

Waterbirds and coastal seabirds of Timor-Leste (East Timor): status and distribution from surveys in August 2002–December 2004

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Field surveys were carried out in 2002–2004 to assess the status, distribution and seasonality of waterbirds and coastal seabirds in Timor-Leste. A total of 3,653 records of 82 waterbird and coastal seabirds were collected during 446 visits to 74 wetland sites. Ten species new to Timor island were recorded: Green Pygmy-goose *Nettapus pulchellus*, Hardhead *Aythya australis*, Ruddy-breasted Crake *Porzana fusca*, Spotless Crake *Porzana tabuensis* (first Wallacean record since 1899), Common Coot *Fulica atra*, Greater Painted-snipe *Rostratula benghalensis*, Spotted Redshank *Tringa erythropus* (second record for Wallacea), Pectoral Sandpiper *Calidris melanotos* (first record for Wallacea), Common Tern *Sterna hirundo* and Black-crowned Night Heron *Nycticorax nycticorax*. Significant populations of three Near Threatened species were recorded: Beach Thick-knee *Esacus neglectus*, Malaysian Plover *Charadrius peronii* and Darter *Anhinga melanogaster*. Three wetlands are highlighted for their importance: (1) Lake Iralalara (c.1,500 ha) is the most significant freshwater site in Timor-Leste and Nusa Tenggara, supporting at least 50 waterbird species including large populations of ducks and rails. It is an important staging site for Oriental Pratincole *Glareola maldivarum* (c.3,000 recorded in November 2004); (2) Tasitolu is a site of high national biodiversity significance with 53 waterbird and coastal seabird species recorded from its saline lakes and mudflats; (3) Kupang Bay in West Timor is the most significant site for migratory waders in Nusa Tenggara. Regular monitoring of key sites and further fieldwork are needed, especially along the south coast (Covalima, Manufahi and Manatuto districts).

INTRODUCTION

Timor island comprises two nations. The western half is Indonesian, with Kupang in the far south-west being the provincial capital of the East Nusa Tenggara province. The eastern half is the new nation of Timor-Leste (East Timor), which gained independence in 2002. Timor is the second largest island in Wallacea, with an area of c.31,000 km². Timor-Leste covers c.14,604 km² including the Oecussi enclave, Atauro island (150 km²) and Jaco island (8 km²).

The status and distribution of waterbirds on Timor are poorly known because historical collections (e.g. Mayr 1944) and recent field surveys (e.g. Noske and Saleh 1996, Lesmana *et al.* 2000) have concentrated on the endemic and threatened forest birds. Some recent information has come from fieldwork in the former Portuguese-controlled Timor (now Timor-Leste) by McKean *et al.* (1975) and Thompson *et al.* (1976), and in West Timor by Andrew (1986) and Johnstone (1994; see Table 1), but considerable gaps in our knowledge remain. Timor is on the East Asian flyway for migratory shorebirds, lying on the migration path for birds migrating south to Australia, and is visited during the non-breeding season by various Palearctic species during August–May (Asia-Pacific Migratory Waterbird Conservation Committee 2001). Northern Australia lies 650–1,000 km to the south of Timor and is an important wintering area for tens of thousands of Palearctic migrants (Chatto 2003, Barrett *et al.* 2003). Most migrants overfly Wallacea and Timor, but for some the area is significant for staging, feeding and resting, with the sandflat, mudflat and fishpond wetlands of Kupang Bay providing important habitat (Johnstone 1994, Coates and Bishop 1997). In

addition, some Australian migrant shorebirds and terns winter on Timor during May–December, and some Australo-Papuan and Oriental waterbirds breed on Timor or occur as regular visitors or vagrants (Coates and Bishop 1997).

Timor-Leste is currently developing strategies to audit and manage its biodiversity resources. This includes plans to evaluate and accede, where appropriate, to relevant international treaties and conventions, including those covering wetland and waterbird management and conservation (e.g. the Ramsar Convention). All bird species are currently protected under regulation 2000/19 (UNTAET 2000). The oceanic islands of Nusa Tenggara are not renowned for their wetlands, but recent surveys have identified numerous, mostly small, freshwater and saline lakes, river estuaries, beaches and reefs in Timor-Leste.

I carried out surveys for BirdLife International during August 2002 to December 2004, concentrating on forest habitats, but also in various wetland habitats on 'mainland' Timor-Leste, the islands of Atauro and Jaco and a brief survey of Kupang Bay. This paper provides a summary of the status and distribution of waterbirds in Timor-Leste based on these field surveys and a synthesis of the literature covering Timor (including West Timor, Roti and Sabu) and Wallacea. A sister paper reviews the status of globally threatened and restricted-range birds (Trainor and Mauro in prep.).

METHODS

Waterbirds were recorded in Timor-Leste during six field visits totalling 60 weeks over a 29 month period:

28 July to 23 August 2002, 22 January to 17 May 2003, 25 July to 5 August 2003, 23 October 2003 to 20 January 2004, 20 February to 8 June 2004 and 1 September to 8 December 2004. Wetlands at Kupang Bay (10°05'S 123°45'E), West Timor, were visited on 10–12 June 2004. Lakes, mudflats, exposed reefs, beaches and rivers were surveyed throughout Timor-Leste, particularly along the accessible north coast and the far east of the island (Lautem district). Opportunistic observations from roadsides of ricefields, streams and beaches were also documented and these localities have also been called 'wetland sites'. A list of all sites, their location, estimated area, elevation and number of occasions surveyed is given in Appendix 2. Most wetlands were small or very small. Only one—Lake Iralalara—was greater than 10 km²; 13 sites were larger than 1 km² and 63 sites were smaller than 50 ha (Appendix 2).

Birds were observed with 8×32 binoculars and identified with the direct aid of a field guide where necessary (Coates and Bishop 1997). Observations of presence, number of individuals, habitat type, ecology including breeding activity, altitude (measured with a Suunto wristwatch to the nearest 10 m), location (latitude and longitude measured with a Garmin global positioning system [GPS]; specific site; village and district name) and date were written in a notebook, or stored on GPS. Each bird record was assigned a 'precise location name' associated with a GPS reading. These were then lumped into geographically

'independent sites' which included all precise locations within an area with a radius of 2–3 km. For one larger wetland (Lake Iralalara; at least 15 km²) the entire area was defined as one site although many precise localities, including the Irasequiro river, were surveyed within it.

IUCN Red List status follows BirdLife International (2004). Geographic localities have not yet been standardised in Timor-Leste (with combinations of local, Indonesian, Portuguese and Tetun language names). I have either followed the Indonesian Peta Ruppabumi 1:25,000 maps, or used the nearest village name to the wetland type (e.g. Los Palos Swamp), or used the village name with local site names (collected from local people who wrote them in a notebook). Lake Laga was called Salina (or erroneously Saltina) de Laga, and Lake Iralalara was called Los Palos Lake or Swamp by McKean *et al.* (1975) and Thompson *et al.* (1976).

The residence status of species was assessed by synthesising information on: (1) the seasonal frequency of survey records; (2) records in the literature; and (3) new or historical information on breeding (including information from local people). Migrants were categorised as 'wintering' if they were recorded over periods of weeks or months (during August–May for Palearctic migrants and May–December for Australian migrants), 'transient' if they were recorded (generally in tight flocks) on a few occasions for periods of one

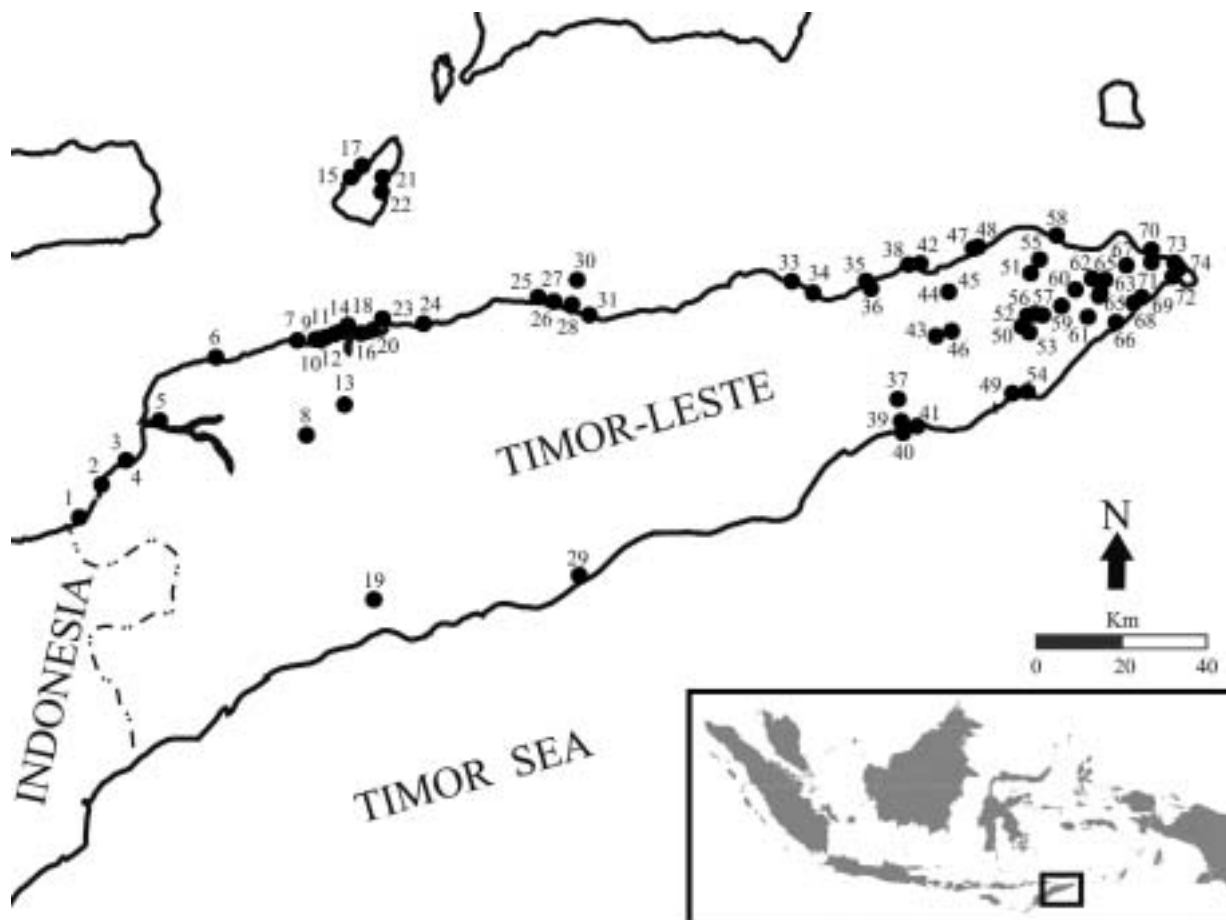


Figure 1. Map of study sites in Timor-Leste. Numbers refer to sites listed in Appendix 2.

Table 1. Summary of literature on waterbirds on Timor, including estimated field effort for primary surveys (n/a= not applicable).

Reference	Notes	Field effort
Mayr (1944)	Annotated bird list describing Stein's 1931–1932 records in West and East Timor	22 weeks
McKean <i>et al.</i> (1975), Thompson <i>et al.</i> (1976)	List of waterbirds and other species recorded in East Timor (in 1973–1975)	c.45 days
Mees (1976)	Clarification of the status of several records of McKean <i>et al.</i> (1975)	n/a
Andrew (1986)	Summary of significant bird records mostly from Kupang Bay, West Timor	10 weeks
White and Bruce (1986)	Summary and annotated list of birds of Wallacea including Timor	n/a
Holmes (1993)	Unpublished annotated list of bird records from the Lasiana beach area of Kupang Bay	c.1 month over 2-year period
Johnstone (1994)	Summary of seabird and shorebird records from Nusa Tenggara and Maluku including Merah island off Semau island, and Kera island in Kupang Bay	c.12 months over 7-year period
Johnstone and Jepson (1996)	Review of birds on Roti, off south-west Timor	17 days
Noske and Ueda (1996)	First Cinnamon Bittern <i>Ixobrychus cinnamomeus</i> record for Timor	n/a
Verbelen (1996)	Summary of observations at Kupang Bay, West Timor, during 6–8 October 1995	3 days
Coates and Bishop (1997)	Synthesis of information on status and habitat use of waterbirds in Wallacean region	n/a
Grantham (2000a)	Record of Australian Pelican <i>Pelecanus conspicillatus</i> from Dili area	n/a
Trainor and Soares (2004)	Summary of bird records from Atauro island	12 days over 6-month period
Olsen and Trainor (2005)	Description of the Red-capped Plover <i>Charadrius ruficapillus</i> nesting on Timor in 2003	c.10 days
Trainor (2005)	Review of recent waterbird records from Roti island	8 days

day to several weeks, and 'summering' if recorded in the month of June and July.

RESULTS

A total of 3,653 records of 82 waterbird and coastal seabirds were collected during 446 visits to 74 wetland sites on 293 field days. Ten waterbirds new to Timor

Table 2. The ten most common waterbird and coastal seabirds recorded in Timor-Leste and the ten most common migrant waders (denoted with *).

Species	No. records
COMMON SANDPIPER <i>Actitis hypoleucos</i> *	276
COMMON GREENSHANK <i>Tringa nebularia</i> *	173
BLACK-WINGED STILT <i>Himantopus himantopus</i>	158
RED-CAPPED PLOVER <i>Charadrius ruficapillus</i>	155
LITTLE PIED CORMORANT <i>Phalacrocorax melanoleucos</i>	151
LITTLE GREBE <i>Tachybaptus ruficollis</i>	144
LITTLE BLACK CORMORANT <i>Phalacrocorax sulcirostris</i>	136
GREAT CRESTED TERN <i>Sterna bergii</i>	128
RED-NECKED STINT <i>Calidris ruficollis</i> *	123
MARSH SANDPIPER <i>Tringa stagnatilis</i> *	118
AUSTRALIAN PELICAN <i>Pelecanus conspicillatus</i>	114
PACIFIC GOLDEN PLOVER <i>Pluvialis fulva</i> *	106
WOOD SANDPIPER <i>Tringa glareola</i> *	104
WHISKERED TERN <i>Chlidonias hybridus</i>	101
LITTLE EGRET <i>Egretta garzetta</i>	100
WHIMBREL <i>Numenius phaeopus</i> *	93
GREAT EGRET <i>Casmerodius albus</i>	92
SHARP-TAILED SANDPIPER <i>Calidris acuminata</i> *	77
EASTERN CURLEW <i>Numenius madagascariensis</i> *	52
GREY-TAILED TATTLER <i>Heteroscelus brevipes</i> *	51

island were recorded: Green Pygmy-goose *Nettapus pulchellus*, Hardhead *Aythya australis*, Ruddy-breasted Crake *Porzana fusca*, Spotless Crake *Porzana tabuensis*, Common Coot *Fulica atra*, Greater Painted-snipe *Rostratula benghalensis*, Spotted Redshank *Tringa erythropus*, Pectoral Sandpiper *Calidris melanotos*, Common Tern *Sterna hirundo* and Black-crowned Night Heron *Nycticorax nycticorax*. Three Near Threatened species were recorded (Beach Thick-knee *Esacus neglectus*, Malaysian Plover *Charadrius peronii* and Darter *Anhinga melanogaster*). The most widespread and common birds are listed in Table 2.

The annotated list documents all waterbirds recorded during the 2002–2004 surveys, summarising their distribution, seasonality (months and extreme dates) and breeding. Appendix 1 lists all species and provides a summary of residence status, abundance, habitat use and sites.

WANDERING WHISTLING-DUCK *Dendrocygna arcuata*

This species is a locally common breeding resident on freshwater lakes and swamps throughout Timor-Leste. It was mostly observed as pairs and small parties, but at least 120 individuals were seen on Lake Iralalara and 60 on Lake Selo (both in December 2003). A pair with eight chicks was recorded on Lake Eraulo on 28 February 2004.

GREEN PYGMY-GOOSE *Nettapus pulchellus*

New island record. Green Pygmy Goose is a regular visitor to Timor-Leste from Australia, with up to 35 birds at Lake Iralalara (October–November 2004, mostly recorded in pairs and possibly breeds at this site), one at Chaiperi swamp on 28 May 2004, and up to two at Lake Farapata on 5 October 2004. The only possible confusion species is Cotton Pygmy-goose *N. coromandelianus* (which has not been recorded from Nusa Tenggara); the birds were small and males had the distinctive white cheek-patches diagnostic of Green

Pygmy Goose. There have been few Wallacean records of this species (Coates and Bishop 1997).

PACIFIC BLACK DUCK *Anas superciliosa*

A locally common to abundant resident and visitor of freshwater lakes and rivers, this species was mostly observed in small flocks of <50 individuals. In the 2003 dry season, some of the largest congregations recorded in Wallacea were observed: 1,000–1,740 birds at Lake Iralalara on 15 November–11 December 2003, 270 birds at Lake Eraulo on 5 November 2003, and 200 birds at Lake Seloi on 27 November 2003. One adult with five juveniles was observed at Lake Seloi on 28 February 2004. Johnstone and Jepson (1996) reported 120 birds on Roti in September 1993.

SUNDA TEAL *Anas gibberifrons*

This is a common species in Timor-Leste, with up to 400 birds recorded on saline lakes, beaches, exposed reefs, mangrove-lined mudflats, and, rarely, freshwater lakes. It is presumably a breeding resident on Timor.

GARGANEY *Anas querquedula*

On 29 February and 26 March 2004, two females or eclipse males (presumably the same individuals on both dates) were seen at Lake Laga. The only previous Timor record was of a male in eclipse plumage at Secal on 25 October 1973 (McKean *et al.* 1975). Garganey is a rare Palearctic visitor to Timor and Nusa Tenggara (Coates and Bishop 1997).

HARDHEAD *Aythya australis*

New island record. This species is a regular visitor throughout the year to Timor, usually in small numbers at shallow saline and inland freshwater lakes, e.g. Lake Iralalara (four birds on 4 March 2003, 3–20 birds in October 2004, c.100 birds on 30 November 2004), Lake Laga (three on 2–4 April 2003), Tasitolu (one male on 14 April 2003), and Lake Veihoorana (five males on 15 January 2004). These birds were identified by their large size (similar to Pacific Black Duck), uniform dark brown to blackish appearance, and white iris (in males) which was visible when observed with binoculars from less than c.50 m. In flight, the broad white band along the length of the upperwing was distinctive and allowed this species to be distinguished in large mixed-species duck flocks (usually including Pacific Black Duck and Wandering Whistling Duck). Coates and Bishop (1997) noted three records of single males in Wallacea; in addition, two small groups were recently reported from Lombok (Grantham 2000b), and there are recent records on Flores: ten birds at Tiwu Bowu lake in August–September 1998 and October 2002 (R. Drijvers verbally 1998, M. Schellekens verbally 2003).

BUFF-BANDED RAIL *Gallirallus philippensis*

This species was widespread and common on the Fuiloro plateau, but it remains poorly known elsewhere. One was recorded at Tasitolu on 3 December 2004.

WHITE-BREASTED WATERHEN *Amaurornis phoenicurus*

This species is a locally common breeding resident at springs, freshwater lakes and wet grassland, particularly

in Lautem district. It was usually observed as singles or pairs, but six birds were recorded at a Baucau spring on 24 November 2003.

RUDDY-BREASTED CRAKE *Porzana fusca*

New island record. A single was video-recorded at Lake Iralalara on 10 October 2004; one was captured by dogs at Ili Lapa on 17 October 2004 (the specimen will be lodged with the Australian Museum), and two birds were observed at nearby O'Swamp on 23 October 2004. No similar-looking rails are currently known from Timor island, and the extensive video footage (10 minutes) and specimen enabled confirmation of the identification by direct reference to Coates and Bishop (1997). There are few records from Nusa Tenggara, where this bird is otherwise known only from Flores and Sumba (Coates and Bishop 1997).

SPOTLESS CRAKE *Porzana tabuensis*

New island record. One bird was flushed from wet grass and killed by young men with sticks (a regular technique to hunt quail) at Lake Veihoorana on 15 January 2004. The specimen was taken to Australia with the intention of submitting to a museum, but was unfortunately destroyed by customs. One to three birds were regularly observed (and video-recorded) at O'Swamp in October–December 2004. The birds were very small (smaller than Ruddy-breasted Crake, which was seen together with Spotless Crake on one occasion), with reddish legs, black bill and white bars on the undertail-coverts. Birds were heard to give *blup* or *blip* calls, which sounded like water dropping into a basin. These are the first records since 1899 in Wallacea, where it is otherwise known only from Tiur island, Maluku (Coates and Bishop 1997).

WHITE-BROWED CRAKE *Porzana cinerea*

White-browed Crake was locally common in Lautem district, especially at Lake Iralalara, but probably more widely. Two birds were seen at a Dili spring on 12 May 2004. Stein also collected five birds from the Dili area (Mayr 1944); Verbelen (1996) observed one at Kupang Bay, and Thompson *et al.* (1976) had a possible record from Lake Iralalara.

PURPLE SWAMPHEN *Porphyrio porphyrio*

This species was locally common at Lake Iralalara (21 birds were counted in a small section of the lake, and an estimated 100–200 birds were present), but it was recorded at just two other sites: Lake Modo Mahut and O'Swamp.

DUSKY MOORHEN *Gallinula tenebrosa*

This species was locally common at Lake Modo Mahut and Lake Iralalara (where up to seven individuals were regularly observed). Immatures were recorded along the Irasequiro river in December 2003 and October 2004. Verbelen (1996) noted two birds at Kupang Bay.

COMMON COOT *Fulica atra*

New island record. This species was recorded at three wetlands: Lake Eraulo (ten birds on 5 February 2003, 37 birds on 5 November 2003, none on 28 February 2004, and four birds on 19 October 2004), Lake Modo Mahut (six birds on 13 March 2003) and Lake Seloi

(at least 20 birds on 26 July, two on 27 November, ten on 17 December 2003, two on 28 February 2004 and eight on 15 September 2004). The white bill and frontal shield of this otherwise all-black bird was diagnostic; birds at Lake Eraulo were observed from as close as 15 m and photographed to confirm identification. This bird was considered a 'rare vagrant to Wallacea' by Coates and Bishop (1997), but it is probably a regular visitor to Timor, with local people suggesting that it breeds locally.

SWINHOLE'S SNIPE *Gallinago megala*

This species was locally abundant at O'Swamp and Lake Iralalara, where up to 40 birds per hour could be flushed. This species winters in significant numbers in Timor-Leste, especially on the Fuiloro plateau, but it was scarce in apparently suitable habitat at other sites. All snipe were assumed to be this species. Trapping or specimen collection would be needed to confirm the presence of Pintail Snipe *G. stenura* or other snipe species which have yet to be recorded from Timor.

BLACK-TAILED GODWIT *Limosa limosa*

This migrant is an uncommon or rare transient with six records of 1–35 individuals in September–December and February. Andrew (1986) recorded 188 on 30 September 1985 at Kupang Bay, where it is a common winter visitor. Black-tailed Godwit was unrecorded by Johnstone (1994), but it is a common winter migrant to Australia (Barrett *et al.* 2003).

BAR-TAILED GODWIT *Limosa lapponica*

This species is an uncommon transient in small numbers (1–6 individuals) on saline lakes, mudflats and aquaculture ponds during August–April. McKean *et al.* (1975) reported four birds at Secal, and Johnstone (1994) recorded 16 at Panite, West Timor.

LITTLE CURLEW *Numenius minutus*

This Australian winter migrant was a rare brief transient on Timor, with only a few records at Lake Iralalara (six birds on 11 December 2003), Tasitolu (a single bird on 7 February 2003, and four on 9 May 2003; presumably these birds were returning north), and Lake Laga (two on 29 February 2004). Previous published records are from September to November and in mid-April (Coates and Bishop 1997). The first Timor record was of 12 birds at Secal on 28 October 1973 (McKean *et al.* (1975). Mauro (1999) recorded 16–40 birds at Kai Kecil on 20–21 October 1998; these birds were presumably staging. Verbelen (1996) recorded seven birds at Kupang Bay, and Johnstone (1994) reported an April record from Selaru island (Tanimbar).

WHIMBREL *Numenius phaeopus*

This species is a common winter visitor and an uncommon transient, mostly recorded as singles or small loose parties of 1–15 birds in August–May. Larger flocks, presumably representing birds on return from Australia, included 22 and 11 birds at Vero river estuary on 25 March 2003 and 65 birds at Tasitolu on 7 May 2003. A total of 19 birds were observed at Kupang Bay on 10–12 June 2004, and Verbelen (1996) reported 20 at Kupang Bay.

EASTERN CURLEW *Numenius madagascariensis*

This migrant was a regular winter visitor on larger expanses of mudflats and estuaries in August–June, and occurred as a transient in small numbers (1–26 birds) on beaches and saline lakes. Ten birds at Kupang Bay on 12 June 2004 represents the latest record for Wallacea. It was not recorded by Johnstone (1994).

SPOTTED REDSHANK *Tringa erythropus*

New island record. At least three birds were video-recorded at Tasitolu on 5 September (when overlooked as Common Redshank *Tringa totanus*) and were subsequently confirmed as Spotted Redshank (by M. Schellekens, A. Vrielink and M. Carter verbally 2005). The footage shows a tall, red-legged shank (10–15% shorter than Common Greenshank *T. nebularia* in direct comparison); the upper body was grey-brown, indicating a bird in winter plumage. The well-developed supercilium, clean white underparts, long-legged appearance and long (about 140% of head length) fine-tipped and slightly curved bill exclude the similar-looking Common Redshank. The birds fed at the muddy shore with a broad sweeping action similar to Royal Spoonbill. Ten redshanks were present on this date and up to six remained in the following two weeks, but it is not known whether the other birds were Common or Spotted Redshanks (Common Redshank had not previously been observed at this section of Lake Tasitolu). Spotted Redshank is a Palearctic migrant which usually winters in Africa through to continental South-East Asia (Hayman *et al.* 1986). It is apparently rare in Wallacea or is possibly overlooked. This is the second record for Wallacea following a record of one bird on 31 August on Sangihe island (Riley 1997). The first record for the Philippines was in February 1987 (Hornskov 1995), and there are very few records for Australia (Carter and Sudbury 1993). Spotted Redshank might occur regularly on Timor, and should be looked for especially in the period of southward migration.

COMMON REDSHANK *Tringa totanus*

This species was generally uncommon in small numbers on mangrove-backed mudflats, with a total of 43 records. The largest group was of 27 birds at Lake Laga on 29 February. At least 20 birds were reported from Secal on 28 October 1973 (McKean *et al.* 1975), with additional records from Lasiana beach on 20 October 1993 (Holmes 1993), and two at Kupang Bay (Verbelen 1996). This species occurs on Timor during passage and when wintering from September to mid-April.

MARSH SANDPIPER *Tringa stagnatilis*

This migrant was a common winter visitor, especially on shallow saline lakes during July–May, but published dates range from September to April (Coates and Bishop 1997). Tasitolu was used for staging by small groups on their northward migration, with 64 birds recorded on 26 February 2004, 58 on 2 March 2004 and 59 on 5 April 2004.

COMMON GREENSHANK *Tringa nebularia*

This species is a common winter (and probably summer) visitor and occasional transient. The increas-

ing number of birds at Lake Laga in April, and at Tasitolu in March–April (e.g. 66 birds on 31 March and 156 on 16 April 2003) suggests that these locations are used as staging sites by birds returning northwards from Australia. Eighteen birds were observed at Kupang Bay on 10–12 June 2004, suggesting that small numbers summer on Timor.

WOOD SANDPIPER *Tringa glareola*

This species was a regular winter migrant and occasional transient in small loose parties or moderate-sized groups on freshwater and saline lakes and mudflats. The flock of 40 birds present at Lake Seloi on 17 December 2003 was presumably a group of transients. Small numbers of birds staged at Tasitolu prior to their return migration, with one present on 28 November 2003, 72 birds on 26 February, 51 on 31 March and one on 10 April 2004. Verbelen (1996) reported ‘hundreds’ from Kupang Bay.

TEREK SANDPIPER *Xenus cinereus*

This species was an irregular visitor to Timor-Leste with records of 1–8 birds from 12 September to 9 November 2004 during the period of southward migration. McKean *et al.* (1975) noted 1–20 birds at Secal on 24–28 October 1973 and Holmes (1993) observed seven birds at Lasiana beach on 9 July 1993. Additionally, three single birds were observed at Kupang Bay, 10–12 June 2004. Terek Sandpipers winter in Australia in large numbers with some birds summering (Barrett *et al.* 2003).

COMMON SANDPIPER *Actitis hypoleucos*

This common and widespread migrant occurred on beaches, estuaries, inland rivers and lakes during July–May, usually as singles and small loose parties of up to 15 birds.

GREY-TAILED TATTLER *Heteroscelus brevipes*

This species was a widespread and regular winter visitor, generally occurring in small parties of 1–20 birds except at mangrove-backed mudflats or estuaries where up to 50 birds were occasionally recorded.

RUDDY TURNSTONE *Arenaria interpres*

This migrant is generally a rare transient in the Timor region, with just five records of 1–8 birds from 17 August to 23 March. Most birds undoubtedly overfly Timor while on route to wintering grounds in Australia. The first Timor records were two birds at Secal on 28 October 1973 and four at Waitala on 26 November 1973 (McKean *et al.* 1975). There are few other records: Holmes (1993) recorded the species regularly in small numbers at Lasiana beach, Johnstone (1994) saw three birds on 7 April 1991 at Kera island, and Johnstone and Jepson (1996) recorded the species on Roti island during 7–16 October 1990.

GREAT KNOT *Calidris tenuirostris*

This wader is a rare transient and occasional short-term visitor in the Timor region, with the possible exception of Kupang Bay, where a record of 13 birds on 10 June 2004 (the latest record for Wallacea) suggests summering. Records spanned September–December and were from Dili foreshore

(one on 31 October to 4 November 2003), Manututo mudflats (two on 19 September 2004), Secal (one on 19 September 2004), Tasitolu (one on 12 November to 16 December), Raumoko river (one on 11 October 2004), Tasitolu (Dili sewerage works: one on 1 November), and Lake Iralalara (one on 15 November). The first Timor records were of 1–4 birds at Secal on 24–28 October 1973 (McKean *et al.* 1975). Great Knot was unrecorded by Johnstone (1994). Flocks of 5,000–10,000 birds winter in northern Australia (Chatto 2003).

RED KNOT *Calidris canutus*

This species is a rare transient in the region, with a single bird video-recorded at Tasitolu on 24 September 2004. Andrew (1986) reported at least 18 birds at Kupang Bay on 5 September. There are very few Wallacean records (Coates and Bishop 1997, P. Benstead in Trainor *et al.* in press), but many thousands winter in northern Australia (Barrett *et al.* 2003, Chatto 2003).

SANDERLING *Calidris alba*

This species was uncommon in the Timor region. Most records were of singles, but a flock of 56 birds was seen at the Loes estuary on 5 December 2004. The first Timor record was of a single bird at Kupang Bay on 24 September 1985 (Andrew 1986). Sanderling winters regularly in Australia but it is uncommon, with an estimated wintering population of 8,000 birds (Chatto 2003).

RED-NECKED STINT *Calidris ruficollis*

Red-necked Stint is a common migrant that winters in small to moderately large flocks from August to May. The largest flocks were of 190 birds at Lake Laga on 14 November 2003, 215 birds at Tasitolu on 29 December 2003, and 150 birds at Tasitolu on 2 January 2004. An estimated 400 birds were present on 10–12 June 2004 at Kupang Bay, where this species probably summers in small numbers. The species is a very common winter visitor in Australia (Chatto 2003).

LONG-TOED STINT *Calidris subminuta*

This species was a generally uncommon winter migrant to Timor-Leste. Singles and groups of up to five birds were occasionally flushed from the muddy margins of Lake Iralalara, Lake Eraulo and O'Swamp, and hundreds of birds probably winter on the Fuiloro plateau. Forty-five birds were recorded in shallow marshland and flooded ricefields at Secal on 19 September 2004. Verbelen (1996) recorded several at Kupang Bay. The species is a rare winter visitor to Australia (Chatto 2003, Barrett *et al.* 2003).

PECTORAL SANDPIPER *Calidris melanotos*

New island record. A single Pectoral Sandpiper was video-recorded on the muddy shore of Lake Laga at 12h15–13h15 on 28 November 2004, feeding together with nine Sharp-tailed Sandpipers *C. acuminata*, Common Greenshank and Marsh Sandpiper. The bird was initially thought to be a Ruff *Philomachus pugnax*. No description was taken at the time, but 14 minutes of video-recordings were made in overcast conditions, on which the following description is based. The bird

was subsequently re-identified as Pectoral Sandpiper by N. McCrie (verbally 2005). The most likely confusion species is Sharp-tailed Sandpiper. The bird was a little larger and longer-necked than Sharp-tailed Sandpiper and stood 1–2 cm taller. When alarmed, it stood erect with its neck at full stretch and was c.5 cm taller than Sharp-tailed Sandpiper. The crown, back and wings were light brown-grey, and this was a little lighter than on Sharp-tailed Sandpiper. The secondaries and primaries had darker centres, but these were significantly less contrasting than in Sharp-tailed Sandpiper (and indicated non-breeding plumage). The bill was light yellow near the base and grey towards the tip (visible only in close-ups), in contrast to the grey bill of Sharp-tailed Sandpiper. It was slightly decurved and about the same as the head length (and therefore similar to Sharp-tailed Sandpiper). The legs were light grey, rather than greenish as in Sharp-tailed Sandpiper. The sharp boundary between the brown-streaked chest and the white belly was the most prominent feature distinguishing it from Sharp-tailed Sandpiper, in which the brown-grey streaks on the chest continued down to the belly, with no clear border. The supercilium was well-developed but was thicker in front of the eye, rather than behind the eye in Sharp-tailed Sandpiper (and this was noticeable from distances of less than 20 m). Both species pecked and probed in shallow water and mud at the lakes edge, but Sharp-tailed Sandpiper occasionally fed in shallow water up to the upper tibia. No sandpipers or shanks were present at Lake Laga on 2 December 2004. This is the first record for Wallacea; the species usually winters in South America and is a rare vagrant to South and South-East Asia (Hayman *et al.* 1986, Undeland and Sangha 2002) and is an uncommon but widespread winter migrant to Australia (Barrett *et al.* 2003).

SHARP-TAILED SANDPIPER *Calidris acuminata*

This migrant is a regular winter visitor, probable summer visitor, and transient on Timor with up to 25 birds recorded on mudflats and the edges of saline and freshwater lakes. Six birds were present at Kupang Bay on 10 June 2004. Previously published Wallacean records are from August–November, with one in April (Coates and Bishop 1997), but records in Timor now span all months.

CURLEW SANDPIPER *Calidris ferruginea*

This species was an uncommon and irregular transient to Timor-Leste, with the first records comprising 1–4 birds on 1–23 September 2004. At Kupang Bay, it is apparently common with 180 birds counted (and a total of 450 birds estimated) on 30 September 1985 (Andrew 1996). Twenty-eight birds were recorded at Kupang Bay fishponds on 12 June 2004. Two were observed at Lasiana beach on 5 December 1991 (Holmes 1993). This species is a regular winter migrant to Australia (Barrett *et al.* 2003).

BROAD-BILLED SANDPIPER *Limicola falcinellus*

This shorebird is a rare migrant to the Timor area, with a single record of 16 birds at Tasitolu on 2 March 2003. The first Timor record was a single at Secal on 28 October 1973 (McKean *et al.* 1975), and Johnstone

(1994) recorded two at Panite on 26 October 1990. White (1975) only listed two Wallacean records. This species is rare in Australia, with an estimated 8,000 birds wintering (Barrett *et al.* 2003, Chatto 2003).

RED-NECKED PHALAROPE *Phalaropus lobatus*

This species is common winter migrant to waters off Timor: a total of 897 birds were observed between Dili and Atauro island during a number of trips (Trainor and Soares 2004). Flocks of 5,000–10,000 individuals have been noted between nearby Pantar and Alor islands (Johnstone 1994).

GREATER PAINTED-SNIPE *Rostratula benghalensis*

New island record. A female was flushed at Lake Iralalara on 15 November 2003, and a single unsexed bird was flushed at Bauro (Lake Ira Arapho) on 15 January 2004. Up to 30 birds of both sexes were flushed from 2 ha of marshland during a morning and afternoon visit to O'Swamp on 29 October 2004 (the day after the first rains of the 2004–2005 wet season). Birds were first noticed after several were flushed by a young man with a dog. I entered the swamp near the path of the young hunter and slowly walked through knee-high mud and water. In this section of swamp, birds were flushed as singles and loose groups of up to ten birds. They typically flew 20–50 m, often flying in an arc initially away and then turning and landing in front of me. This allowed repeated but brief observations of males and females showing the distinctive white eye-ring and white streak behind the eye on a rufous or greyish head, and the white 'harness' between the grey-brown wing and shoulder. These features clearly identified the birds as Greater Painted-snipe. On the same day and the following week I spent about two hours attempting to video-record the species, but was unsuccessful and never saw birds before they flushed (sometimes as close as 2–3 m). Birds were silent when flushed, in contrast to Swinhoe's Snipe which almost always gave an *etch* or *eck* call. This inconspicuous species has been overlooked on Timor but it is presumably a widespread breeding species on the Fuiloro plateau. Breeding in the region has been documented only on Flores, but there are also records from Lombok and Sumbawa (Verheijen 1964, Coates and Bishop 1997). This is the most south-eastern population of Greater Painted-snipe because the Australian population is now considered a separate species (Lane and Rogers 2000, D. Rogers verbally 2005).

COMB-CRESTED JACANA *Irediparra gallinacea*

This species was locally common at Lake Modo Mahut and Lake Iralalara, where up to 20 birds were recorded and c.100 birds estimated on waterlily-lined wetlands. Four juveniles were noted at Iralalara on 12 December 2003. There are few records of Comb-crested Jacana in Nusa Tenggara (Coates and Bishop 1997).

BEACH THICK-KNEE *Esacus neglectus*

Near Threatened. This species was relatively common, with records from nine sites mostly in the extreme far east: Secal (a pair), Ochafalai (a single), Valu Beach (a pair and a single), Helapuna Beach (a pair), Uatu Lari

(a single), Vero (a pair), Lore (a pair) and nearby Namulutu River Estuary (a pair). Beach Thick-knee occurs as a resident at low population densities, but significant populations remain on Timor-Leste. This species probably prefers remoter and less-visited beaches, but the records at Secal indicates that it can tolerate areas used heavily by local communities. McKean *et al.* (1975) reported four birds on Jaco island in October 1973, but none was recorded during four visits in 2002–2003. Johnstone (1994) recorded four birds on Merah island.

BLACK-WINGED STILT *Himantopus himantopus*

This species was locally common to abundant at the margins of shallow saline and freshwater lakes, mudflats and estuaries, with records from all months. It is probably a breeding resident: two immatures were recorded at Kupang Bay on 12 June 2004, where Verbelen (1996) had previously observed juveniles. At Tasitolu, numbers increased from 110 birds on 5 April to 338 on 11 May 2003; 129 were recorded at Lake Seloi on 27 November 2003 and 200 were seen at Lake Seloi on 17 December 2003. The rapid rise and fall of numbers may indicate that Black-winged Stilts use these sites for staging on their way to Australia or other areas.

PACIFIC GOLDEN PLOVER *Pluvialis fulva*

This shorebird was a regular on passage and in winter, and was generally recorded in small numbers at coastal wetlands and inland lakes. The largest group recorded was of 52 birds at Lake Eraulo on 5 November 2003.

GREY PLOVER *Pluvialis squatarola*

This species was less common than Pacific Golden Plover and it was generally recorded as singles or a small parties along beaches. About 100 individuals were present on short grass on the floodplain at Lake Iralalara on 13 December 2003.

LITTLE RINGED PLOVER *Charadrius dubius*

This plover was a regular but uncommon visitor to Timor, with seven records at Loes estuary (one on 18 September and probably the same bird on 25 September 2004), Manatuto (one on 14 December), Tasitolu (two on 20 December 2004, one on 17 May 2004, and three on 6 December 2004) and Lore (two groups of three on 3 April 2003). The first Timor records were of twos and threes at Secal and Lake Laga on 24–28 October 1973 (McKean *et al.* 1975). This species was unrecorded by Johnstone (1994). It occurs relatively frequently in Nusa Tenggara (personal observations), but it is a rare visitor to nearby Australia (Barrett 2003, Chatto 2003).

RED-CAPPED PLOVER *Charadrius ruficapillus*

This species is a locally common breeding resident on mudflats associated with saline lakes and aquaculture ponds, with nests noted at Tasitolu in 2003 (Olsen and Trainor 2005) and 2004. A pair was observed mating at Taitolu on 13 May 2004; one young chick was noted on 17 May 2004, and a nest with one egg was photographed and an immature bird were seen on 4 June 2004. Another fledgling was observed at Secal on 30 April 2004. A nest with two eggs was photographed

at Kupang Bay on 10 June 2004. This nest was protected by the peeled bark of a log beside a dry fishpond. Groups of up to 66 individuals were regularly observed, and 240–300 birds were recorded at Tasitolu on 31 December 2003 to 4 January 2004. At Kupang Bay, 217 birds were counted in c.800 ha of mudflats on 10–12 June 2004. Just six previous Wallacean records were listed by Coates and Bishop (1997). In addition, Verbelen (1996) noted at least ten at Kupang Bay. Previous authors have considered this species to be an Australian winter migrant or vagrant (Mayr 1944, Johnstone 1994, Coates and Bishop 1997).

MALAYSIAN PLOVER *Charadrius peronii*

Near Threatened. This plover is an uncommon but widespread resident beach-dweller along the coast of Timor-Leste, with records from 14 sites: Loes river estuary (three pairs), Comoro estuary (two pairs), Secal (two pairs and a single), Tua Koin (2–3 birds); Atekru (a pair); Manatuto (a pair); Baucau beach (two pairs), Com (1–3 birds), Irebere estuary (a pair); Laga beach (a pair), Lore-Namulutu (a single and a pair), Namulutu estuary (a single), Vero (three pairs), and Waiara river estuary (one female). A pair was also recorded at Kupang Bay on 12 June 2004.

LESSER SAND PLOVER *Charadrius mongolus*

This species was a regular but widespread migrant of beaches, estuaries and mudflats, and it was probably only present as a rapid transient on route to and from Australia (in August–December and March–April). Most records were of small parties, but 70 birds were observed at Lake Laga on 14 November 2003. There was one inland record at Lake Iralalara on 18 November 2004.

GREATER SAND PLOVER *Charadrius leschenaultii*

This species was an uncommon winter visitor, with records from exposed reef, beaches, estuaries, mudflat and short grass in September–April. It was typically recorded in small parties of fewer than ten birds, but 40 were present at Lake Laga on 16 February 2003. There are surprisingly few other records for the Timor region (Thompson *et al.* 1976, Johnstone 1994).

ORIENTAL PLOVER *Charadrius veredus*

This species occurs regularly on Timor during the southward migration and probably stages at some sites in small numbers. There were 34 records of 1–95 birds from 23 September to 7 February at the edge of freshwater lakes, swamps, saline lakes, and fallow ricefields. Remarkably, there were more records of this species than both Lesser and Greater Sand Plovers. At the Assalaino pass (500 m), this species probably stages in small numbers (to 100 birds) on karst shrubland. It was regularly observed in central Dili at the former United Nations heliport. Oriental Plover has been regularly recorded at Kai Kecil: Mauro (1999) reported up to five birds on 21 October 1998, and Kuhn collected this species repeatedly (Hartert 1901, White 1975). Johnstone (1994) recorded a single bird at Sabu island on 29 September 1990. Oriental Plover has been considered a rare transient in Wallacea (Coates and Bishop 1997).

ORIENTAL PRATINCOLE *Glareola maldivarum*

Small numbers of Oriental Pratincole were observed at several sites in 2003, but in November 2004 large numbers staged at Assalaino pass and Lake Iralalara, before migrating to wintering grounds in Australia. During 17–19 November, small to large groups (3–1,500 birds) were observed at Lake Iralalara resting in short grass, or feeding swallow-like over the floodplain and surrounding woodland in the late afternoon. On 18 November, a flock of c.1,500 birds was observed at 12h30–13h30, feeding in compact groups, and spiralling upwards in thermals. Groups of up to 500 birds were observed feeding over an area of about 5 km² and resting on short grass amongst karst limestone at Assalaino pass (500 m) in the late afternoon on 24 and 25 November. At dusk, groups were observed flying towards Lake Iralalara (15 km to the south-east) with other birds returning from that direction. On 26 November, a group of about 1,000 birds flew high (>1,000 m) and were then lost amongst approaching storm clouds; other groups of 400–500 were observed later in the day. On 28 November, nine birds were seen flying south-east at Raumoko (30 km west of Assalaino pass) and 100 birds were observed feeding low over fallow ricefields in Los Palos. Lake Iralalara was visited again on 29 November, and c.2,500–3,000 birds were video-recorded as they flew in compact groups and rode thermals at 13h00. The following day no birds were present. It is likely that the 1,000 birds from Assalaino had joined the Lake Iralalara group, and on 29 or 30 November they all departed for their winter grounds. Other records included 120 birds resting at the Loes river estuary on 11 November 2004, and c.130 birds at O'Swamp on 16 November 2004. The last record was of one bird at Tasitolu on 3 December 2004.

There are few Wallacean records of substantial numbers: Hornbuckle (2001) saw 120 birds on Sumba on 1 November 2001, and Verhoeve and Holmes (1998) noted 85 birds on Flores on 3 December 1990. The extensive grasslands of Sumba might also be used for staging by Oriental Pratincole.

AUSTRALIAN PRATINCOLE *Stiltia isabella*

This species is a regular and widespread Australian winter migrant, recorded in small numbers (1–20 birds) from 2 August to 21 November and on 2 May 2004 on fallow ricefields, braided stream channels and fringing lakes. An estimated 1,500–2,500 birds were present at Kupang Bay on 10–12 June 2004. Thompson *et al.* (1976) reported c.30 at Secal on 19 May 1974, and Holmes (1993) indicated that they were 'very common' in West Timor in July. Verbelen (1996) noted at least 50 birds at Kupang Bay.

GULL-BILLED TERN *Gelochelidon nilotica*

This species apparently occurs transiently in Timor-Leste. The only records of this species were of 1–5 birds at Tasitolu from 30 October to 26 November 2003, and observations at several sites during 18 September to 11 October 2004. Andrew (1986) noted a maximum of 82 birds at Kupang Bay on 1 October 1985. McKean *et al.* (1975) recorded two at Secal on 28 October 1973, and Verbelen (1996) reported at least 20 from Kupang Bay.

Gull-billed Tern is an uncommon visitor during June to November (particularly October–November), presumably from Australia.

LESSER CRESTED TERN *Sterna bengalensis*

This species was scarce but possibly overlooked, with four records of 1–8 birds along Dili foreshore during 1–7 November 2003.

GREAT CRESTED TERN *Sterna bergii*

This tern was locally common around Dili but generally scarce elsewhere (128 records from 14 sites). Tasitolu was regularly used as a roost by 50–150 birds, with a maximum of c.380 birds on 2 January 2004.

LITTLE TERN *Sterna albifrons*

This species is an uncommon breeding visitor to Timor-Leste. At Lake Laga, 25 birds including at least six pairs were incubating eggs or feeding fish to chicks on a small gravel islet on 2 August 2003; five adults and one downy chick were present on 11 October 2004; six adults and five chicks were seen on 23 October 2004; and three juveniles were seen on 5 November 2004 (with no birds seen on 28 November or 2 December 2004). This species was also recorded (probably breeding) at Loes river estuary on 25 September 2004. Forty birds were present at Kupang Bay on 12 June 2004, with mating observed. McKean *et al.* (1975) reported four birds at Laivai and two at Secal on 25–28 October 1973. Johnstone (1994) noted breeding at Merah island on 8 May 1991. In Wallacea, breeding was given as May–September (Coates and Bishop 1997), but it breeds throughout the dry season on Timor.

COMMON TERN *Sterna hirundo*

New island record. One bird was observed in flight and perched on rocks near Atabae on 11 November 2004 and two were present at Dili on the foreshore on 13 November 2004 (both observations were video-recorded). The birds at Dili perched on a rusting shipwreck about 30 m from the beach. These birds were large (35–40 cm long), eliminating smaller species such as Whiskered Tern *Chlidonias hybridus*, White-winged Tern *C. leucopterus* or Little Tern. The most likely confusion species is the smaller Black-naped Tern *Sterna sumatrana* or Roseate Tern *Sterna dougallii*. The bill was black, moderately long (almost the same as head length, and longer than shown in Coates and Bishop 1997) and appeared to be slightly decurved. The bill shape excluded the possibility of Gull-billed Tern, although the length suggested Roseate Tern. The legs were black, probably excluding Roseate Tern. The forehead was white, and there was a well-developed black cap from behind and above the eye to the nape. The neck and chest were clean white, the wings were light grey with a well-defined blackish carpal-bar. The light grey wings, dark carpal-bar and blackish outer primaries are typical of non-breeding Common Tern, and darker than in Black-naped Tern or Roseate Tern. Common Tern breeds in North America, Eurasia, and Africa and winters in South America, South Africa, South-East Asia and Australia (Coates and Bishop 1997). In the Lesser Sundas there are records from

Sumbawa, Flores and Sumba, but it is apparently uncommon (Coates and Bishop 1997).

WHITE-WINGED TERN *Chlidonias leucopterus*

This tern is an uncommon migrant, with two seen at an estuary 10 km east of Vermasse on 11 October 2004 and up to six at Tasitolu on 13–20 October 2004. McKean *et al.* (1975) reported 500 birds at Baucau beach on 22 October, ten at Jaco island on 25 October and five at Secal on 28 October 1973, probably indicating that passage through the Timor area occurs in October.

WHISKERED TERN *Chlidonias hybridus*

This species was seasonally locally common, with records from five sites, extending through all months except February–March. Larger groups included 82 birds at Lake Iralalara on 29 September 2004 and up to 50 birds at Tasitolu through September 2004. Andrew (1986) reported the Australian race *javanicus* from Kupang Bay in September.

LITTLE GREBE *Tachybaptus ruficollis*

Little Grebe is a locally common breeding resident on lakes and rivers in Timor-Leste. At Lake Eraulo, three stripe-headed juveniles were present on 26 April 2003, and at Lake Iralalara two juveniles were present on 25 April 2004. The species is an abundant non-breeding resident at Tasitolu, with 40–50 birds usually recorded, and up to 82 birds on 20 October 2004.

AUSTRALASIAN GREBE *Tachybaptus novaehollandiae*

A breeding adult with two chicks (with striped head, red bill and dark iris) was recorded at Lake Iralalara on 24 and 28 May 2004. Little Grebe occurs sympatrically at this site. Australasian Grebe is apparently rare on Timor, and this is one of the first breeding records. An immature male was collected 10 km west of Lautem on 14 April 1974 by Thompson *et al.* (1976). Other Timor records include an adult male collected at Supul on March 30 (Thompson *et al.* 1976). On Timor, Coates and Bishop (1997) note this species occurring only in West Timor. This species was also recently recorded from a large freshwater lake on Roti island (Trainor 2005).

DARTER *Anhinga melanogaster*

Near Threatened. Darter is a locally common species in Timor-Leste on freshwater lakes and rivers, estuaries and outcrops along the coast. A large (probably breeding) population is present on Lake Iralalara, with regular counts of more than ten individuals, and maximum counts of 19–20 birds (flying to a roost along the Irasequiro river), but otherwise this species was observed mostly as singles and small parties. Females have pale necks and males have a broad white stripe behind the eye and rusty foreneck-patch; these characters identify the race occurring on Timor as *novaehollandiae*. McKean *et al.* (1975) observed 30 birds at Lake Iralalara. At least three individuals were seen at Kupang Bay by Verbelen (1996).

LITTLE PIED CORMORANT *Phalacrocorax melanoleucos*

This species was common, widespread and usually recorded as singles and groups of up to five birds, but a large resident population of 100–350 birds was present at Lake Iralalara, probably one of the largest in Wallacea (cf. Coates and Bishop 1997). In August–September 2001, local communities collected eggs and chicks from an estimated 500–1,000 nests at Lake Iralalara during receding flood waters (C. da Silva and A. Marcus verbally 2004). This species is also abundant on Roti island (Trainor 2005).

LITTLE BLACK CORMORANT *Phalacrocorax sulcirostris*

This cormorant was locally common in small to large flocks on saline or freshwater lakes, and along the coast. Two large groups were recorded: c.350 at Tibar aquaculture ponds (these birds frequently flew to Tasitolu to feed and roost) and 200–300 birds at Lake Iralalara (where local people state that they breed).

WHITE-FACED HERON *Egretta novaehollandiae*

This species was locally common in ricefields east of Baucau (at Secal, Vermasse and Laivai), but there were only two records from Lautem district. Verbelen (1996) noted at least 30 birds at Kupang Bay. It is probably a breeding resident.

LITTLE EGRET *Egretta garzetta*

This egret was locally common on mudflats, exposed reefs, freshwater lakes and streams, occurring mostly singly or in small groups, but 30–60 birds were recorded at Lake Iralalara and Manatuto mudflats. Numbers rose steadily at Tasitolu from two birds on 12 April to 41 birds on 11 May 2003, presumably indicating the arrival of visitors from Australia.

PACIFIC REEF EGRET *Egretta sacra*

Pacific Reef Egret was common and widespread along the coast, and was usually recorded as singles and small loose groups of up to 15 birds. An exceptional group of 68 birds was present at Secal on 19 September 2004.

PIED HERON *Egretta picata*

This heron was generally an uncommon or rare visitor to Timor-Leste (from Australia), and it was regularly recorded only at Lake Iralalara, where 1–6 birds were noted in the dry season from September to December in 2003 and 2004 (but were absent during January–April 2004). A single immature bird with a white head and neck was present at Tasitolu on 18 May 2004. The first Timor records were of up to 18 birds at Kupang bay on 31 August 1985 (Andrew 1986). On Roti, Johnstone and Jepson (1996) noted two birds on 7 October.

GREAT-BILLED HERON *Ardea sumatrana*

Near Threatened. Great-billed Heron was an uncommon resident of remote coastline in Timor-Leste. There were six records: Lake Modo Mahut (one), Namulutu estuary (four singles along several kilometres of reef), Maca beach (three singles), and Com (one). Additional records include one at Tutuala, one near Baucau beach and one along rocky coast between Dili and Manatuto (McKean *et al.* 1975,

Thompson *et al.* 1976). Lesmana *et al.* (2000) reported an observation of one bird at Bena Hunting Park, West Timor.

PURPLE HERON *Ardea purpurea*

This large heron was a surprisingly rare resident of beaches and exposed reefs, with records at Valu beach (a single on the beach and three roosting in sea caves 1 km to the south), Vero river estuary (one), and Jaco island (one). Coates and Bishop (1997) noted only one Timor record of Purple Heron, but Verbelen (1996) saw a single bird at Kupang Bay. Ten Kate collected this bird on Roti in 1891 (Johnstone and Jepson 1996).

GREAT EGRET *Casmerodius albus*

Great Egret was locally common at coastal and freshwater wetlands. Large groups totalling at least 53 birds were present at Lake Iralalara on 12 November 2003, and 12 were present at Cristo Rei on 14 November 2003. This bird possibly breeds at Lake Iralalara. This species was unrecorded by Thompson *et al.* (1976).

INTERMEDIATE EGRET *Mesophoyx intermedia*

This egret was generally uncommon on freshwater lakes and estuaries, except at Lake Iralalara where large groups of 100–200 individuals were observed on several occasions.

CATTLE EGRET *Bubulcus ibis*

This species was locally common, with records from ricefields, freshwater lakes and estuaries, usually in tight groups of 10–40 birds. There were at least 300 birds at Lake Iralalara in October 2004.

LITTLE HERON *Butorides striatus*

This heron was a locally common resident, especially on coastal mudflats and estuaries, with one inland record at the Lake Iralalara (Irasequiro river).

BLACK-CROWNED NIGHT HERON *Nycticorax nycticorax*

New island record. Thirty birds roosted in *Hibiscus tiliaceus* and other riverine trees at Lake Iralalara (Irasequiro river) on 9 March 2003 (none was present 20 March 2004, but eight birds were present on 2 October 2004), and c.85–100 birds were flushed from *Typha* sp. reedbeds at O'Swamp on 11 March 2004 (and also on 27 November 2004). The black crown and hindneck contrasting with the white neck and underparts distinguished these birds from Rufous Night Heron, which has a rufous back and cinnamon neck and underparts. This species is either an occasional visitor or possibly a local breeding resident. There is one published Nusa Tenggara record (on Flores), one record for Ashmore Reef off south-west Timor (Coates and Bishop 1997), and it has recently been newly recorded on Sumbawa and Lombok (Y. Rusila-Noor in Trainor *et al.* in press, personal observations).

RUFOUS NIGHT HERON *Nycticorax caledonicus*

This species was generally an uncommon and local resident, with records from *Typha* sp. swamps, mangroves and rivers. All observations were of singles, except for ten found roosting with Black-crowned Night Herons at Lake Iralalara, and three at Com

(Lake Airleo) which were repeatedly but unsuccessfully attacked by a Peregrine Falcon *Falco peregrinus*. Thompson *et al.* (1976) reported a single subadult at Secal, and Stein collected one in West Timor (Mayr 1944).

YELLOW BITTERN *Ixobrychus sinensis*

This bittern was locally common at freshwater marshes, lakes and swamps, but with only 11 records of 21 birds, this bird was probably often overlooked because of its inconspicuous behaviour. It was usually flushed as singles, including six birds at O'Swamp.

CINNAMON BITTERN *Ixobrychus cinnamomeus*

This species was locally common, with 18 records from four sites, all on the Fuiloro plateau, covering wet grassland, sedge and *Typha* sp. swamp habitat. Noske and Ueda (1996) reported the first Timor record of Cinnamon Bittern from near Kupang.

BLACK BITTERN *Dupetor flavicollis*

This species was an occasional resident of rivers, freshwater lakes and swamps, with records of singles and pairs from eight sites; it was particularly frequent at Lake Iralalara (Irasequiro river). It is probably a breeding resident. A dark brown juvenile bird was observed at Lake Be Malae on 17 December 2003, and a streak-chested juvenile was observed at the Irasequiro river on 15 October 2004 (R. F. A. Grimmett verbally 2004). The species was not recorded by Thompson *et al.* (1976), but a single was collected in West Timor (Mayr 1944).

GLOSSY IBIS *Plegadis falcinellus*

Glossy Ibis is an uncommon visitor to Timor, presumably from Australia. One was present at Tasitolu from 17 May to 7 June 2004, and four birds were observed at Iralalara from 8 October to 30 November 2004. Andrew (1986) reported 26 birds on 31 August and 21 on 2 October at Kupang Bay.

ROYAL SPOONBILL *Platalea regia*

This species was a regular Australian visitor to Timor-Leste (and Timor), with 23 records from seven sites during September to February (but probably present year-round). It was usually observed in small groups, but 109 birds were present at the Loes estuary from 11 November 2004 to 5 December 2004. Two specimens from Dili have been collected (on 17 April 1931: Mayr 1944). Verbelen (1996) saw at least 40 birds at Kupang Bay.

AUSTRALIAN PELICAN *Pelecanus conspicillatus*

This species was frequent on coastal lakes, mudflats and inland freshwater lakes and marshes throughout the year. It should be considered as a regular visitor to Timor rather than an uncommon vagrant from Australia (cf. Coates and Bishop 1997). Most flocks were small (mean = 10.3 birds), but there were nine observations of larger flocks (30–71 individuals). The first Timor record was of two birds at Secal (McKean *et al.* 1975).

DISCUSSION

Species status

The discovery of ten new waterbirds for Timor, and a revision to our understanding of the status of many species on Timor, highlights the former poverty of knowledge of Timor's waterbird fauna. Inconspicuous species such as Greater Painted-snipe and Spotless Crake (and possibly the nocturnal Black-crowned Night Heron) almost certainly breed on Timor but have been overlooked in the past. Their presence on the island hints at the possibility that other skulking waterbirds, particularly rails, may be resident. It is telling that there are no endemic rails known from Timor, whereas several of the wetter Wallacean islands (e.g. Sulawesi, Talaud and Halmahera) support endemic forms (Coates and Bishop 1997, Lambert 1998a,b).

The status of a number of Australian waterbirds has been clarified by the records presented here. Australian Pelican is clearly a common year-round visitor to Timor, and not a vagrant, or a visitor following periodic 'influxes' as suggested by Coates and Bishop (1997). Species such as Pied Heron and Glossy Ibis possibly occur as regular winter visitors in low numbers but more observations will be needed to confirm this. Hardhead and Common Coot clearly occur as regular long-term visitors. Observations of Hardhead at Lake Iralalara suggest that it arrives in large numbers at the end of the dry season to exploit favourable feeding conditions. Red-capped Plover has been confirmed as a breeding resident (Olsen and Trainor 2005), with observations of juveniles and mating in the current survey, even though the species was previously not even recognised as occurring in Wallacea by some authors (Marchant and Higgins 1993).

Timor-Leste has been confirmed as a regular wintering area for many Palearctic passage migrants, especially Whimbrel, Eastern Curlew, Pacific Golden Plover, Grey Plover, Greater Sand Plover, Marsh Sandpiper, Common Greenshank, Wood Sandpiper, Common Sandpiper, Grey-tailed Tattler, Red-necked

Stint, Long-toed Stint and Swinhoe's Snipe. Only three of these species were observed in flocks of 100 birds or more (Red-necked Stint, Grey Plover and Common Greenshank). This appears to be typical in Wallacea, with the exception of Kupang Bay and Gulf of Bone where large flocks occur (Andrew 1986, Coates and Bishop 1997). The high turnover of transients at several wetlands (notably Tasitolu and Lake Laga) is another important feature of Timor-Leste wetlands. While peak numbers are small, significant numbers of birds use many wetlands as stopover sites during southward or northward migration.

The discovery of Oriental Pratincole and Oriental Plover staging in Timor-Leste is one of the most interesting findings of this study. Both species winter in Australia and have been irregularly reported in Wallacea (presumably because of the sporadic nature of past field-effort). Lake Iralalara is particularly important for these species with up to c.3,000 Oriental Pratincole recorded November 2004. The low number of Little Curlew records was striking, but possibly in some years short-grass habitat in Timor-Leste is used by this species as well.

Timor island is important for several species that typically do not continue migrating further south to winter in Australia. These include Common Redshank, Long-toed Stint and Little Ringed Plover. The latter species occurs regularly in small numbers in Timor-Leste and through Nusa Tenggara, with recent records from Roti, Sumba and Lombok (Trainor submitted, N. Kemp, verbally 2004). On current information, Timor probably provides an important stopover for small numbers of uncommon migrants such as Ruddy Turnstone, Red Knot, Great Knot, Sanderling and Ruff (and probably Asian Dowitcher *Limnodromus semipalmatus* and Eurasian Curlew *Numenius arquata*: Andrew 1986).

The Near Threatened Beach Thick-knee and Malaysian Plover, which both have restricted beach and coastal distributions, were recorded relatively frequently; Timor-Leste hosts important populations of

Table 3. The top 15 Timor-Leste wetlands ordered by the total number of waterbird species recorded.

Site	No. field-days	No. waterbird species (& no. wader species)	Habitat	Importance for waterbirds	Priority for further surveys
Tasitolu	110	53(30)	Saline lakes, mudflat, beach	***	**
Lake Iralalara	28	50(20)	Freshwater lake, swamps, stream	***	***
Secal	5	43(24)	Estuary, mangroves and mudflats	**	***
Loes river estuary	5	38(21)	Braided stream, estuary and mudflats	**	***
Lake Laga	21	35(24)	Saline lake, beach	**	**
Lake Be Malae	5	31(14)	Shallow saline lake and estuary	**	*
Manatuto mudflats	10	31(19)	Mudflats, mangrove and fishponds	**	**
Tibar aquaculture	21	31(21)	Mudflats, mangrove and fishponds	*	**
O'Swamp	14	23(9)	Spring-fed marsh, reedbeds, short grass	***	***
Raumoko estuary	7	21(14)	Beach and exposed reef	*	*
Dili foreshore	42	20(12)	Beach and estuary	*	*
Lake Eraulo	5	19(7)	Freshwater marsh	**	**
Lake Maubara	10	18(9)	Shallow saline lake	*	*
Lake Seloi	5	17(8)	Freshwater marsh	**	**
Lake Modo Mahut	1	15(2)	Freshwater lake	***	***

these species. Malaysian Plover was repeatedly observed on beaches used intensively by people (at Tua Koin, Com and Comoro river estuary), apparently indicating that the species can cope with high levels of disturbance. Of the resident waterbirds, some of the largest Wallacean flocks were observed for Little Pied Cormorant, Little Black Cormorant, Pacific Black Duck, and Sunda Teal.

Seven waterbirds and coastal seabirds listed for Timor went unrecorded in the current survey: White-headed Shelduck *Tadorna radjah*, Kentish Plover *Charadrius alexandrinus*, Eurasian Curlew, Asian Dowitcher, Ruff, Caspian Tern *Sterna caspia* and Australian Ibis *Threskiornis molucca*. The plover, curlew and Ruff are winter visitors from the Palearctic and are known only from Kupang Bay in West Timor, highlighting the importance of that area to passage migrants (Andrew 1986). The first Timor record of Ruff was of two birds photographed at Kupang Bay by Verbelen (1996). The Kupang Bay wetlands, with c.2,000–4,000 ha of mudflats and fishponds, has no equivalent in Timor-Leste, but these migrants might occur as rare visitors to Timor-Leste. The only Timor record of Australian White Ibis was also at Kupang Bay on 7 August 1998 (R. Drijvers in Trainor *et al.* in press). Up to five Asian Dowitchers were recorded from mudflats at Hera in October 2003 (J. Keast verbally 2005). A large flock of White-headed Shelduck was recorded in Timor-Leste on a pond at 1,280 m in April 1882 (Forbes 1885). The status of the Caspian Tern is poorly known, with the only records coming from Baucau and around Dili in October, January and May (McKean *et al.* 1975). Australian White Ibis is probably a rare visitor from Australia, like White-headed Shelduck.

Key sites

While there were substantial differences in survey effort between sites, a number of nationally and regionally important wetlands have been identified in this study (Table 3). Lake Iralalara, including the Irasequiro river, is the most important freshwater wetland in Timor-Leste, and probably the entire Nusa Tenggara region. It will be included in the nation's first national park along with the adjacent closed-canopy forests around Tutuala, Maupiting and Mehara villages. The lake usually covers 5–8 km², but during irregular flooding (e.g. in 1954, 1966, 1970, 1974–1975, 1997, 1999–2001; I. Mendes verbally 2004) it reaches about 100 km². A diverse range of wetland habitats in the area support large populations of egrets, cormorants and Pacific Black Duck (which occurs in large congregations at the end of the dry season each year). Local people state that flooding triggers colonial nesting by many waterbirds, especially cormorants, but this has never been formally documented. Five of the ten species newly reported for Timor island were recorded at Lake Iralalara: Hardhead, Green Pygmy-goose, Ruddy-breasted Crake, Greater Painted-snipe and Black-crowned Night Heron, and a further species, the Spotless Crake, was recorded at associated wetlands. Several Palearctic winter migrants including Sharp-tailed Sandpiper, Long-toed Stint and Swinhoe's Snipe overwinter at the lake, with populations numbering in the tens or low hundreds of birds.

The saline lakes of Tasitolu were repeatedly censused and consequently had the highest total number of waterbird species, including 27 Palearctic migrants, resident populations of Little Grebe and Red-capped Plovers and occasional occurrences of rare waterbirds (Hardhead, Red Knot, Spotted Redshank and Little Ringed Plover). Tasitolu was identified as an Important Bird Area, with surrounding savannas hosting Timor Sparrow *Lonchura fuscata* (Vulnerable) and Slaty Cuckoo Dove *Turacoena modesta* (Vulnerable), and it will be gazetted as a Peace Park (BirdLife International 2003, Ministry of Agriculture, Forestry and Fisheries *et al.* 2003). The Tasitolu lakes are ecologically linked to numerous surrounding small wetlands: the Tibar mudflats and aquaculture ponds 3 km to the west, Comoro river estuary, Dili and Cristo Rei foreshore. The extensive mudflats at Hera and Metinaro (15–30 km east of Dili) support relatively high numbers of cormorants, Darter and winter migrants.

Lake Laga is a second shallow saline lake that deserves special mention. It appears to be important for numerous flocks of transient waders, and provides habitat for Oriental Plover and breeding Little Tern.

Suggestions for further study

The status of a number of waterbirds remains poorly known on Timor, with targeted surveys needed for elusive rails, snipe and perhaps night herons. Wetlands on the Fuloro plateau and the Lake Modo Mahut region, both of which include a wide range of springs, swamps, marshes, and reedbeds, should be targeted initially. The status of several winter migrants remains poorly known and further surveys of saline lakes, mudflats and large river estuaries (e.g. Loes and Secal, but others might be identified) are a priority. The accessibility from Dili of a range of wetlands along the north coast (e.g. Lake Maubara, Tibar aquaculture, Tasitolu, Metinaro and Manatuto mudflats) would make these candidates for regular monitoring of waterbird populations (and perhaps research and environmental education programmes). Further study of migrants at the regionally important Kupang Bay is also needed. At this site winter counts of Australian Pratincole (at least) qualify this site as an internationally significant wetland (following Delaney and Scott 2002).

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APPENDIX 1

Summary of status, habitat use and sites for waterbird species recorded in Timor-Leste (2002–2004).

Species	Status	Abundance	No. records	Elevation (m)	Sites
WANDERING WHISTLING-DUCK <i>Dendrocygna arcuata</i>	Br	C	31	0–1,130	60, 63, 58, 8, 57, 65, 29, 14, 5, 50
PACIFIC BLACK DUCK <i>Anas superciliosa</i>	Br	C	51	0–1,130	60, 58, 53, 35, 8, 57, 14, 43, 5, 56, 64, 50, 34, 13
SUNDA TEAL <i>Anas gibberifrons</i>	Br	C	73	0–330	13, 35, 2, 65, 29, 5, 31, 34, 13, 11
GARGANEY <i>Anas querquedula</i>	Pv	R	2	3	35
HARDHEAD <i>Aythya australis</i>	Va	U	10	3–340	13, 35, 60, 65
BUFF-BANDED RAIL <i>Gallirallus philippensis</i>	Br	U	14	340–420	13, 50, 51, 53, 56, 60
WHITE-BREADED WATERHEN <i>Amauorornis phoenicurus</i>	Br	F	27	0–600	5, 33, 46, 47, 48, 50, 54, 56, 58, 60, 64, 65
RUDDY-BREADED CRAKE <i>Porzana fusca</i>	Br	U	3	330–420	50, 53, 65
SPOTLESS CRAKE <i>Porzana tabuensis</i>	Br	U	8	340–420	50, 60
WHITE-BROWED CRAKE <i>Porzana cinerea</i>	Br	F	30	0–420	16, 50, 56, 60, 63, 65
PURPLE SWAMPHEN <i>Porphyrio porphyrio</i>	Br	LC	13	5–420	29, 50, 60, 65
DUSKY MOORHEN <i>Gallinula tenebrosa</i>	Br	LC	18	5–334	29, 65
COMMON COOT <i>Fulica atra</i>	?Va/Br	LC	10	5–1,130	8, 14, 29
SWINHOE'S SNIFE <i>Gallinago megalala</i>	Pm	F	36	2–1,130	8, 39, 43, 50, 53, 55, 62, 65
BLACK-TAILED GODWIT <i>Limosa limosa</i>	Pm	U	13	0–1,050	11, 13, 14, 34, 35, 65
BAR-TAILED GODWIT <i>Limosa lapponica</i>	Pm	U	14	0–5	5, 11, 13, 65
LITTLE CURLEW <i>Numenius minutus</i>	Pm	R	4	3–334	13, 35, 65
WHIMBREL <i>Numenius phaeopus</i>	Pm	C	93	0–10	1, 2, 3, 5, 7, 9, 11, 13, 16, 20, 23, 24, 28, 31, 33, 34, 35, 45, 68, 69, 72, 73
EASTERN CURLEW <i>Numenius madagascariensis</i>	Pm	F	52	0–5	2, 7, 9, 11, 13, 23, 24, 31, 33, 34, 35
SPOTTED REDSHANK <i>Tringa erythropus</i>	Pm	?R	1	0	13
COMMON REDSHANK <i>Tringa totanus</i>	Pm	LC	42	0–5	2, 11, 13, 31, 34, 35
MARSH SANDPIPER <i>Tringa stagnatilis</i>	Pm	LC	118	0–420	2, 5, 6, 11, 13, 16, 20, 34, 35, 44, 48, 50, 53, 65, 73
COMMON GREENSHANK <i>Tringa nebularia</i>	Pm	LC	173	0–1,050	2, 5, 6, 11, 13, 14, 20, 29, 31, 34, 35, 40, 42, 44, 45, 48, 49, 56, 65
WOOD SANDPIPER <i>Tringa glareola</i>	Pm	LC	105	0–1,130	2, 5, 8, 11, 13, 14, 30, 34, 35, 45, 48, 50, 56, 60, 63, 65
COMMON SANDPIPER <i>Actitis hypoleucos</i>	Pm	C	277	0–1,130	1, 2, 5, 6, 8, 9, 11, 13, 13, 14, 15, 16, 17, 20, 22, 23, 24, 25, 29, 30, 30, 31, 33, 34, 35, 39, 40, 42, 44, 45, 48, 49, 54, 58, 61, 63, 65, 68, 69, 72, 73, 74
GREY-TAILED TATTLER <i>Heteroscelus brevipes</i>	Pm	LC	51	0–5	1, 3, 11, 13, 13, 16, 20, 23, 24, 31, 34, 35, 36, 45, 49, 54, 69, 73
RUDDY TURNSTONE <i>Arenaria interpres</i>	Pm	R	5	0–5	5, 13, 45, 69, 73
GREAT KNOT <i>Calidris tenuirostris</i>	Pm	R	18	0–334	13, 20, 31, 34, 45, 65
RED KNOT <i>Calidris canutus</i>	Pm	R	2	0	13
SANDERLING <i>Calidris alba</i>	Pm	R	9	0	5, 11, 13, 16, 34, 69
RED-NECKED STINT <i>Calidris ruficollis</i>	Pm	C	123	0–10	2, 5, 6, 11, 13, 16, 31, 33, 34, 35, 45, 48, 65, 69
LONG-TOED STINT <i>Calidris subminuta</i>	Pm	U	37	3–1,050	8, 13, 14, 34, 35, 50, 60, 63, 65
PECTORAL SANDPIPER <i>Calidris melanotos</i>	Pm	R	1	3	35
SHARP-TAILED SANDPIPER <i>Calidris acuminata</i>	Pm	F	77	0–1,050	2, 5, 6, 8, 11, 13, 14, 31, 34, 35, 65
BROAD-BILLED SANDPIPER <i>Limicola falcinellus</i>	Pm	R	1	5	13
RED-NECKED PHALAROPE <i>Phalaropus lobatus</i>	Pm	F	1	0	22
GREATER PAINTED-SNIPE <i>Rostratula benghalensis</i>	Br	U	5	334–400	50, 60, 65
COMB-CRESTED JACANA <i>Irediparra gallinacea</i>	Br	LC	23	5–334	29, 63, 65
BEACH THICK-KNEE <i>Esacus neglectus</i>	Br	LC	10	0–5	5, 34, 39, 49, 54, 58, 69, 72, 74
BLACK-WINGED STILT <i>Himantopus himantopus</i>	?Br	LC	158	0–1,130	2, 6, 8, 11, 13, 14, 20, 31, 34, 35, 65
PACIFIC GOLDEN PLOVER <i>Pluvialis fulva</i>	Pm	F	107	0–1,130	2, 5, 8, 11, 13, 18, 20, 30, 31, 33, 34, 35, 36, 45, 49, 50, 56, 64, 65
GREY PLOVER <i>Pluvialis squatarola</i>	Pm	F	33	0–326	7, 11, 13, 16, 20, 31, 35, 48, 49, 54, 65, 69, 73
LITTLE RINGED PLOVER <i>Charadrius dubius</i>	Pm	U	7	0–5	5, 13, 31, 54
RED-CAPPED PLOVER <i>Charadrius ruficapillus</i>	Br	C	155	0–10	2, 5, 6, 11, 13, 16, 20, 31, 34, 35, 69
MALAYSIAN PLOVER <i>Charadrius peronii</i>	Br	F	36	0–1	2, 5, 15, 16, 22, 31, 33, 34, 35, 39, 40, 45, 48, 49, 54, 58, 66, 69
LESSER SAND PLOVER <i>Charadrius mongolus</i>	Pm	U	30	0–330	5, 6, 11, 13, 16, 20, 31, 34, 35, 45, 48, 65, 69, 73

Species	Status	Abundance	No. records	Elevation (m)	Sites
GREATER SAND PLOVER <i>Charadrius leschenaultii</i>	Pm	U	28	0–5	2, 3, 5, 6, 11, 13, 16, 20, 31, 33, 34, 35, 40, 45, 48, 49
ORIENTAL PLOVER <i>Charadrius veredus</i>	Pm	R	34	0–500	13, 18, 30, 35, 50, 51, 55, 56, 64, 65
ORIENTAL PRATINCOLE <i>Glareola maldivarum</i>	Pm	R	50	0–1,050	5, 13, 14, 45, 50, 55, 56, 62, 65
AUSTRALIAN PRATINCOLE <i>Siltia isabella</i>	Am	F	33	0–334	5, 12, 13, 16, 30, 34, 35, 50, 64, 65
GULL-BILLED TERN <i>Gelochelidon nilotica</i>	Am	F	13	0–5	2, 13, 34, 36, 45
LESSER CRESTED TERN <i>Sterna bengalensis</i>	?Av	U	4	0–5	20
GREAT CRESTED TERN <i>Sterna bergii</i>	Iv	C	128	0–5	2, 3, 5, 7, 10, 13, 16, 20, 23, 31, 33, 34, 40, 73
LITTLE TERN <i>Sterna albifrons</i>	Br	R	12	0	5, 34, 35, 36, 45, 50
COMMON TERN <i>Sterna hirundo</i>	Pm	R	3	0	3, 20, 48
WHITE-WINGED TERN <i>Chlidonias leucopterus</i>	Pm	R	3	0	13, 36
WHISKERED TERN <i>Chlidonias hybridus</i>	Am	F	100	0–400	2, 5, 13, 13, 20, 34, 35, 56, 65
LITTLE GREBE <i>Tachybaptus ruficollis</i>	Br	LC	144	0–1,130	2, 6, 8, 13, 19, 29, 56, 58, 60, 63, 65
AUSTRALASIAN GREBE <i>Tachybaptus novaehollandiae</i>	Br	R	1	330	65
DARTER <i>Anhinga melanogaster</i>	?Br	F	57	0–1,130	2, 6, 7, 8, 9, 11, 13, 23, 29, 39, 49, 58, 64, 65
LITTLE PIED CORMORANT <i>Phalacrocorax melanoleucos</i>	Br	LC	151	0–1,130	5, 6, 7, 8, 13, 14, 23, 29, 31, 33, 37, 39, 40, 44, 45, 48, 50, 56, 57, 58, 60, 63, 64, 65, 69, 74
LITTLE BLACK CORMORANT <i>Phalacrocorax sulcirostris</i>	Br	LC	137	0–1,130	2, 6, 8, 11, 13, 14, 20, 23, 27, 29, 31, 34, 40, 45, 65
WHITE-FACED HERON <i>Egretta novaehollandiae</i>	?Br	LC	21	0–50	2, 5, 30, 33, 34, 35, 38, 39, 40, 42, 44, 45
LITTLE EGRET <i>Egretta garzetta</i>	Br	LC	100	0–1,130	2, 5, 8, 11, 13, 14, 23, 24, 31, 33, 34, 56, 65
PACIFIC REEF EGRET <i>Egretta sacra</i>	Br	C	70	0–5	4, 5, 10, 11, 13, 15, 17, 20, 21, 22, 23, 33, 34, 45, 48, 49, 54, 58, 68, 69, 71, 72, 73, 74
PIED HERON <i>Egretta picata</i>	Am	U	13	0–334	13, 65
GREAT-BILLED HERON <i>Ardea sumatrana</i>	Br	U	9	0–5	5, 6, 29, 49, 54, 58, 66
PURPLE HERON <i>Ardea purpurea</i>	Br	R	6	0–2	58, 69, 73, 74
GREAT EGRET <i>Casmerodius albus</i>	?Br	F	92	0–1,130	2, 5, 7, 8, 11, 13, 14, 23, 24, 29, 31, 34, 38, 40, 45, 49, 54, 56, 65
INTERMEDIATE EGRET <i>Mesophoyx intermedia</i>	?Br/Am	U	35	0–1,130	2, 8, 13, 14, 31, 34, 45, 56, 65
CATTLE EGRET <i>Bubulcus ibis</i>	?Br	LC	15	0–340	2, 5, 6, 31, 34, 39, 65, 67
LITTLE HERON <i>Butorides striatus</i>	Br	LC	41	0–340	1, 2, 6, 11, 13, 23, 24, 31, 34, 35, 42, 48, 49, 58, 65, 69
BLACK-CROWNED NIGHT HERON <i>Nycticorax nycticorax</i>	?Br/Va	R	6	0–420	34, 50, 64, 65
RUFIOUS NIGHT HERON <i>Nycticorax caledonicus</i>	Br	U	12	0–420	2, 11, 31, 34, 35, 42, 50, 58, 64, 65
YELLOW BITTERN <i>Ixobrychus sinensis</i>	Pv	LC	11	5–420	29, 50, 52, 53, 65
CINNAMON BITTERN <i>Ixobrychus cinnamomeus</i>	Br	LC	18	330–420	50, 53, 60, 65
BLACK BITTERN <i>Dupetor flavicollis</i>	Br	U	15	0–1,130	2, 8, 39, 58, 60, 65, 69
GLOSSY IBIS <i>Plegadis falcinellus</i>	?Am/Av	R	8	3–334	13, 65
ROYAL SPOONBILL <i>Platalea regia</i>	Am	U	27	0–334	2, 5, 11, 13, 31, 40, 65
AUSTRALIAN PELICAN <i>Pelecanus conspicillatus</i>	Av	F	114	0–1,130	5, 6, 8, 11, 13, 14, 65, 71, 74

Key

Species status

Br= Breeding resident

Non-breeding visitor: Av= Australian visitor, Pv= Palearctic winter visitor, Iv= Indian Ocean

Passage migrant: Am= Australian summer passage migrant, Pm= Palearctic winter passage migrant

Va= Vagrant

Abundance

A= Abundant

C= Common

LC= Locally common

F= Frequent

U= Uncommon

R= Rare

APPENDIX 2

Timor-Leste wetland sites (site numbers correspond to those in Fig. 1)

No.	Wetland site	District	Area (ha)	Elevation (m)	Habitat	Coordinates
1	Batugade	Bobonaro	3	0	Exposed reef, mudflat	8°56'54"S 124°57'44"E
2	Lake Be Malae	Bobonaro	30	5	Shallow saline lake	8°52'42"S 125°00'33"E
3	Atabae	Bobonaro	3	0	Exposed reef, mudflat	8°49'35"S 125°03'42"E
4	Biacau	Bobonaro	5	0	Mudflat	8°49'35"S 125°03'42"E
5	Loes river estuary	Bobonaro	500	0	Braided stream channels, estuary	8°44'30"S 125°08'00"E
6	Lake Maubara	Liquica	8	10	Shallow saline lake	8°36'24"S 125°15'14"E
7	Tibar, 10 km west	Liquica	5	0	Mudflats and mangrove	8°34'13"S 125°25'40"E
8	Lake Eraulo	Ermera	120	1,130	Freshwater marsh	8°46'22"S 125°26'50"E
9	Tibar, 7 km west	Liquica	5	0	Mudflats and mangrove	8°34'06"S 125°27'59"E
10	Tibar, 3 km west	Liquica	5	0	Mudflats and mangrove	8°34'04"S 125°28'14"E
11	Tibar aquaculture	Liquica	300	3	Mudflats and mangrove	8°33'50"S 125°29'14"E
12	Dili airport	Dili	2	10	Short grass, beach	8°33'10"S 125°30'59"E
13	Lake Seloi	Aileu	100	1,030	Freshwater marsh	8°42'28"S 125°31'42"E
13	Tasitolu or 'Tasi-tolu'	Dili	200	0	Shallow saline lakes, mangroves, beach	8°33'24"S 125°30'26"E
15	Atauro (Atekrue)	Dili	5	0	Exposed reef, beach	8°13'20"S 125°32'30"E
16	Comoro river estuary	Dili	5	0	Mud and sandflats, beach	8°32'18"S 125°32'07"E
17	Atauro (Adara-Kitale)	Dili	5	0	Exposed reef, beach	8°11'50"S 125°33'57"E
18	Dili helicopter pad	Dili	na	10	Village/agricultural	8°33'18"S 125°33'50"E
19	Lake Hatodo	Aileu	10	390	Freshwater lake	9°07'27"S 125°35'27"E
20	Dili foreshore	Dili	5	0	Exposed reef, beach	8°32'52"S 125°35'23"E
21	Beloi	Dili	100	0	Beach	8°13'19"S 125°36'34"E
22	Atauro, Tua Koin	Dili	5	0	Exposed reef, beach	8°15'11"S 125°36'27"E
23	Cristo Rei	Dili	10	0	Exposed reef, beach	8°31'26"S 125°36'33"E
24	Hera	Dili	300	0	Mudflats and mangrove	8°32'05"S 125°41'50"E
25	Mount Curi	Manututo	400	0-20	Beach, woodland	8°28'41"S 125°56'29"E
26	Manatuto estuary	Manututo	2	0	Beach, coastal waters	8°29'14"S 125°58'31"E
27	Manatuto, 5 km west	Manututo	5	0	Beach	8°29'14"S 125°58'31"E
28	Manututu	Manututo	100	0	Beach, town	8°29'37"S 126°00'49"E
29	Lake Modo Mahut	Manufahi	500	3	Freshwater lake	9°04'21"S 126°01'46"E
30	Vermasse	Baucau	300	20	Ricefields	8°26'29"S 126°01'30"E
31	Manatuto mudflats	Manututo	100	5	Mudflats and mangrove, beach	8°30'58"S 126°03'03"E
33	Baucau	Baucau	10	0	Exposed reef, beach	8°26'39"S 126°29'00"E
34	Secal	Baucau	200	0	Mudflats and mangrove, beach	8°28'07"S 126°31'43"E
35	Lake Laga	Baucau	10	3	Shallow saline lake, mangroves, beach	8°26'36"S 126°38'30"E
36	Vermasse estuary	Baucau	5	0	Beach, estuary	8°27'36"S 126°39'09"E
37	Ireberé spring	Viqueque	5	80	Freshwater spring	8°41'46"S 126°42'36"E
38	Ominginny	Lautem	1	0	Coastal savanna	8°24'31"S 126°43'57"E
39	Uato Lari	Viqueque	5	0	Freshwater lagoons and mangroves	8°44'36"S 126°43'01"E
40	Laivai river estuary	Lautem	6	0	Beach, estuary	8°52'12"S 126°43'48"E
41	Ireberé estuary	Lautem	20	0	Mudflats and beach	8°45'09"S 126°44'12"E
42	Laivai	Lautem	20	50	Inland river channel	8°24'22"S 126°45'28"E
43	Legumau	Lautem	3	950	Freshwater ponds, wet grass	8°33'41"S 126°47'28"E
44	Daudere	Lautem	100	50-100	Inland river channel	8°28'00"S 126°49'07"E
45	Raumoko river	Lautem	5	30	Wide river channel	8°28'00"S 126°49'07"E
46	Luro	Lautem	2	600	Freshwater spring	8°33'02"S 126°49'29"E
47	Laleno	Lautem	100	670	Short grass, ponds	8°22'28"S 126°52'13"E
48	Lautem, 5 km west	Lautem	5	0	Exposed reef, beach	8°22'14"S 126°52'52"E
49	Lore, Namulutu estuary	Lautem	5	0	Mudflats and beach	8°41'01"S 126°57'16"E
50	O'Swamp	Lautem	150	400	Freshwater marsh	8°32'26"S 126°58'29"E
51	Rasa	Lautem	400	400	Short grass	8°25'37"S 126°59'37"E
52	Los Palos marsh	Lautem	10	400	Freshwater marsh	8°31'04"S 126°59'11"E
53	Ili Lapa	Lautem	200	390	Freshwater marsh	8°33'12"S 126°59'26"E
54	Lore	Lautem	3	0	Beach	8°40'48"S 126°59'11"E

No.	Wetland site	District	Area (ha)	Elevation (m)	Habitat	Coordinates
55	Assalaino	Lautem	500	500	Short grass on karst	8°23'51"S 127°00'45"E
56	Los Palos	Lautem	3	390	Freshwater spring	8°30'51"S 127°00'10"E
57	Lake Farapata	Lautem	200	340	Freshwater swamp	8°30'59"S 127°01'09"E
58	Com	Lautem	3	0	Beach	8°20'46"S 127°02'55"E
59	Lake Veihorana	Lautem	2	340	Freshwater lagoon	8°29'49"S 127°03'34"E
60	Bauro	Lautem	300	360	Freshwater swamp	8°27'43"S 127°05'20"E
61	Maupiting (Aramaco river estuary)	Lautem	200	0	Beach, estuary	8°31'12"S 127°06'57"E
62	Poros swamp	Lautem	100	340	Freshwater sedge	8°26'17"S 127°07'28"E
63	Chaperi swamp	Lautem	5	335	Freshwater marsh	8°28'06"S 127°08'32"E
64	Malahara	Lautem	1	335	Freshwater ponds	8°28'31"S 127°08'23"E
65	Lake Iralalara	Lautem	1,500	330	Freshwater lake, spring	8°26'27"S 127°09'09"E
66	Waiara river estuary	Lautem	3	0	Beach, exposed reef	8°31'54"S 127°10'33"E
67	Mehara	Lautem	2	350	Grassland	8°24'37"S 127°11'52"E
68	Maca beach	Lautem	5	0	Beach, exposed reef	8°29'25"S 127°12'48"E
69	Vero	Lautem	400	0-200	Beach, inland river	8°28'42"S 127°13'51"E
70	Zonu beach	Lautem	1	0	Beach, exposed reef	8°22'37"S 127°15'05"E
71	Tutuala	Lautem	1,000	0-400	Beach, village. Woodland	8°24'37"S 127°15'05"E
72	Helipuna beach	Lautem	3	0	Beach, exposed reef	8°26'01"S 127°17'50"E
73	Jaco island	Lautem	2	0	Beach, exposed reef	8°24'59"S 127°18'36"E
74	Valu beach	Lautem	10	0	Beach, exposed reef	8°24'15"S 127°18'02"E