* flight call uttered by migrant Little Tern. In non-breeding plumages, can also be confused with **Black-naped Tern** (q.v.).

Coastal. Gregarious; usually in small groups, though often roost in large flocks. Often roost or feed with other terns, especially Fairy Tern. Active, noisy and excitable. Horizontal carriage and trotting gait as other small terns. Flight and feeding actions very similar to those of Fairy Tern: normal flight, fast hurried and wader-like, with quick fluttering wing-beats; wings held strongly angled and, in breeding plumage, long tail often held closed, forming long spike. When feeding, fly to and fro 3–10 m above water, hovering on rapidly beating wings with bill pointing down, followed by near-vertical descent, with wings held in steep V before plunging into water, rising again after a few seconds. Very vocal; usual flight call of migrants, shrill high-pitched *kik* or *kip*, repeated; also high-pitched, slightly rasping, disyllabic *gi-wick* or *kid-ick*, often strung together in long chattering series, recalling similar, though lower-pitched, more nasal and trisyllabic *der-der-vik* or *ker-ker-vick* of Fairy Tern.

HABITAT Sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits; also ocean beaches. May occur several kilometres from sea, in harbours, inlets and rivers (Eckert 1970; Smith 1990). Occasionally on offshore continental islands or coral cays (Hill *et al.* 1988). Regularly at saltworks in nw. Aust. (e.g. at Port Hedland) (C.D.T. Minton), though apparently less so elsewhere (Cox & Close 1977). Rarely on rocky or muddy shores (Cox & Close 1977). Reports over inland marshes and fields near Narracoorte, SA (Morgan 1919) incorrect.

Breed on sand-spits, banks, ridges or islets in sheltered coastal environments, such as lakes, estuaries and inlets; also on sandy ocean beaches (wide and flat or gently sloping); occasionally in sand-dunes. Often nest on artificial banks, islets or dunes of dredge-spoil; said to nest readily on newly deposited spoil (e.g. in Botany Bay, NSW); also nest on excavated areas of gravel or shell; even on bulldozed sand-bed on building site c. 1.6 km from water. However, nests in newly created habitats sometimes abandoned because: sand dry and unstable; shell-grit in substrate not weathered and settled into beds; or darker colour of new substrates may result in overheating of eggs or young (Gwynne 1933; McGill 1945; Campion 1963; Morris 1979; Vincent 1983; Larkins 1984; Hill *et al.* 1988; Reside 1988; Reside & Hill 1989; Reside *et al.* 1989; Owen 1990; Smith 1990, 1994; Murray 1994; Aust. NRS). Rarely, nest on muddy islands (Cox & Close 1977; Owen 1990). Said to nest on coral cays (Hill *et al.* 1988).

Most nest on sandy substrates containing much shell-grit or shingle (Napier 1972; Vincent 1983; Larkins 1984; Murray

1994), which provides camouflage for eggs and chicks; the size of shells is not a determining factor (Larkins 1984). Usually do not nest where shell-grit covered by sand (Reside *et al.* 1989). Recorded nesting in Aboriginal shell-middens (Morris 1979). Sometimes also in sand strewn with pebbles (Larkins 1984; Smith 1990). Eggs laid in pure sand said to have lower success (Smith 1990).

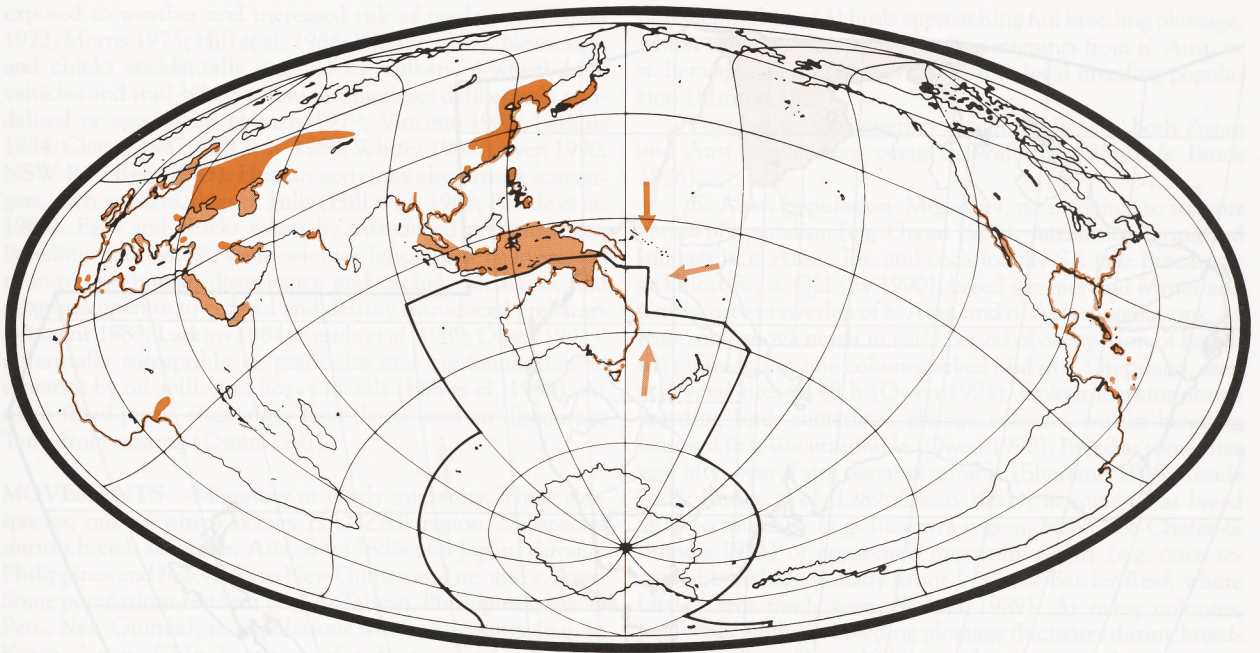
Usually nest on raised areas within 150 m of tideline; most within 5 m of high-tide mark, with those near edge of water prone to flooding (Morris 1979; Vincent 1983; Bolger 1984; Hill *et al.* 1988; Reside *et al.* 1989; Ey 1990; Smith 1990; Owen 1991; Starks 1992; Murray 1994). Management to prevent Terns nesting at flood-prone sites includes displacing birds by flagging beaches with lines of bunting, or raising nests on sandbags (Reside 1988; Reside *et al.* 1989; Owen 1990, 1991; Murray 1994).

Colony sites bare or with sparse clumps of low vegetation, including Sea Rocket *Cakile maritima*, Marram Grass *Ammophila arenaria*, or Hairy Spinifex *Spinifex sericeus*. Will not nest on sites with >5% vegetation cover, and areas that become too densely vegetated (e.g. with colonising reeds, grass and wattles) are abandoned (Campion 1963; Morris 1979; Vincent 1983; Larkins 1984; Reside 1988; Hill *et al.* 1988; Reside & Hill 1989; Reside *et al.* 1989; Smith 1990). Vegetation traps windblown sand, which can cover areas of shell-grit (Reside *et al.* 1989; Owen 1991). Terns will colonize overgrown sites if vegetation removed (Reside *et al.* 1989). Mixed pair of Little and Fairy Terns recorded breeding among samphire (Eckert 1970).

Forage in shallow waters of estuaries, coastal lagoons and lakes, usually over channels next to spits and banks; often close to breeding colonies. Occasionally forage along coasts, especially round bars off entrances to rivers and lagoons. Also occasionally at sea, usually within 50 m of shore; not recorded >1.5 km from shore (Reside 1988; Reside *et al.* 1989; Owen 1990, 1991; Smith 1990, 1994; Chafer & Brandis 1991; Egan 1992). During floods, increased turbidity close to coast may force Terns to forage well out to sea (Reside *et al.* 1989). However, on rising tides during floods, foraged in estuary, at interface between incoming seawater and muddy lakewater (Owen 1991). Modifications to drainage patterns, including damming of tidal creeks, reclamation of intertidal areas and destruction of seagrass beds, mangroves and saltmarsh all affect availability of food (Martindale 1985; Smith 1990).

Usually roost or loaf on exposed sand-spits, banks and bars within sheltered estuarine or coastal environments, often at or near edge of water, in shallows or along tideline (Vincent 1983; Bolger 1984; Owen 1991). Also on sandy shores of lakes and ocean beaches (Bolger 1984; Reside *et al.* 1989; Owen 1990, 1991). Prefer sheltered sand-spits surrounded by narrow shallow channels within lakes to more exposed spits in large lakes, which are, in turn, preferred to ocean beaches (Reside *et al.* 1989). Infrequently recorded on rocky shores (Morris *et al.* 1990; Chafer 1991; Tas. Bird Rep. 20) or mudflats (Hoskin & Hindwood 1964). May shelter in sand-dunes (Cooper 1971), especially during bad weather (Vincent 1983; Dale 1988); possibly roost in saltworks (C.D.T. Minton). Traditional roosting sites that become covered with decaying aquatic vegetation abandoned (Owen 1991). Chicks shelter beneath vegetation on beach or in dunes, and will use specially provided artificial shelters (Reside & Hill 1989; Reside *et al.* 1989).

Colonies disrupted or destroyed by industrial, residential and recreational developments, including sand and rutile mining, establishment of waste-disposal dumps and construction



(Gibson 1977; Morris 1979; Larkins 1984; Smith 1990).

DISTRIBUTION AND POPULATION Europe, Asia and A'asia. Breed from British Isles, S to Mediterranean Sea (including n. Africa), and E along North Sea and Baltic coasts through central Russia, w. China and Mongolia, to se. Siberia, Japan, China and Philippines; also E from Mediterranean, through Middle East to Indian subcontinent, se. Asia and Malay Arch., and S to New Guinea, and n. and e. Aust. During non-breeding season, on coasts of Baltic and Mediterranean Seas and e. Atlantic Ocean, from Scandinavia S to Gulf of Guinea; in w. Indian Ocean on coast of Africa, including Red Sea; also Persian Gulf, ne. Arabian Sea, e. Bay of Bengal and Malay Pen.; in w. Pacific Ocean, from s. Japan, Korean Pen. and e. China, S through Philippines, Indo-China and se. Asia to PNG, Solomon Is, n. and e. Aust. and NZ. Regular migrant to islands in tropical w. Pacific Ocean (Urban *et al.* 1986; Pratt *et al.* 1987; Blaber 1990; BWP).

Aust. WA Few records S of 20°S: single, Monkey Mia, Shark Bay, 1979, after Cyclone Hazel (Aust. Atlas); flock, Carnarvon, Mar. 1980 (Roberts 1982; Storr 1985); report from Dirk Hartog I. (Chenery 1928) rejected (Davies & Chapman 1975). Recorded inland at Wittenoom, Oct. 1978, after strong winds (Aust. Atlas). Also recorded Barrow and Monte Bello Is (Aust. Atlas). Regularly recorded between Port Hedland Saltworks and Roebuck Bay, Broome, and thought to occur patchily from there to C. Londonderry (Serventy & Whittell 1976; Smith *et al.* 1978; Storr 1980; Johnstone 1983; Aust. Atlas; C.D.T. Minton). **NT** Coasts, from Darwin to se. Gulf of Carpentaria, including offshore islands (Aust. Atlas; H.A.F. Thompson & D.K. Goodfellow). **Qld, NSW** Entire coast, from se. Gulf of Carpentaria to Vic. border, including islands of Torres Str. and Great Barrier Reef. **Vic.** Mainly e. coast, between Mallacoota and Corner Inlet; rare Westernport Bay; small numbers reach Port Phillip Bay (Vic. Atlas). **Tas.** In NW, from Robbins I. to Port Latta; on ne. and e. coasts, from Adam's Cut to Marion Bay (Rounsevell 1983; Tas. Bird Reps). Also King and Flinders Is (Newman *et al.* 1984; Tas. Bird Rep. 20). **SA** Uncommon. Recorded in SE, from Port MacDonnell,

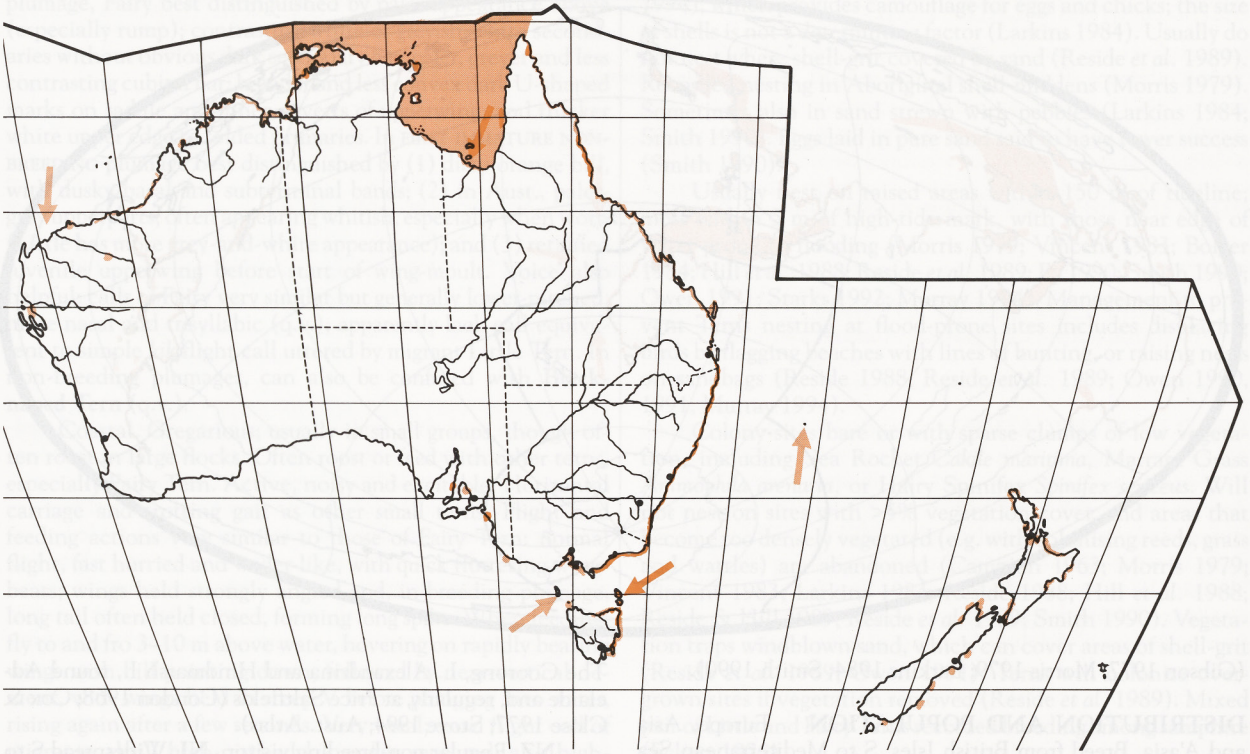
The Coorong, L. Alexandrina and Hindmarsh I., round Adelaide and, regularly, at Price Saltfields (Condon 1968; Cox & Close 1977; Stove 1994; Aust. Atlas).

NZ Regular non-breeding visitor. **NI** Widespread S to line between Ohiwa and Kawhia Harbours; also East Coast and Hawke's Bay, between C. Waipoa and Tukituki R.; in SW, from L. Wairarapa to Wanganui R. estuary (NZ Atlas; CSN). **SI** Mostly from Orowaiti, NE to Golden Bay, and SE to estuary of Waimea R.; and in Canterbury between mouth of Ashley R. and L. Ellesmere. Also Timarou, Otago Harbour, Taeri R., Invercargill and Stewart I. (Andrew 1967; Edgar 1974; Falla *et al.* 1981; CSN). Three records on West Coast, 1986–87 (CSN 35).

Lord Howe I. Single, specimen, 15 Dec. 1975 (NSW Bird Rep. 1975); single, 4 Mar. 1986 (NSW Bird Rep. 1986).

Norfolk I. Two unconfirmed records: single (remains of two wings and tail), 15 Nov. 1975, thought to be either Little or Fairy Tern (McKean *et al.* 1976; Schodde *et al.* 1983); single, 1980 (Hermes *et al.* 1986).

Breeding Known sites (+ = where last recorded breeding <1970 or date unknown). **Qld** Wellesley Is¹; Austin I.²; Mitchell R.³; Edward R.⁴⁺; Balaargah Ck³; Munkun R.⁴⁺; Pipon I.⁵⁺; mouth of Daintree R.³; Michaelmas Cay⁶⁺; Willis I.⁷⁺; Coquette Pt^{3,8}; Cowley Beach^{3,8}; Dunk I.⁹⁺; Brook I.³; Lihou Reef (Observatory Cay)¹⁰⁺; Murray R. mouth³; Elliott R.¹¹; Port Denison⁹⁺; Mackay (Victor I.⁹⁺; Shoal Pt.¹²⁺); Pelican Beach, Bundaberg⁹⁺; Noosa R. mouth¹³⁺; Maroochy R. mouth¹³⁺; Mud I.¹²⁺. **NSW** Tweed Heads¹⁴; Kingscliff¹⁵⁺; Hastings Pt.^{14,16}; Pottsville^{14,15}; Brunswick Heads^{14,16}; Belongil Ck, Byron Bay^{14,15,16}; s. side Richmond R., Ballina¹⁵⁺; Jerusalem Ck^{14,16}; Yamba^{15,17+}; Broom's Head¹⁵; Woolli-Jones Beach^{14,15,16}; Station Ck^{14,15,16}; 5 km S of Smoky C.¹⁶; Red Rock^{3,14,15,16,18,48}; Deep Ck³; Bonville Ck³; Sawtell^{14,15,16,19}; Nambucca Heads^{3,14,15,16}; Grassy Head¹⁵; Stuart's Pt (Macleay R.)¹⁵⁺; Hat Head¹⁵; Pelican I.³; Pt Plomer²⁰; Camden Haven¹⁵⁺; Harrington^{14,47}; Old Bar¹⁵⁺; Miles I.³; Dredgesoil I.³; Forster^{14,21} (Wallace L.^{15,45}; Piper's Bay¹⁵; Forsters Quays²²; Corrie I.¹⁵); Stockton¹⁵⁺; Swansea¹⁵⁺; Red-head^{15,23+}; Myall Is²⁴; Port Stephens¹⁷⁺; Hunter R. estuary²³⁺; Budgewoi¹⁵⁺; The Entrance²⁵; Dee Why¹⁵⁺; Homebush Bay¹⁵⁺;



Botany Bay²⁴ (Port Botany²⁶; N. Botany Bay³; Boat Harbour¹⁵⁺; entrance Cook R.¹⁵; entrance George's R.¹⁵⁺; Gawley Bay¹⁵⁺); Bellambi Pt¹⁵; Towradgi Beach¹⁵⁺; Tom Thumb Lagoon^{15,27+}; S. Wollongong Beach¹⁵; Wollongong Coal Loader¹⁵⁺; Port Kembla¹⁵⁺; Windang¹⁵⁺; L. Illawarra^{15,17+}; Minnamurra¹⁵⁺; Shoalhaven Heads^{15,24}; Comerong I.³; L. Woolomboola¹⁵; L. Conjola¹⁵⁺; Ulladulla–Burrill Ls¹⁵⁺; Tambourie L.¹⁵⁺; Meroo L.^{15,17+}; Mossy Pt¹⁵⁺; Coila L.^{15,24}; Tuross L.¹⁵⁺; Tuross S. Beach²⁸; Brou L.^{3,5,28,29}; Tilba L.^{3,15,28,30,31}; Wallaga L.¹⁵; Murrah Lagoon³; Mogareka Inlet³; L. Wallagoot³⁺; Salt Lake¹⁵. **Vic.** Mallacoota⁴⁶ (Goodwin Sands^{9,32,33}; Ocean Beach³³); Betka R.³²⁺; Tamboon Inlet^{3,32,46}; Sydenham Inlet–Bemm R.³²; Marlo^{32,33}; L. Tyers^{3,32,34,35}; Lakes Entrance (E. Beach^{32,34}; Beach opposite Club Hotel³²; Mouth Tambo R.^{33,34,35}); Rigby I.^{3,35}; Crescent I.^{3,35}; Barton I.³³; Pt Turner, Banksia Pen.³³; Corner Inlet – New I.³; formerly at Sperm Whale Head^{19,32+}. **Tas.** Flinders I. (Patriarch's Inlet³; Cameron's Inlet³); Adam's Cut³⁶; Waterhouse I.³⁷; Great Forester R.³; Lt Musselroe Bay^{3,38}; St Helen's Pt³; Diana's Basin^{39,40}; Scamander R.^{36,40,41}; Falmouth R.^{36,40,41}; Chain of Lagoons³⁹⁺; Marion Bay³⁶, possibly at Sandpit R.³⁶. **SA** An island in The Coorong⁴³; Price Saltfields (nested with Fairy Terns or hybrids)⁴⁴. **NT** Nhulunbuy (not Fairy Terns, as originally recorded by H.R. Officer [Aust. Atlas])⁹; Pt Dundas, Gove Pen.⁴²; Rosie Ck³; Pine Ck³; Unnamed creek (15°57'S, 137°07'E)³ (REFERENCES: ¹ Walker 1992; ³ Garnett 1985; ³ Starks 1992; ⁴ Garnett & Bredl 1985; ⁵ Warham 1962; ⁶ Storr 1984b; ⁷ Serventy 1959; ⁸ Gill 1970; ⁹ Aust. Atlas; ¹⁰ Hindwood *et al.* 1963; ¹¹ Ey 1990; ¹² HASB; ¹³ Seaton 1960; ¹⁴ Clancy 1987; ¹⁵ Morris 1979; ¹⁶ Martindale 1985; ¹⁷ Campion 1963; ¹⁸ NSW Bird Rep. 1986; ¹⁹ NSW Bird Rep. 1982; ²⁰ NSW Bird Rep. 1975; ²¹ NSW Bird Rep. 1984; ²² NSW Bird Rep. 1977; ²³ Morris 1975; ²⁴ NSW Bird Rep. 1983; ²⁵ A.K. Morris; ²⁶ Larkins 1984; ²⁷ McGill & Lane 1955; ²⁸ Whiter 1989; ²⁹ Whiter 1991b; ³⁰ Bolger 1984; ³¹ Whiter 1991a; ³² Vincent

1983; ³³ Reside *et al.* 1989; ³⁴ Owen 1990; ³⁵ Owen 1991; ³⁶ Rounsevell 1983; Tas. Bird Rep.:³⁷ 15; ³⁸ 20; Napier:³⁹ 1970, ⁴⁰ 1978; ⁴¹ 1972; ⁴² Officer 1976; ⁴³ Eckert 1970; ⁴⁴ Cox & Close 1977; ⁴⁵ Smith 1994; ⁴⁶ J. Reside; ⁴⁷ P. Smith; ⁴⁸ M. Williams).

Anomalies Large influx into NI of NZ, 1989–90 (CSN 38) coincided with largest Tas. count since 1971 (Starks 1992).

Status Aust. breeding population vulnerable (Garnett 1993); uncommon to rare throughout Aust. (Hill *et al.* 1988). Asian migrants widespread and common (C.D.T. Minton).

Populations Survey of e. Aust. in Dec. 1989 recorded a total breeding population of 310–319 pairs: Qld, 3178 birds, including 56 breeding pairs; NSW, 1134, including 80 or 87 breeding pairs; Vic., 314, including minimum of 155 breeding pairs; Tas., 29, including six breeding pairs (Starks 1992; see also Hill *et al.* 1988). Total of 740 Little Terns counted at selected sites in n. NSW, Jan. 1985 (Martindale 1985). Populations in nw. WA estimated in hundreds (Hill *et al.* 1988); 800, Bush Pt, Roebuck Bay, 27 Apr. 1994 (AWSG); 202, Eighty Mile Beach, 29 June 1994 (B. Hayward & J. Fallaw); 133, Port Hedland Saltworks, 12 Apr. 1994 (AWSG). Populations in parts of Aust. range have declined (Hill *et al.* 1988). Total number of nests in NSW has declined since 1950s (Morris 1979; Whiter 1989): in 1950, estimated 350 breeding pairs at 52 active colonies; by 1979, 32 pairs at ten active colonies (Morris 1979); in 1984–85, 100 pairs (Hill *et al.* 1988); in Dec. 1989, 80–87 breeding pairs (Starks 1992). In Vic., population has remained stable between 1978 and 1988 (Hill *et al.* 1988). In Tas., first recorded 1968 (Napier 1970); now regular breeding visitor; population said to have decreased slightly in 1980s (Hill *et al.* 1988), though total of 29 recorded Dec. 1989 largest recorded since 1971 (Starks 1992).

Adversely affected by coastal recreational activities. At nesting sites, easily disturbed by people: leave nests when person approaches within 100–150 m, leaving chicks and eggs

exposed to weather and increased risk of predation (Napier 1972; Morris 1975; Hill *et al.* 1988; Whiter 1989). Nests, eggs and chicks accidentally crushed by walkers, 4-wheel-drive vehicles and trail-bikes; colonies sometimes deliberately vandalised or eggs taken (Morris 1979; Vincent 1983; Larkins 1984; Clancy 1987; Hill *et al.* 1988; Whiter 1989; Owen 1990; NSW Bird Rep. 1983). Human activities also attract scavengers, such as foxes, dogs or gulls (Hill *et al.* 1988; Reside *et al.* 1989). Eggs and chicks taken by introduced predators (see Breeding: Success). At some colonies, fences have been erected to minimise human disturbance and exclude predators, and programs operate to control and destroy introduced predators (Vincent 1983; Larkins 1984; Reside *et al.* 1989; Owen 1991). Potentially susceptible to pesticides and contamination of estuaries by oil-spills and heavy metals (Hill *et al.* 1988). At some flood-prone sites, flags have been used to discourage Terns from nesting (Owen 1991).

MOVEMENTS Migratory or partly migratory. Three subspecies, one of which occurs HANZAB region. Subspecies *sinensis* breeds se. and e. Asia, from India and Japan, through Philippines and Indonesia to New Guinea and ne. and e. Aust. Some populations resident (e.g. in Taiwan, Philippines, Malay Pen., New Guinea); n. populations wholly migratory (e.g. in Korea, Japan, China); ranges of sedentary and migratory populations often overlap in non-breeding season. Birds from e. Asia move to non-breeding areas on Malay Arch., s. China, Indonesia, Philippines (uncommon) and New Guinea. Many birds from Asian breeding populations also spend non-breeding period in Aust. and, probably, NZ (treated as Asian population below). At least some Aust. birds migratory and, though non-breeding range not fully known, some occur Java, Lesser Sundas, Moluccas, Celebes and possibly Philippines; *sinensis* vagrant to Ghana (single band-recovery) (la Touche 1931–34; Delacour & Mayr 1946; Orn. Soc. Japan 1974; Medway & Wells 1976; Severinghaus & Blackshaw 1976; Blake 1977; AOU 1983; de Schauensee 1984; Urban *et al.* 1986; van Marle & Voous 1988; Dickinson *et al.* 1991; Roberts 1991; HASB; BWP). Rest of account refers only to subspecies *sinensis*.

Three separate populations occur in Aust.: (1) **E. AUST. POPULATION:** breeding spring–summer in E and SE, in Tas., Vic., NSW and Qld, N to about Elliott R. (20°S), where may overlap with n. Aust. population; occasionally breed SA. (2) **N. AUST. POPULATION:** poorly known but breed Gulf of Carpentaria and e. coastal C. York Pen. in austral autumn and winter; and (3) **ASIAN POPULATION:** non-breeding migrants from Asia, breeding in austral autumn and winter (as n. Aust. populations), migrating to Aust. and NZ in spring and leaving late summer to autumn. Non-breeding range of populations not well known; some references state origins of non-breeding populations but without evidence. In non-breeding plumages, populations cannot be separated on present knowledge (e.g. Minton 1989). However, different populations can sometimes be distinguished by differing plumages (e.g. adult breeding, adult non-breeding, juvenile) at different times of year (see below; Driscoll 1993); at other times, difficult to separate breeding and non-breeding populations. Much overlap of populations in HANZAB region and two or three populations can occur in one area at same time; for example, at Gippsland Ls, Vic., in Mar. (1989), four categories of birds caught: (1) birds moulting to non-breeding plumage, which were probably from local breeding population; (2) birds in full non-breeding plumage, which could have been second-year birds from local breeding population or non-breeding migrants from n. Aust.

or n. hemisphere; (3) birds approaching full breeding plumage, which were probably non-breeding migrants from n. Aust. or n. hemisphere; and (4) juveniles from local breeding population (Minton 1989).

Populations also overlap extralimitally, e.g. both Asian and Aust. populations occur in Wallacea (White & Bruce 1986).

E. Aust. population Migratory; no evidence to support claims of nomadism (e.g. Green 1989). **BREEDING:** Spring and summer in e. Aust., Tas. and occasionally SA (see Breeding); at Elliott R., n. Qld (Ey 1990), breed summer and winter and may be area of overlap of e. Aust. and n. Aust. populations. At least some move much in early period of occupation of breeding grounds, e.g. one colour-marked bird in e. Gippsland, seen at several sites in 48 h (Owen 1991). Colour-marking shows breeding birds sometimes change colonies within breeding season if first site unsuitable (Owen 1990). Breed at some sites year after year if site remains suitable (Sharland 1938; Reside 1988; Reside *et al.* 1989; Owen 1991); in some areas breed only occasionally (e.g. Illawarra region, NSW, see Chafer & Brandis 1991) or apparently opportunistically (e.g. once recorded breeding on Lady Elliot I., Great Barrier Reef, where Little Terns rarely seen, Walker 1989). At many colonies, number of adults in breeding plumage fluctuates during breeding season (e.g. Owen 1990); at other sites, numbers constant through season (e.g. Martindale 1985). Typically, birds in non-breeding plumage (possibly from other populations) associate with breeding colonies (e.g. Reside *et al.* 1989). At Rigby I., Lakes Entrance, Vic., breeding birds usually foraged within c. 4.5 km of colony (Reside 1988). **DEPARTURE:** In e. Gippsland, generally leave colonies, Jan.–Mar. (Reside 1988; Reside *et al.* 1989); fledgelings and adults recorded leaving on same day (e.g. Reside *et al.* 1989). On Rigby I., Gippsland Ls, some early breeders left colony, with young, by mid-Jan. 1991, with all gone by late Jan. (Owen 1991). At first, appear to disperse to surrounding areas (Owen 1990); in e. Gippsland, frequent some areas for up to 2 months before migrating. Flying juveniles recorded in NSW as early as late Dec. (NSW Bird Rep. 1990). Recorded deserting colony sites early if breeding unsuccessful (Wheeler 1959); in Vic. recorded deserting as early as Dec. (Vincent 1983; Reside 1988). **NON-BREEDING:** Range not completely known (Lane 1978); Aust. birds occur Java, Lesser Sundas, Moluccas and Celebes (BWP, probably based on skins). Most appear to leave s. Aust. outside breeding season; reporting rates in e. Aust. for all birds (i.e. including other populations present as non-breeding migrants): 1.8% in summer, 0.2% in winter (Aust. Atlas). Some records of birds in e. Aust. breeding range outside breeding period (e.g. Lane 1978; Gosper 1981; Vic. Atlas), when n. Aust. and Asian populations breeding; >70 spent winter in Gippsland Ls, in 1990 and 1991 (Garnett 1993). **RETURN:** Timing of arrival at colonies varies between years, by up to several weeks (Owen 1990). Large concentrations of birds (c. 500) in breeding plumage noted in Dec. at Noosa R., Qld (Qld Bird Rep. 1988), probably e. Aust. population. In NSW, breeding recorded as early as Sept. and birds in breeding plumage first recorded Sept. and Oct. (McGill 1945; Chafer & Brandis 1991; Driscoll 1993; NSW Bird Rep. 1986). In e. Gippsland, Vic., first arrive near colonies between late Sept. and Nov., with number of breeding birds at some colonies increasing into Dec. (Vincent 1983; Reside 1988; Owen 1990, 1991; Reside *et al.* 1989). Recorded Tas. as early as Oct. in years when breeding occurs (Napier 1978). Recorded SA, Jan.–Apr., probably moving W from Vic. (Condon 1968; Eckert 1970). **DISPERSAL OF YOUNG:** In Vic., juveniles disperse

round colony and even visit other colonies nearby (Starks 1992); adults and flying young forage and roost widely in region of colony (Owen 1990). Some adults apparently accompany young after leaving natal area, e.g. adult feeding juvenile recorded 450 km from nearest known breeding colony (Starks 1992). Banding indicates at least some birds move N in first non-breeding season (see Banding). Some juveniles recaptured in natal area in following summer, when recorded in plumage almost identical to adult breeding plumage (Minton 1990; Owen 1990). Some evidence that at least some breed in season after hatching; one bird banded as first-year in Mar. 1989 at Gippsland Ls, Vic., sighted on nest at Botany Bay, NSW, Sept. 1989 (Driscoll 1993); bird banded as juvenile seen engaging in courtship behaviour 8.5 months later (Owen 1991).

N. Aust. population Movements poorly known. Unknown whether resident or migratory (Starks 1992), though numbers round known nesting sites in Gulf of Carpentaria similar in winter and summer suggesting population resident (Garnett 1993). On present knowledge (which is poor), cannot be separated from Asian populations in non-breeding plumages away from colonies. **BREEDING:** In autumn and winter in Gulf of Carpentaria and e. C. York Pen. (see Breeding). **DEPARTURE, NON-BREEDING, RETURN:** Not known (see Unknown populations, below).

Asian population Partly migratory and partly resident; in HANZAB region a non-breeding visitor in large numbers to e. Aust. in austral spring–summer (Morris 1979; Starks 1992). Probable that birds recorded NZ also this population (see below). **BREEDING:** Extralimital, in austral autumn–winter. No records of birds in breeding plumage in winter in se. Aust. Recorded in winter months in NZ, when some recorded in breeding plumage (CSN 37). **DEPARTURE:** Leave Korea, Aug.–Sept. (Gore & Won 1971); leave Osaka Bay, Honshu, Japan, late Aug. and early Sept. (Kobayashi 1953); in e. China, recorded Chinwangtao till mid-Oct. (la Touche 1931–34); passage migrant Hong Kong, mainly between mid-Aug. and late Oct. (Chalmers 1986). Uncommon visitor to Micronesia in boreal winter (Pratt *et al.* 1987). Birds, including at least some from ne. Asia, present New Guinea from mid- to late Sept. (Coates 1985; Hicks 1990). Recorded Bali, Sept.–Oct. 1981–82 (Ash 1984). **NON-BREEDING:** In Aust., not possible to distinguish from n. Aust. breeding populations away from colony (see Unknown populations, below). **RETURN:** As cannot currently be distinguished from n. Aust. population, passage difficult to describe (see below: Unknown populations).

Extralimitally, mostly leave New Guinea in Mar., though migratory birds present till early May (Coates 1985; Beehler *et al.* 1986). Recorded Bali, Mar.–Apr. 1981–82 (Ash 1984) and as passage migrant in Hong Kong between mid-Apr. and early May (Chalmers 1986). Arrive Korea between late Apr. and early May (Gore & Won 1971); arrive Osaka Bay, Honshu, Japan, during Apr. (Kobayashi 1953).

Unknown populations As stated above, breeding origin cannot be proved (on current knowledge) for birds in non-breeding plumage. While there is no evidence that n. Aust. populations migrate to s. and e. Aust., the possibility cannot be ruled out. Nevertheless, several lines of evidence (none of them conclusive) suggest that Asian migrants at least predominate on most Aust. and NZ coasts: (1) numbers of birds seen in non-breeding plumage far exceed known breeding population in n. Aust.; (2) there have been several band-recoveries between Japan and Aust.; (3) if n. Aust. Little Terns migrated from breeding grounds in Tropics to non-breeding areas in temperate regions, their migration strategy would be

most unusual; and (4) throughout Aust., timing of moult of migrants from N is consistent and very similar to that of nominate *albifrons*, which also breeds in n. hemisphere and migrates S (see Moults); in general, breeding season, and thus timing of moults, varies much more in seabirds breeding in Tropics than in n. hemisphere migrants, yet Aust. moult-records from Vic. and nw. Aust. show little variation in timing of moult of migrants from N (D.I. Rogers). (1) **E. Aust.** Large numbers of birds in non-breeding plumage recorded annually in e. Aust. in austral spring–summer (when e. Aust. population in breeding plumage and breeding); apparently mainly Asian population, but some may be from n. Aust. population and some possibly immatures from e. Aust. breeding populations (Hitchcock 1959; Clancy 1987; Minton 1989). Non-breeding birds more widespread and numerous than breeding population (Hill *et al.* 1988), e.g. at Windang, NSW, 99% of local population apparently non-breeding visitors (Chafer & Brandis 1991). In summer survey of Aust. in 1989, only 22% of birds in breeding plumage; proportion of birds in non-breeding plumage decreased from N to S, with most in Qld, proportion dropping quickly S of 28°S; proportion by State: Qld, 89.0%, NSW, 83.6%, Vic., 32.8%, Tas., 11.1% (Starks 1992). In Aust., numbers in at least some areas fluctuate between years (Martindale 1985; Clancy 1987). Numbers of non-breeding birds at some NSW and Vic. sites fluctuate greatly within season, suggesting dispersive movements (Clancy 1987; Reside *et al.* 1989). **ARRIVAL:** Passage of large numbers along coasts of central and n. Qld (Hill *et al.* 1988) probably includes birds from Asian and e. Aust. populations (and possibly n. Aust. population); passage apparent at Moreton Bay, Qld, late Sept. to at least early Dec. (Hitchcock 1959). In NSW, non-breeding birds mostly arrive from late Aug. to Oct.; at Windang, numbers increase gradually at first, then more rapidly, then stable from Nov.–Jan. to Feb.–Mar. (Hitchcock 1959; Lane 1978; Morris 1979; Chafer 1989; Chafer & Brandis 1991). Non-breeding birds first arrive e. Gippsland, Vic., between late Sept. and Nov., with influxes as late as Jan. (Reside 1988; Reside *et al.* 1989; Owen 1991). Birds present on some Great Barrier Reef islands over summer, e.g. present One Tree I. Sept. to at least Mar. (Hulsman 1977). Birds recorded throughout year at some localities where breeding does not occur, e.g. Heron I., Great Barrier Reef (Kikkawa 1970). **RETURN:** Birds in non-breeding plumage recorded as late as Mar. in e. Gippsland (Reside *et al.* 1989). Leave NSW, Mar.–May, with many moulting into partial or full breeding plumage before departure (Lane 1978; Morris 1979; Chafer 1989; Chafer & Brandis 1991). On s. Qld coast non-breeders moult into breeding plumage in Apr. before disappearing (Starks 1992); on 24 Mar. 1974, c. 1500 passed Pt Lookout, North Stradbroke I., Qld, in 5 h (Greensmith 1973). Passage observed Moreton Bay, Qld, between early Mar. and May (Hitchcock 1959); birds in breeding plumage recorded Fraser I., Qld, mid-May 1975 (Perkins 1973). (2) **N. and w. Aust.** Origin of birds in non-breeding plumage in n., nw. and w. Aust. between end Sept. and Apr. not certain; may be from Asian populations or from n. Aust. breeding populations (see introductory comments above). Origin of birds in breeding plumage in autumn and winter at Houtman Abrolhos and Carnarvon, WA (Roberts 1982) also not known. In Darwin region, NT, passage apparent Oct.–Nov.; some birds remain over summer, then passage again observed Mar.–May (Hitchcock 1959; Crawford 1972; McKean 1981). Observed Port Hedland area between end Sept. and early Apr. (Serventy & Whittell 1976). (3) **NZ** Small numbers of birds in non-breeding plumage, assumed

from Asian populations (though possibly from Aust. populations) regular to NZ, generally arriving about Nov., but recorded Sept. and Oct.; probable immatures also recorded (McKenzie & Sibson 1957; Sibson & Edgar 1962; CSN 35, 38, 39). Recorded at some localities for months, e.g. Nov.–Feb., L. Wairarapa (CSN 38). Generally leave about Apr., though birds in breeding plumage recorded Feb.–July (McKenzie & Sibson 1957; Sibson & Edgar 1962; CSN 37). Small terns recorded in non-breeding plumage in May and June suggested to be young Little Terns (McKenzie & Sibson 1957).

Banding, Colour-marking Several international recoveries show movement between A'asia and Japan: (1) nestling banded Tenryu R., Japan, 15 June 1994, recovered 5605 km S at Kowanyama, Qld, 2 Oct. 1994; (2) adult banded Spermwhale Head, Vic., 14 Jan. 1990 recovered 8154 km N at Tenryu R., Japan, 26 June 1995; (3) extraliminally, one banded Japan recovered New Guinea (ABBBS 1977, 1995). Of recoveries of Aust.-banded birds up to June 1991 (n=206) c. 85% are within 12 km of banding site (Driscoll 1993). Banding indicates at least some movement between areas where breeding occurs (Minton 1991, 1993b). Some recoveries indicate some breed at natal colonies (ABBBS 1985). At least some adults apparently show high site-fidelity (ABBBS 1986, 1990; Smith 1994); colour-marked birds recorded in Gippsland in consecutive seasons (Owen 1990). Some movement between colonies, and appears to be strong relationship between colonies in se. Aust. (Smith 1994). Maximum displacement between Aust.-banded runner and recapture as adult, 544 km; maximum displacement of Aust. adult between banding and resighting 1207 km (two birds) (Minton 1993a,b; ABBBS 1995).

FOOD Carnivorous; mainly small fish but also crustaceans, insects, annelids and molluscs. Extraliminally, see BWP and Urban *et al.* (1986); no information for Asia. **Behaviour** Mainly diurnal (Davies 1981). In HANZAB region, feed by PLUNGING in shallow water of channels and estuaries, and in surf on beaches (Reside *et al.* 1989; Owen 1990, 1991). At Windang, NSW, beyond surf-zone, dive from 5–10 m above surface, stall momentarily near water and then shallow-dive; in estuarine channels, hover and dive from 3–6 m (Chafer & Brandis 1991); dives from 10–13 m above surface also recorded (Hulsman 1974). May make shallow dives and only half-submerge (CSN 26). On lakes, dive and glean items from surface (Chafer & Brandis 1991); elsewhere recorded obtaining fish from or just below surface of water (Smith 1994). At Wallis L., NSW, breeding adults spend 21–26% of their time feeding, compared to 7–11% for non-breeding adults (Smith 1994). Usually feed solitarily but up to 50 small terns seen in feeding flocks off breeding grounds, especially during flood tide (Owen 1991); 11 seen feeding with Sooty Shearwaters *Puffinus gavia* (CSN 26); also seen feeding with large flocks of cormorants (Smith 1994). Courtship feeding commonly observed (see Social Behaviour). Occasionally have food stolen; by Silver Gulls *Larus novaehollandiae* and Kelp Gulls *L. dominicanus* (Hulsman 1974; Owen 1990; Chafer & Brandis 1991). For data on foraging behaviour outside region, see BWP; carry only one fish at a time (BWP).

Adult No detailed studies in HANZAB region. At Forster, NSW (Smith 1994): Fish: Centropomidae: *Ambassis jacksoniensis* ad.; Clupidae: *Hyperlophus vittatus* ad.; Eleotridae: *Gobiomorphus australis* juv.; Exocoetidae juv.; Mugilidae: *Myxus elongatus* juv.; Scorpidae: *Scorpius lineolatus* juv.; Sillaginidae: *Sillago maculata* juv.; Tetraodontidae: *Tropidostethus rhizophilus* ad. **Other records** Crustaceans⁷; Insects⁷; Fish^{1,2,3,4,5,6,7,8,9,10}:

Mugilidae: Yellow-eyed Mullet *Aldrichetta forsteri*⁶; Atherinidae: hardyheads *Atherina microstoma*² (REFERENCES: ¹ Morgan 1919; ² Hitchcock 1959; ³ van Tets *et al.* 1977; ⁴ Martindale 1985; ⁵ Reside *et al.* 1989; ⁶ Owen 1990, 1991; ⁷ Chafer & Brandis 1991; ⁸ Lea & Grey; ⁹ HASB; ¹⁰ FAB).

Young Fish: Atherinidae: hardyheads *Atherina microstoma*, *Atherinosoma presbyteroides*; Clupeidae: Pilchard *Sardinops neopilchardis*; Blue Sprat *Spratelloides robustus* (Vincent 1983).

Intake Feeding of chicks peaks morning and evening (Davies 1981). In Europe, young fed 1.85–10.4 times/h; size of prey increases and frequency of feeding decreases with age (BWP).

SOCIAL ORGANIZATION Prepared by M.A. Weston. For extralimital details, see BWP. Reasonably well known in Aust. (e.g. Reside *et al.* 1989; Owen 1990). Generally gregarious, throughout year (Reside *et al.* 1989; Owen 1990; D.W. Eades); sometimes in large flocks, e.g. 1600 birds, Sawtell, NSW, Nov. (NSW Bird Rep. 1976). Non-breeding birds seen roosting in group separate from colony of breeding birds (Reside *et al.* 1989). However, dispersion of birds little studied and complicated by different populations that occur in Aust. and timing of breeding of each (see Movements); birds from different populations probably associate with one another. Feed singly, in small groups, or, less often, in tight flocks of up to 50 birds (Owen 1990, 1991). Feed with Fairy (Owen 1990) and Crested *Sterna bergii* Terns (Gwynne 1933); seen feeding with Sooty Shearwaters (CSN 26) and cormorants (Smith 1994). Have food stolen by Silver and Kelp Gulls, which chase and harass Terns till they drop food (Owen 1990; Chafer & Brandis 1991). Often roost with Fairy Terns; also with waders (McKenzie & Sibson 1957; Reside 1993) and Whiskered Terns *Chlidonias hybridus* (Owen 1991) or away from other species (Bolger 1984).

Bonds Monogamous; at least seasonal. In USA, changes of partner occur but bond sometimes stable for >2 years; in w. Palaearctic, change partners more often in colonies that are disturbed (BWP). Extra-pair copulations recorded and studied in Japan (Toba 1989). Will pair with Fairy Terns (Cox & Close 1977; Vincent 1983; NSW Bird Rep. 1980). Probably breed at 2–3 years old (Owen 1991); possibly at 1 year of age (Minton 1990 *contra* Hitchcock 1959). Bird in non-breeding plumage recorded scrape-making with breeding bird (Reside *et al.* 1989).

Co-operative breeding Non-breeding birds seen to mind chicks while parents away collecting food (Reside 1988; Reside *et al.* 1989). Extra-pair males driven away by male occupant or by female if they approach without fish (Toba 1989).

Parental care Both sexes incubate eggs and brood young (e.g. Gwynne 1933; Smith 1990); in Japan, female incubates more than male and both feed young; female on nest fed by male (Toba 1989). Chicks leave nest-sites and form crèches in dense vegetation (Larkins 1984; Smith 1990). When near fledging, adults lead young from colony to beach; fledged young join flocks of adults (Reside *et al.* 1989; Owen 1990). Young fed till after fully fledged (Eckert 1970; Morris 1979; Chafer & Brandis 1991). Fledged young recorded being fed away from breeding colony (Egan 1992). In mixed pairs of Fairy and Little Terns, both parents feed young and incubate; foraging parent may be absent for up to 1 h (Cox & Close 1977).

Breeding dispersion Usually colonial (e.g. Owen 1990) but solitary breeding recorded (e.g. Napier 1978; Smith 1990). Sometimes nest with Fairy Terns and other species of terns (see Breeding). Colonies form rapidly (Owen 1990). In Aust.,

colonies usually up to c. 50 pairs (Morris 1979; Hill *et al.* 1988); in one colony in Vic., c. 265 birds in breeding plumage noted (Reside *et al.* 1989). In NSW, colonies usually small (Smith 1990); of 59 breeding attempts between 1950 and 1979, 25% were single pairs, 40% 2–5 pairs, 20% 6–10 pairs, and only 15% >10 pairs (Morris 1979). Density within colony varies between sites and years; on Rigby I., at colony of Fairy and Little Terns, 1988–89, many nests 2–3 m apart, with greatest density, 1 nest/42.2 m²; in 1989–90 1 nest in 7 m² (Reside *et al.* 1989; Owen 1990); in NSW, nests seldom <2 m apart (Smith 1990); at Forster, NSW, usually 1.5–2 m apart (Smith 1994); at Port Botany, NSW, 23 nests in c. 1.25 ha with average of 23 m between nests (Larkins 1984); other recorded densities of 1 nest/400 m² and 1 nest/100 m² (Hill & Montague 1985). High density of nests may reduce reproductive success (Owen 1990). Extraliminally, birds that participate in aerial courtship together tend to form sub-colonies (BWP). Mixed pairs of Fairy and Little Terns tend to nest apart from other mixed pairs and the rest of colony (Cox & Close 1977). Chicks recorded returning to natal colony to breed (e.g. Starks 1992; Reside 1993) but extraliminally often breed elsewhere (Haddon & Knight 1983). **Territories** Small breeding territory held round nest. One pair recorded defending nine fresh scrapes (Owen 1990).

Roosting Nocturnal and diurnal. Roost at high tides, in strong winds that chop up water, and at night; birds arrive at roosts 15–30 min before sunset (Campion 1963; Chafer & Brandis 1991). Some activity at night (Lane 1978; Reside *et al.* 1989). When leaving roost to feed, leave and begin feeding quickly (Chafer & Brandis 1991). Birds may roost together before colony formed; non-breeding birds may roost away from or in colony; when dispersing after breeding, roost in flocks that include fledgelings and breeding and non-breeding adults (Reside *et al.* 1989; Owen 1990, 1991); if such flocks disturbed, fledgelings may crouch as rest of flock takes off (T. Howard). Often stand in shallows facing wind (Owen 1991).

SOCIAL BEHAVIOUR Prepared by M.A. Weston. For extralimital information, see BWP. Not well known in HANZAB region. Most observations from s. Aust. Displays in air and on ground readily observed. **Flock behaviour** Members of colony co-operate to mob predators (Owen 1990, 1991), see Parental anti-predator strategies; probably coordinate mobbing in part with calls (Owen 1991). Laying not synchronous (see Breeding).

Agonistic behaviour Territorial disputes common in colonies where density of nests high; returning birds often forced to land in clear area outside own territory where immediately confronted and chased by owner (Owen 1990). Chicks >5 days old that stray into other territories are attacked by adults on ground (Reside *et al.* 1989). Extra-pair males are driven away by male occupant or by female if they approach without fish (Toba 1989).

Sexual behaviour Courtship often involves many pairs at one time (Reside *et al.* 1989). **COURTSHIP FLIGHT:** Two, sometimes three, birds fly to considerable height, circling and calling loudly; birds dive, almost vertically, then perform slow, low passes with one bird zigzagging behind other (Sefton 1959; Owen 1991; HASB). Courtship Flight often begins and ends from flock on ground. **SURVEY FLIGHT:** Low (\leq 5 m asl), slow passes over potential nesting site; usually involves two birds in breeding plumage and occurs after Courtship Flight; usually followed by prospecting on ground for nest-site (Owen 1991). **Courtship feeding** Early in season fish may be offered to

prospective mate, which may show little interest (Reside *et al.* 1989). Courtship feeding sometimes occurs before or after Courtship Flights; birds land and exchange fish, sometimes circling round each other in Parade with neck outstretched; courtship continues throughout breeding (Toba 1989; Owen 1991; Reside 1993; HASB). Rate of courtship feeding greatest, 0.72 feeds/h, during laying; decreases to 0.36 feeds/h during early incubation and 0.17 feeds/h in late incubation; weight of food given per hour also decreases as breeding progresses. During laying, male does not guard female but feeds her intensively, possibly to reinforce pair-bond (Toba 1989). **SCRAPE-MAKING:** Pair sometimes makes many scrapes; one bird observed shuffling about in three different scrapes while partner rested nearby (Bolger 1984); one female constructed nest 20 min before laying (Owen 1991). Scrape-making may not result in breeding; non-breeding birds observed making scrapes (Reside *et al.* 1989). **Greeting** Change-over at nest described for mixed pair of Fairy and Little Tern: incoming bird hovered briefly, then attendant adult flew off and incoming bird alighted directly onto nest; or incoming bird landed and walked to nest, then attendant adult flew or walked away. In mixed pairs, bills sometimes rubbed together during change-over and birds sometimes called when landing near nest (Cox & Close 1977). **Copulation** **PRE-COPULATORY DISPLAY:** Male, with fish in bill, walks to female, sometimes strutting round her with neck outstretched; drapes fish over female's back and wipes it back and forth a number of times for up to 5 min (Reside *et al.* 1989; Reside 1993). In Japan, Toba (1989) found that in normal copulation between bonded pair, male approached mate without fish and female hunched, with or without flapping wings, then male mounted; in contrast, extra-pair males attempted copulation with female by approaching with fish in bill. During attempted copulations by extra-pair males, females hunch and then may: grab fish by jumping up before mounting; pick up fish male dropped during mounting; grab fish after copulation; or fail to grab fish. In 9.6% of approaches, only mounting occurred and only 3.5% of approaches resulted in copulation. As breeding progresses, frequency of courtship feeding by mate decreases and approaches by extra-pair males increases (Toba 1989).

Relations within family group Both sexes incubate and brood young (see Breeding). Incubate in strong winds (Morris 1979); chicks and eggs may be abandoned after heavy rain, storms, disturbance and high tides (Vincent 1983; Larkins 1984) though known to incubate after wave washed over colony (Owen 1990). Egg covered by sand possibly uncovered by adult (Larkins 1984). Adults may cool eggs by flying and dipping belly in water before change-over (Ali & Ripley 1969). Chicks may die from exposure to wind or high tides; will huddle together behind or under cover, especially during bad weather (Eckert 1970; Reside *et al.* 1989). In Vic., 37% of adults returning to colony (with chicks and fledgelings) carried fish (Owen 1991). Kleptoparasitism can lead to starvation in chicks (Larkins 1984). **Anti-predator responses of young** Recorded forming crèches. Soon after hatching, chicks move to nearby cover (Larkins 1984). Chicks adopt cryptic posture, usually in cover, by squatting with legs folded beneath body and remaining motionless with head down (Vincent 1983; Larkins 1984). When intruder approaches colony, chicks >5 days old scatter, sometimes running >20 m, then hiding; chicks may be attacked by neighbouring adults; can take up to 35 min for parent and chick to reunite. Chicks sometimes run into dangerous situations, e.g. into surf (Reside *et al.* 1989). **Parental anti-predator strategies** Watch intruders from elevated

positions (Cooper 1971); preferred nesting sites have wide views (Reside & Hill 1989). One brooding bird sat tight when attacked by Silver Gull (Secomb 1994). Adults lead young away from nest to cover (Reside *et al.* 1989). **MOBBING:** Entire colony will attack predators (Smith 1990); birds take flight, uttering Alarm Calls, and fly above terrestrial predators; some birds swoop to within c. 1 m of predator then rejoin higher birds (Gwynne 1933; Cooper 1971; Owen 1991); do not strike (Garnett 1985). At one colony, attacking birds did not seem to be associated with nests (Secomb 1994). Swarm round avian predators until they are away from colony (Owen 1990). At Forster, NSW, Silver Gulls mobbed far more often than any other potential predator (Smith 1994); other species mobbed include: people, dogs, raptors, Australian Ravens *Corvus coronoides*, Torresian Crows *C. orru*, Pied Oystercatchers *Haematopus longirostris*, Silver Gulls, Crested Terns, Gull-billed Terns *Sterna nilotica*, Beach Thick-knees *Burhinus neglectus* and an Echidna *Tachyglossus aculeatus* (Morris 1979; Larkins 1984; Clancy 1987; Reside *et al.* 1989; Owen 1991; Smith 1994). Other birds pursued from colony include: Australian Magpies *Gymnorhina tibicen* and Pacific Gulls *Larus pacificus* (Reside *et al.* 1989). Skirmishes observed with Pied Oystercatchers, Crested Terns and Caspian Terns *Sterna caspia* (Reside *et al.* 1989). Mobbing birds grabbed by wing and pulled to ground by Pied Oystercatcher (Owen 1990); incubating bird pulled from nest by Silver Gull grabbing wing (Egan 1990). In the hand, birds aggressive and bite (Reside *et al.* 1989).

VOICE Only anecdotal information from HANZAB region. Elsewhere, well known from accounts of Massey (1976), Moseley (1979) and BWP, all of which contain sonagrams. In Courtship Flight may call when ascending and descending (McKenzie & Sibson 1957; Sefton 1959). Loud cries when colony disturbed by people (Gwynne 1933; Sharland 1938; Cooper 1971). White-bellied Sea-Eagles *Haliaeetus leucogaster* or Whistling Kites *Haliastur sphenurus* caused most adults at colony to take to air uttering Alarm Calls (not described); also given when flying over intruding person or dog (Owen 1991). Outside HANZAB area, adults distinguish Advertising Calls of mates from those of strangers; sonographic analysis shows first syllable of Advertising Call to be significantly different

between individuals (Moseley 1979). Difference between calls of subspecies *sinensis* in Aust., nominate subspecies in England, and Fairy Tern said to be inaudible (McKenzie & Sibson 1957; Cox & Close 1977) but difference between Little and Fairy said to be distinguishable with practice (Aust. RD; see Field Identification).

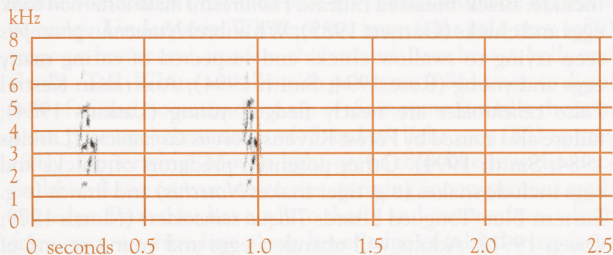
Adult Sharp *kweek* (two shown in sonagram A) or rasping *zweek* (three shown in sonagram B); appears to be given in anger or alarm; sometimes repeated. **Other calls** Urgent repeated *peep* while hovering; pleasant chattering *chi-chi-chi*; excited chittering (McKenzie & Sibson 1957). Noisy screaming from adults (probably parents) when chick handled (Sharland 1938).

Young No information.

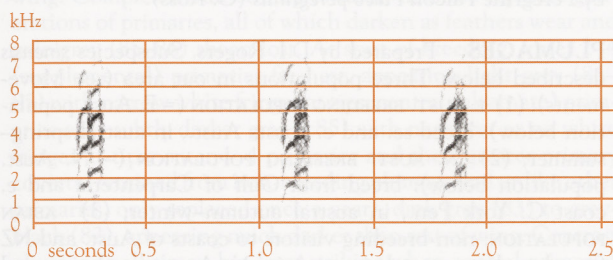
BREEDING Cosmopolitan; breeds throughout range. Studied in NSW by Morris (1979), Larkins (1984), Martindale (1985) and Clancy (1987); nationally by Hill *et al.* (1988) and Starks (1992). In Vic., colonies regularly monitored by CNR (Reside 1988; Reside *et al.* 1989; Owen 1990, 1991). Breeding well known in Aust. Nest in colonies or singly. Early nests often washed out by high tides, thus all stages of breeding may be recorded in colonies as season progresses. Will hybridize with Fairy Tern (Cox & Close 1977; Vincent 1983).

Season Two populations in Aust.: one in N, in Gulf of Carpentaria and C. York Pen., breeding autumn and winter but poorly known; and second on e. and se. coast and Tas., occasionally SA, breeding spring and summer. In n. Aust., breeding recorded Elliott R. (19°53'S) n. Qld, June and Dec. (Ey 1990); in Gulf of Carpentaria: said to nest Apr.–July; eggs recorded mid-Apr., and mid- and late-June (Officer 1976; Garnett 1985; Starks 1992; Aust. NRS); apparently breeding season protracted (Starks 1992). In e. Aust.: laying usually begins in late Oct., continues through Nov. and Dec. and into Jan.; peak laying, late Nov. to mid-Dec. (Reside *et al.* 1989; Smith 1994; Aust. NRS); in Tas., laying begins Nov. (Napier 1972, 1978). Campion (1963) summarized egg dates in e. Aust.: ne. Qld (N of 23°S), late Sept. to mid-Nov.; se. Qld, late Aug. to mid-Oct.; NSW and Vic., late Aug. to late Jan.; records in late Aug. at Bundaberg, Qld, and late Aug. and early Sept. at Ballina, NSW, seem exceptionally early and are not supported by other references. Arrival at colonies may vary by 2–3 weeks (Napier 1972, 1978; Reside *et al.* 1989). Extralimitally: in China and Japan: laying, late May to early July (Jones 1911; la Touche 1931–34; Dement'ev & Gladkov 1951); Korea: eggs, late May (Gore & Won 1971); Malay Pen.: after ne. monsoon, eggs in early June (Robinson & Chasen 1936); India and Sri Lanka: laying, late May to early Aug. (Baker 1935); Java: fledgeling banded early Mar. (HASB); North Solomons Province, PNG: nesting recorded July and Aug. (Hadden 1981; Bishop 1983).

Site Coastal (see Habitat). Nest usually a shallow scrape in sand, sometimes placed close to driftwood, beachcast seaweed, other debris on beach or vegetation (Cooper 1971; Hadden 1981; Clancy 1987; Ey 1990; Smith 1990). Sites traditional and probably used each year if undisturbed. Will re-nest after failure, up to twice, at same or nearby site (Napier 1978; Reside *et al.* 1989); one female moved c. 15 km (Owen 1990). At least some chicks return to natal colony to breed (Starks 1992). Fairy Terns nest in colonies of Little Terns and Little Terns in colonies of Fairy Terns (Owen 1990; Starks 1992; *contra* Napier 1972). Red-capped *Charadrius ruficapillus* and Hooded *Thinornis rubricollis* Plovers and Pied Oystercatchers will nest in or on edge of colonies (Owen 1990, 1991;



A P. Fullagar; Tuross R., NSW, Jan. 1984: P39



B P. Fullagar; Tuross R., NSW, Jan. 1984: P39

Starks 1992; Aust. NRS). Pairs prospect for sites and will excavate up to ten scrapes (Owen 1991); will try out scrapes by shuffling about in them before selecting one (Bolger 1984).

Nest, Materials Shallow scrape in sand; dug with feet and shaped by pressing breast against edges (Clancy 1987). Unlined or lined with varying amounts of shells and shell fragments, twigs or mudstone (Gwynne 1933; Campion 1963; Aust. NRS); scrape 7.6–10.2 cm across, 1.6–3.2 cm deep (n=4) (Aust. NRS).

Eggs Oval or elongate oval, some slightly pointed, others terminating abruptly towards smaller end; close-grained, smooth, lustreless (North). In Aust.: dull white to pale coffee-brown or stone-grey, spotted or blotched blackish brown, umber-brown and dark slate-grey, with intermingled markings of fainter slate-grey (North). MEASUREMENTS: 32.2 (30–36.3; 13) x 24.1 (22.9–24.9) (North).

Clutch-size One to three. Average 2.21: C/1 x 5, C/2 x 20, C/3 x 14 (Aust. NRS); in NSW: average 2.09: C/1 x 33, C/2 x 64, C/3 x 46 (Clancy 1987); 2.29 (0.60; 93): C/1 x 7, C/2 x 52, C/3 x 34 (Larkins 1984); in 1992–93 average 2.31; in 1993–94 average 2.28 (Smith 1994); Tas.: 2.37: C/1 x 3, C/2 x 20, C/3 x 18 (Napier 1972, 1978). At Forster, C/3 more frequent early in season, C/1 recorded only later in season, and mean clutch-size declined through season (Smith 1994).

Laying Not synchronous in colony; continuous for up to 74 days, with some nests failing and birds re-nesting; 73% clutches laid over 29 days, 96% over 43 days (Reside *et al.* 1989). Eggs usually laid on alternate days, sometimes on successive days (Campion 1963; Aust. NRS). Laying observed once: bird landed on sand and immediately dug a scrape, then settled down as if incubating; 20 min later its mate flew in and landed 2–3 m from scrape; both then flew off after 2 min, revealing an egg (Owen 1991). Will re-lay after failure, up to twice; clutches re-laid within 14 days of colony being destroyed; one pair possibly re-laid clutch of two eggs 3 days after failure (Napier 1972).

Incubation By both sexes, probably starting when clutch complete, as hatching usually synchronous (Campion 1963; Toba 1989). In Japan: female incubated 55% of time (from 78% during laying to 59% in late incubation); male 27% of time (3% to 39%); eggs not incubated for 19% time during laying, only 2% in late incubation (368 h observations of colony; Toba 1989). Male feeds female during laying and incubation (see Social Behaviour) (Gwynne 1933; Toba 1989). Sitting bird will uncover eggs covered by wind-blown sand by putting bill over egg and drawing it against body; does not try to make a scrape (Cooper 1971). Eggs moved onto sand-bagged mounds to avoid rising water continued to be incubated (Owen 1990). INCUBATION PERIOD: 17–22 days (Smith 1994); 19–21 (Napier 1972); 20–21 days from completion of clutch (Campion 1963); >25 days (Reside *et al.* 1989).

Young Precocial, nidifugous. Fine cracks may appear round larger end of egg 3–4 days before hatching; chicks call from inside egg 24–48 h before hatching (Campion 1963). Weight at hatching for three chicks in same clutch, 7.3–10.3 g (Niimi 1979). MEASUREMENTS (mm): at hatching: culmen, 7.2, 7.9; tarsus, 12.5, 13. One chick at c. 2 weeks: culmen, 17.1; tarsus, 18.7; wing, 79 (Aust. NRS). **Parental care, Role of sexes** Both adults brood newly hatched young; chicks remain in nest for 24 h (Gwynne 1933; Campion 1963); after leaving nest, move to nearby vegetation; may form crèches (Larkins 1984; Aust. NRS). Chicks run away from danger (Reside *et al.* 1989; Owen 1991). Non-breeding birds may mind chicks while parents foraging (Reside *et al.* 1989). When

near fledging, adults lead young from colony to beach; young later join flocks of adults (Reside *et al.* 1989; Owen 1990).

Fledging to maturity FLEDGING PERIOD: 17–19 days (Smith 1994).

Success In Tas., from 56 eggs, 21 (37.5%) hatched (n=23 clutches), or 0.91 young hatched per clutch; from 39 eggs, 7 (17.9%) fledged (n=17 clutches), or 0.41 young fledged per clutch (Napier 1972, 1978). At Botany Bay, NSW, from 215 eggs, 88 (40.9%) hatched, 14 (6.5%) fledged (n=93) (Larkins 1984). At Forster, in 1992–93, 17 fledged from 104 nests, with success higher in late Dec. to Jan. and poorer earlier in season; overall 82% of eggs failed to hatch and 48% of chicks failed to fledge; in 1993–94, 48 fledged from 51 nests, with success declining during the season; 23% of eggs failed to hatch and 44% of chicks failed to fledge (Smith 1994). On Rigby I., counts of clutches and fledgelings indicate success rate of 0.5–0.81 young per clutch (Reside *et al.* 1989; Owen 1991). At Harrington, NSW, in 1993–94, 76 nests in colony produced at least 70 fledgelings (P. Smith). On Red Rock I., NSW, in 1993–94, 21 pairs fledged 19 young (M. Williams). Nests often washed out by storms and high tides; eggs may also be buried by sand on windy days and chicks abandoned in bad weather; chicks die through exposure to wind and high tides (Reside *et al.* 1989). Foxes and feral and pet dogs most serious predators, killing and eating chicks and eggs, and causing desertion of whole colonies (Hill *et al.* 1988; Reside *et al.* 1989; Whiter 1989; Owen 1991). In sample of four nests in a colony, a Fox ate all eggs from three of the nests (Owen 1991). Domestic dogs chase chicks and crush eggs (Vincent 1983). Chicks and eggs also eaten by cats and rats (Larkins 1984; Whiter 1989; Owen 1991; Starks 1992). At some sites, human disturbance a major cause of failure of nests, particularly during summer holidays (Vincent 1983; Smith 1994; J. Reside); people (and their pets) trample eggs and young or keep adults off nests, allowing gulls to take eggs (Napier 1972; Vincent 1983; Smith 1994); egg-collectors take eggs (Morris 1979). Silver Gulls a major predator of eggs and young (Rose 1994; Smith 1994); one Gull seen to pull incubating Tern off nest by its wing, then eight more Gulls converged on nest and ate eggs (Egan 1990); another Gull attacked a sitting Tern and grabbed an egg (Secomb 1994). Other reports of predation by birds include: Black-breasted Buzzard *Hamirostra melanosternon* took eggs and chicks (Garnett 1985); Whimbrel *Numenius phaeopus* seen trying to swallow chicks and suspected of eating many eggs and young (Rose 1994; Smith 1994); Australian Kestrel *Falco cenchroides* ate nearly fledged young (Larkins 1984); failure also caused by Forest Ravens *Corvus tasmanicus* (Larkins 1984; Smith 1994). Other potential predators of chicks and eggs include snakes (e.g. tiger snakes *Notechis*) and lizards (e.g. Eastern Blue-Tongued Lizards *Tiliqua scincoides*) (Morris 1979; Owen 1991). Adults will abandon eggs and young at end of season (Owen 1990); nests abandoned after colony harassed by Peregrine Falcon *Falco peregrinus* (G. Ross).

PLUMAGES Prepared by D.I. Rogers. Subspecies *sinensis* described below. Three populations in our area (see Movements): (1) E. AUST. BREEDING POPULATION (= E. Aust. population below): breed se. and e. coasts Aust., in austral spring–summer; (2) N. AUST. BREEDING POPULATION (= N. Aust. population below): breed from Gulf of Carpenteria and e. coast C. York Pen., in austral autumn–winter; (3) ASIAN POPULATION: non-breeding visitors to coasts of Aust. and NZ from breeding grounds in n. Asia. N. Aust. population and Asian migrants breed at about the same time and, on present

knowledge, are not reliably separable away from breeding grounds; hence non-breeding visitors to Aust. and NZ referred to below as 'MIGRANTS FROM N' in contexts where breeding origin is uncertain. Following descriptions of breeding, downy young and juvenile plumages based on both Asian migrants (Japan) and e. Aust. populations; other plumages described mostly from migrants from N (in which Asian migrants thought to predominate, see Movements). No specimens of n. Aust. population, or of non-breeding plumages of e. Aust. population available for study.

Adults moult three times annually: (1) a complete post-breeding (pre-basic) moult to non-breeding plumage, usually beginning in breeding areas, suspended during migration and finished in non-breeding areas; (2) a partial pre-breeding (pre-alternate) moult of head, body, tail, upperwing-coverts and inner primaries before migration from non-breeding areas; and (3) a partial pre-supplemental moult of innermost primaries, occurring at about the same time or slightly later than pre-breeding moult. Post-juvenile moult to first immature non-breeding (first basic) complete. Migrants from N perform partial first immature pre-breeding (first pre-alternate) moult of inner primaries and sometimes some feathers of body, usually retaining non-breeding appearance; adult non-breeding first attained in complete second pre-basic, when about 1 year old; probably first breed when at least 2 years old. Sequences of subadult plumages of e. Aust. population apparently differ: plumage like adult breeding can be attained in first pre-alternate, with first breeding attempt occurring when 1 year old.

Adult breeding (Third and subsequent alternate). **Head and neck** Crown, nape and hindneck, black (89), joining broad black (89) eye-stripe on upper ear-coverts; eye-stripe continues through eye, tapering on lores to join bill at level of nasal groove. Forehead, chin and throat, white. Junction of white forehead and black crown, convex (mostly straight in Fairy Tern), roughly just in front of eye in midline of top of head, extending back to point level with rear of eye at sides. **Upperparts** Mantle, back and scapulars, light grey (c85; slightly darker than *S. nereis nereis* but similar to *S. nereis davisaiae*); can be slightly paler on upper mantle (at junction with cap) and longest scapulars have narrow white tips (more conspicuous than in Fairy Tern). Rump and uppertail-coverts, white, sometimes with faint pale-grey (c86) suffusion in centre of rump. **Underparts** White; some have faint pale-grey (c86) tinge on breast and, in a few, this extends over breast, belly and flanks. **Tail** White, usually with pale-grey (c86) tinge to distal half of t6 and, sometimes, to tip of t5; in some (usually those in worn plumage) these areas of t5 and t6, light grey (85) to grey (84). **Upperwing** Mostly light grey (c85) like mantle. Secondaries have narrow white tips, forming inconspicuous trailing-edge. Primaries have white shafts and inner edges, which form narrow white line along lower edge of folded wing (narrower than in Fairy Tern) and petering out farther from tip of wing. Complex moult-strategies result in three separate generations of primaries, all of which darken as feathers wear and pale-grey (85–86) sheen lost. At start of breeding, inner 2–4 (supplemental) primaries freshest, appearing light grey (86–85) with narrow white fringes at tips; central (alternate) primaries only subtly darker grey (c85) with narrower or no white fringes at tips; outer 1–4 primaries and their greater primary coverts (retained from non-breeding plumage and unlike other primaries, only replaced once a year), dark grey (83) to grey-black (82), appearing much darker than rest of wing. Contrast obvious at all times, but least striking when central primaries also darken with wear. **Underwing** White; dark-grey (83)

border to shaft of p10 (see Recognition) forms dark leading-edge to wing (broader than in Fairy Tern); other outer primaries have similar markings, partly exposed at tips of p7–p9 when wing is at full stretch.

Adult non-breeding (Second and subsequent basic). Differences from adult breeding: **Head and neck** Anterior half of lores, and all crown, white. Feathers of mid- to rear-crown usually have pale-grey to light-grey (85–86) fringes and short broad largely concealed dull-black (82) shaft-streaks; these form varying faint-grey suffusion and faint-black streaking or spotting on rear-crown. Black (82–89) patch on rear of lores extends through eye, broadening gradually and joining black (82) nape and hindneck, forming half-cap (narrower than that of non-breeding Fairy Tern). **Upperparts** Mostly as adult breeding, but rump and uppertail-coverts, light grey (c85), concolorous with mantle and scapulars; feathers at sides of rump and lateral uppertail-coverts, grey-white. **Underparts** White. **Tail** Mostly light grey (c85) like upperparts but outer rectrices (especially t6), paler grey (c86) to grey-white. **Upperwing** Like adult breeding, but partly exposed dark-grey (84–85) bases to shortest 2–3 rows of lesser secondary coverts form narrow dark cubital bar. Appearance of remiges varies with stage of moult, but outermost primaries and primary coverts always darker grey (83) than adjacent feathers. **Underwing** As adult breeding.

Downy young Not known to differ from Fairy Tern (q.v.).

Juvenile Differences from Fairy Tern: **Head and neck** Varies much and overlaps with Fairy Tern. Feathers of crown have black-brown (119) to brown (119B) shaft-streaks, broadening at tips; in palest birds, streaks only c. 1–2 mm wide; black half-cap narrower; generally, crown appears streaked, not speckled, with black. **Upperparts** Submarginal bars of mantle, scapulars and back, narrower and more strongly convex; mantle always appears scalloped darker, not speckled darker. Ground-colour of scapulars, back and rump, slightly darker, light grey (85–86); appear not to have dark speckling in centre of rump. **Underparts** White. When newly fledged, buff and dark-brown scalloping of mantle may extend farther onto sides of breast. **Tail** Grey tinge to tail stronger, sometimes extending to t5; centre of tail often appears darker than uppertail-coverts and sides of tail. Dark-brown submarginal markings usually narrow (<1–2 mm wide), faint, often broken, and seldom as dark as subterminal bar. **Upperwing** Most secondary coverts, darker, light grey (85–86); when fresh, usually have narrower dark-brown (119A) submarginal lines (absent in some, especially e. Aust. population), which are more strongly convex. Cubital bar and leading-edge darker because light-grey (85–86) tips to feathers narrower. White tips and inner edges of secondaries narrower and rest of feathers darker, usually grey (84) or dark grey (83), rarely light grey (85) (as darkest Fairy Tern); secondaries usually look darker than overlying coverts, often appearing as distinct dark secondary bar. When fresh, ground-colour of primaries grades from light grey (c85) on inner three or so feathers to mid-grey or dark grey (84–83) on outer primaries and grey-black (83–82) on outer web of p10; outer 3–4 primaries become grey-black (82) with wear; in general, primaries appear darker at same stage of wear. Outer primaries have narrower white inner edges, forming narrower white line along lower edge of folded wing. **Underwing** As adult; differs from juvenile Fairy Tern in broader dark strip on p10 (see Recognition).

First immature non-breeding (First basic). Like adult non-breeding, and, in HANZAB region, not reliably separable

after p6 replaced in post-juvenile moult. In early stages of post-juvenile moult (Sept.–Oct. in migrants from N), retained juvenile feathers in cubital bar and, especially, dark subterminal bars of juvenile rectrices and any remaining scapulars and tertials, diagnostic of age. Later (until Dec. in migrants from N), when few or no other juvenile feathers remain, outer primaries retained from juvenile plumage and thus have uniform wear (cf. obvious moult-contrast in outer primaries of adults). Thereafter, too few outer primaries remain to avoid confusion with those adults that have moulted all alternate (breeding) inner primaries. Older immatures may differ from adults in having less advanced moult of primaries, as reported for nominate *albifrons* (BWP) but no Aust. data; ageing also complicated in HANZAB region by variation in timing of moult with location of breeding.

First immature breeding (First alternate). **MIGRANTS FROM N:** Some, as adult non-breeding, differing only in stage of moult of primaries (see Moults). Others develop scattered breeding plumage in cubital bar and on crown; black speckling on rear of crown can be as extensive as in adult non-breeding Fairy Tern. **E. AUST. POPULATION:** The few data available (see Moults) suggest plumage similar to adult breeding.

Second immature non-breeding (Second basic). No Aust. information. In nominate *albifrons*, identical to adult non-breeding except that outer primaries may be slightly fresher (see Moults).

Second immature breeding (Second alternate; some migrants from N, and many from e. Aust. population may breed in this plumage). As adult breeding. In nominate *albifrons*, said to have some grey-brown in primary coverts (Olsen & Larsson 1995); can also have some white-tipped feathers of crown and some dark remnants of non-breeding cubital bar. Not known if this applies in subspecies *sinensis*.

BARE PARTS Based on museum labels (sources given in Measurements) and photos (Pringle 1987; Hill *et al.* 1988; unpubl.: J.N. Davies; D. Graham; D. Hobcroft & D.W. Eades; P. Pert; D.I. Rogers). Information on bill of adults also taken from skins.

Adult breeding Iris, black-brown (119). Legs, orange (16–17) with black (89) claws. Bill, bright yellow (157) to orange-yellow (118, 17) with sharply defined black (89) tip. Yellow of bill typically has less intense orange tinge than Fairy Tern, but brightest Little and duldest Fairy Terns are similar. Black bill-tip appears broader in Asian migrants but comparison difficult because black at tip slightly narrower towards end of breeding season; Asian migrants (Japan, Apr.–June) 7–12 mm; e. Aust. population: (Vic., Nov.–Jan.) 1–6 mm. Small samples from Vic. in Jan. also suggest width of black bill-tip varies with sex: 3.1 (1.14; 3–4.5; 5) in males, 2.2 (0.95; 1–3; 7) in females. When breeding colour developing or receding, bill tinged yellow-brown (123A) and often have black (82–89) patch in nasal groove meeting black (82–89) band across base of culmen. **Adult non-breeding** Iris, black-brown (119). Bill, black (82–89), often with tiny translucent off-white tip. Legs vary, from dull black (c82), often with scattered dirty orange-brown patches (especially on webs), to wholly dull orange-brown (123B, 121A). **Downy young** Iris, black-brown. Bill, pale pink-brown (219D) with small black (89) tip, and smudgy grey (84) base to upper mandible; unlike Fairy Terns examined, dark base of upper mandible noticeably paler and less clearly defined than dark tip. Feet, flesh-pink, with very pale yellow webs (MV); feet said to look pinker, less yellow, than in Fairy Tern (Eckert 1970). **Juvenile** Iris, black-brown (119).

Bill: at fledging, yellow-brown (123B) grading to dark-grey (83–82) tip, culmen and base to upper mandible; soon after, mainly grey-black (82) with varying yellowish-brown (c123) tinge or patches on cutting edges and, sometimes, on sides of bill. Legs, brownish yellow (123C–123B); some older birds begin to develop dark-brown (c121) areas on tibia and front of tarsus. **Immatures** Mostly as adult non-breeding. Youngest (in post-juvenile moult) have yellow-brown tinge on legs and, especially, on cutting edge of bill; in Aust., migrants from N can retain this until at least Oct. In nominate *albifrons*, some in breeding areas during second boreal summer have some yellow on base of bill between June and Aug. (in first, skipped, breeding season, when c. 12 months old); not known if same change in colour can occur in *sinensis*. Possibly have more black on bill in second alternate plumage (i.e. first breeding plumage) than in adult breeding (Olsen & Larsson 1995; BWP).

MOULTS Based mostly on 95 Aust. and n. Asian skins (sources in Measurements) and c. 400 records of primary-moult from banding studies in Vic. and n. WA (AWSG). No information for n. Aust. population but presumably attain breeding and non-breeding plumages at much the same time as Asian migrants. Moults of migrants from N appear identical to those of nominate *albifrons*; for information on moults of nominate *albifrons*, see Baker (1993), Chandler & Wilds (1994), Olsen & Larsson (1995) and BWP.

Adult post-breeding (Third and subsequent pre-basic). Complete; primaries outwards. **MIGRANTS FROM N:** Asian migrants (Japan) begin moult on breeding grounds, probably when feeding young (as in nominate *albifrons*). Moult much of head and upperparts, some of underparts and central rectrices, and inner 4–7 primaries before suspending moult for s. migration. Resume moult on arrival in Aust., where most moult of tail (centrifugal, except that t6 starts before t5) and secondaries occurs. Moult finished with growth of p10; usually Dec.–Feb. but a few finish in Nov., a few not till Mar. End of moult overlaps start of pre-alternate and pre-supplemental moults of primaries. **E. AUST. POPULATION:** In Vic., begin moult with p1 and some feathers of forehead; mid-Jan. to start Feb.; 4–5 primaries replaced by Mar.; not known when moult ends, but by Oct. Breeding season begins slightly earlier in more n. areas of e. coast (see Breeding), which probably affects timing of moult. **Adult pre-breeding** (Second and subsequent pre-alternate). Partial. Moult all feathers of head, body, tail and tertials, and most upperwing-coverts; retain secondaries and outer primaries and their greater primary coverts. **E. Aust. population** (mainly Vic.) retain 2.67 (0.63; 1–4; 24) outer primaries from non-breeding; Asian migrants 1.93 (0.45; 1–3; 15). **MIGRANTS FROM N:** Moult of head and body starts Feb.–Mar.; most attain full breeding appearance by mid-Apr. (a few by mid-Mar.); most or all finish moult before start of n. migration. Moult of primaries begins early; indeed, so far in advance of pre-alternate body-moult that BWP treated this primary-moult as a second series of adult post-breeding; this not done here as only one generation of feathers ought to grow in a single moult, but it is possible that this primary-moult should be regarded as a pre-supplemental. Moult of primaries typically starts in late Oct.–Dec. and 4–7 primaries usually replaced by Jan. (when a few adults have yet to start); moult usually begins when p6–p8 (from p4 to p9) still undergoing pre-basic moult. Moult of primaries usually finished Mar.–Apr., at about same time as moult of body. **E. AUST. POPULATION:** None examined in active moult; moult has not begun by Jan., complete by Oct.

Adult, Third series of primaries (Second and subsequent pre-supplemental). Partial. All adults replace innermost primaries in a third moult of primaries. **MIGRANTS FROM N:** Occurs Mar.–Apr., usually starting when p4–p6 still being replaced in pre-alternate moult, and p7–p10 still being replaced in pre-basic moult; replace 3.88 primaries (0.60; 3–5; 9). **E. AUST. POPULATION:** Replace 3.11 primaries (0.96; 2–4; 18); no information on timing of moult. Some nominate *albifrons* said to undergo a third series of moult of rectrices (BWP); this not recorded in *sinensis*, but no detailed studies. **Post-juvenile** (First pre-basic). Complete; primaries outwards. **MIGRANTS FROM N:** Moult begins on scapulars, before leaving breeding areas; in Japan, earliest record of active moult, 15 July, but many not started in early Aug. Recently arrived birds in Aust., early Sept.–Oct., have attained most of first immature non-breeding plumage on head and body, though crown and underparts still moulting; remiges, rectrices and some or most wing-coverts (especially alula, primary coverts and feathers of cubital bar) usually retained on arrival. Moult of secondaries, primaries (outwards) and tail (centrifugal) begins Sept.–Oct., at about time of arrival; 1–4 inner primaries growing or replaced in Aust. specimens examined early Oct. By late Feb. to early Mar., only remaining juvenile feathers are outer 2–3 primaries and their coverts; analogy with nominate *albifrons* (BWP) suggests primaries completed Apr.–May, but no data for Aust. **E. AUST. POPULATION:** Vic. birds in early Mar. were completing moult of head and body but only one of 33 examined had started moult of primaries (Minton 1989). NSW specimen in first immature non-breeding, 11 May, had primary-moult N⁴O⁵ and retained some juvenile feathers on crown. No other information. **First immature pre-breeding** (First pre-alternate). **MIGRANTS FROM N:** Begin second outwards primary-moult, Feb.–Mar. of second calendar year, while outer primaries (usually p7–p8) are still being replaced in first pre-basic moult. Later stages of this moult poorly known; by analogy with nominate *albifrons*, some may arrest moult at p5–p7, at about end May to June, while others gradually replace remaining outer primaries during boreal summer. Some *albifrons* (especially those that arrest moult of primaries), and the only first immature breeding *sinensis* examined in this study, moult scattered feathers of crown, cubital bar, mantle and scapulars in about May, developing feathers like those of adult breeding; other *albifrons* retain all first immature non-breeding head and body. **E. AUST. POPULATION:** Few data; no specimens examined in this study. Observations of banded birds in second austral spring and summer (when c. 9–12 months old) suggest that first pre-alternate moult of body much more extensive than in migrants from N or *albifrons*: recaptures in Jan. and Mar. were ‘almost identical to full breeding adult’ (Minton 1990; Owen 1990); colour-banded bird seen on nest in Sept. of second austral spring (Driscoll 1993); another was seen engaging in courtship behaviour (Owen 1991). **Subsequent moults of subadults** **MIGRANTS FROM N:** Some *albifrons* begin a third moult of primaries in May of second calendar year, replacing 1–3 innermost primaries before arresting moult in late May–June. A few may also replace innermost primaries in a fourth moult of primaries. These moults presumably pre-supplemental, but there have been no detailed studies; it is not known whether they are also performed by *sinensis*. Subsequent moults poorly known. Those *albifrons* that arrest pre-alternate moult of primaries appear to start new complete series of primaries in July; this appears to be a second pre-basic moult resembling adult post-breeding. More retarded *albifrons* continue to replace outer primaries in first pre-alternate moult, and also

begin complete second pre-basic moult, thus moulting directly from first immature non-breeding to second immature non-breeding plumage. **E. AUST. POPULATION:** Two retraps in Mar. of second austral autumn had primary-moults of N³O⁵ and N²O¹S³O¹N³, suggesting that strategy of moult of primaries in first year varies as in *albifrons*. No other information.

MEASUREMENTS (1–4) Skins; T1 = length of central rectrix; Tail = length of tail to tip of t6; Bill D(G) = depth of bill at gonydeal angle (AM, ANWC, HLW, MV, NTM, QM, SAM, WAM): (1) **E. AUST. POPULATION**, adult breeding, with fresh p10 and breeding-plumage tail. (2–4) **MIGRANTS FROM N**, from se. Aust. and Japan: (2) Adult breeding, with fresh p10 and breeding-plumage tail; (3) Adult non-breeding, with worn p10 and non-breeding-plumage tail; (4) Juveniles.

	MALES	FEMALES	
WING	(1) 187.2 (5.03; 180–198; 14)	183.8 (4.43; 178–193; 16)	ns
	(2) 185.3 (2.75; 181–191; 13)	180.7 (5.70; 172–188; 8)	*
	(3) 177, 181, 188	177.3 (5.13; 172–188; 8)	ns
	(4) 172.8 (3.77; 167–176; 5)	164, 169, 176	
T1	(1) 47.8 (2.33; 45–52; 15)	47.3 (1.96; 44–51; 15)	ns
	(2) 47.3 (3.23; 44–53; 11)	45.8 (3.25; 42–50; 6)	ns
	(3) 45.8 (2.43; 41–49; 8)	45.0 (3.15; 42–51; 8)	ns
	(4) 41, 42, 46	44.5 (2.65; 42–48; 4)	ns
TAIL	(1) 101.9 (6.49; 91–112; 14)	90.5 (9.75; 75–109; 13)	**
	(2) 109.4 (7.23; 98–117; 5)	95, 96, 112	
	(3) 81.0 (10.6; 65–95; 6)	70.6 (10.1; 58–81; 5)	ns
	(4) 58, 61, 63	62.0 (1.63; 60–64; 4)	ns
BILL	(1) 31.4 (1.47; 28.4–34.7; 15)	29.0 (0.79; 27.7–30.3; 17)	**
	(2) 31.1 (1.30; 28.5–33.5; 15)	29.1 (1.71; 26.3–31.7; 13)	**
	(3) 27.4 (4.14; 23.5–31.5; 4)	26.4 (3.32; 22.4–30.1; 5)	ns
BILL D(G)	(1) 6.29 (0.242; 5.9–6.7; 10)	5.57 (0.253; 5.2–6.0; 11)	**
	(2) 6.14 (0.234; 5.7–6.5; 14)	5.79 (0.310; 5.3–6.2; 9)	**
	(4) 5.7, 5.8	5.3, 5.7	
TARSUS	(1) 17.3 (0.75; 15.5–18.4; 17)	17.2 (0.45; 16.3–18.0; 19)	ns
	(2) 16.8 (0.57; 16.1–17.9; 17)	16.4 (0.62; 15.0–17.3; 14)	ns
	(4) 16.8 (0.85; 16.1–17.9; 4)	16.8 (0.93; 16.2–18.2; 4)	ns
TOE C	(1) 19.0 (1.19; 17.7–21.4; 16)	18.6 (0.72; 17.8–20.1; 17)	ns
	(2) 18.2 (0.75; 16.8–19.7; 14)	18.4 (0.97; 16.2–19.8; 14)	ns

(5) Migrants from N (probably Asian migrants), n. WA and Vic., live (AWSG, VWSG). Sexes separated using SHEBA (Rogers 1995), assuming coefficients of variation equal in both sexes. When sexes combined, no significant differences between n. WA and Vic.

	MALES	FEMALES	
WING	(5) 186.0 (4.41; 156)	176.3 (4.18; 76)	**
BILL	(5) 30.8 (1.49; 223)	29.0 (1.40; 42)	**
THL	(5) 63.0 (1.92; 203)	59.0 (1.80; 59)	**

Length of wing of adults decreases significantly with wear; also, tail of adult non-breeding significantly shorter than tail of adult breeding. In skins, bills of adult non-breeding significantly shorter than adult breeding; may indicate some seasonal variation in length, but other causes also possible (e.g. some immatures in second basic may have been included in samples). Wing and tail of juveniles significantly shorter than those of adults; juveniles also have shorter, less deep bill than adults but not known when attains adult size; tarsus and toe have attained full length at fledging.

WEIGHTS (1–2) Aust. (AM, ANWC, MV, QM, SAM, WAM): (1) E. Aust. population; (2) Migrants from N. (3–4) Live (AWSG); ages combined but mostly adult; sexes separated using SHEBA (Rogers 1995), assuming coefficients of variation equal in both sexes: (3) Vic. and n. WA, Mar.; (4) Vic., Jan.

	MALES	FEMALES	
ADULT BREEDING			
(1)	51.2 (9.25; 35–60; 8)	51.9 (7.61; 39–60; 6)	ns
(2)	52.4 (5.69; 45–60; 6)	51.1 (7.13; 42–60; 8)	ns
(3)	54.2 (3.40; 171)	48.5 (3.04; 87)	**
ADULT NON-BREEDING			
(2)	–	50.1 (8.53; 41–60; 6)	ns
(4)	51.8 (2.77; 112)	46.9 (2.46; 40)	**
JUVENILE			
(2)	39, 42, 52	42, 49, 49	ns

(5–6) Migrants from N, ages combined but mostly adult: (5) Vic. (VWSG); (6) N. WA (AWSG).

	UNSEXED
Jan.	(5) 50.5 (3.43; 42–58; 152)
Mar.	(5) 53.0 (4.10; 44–66; 171)
	(6) 51.7 (5.27; 42–65; 93)
Apr.	(6) 49.3 (3.24; 43–56; 34)
Sept.	(6) 45, 55
Oct.	(5) 46, 52, 52
	(6) 47.5 (3.79; 42–50; 4)
Nov.	(5) 53.0 (3.46; 50–56; 4)
	(6) 50
Dec.	(5) 50.0 (4.47; 43–56; 6)

Weights vary little; no significant differences with location. In samples (3) and (4) above, males c. 5 g heavier than females (difference significant) and both sexes significantly heavier in Mar. than in Jan. Asian migrants possibly heavier when in n. hemisphere; at Hopeh (China), males 60 (45–108; 26), females 55 (44–68; 23) (BWP).

STRUCTURE Wing, long, narrow and pointed. Eleven primaries: p10 longest, p9 9–13 mm shorter, p8 22–28, p7 35–44, p6 52–60, p5 66–73, p4 80–87, p3 92–102, p2 102–112, p1 114–123; p11 minute, concealed by primary coverts. Wing of juveniles slightly less pointed. Structure similar to that of Fairy Tern (q.v.), but generally slightly smaller and slimmer (see Measurements, Weights) with more deeply forked tail. Bill, slimmer than in Fairy Tern but with slightly more pronounced gonyleal angle.

RECOGNITION Downy young very similar to those of Fairy Tern and not reliably separable till diagnostic juvenile plumage has emerged on wing and mantle. Other plumages often confused with Fairy Tern, but can be distinguished in the hand from all subspecies of Fairy Tern by pattern of outer primaries, which are darker than adult Fairy Tern but similar in colour to juvenile Fairy Tern; and, on inner web, dark strip bordering shaft consistently broader than in juvenile and adult Fairy Tern (Fig. 1); width of dark strip bordering shaft on inner web (measured level with tip of p4 on folded wing): Little Tern, 3.4 mm (0.49; 3.0–4.5; 10); Fairy Tern 1.2 (0.23; 1.0–1.5; 12).

GEOGRAPHICAL VARIATION Slight and gradual; taxonomic treatments vary but three or four subspecies usually

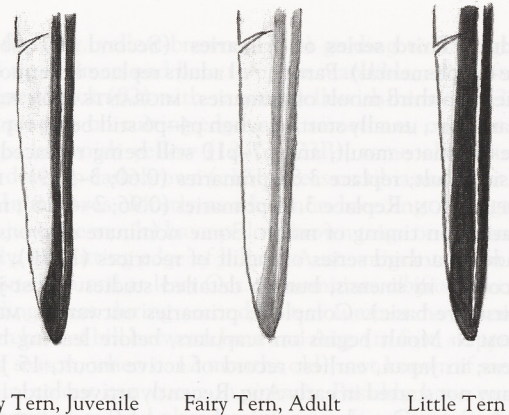


Figure 1 Outer primary of Fairy and Little Terns

recognized. Three populations of subspecies *sinensis* occur in Aust. (see Plumages, Movements). In HANZAB region, e. Aust. population and migrants from N can usually be distinguished as annual cycles differ: e. Aust. population breeds austral summer, in breeding plumage from Sept.–Feb. (sometimes Mar.), juvenile plumage from Jan.–Mar., and first immature non-breeding from Mar. to at least May; migrants from N breed in austral winter, have breeding plumage Apr.–Aug., juvenile plumage July–Sept., and first immature non-breeding from about Sept.–Nov. In non-breeding plumages, separation probably more difficult as adult non-breeding plumage of e. Aust. population may resemble that of immature migrants from N and *vice versa*; few data on this problem as non-breeding grounds of Aust. Little Terns are not known. Morphology of e. Aust. population remarkably similar to that of Asian migrants but adults in breeding plumage have some slight differences: (1) Asian populations have significantly longer t6 and deeper tail-fork; (2) wing of e. Aust. population possibly slightly longer (see Measurements); (3) black tip to bill smaller in e. Aust. population (see Bare Parts); (4) Asian migrants moult more inner primaries in pre-alternate and pre-supplemental moults than in e. Aust. population; and (5) in e. Aust. population, available data suggest first alternate plumage resembles adult breeding (resembles adult non-breeding in Asian migrants and nominate *albifrons*). It is not clear whether these differences, and slight differences in juvenile plumage (see Plumages) are sufficient to justify recognition of e. Aust. population as a separate subspecies. In particular, research needed on little known n. Aust. population, and the area where its range meets that of e. Aust. population.

Nominate *albifrons* of Eurasia most reliably distinguished from *sinensis* on darker shafts to outer primaries of most adults and all juveniles; typically dark horn to black on p9 (p8), white to pale horn on p10 (and uncommonly p8–p9). In adult breeding plumage, also smaller than *sinensis*: (1) tail much less deeply forked (average 43 mm in males and 36 mm in females, cf. 62 and 55 respectively in Asian *sinensis*); (2) wing and bill slightly shorter (average 181 and 30.2 in males, 175 and 28.7 in females); and (3) bill slightly less deep. Subspecies *guineae* from w. and central Africa like nominate, but slightly smaller and bill of adults usually entirely yellow. For further information on extralimital subspecies, especially geographical variation within nominate *albifrons*, see BWP and Olsen & Larsson (1995).

Forms superspecies with several other small terns with similar plumages and moult-strategies, breeding ranges of which show little or no overlap: Least Tern *S. antillarum*, Peruvian

Tern *S. lorata*, Fairy Tern *Sterna nereis*, Saunders's Tern *Sterna (albifrons) saundersi* and Yellow-billed Tern *S. supercilialis*. Taxonomic status of some of these is controversial, e.g. Least Tern of North and Central America (see Massey 1976; Massey & Attwood 1978; Thompson *et al.* 1983, 1992; Yates & Taffs 1990; Chandler & Wilds 1994; Olsen & Larsson 1995; BWP). Saunders's Tern has usually been treated as a full species following revision by Vaurie (1965) but differences from *S. a. albifrons* so slight that reliable identification often not possible (Chandler & Wilds 1994; Olsen & Larsson 1995) and intergrades with Little Tern occur in some parts of range (BWP).

Species status of Fairy Tern not in doubt, despite some hybridization with Little Tern (see Fairy Tern: Geographical Variation); plumages differ consistently, moult-strategy differs markedly, and hybrids are rare, even where breeding ranges overlap.

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Fairy Tern *Sterna nereis* (page 725) Nominate *nereis* unless stated

1 Adult breeding; 2 Adult breeding, subspecies *davisae*; 3 Adult breeding, austral spring, showing bill in transition to breeding; 4 Adult non-breeding; 5 Downy young, light morph; 6 Downy young, dark morph; 7 Juvenile; 8 Early stages of moult from juvenile to first immature non-breeding; 9 Early stage of moult from juvenile to first immature non-breeding, subspecies *exsul*; 10 Adult breeding, worn plumage; 11 Adult non-breeding; 12 Juvenile; 13 Late stage of moult from juvenile to first immature non-breeding

Little Tern *Sterna albifrons* (page 709)

14 Adult breeding, population breeding se. Aust.; 15 Adult showing head and bill in transition to or from breeding plumage; 16 Adult non-breeding; 17 Juvenile; 18 Early stage of moult from juvenile to first immature non-breeding; 19 Adult breeding, Asian population; 20 Adult non-breeding; 21 Juvenile; 22 Late stage of moult from juvenile to first immature non-breeding