

Birds of the Pilbara region, including seas and offshore islands, Western Australia: distribution, status and historical changes

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Abstract – The geographic range, status and breeding season are documented for 325 bird species known to occur in the Pilbara, Western Australia, since the first records were made in 1699. The fauna is a mixture of Torresian, Eyrean and Bassian components, along with a variety of seabirds, migratory wading birds and Asian vagrants. The region lies entirely within the arid zone and the overall harshness of the environment means that few species are resident. The richness of the total avifauna (resident and non-resident) is due mainly to the diversity of habitats, especially those on or near the coast. The region is an important refugial destination for a variety of Australian species and includes a range of endemic subspecies and colour morphs. The area from Eighty Mile Beach to Port Hedland saltworks is of international importance for shorebirds and, following cyclonic rains, Mandora Marsh and Fortescue Marsh are of continental importance for waterbirds. The 204 breeding species are mapped, and each species is assessed for possible changes in distribution or abundance since 1900.

Keywords – Pilbara birds, ecological status, relative abundance, breeding, movements, taxonomy

INTRODUCTION

The Pilbara region of Western Australia (WA), with internationally significant mineral deposits, is of considerable importance to the Australian economy but the region also contains significant, but inadequately documented, conservation values (e.g. McKenzie *et al.* 2009). As a contribution to assessing these values, we set out to provide an up-to-date summary of the bird fauna of the Pilbara, with particular reference to historical data and the distribution of individual species. Ecological patterns in bird occurrence across the region were explored in a previous paper (Burbidge *et al.* 2010).

The Pilbara coast was one of the first parts of Australia discovered by Europeans and is the site of some of the earliest references to Australian birds by early English navigators. On 22 and 31 August 1699 (early September in the modern [Gregorian] calendar [George 1999]), William Dampier landed on islands in the Dampier Archipelago (naming one island Rosemary Island) and noted ‘some

Cormorants, Gulls, Crab-catchers, &c a few small Land Birds, and a sort of white Parrots, which flew a great many together’ (p. 10, Whittell 1954). The white parrots were Little Corellas which still occur on these islands. On 28 August 1699 he also recorded some ‘Boobies and Noddy-birds’; based on his description the latter were Bridled Terns. He also noted ‘The Land-fowls that we saw here were Crows (just such as ours in England), small hawks and Kites; a few of each sort; But here are plenty of small Turtle-Doves, that are plump, fat and very good Meat. Here are 2 or 3 sorts of smaller Birds, some as big as Larks, some less; but not many of either sort. The Sea-Fowl are Pelicans and Boobies, Noddies, Curlews, Sea-pies, &c. and but few of these neither’ (p. 10, Whittell 1954). Unfortunately, Dampier made no collections of birds, or at least no specimens survive.

Brief observations and collections were made by the French expedition under the command of Nicolas Baudin (1800–1804) including a visit

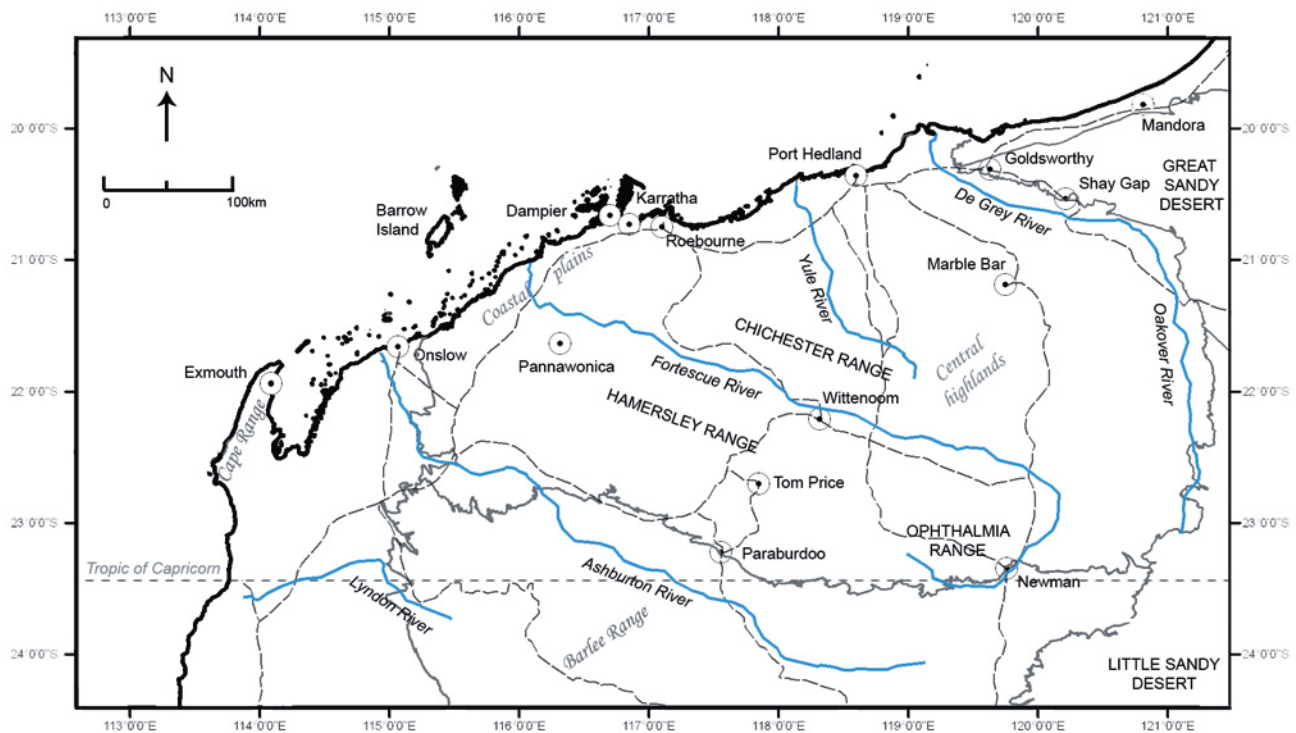


Figure 1 Map of the study area, showing major place names and rivers mentioned in the text. Note that this extends slightly beyond the Pilbara IBRA region.

to Depuch Island in 1801 by François Péron. All he could say about the birdlife was that 'Birds are reduced to some species of flycatchers and shore-birds' (p. 61, Whittell 1954), although on 11 December 1801 he recorded a Cape Petrel and a tropicbird at latitude 20°S (i.e. at their northern limit in WA).

On 9 June 1840 Benjamin Bynoe, the assistant surgeon on HMS *Beagle*, landed on Depuch Island and collected a specimen of the Painted Finch, which remained for many years the only specimen known and is the type specimen for *Emblema pictum* Gould, 1842.

In 1887 the English ornithologist Thomas Carter arrived in WA and did extensive fieldwork and collecting in the region of North West Cape (Carter 1903, 1904). Attributed to him is the discovery of the Rufous-crowned Emu-wren (*Stipiturus ruficeps*) and the Spinifex-bird (*Eremiornis carteri*).

In 1900 John Thomas Tunney spent two months collecting birds and mammals on Barrow Island. Between April and October 1901 he collected specimens for the Western Australian Museum (WAM) and the Tring Museum (UK). His Pilbara work included visits to Port Hedland, Marble Bar, Nullagine, the De Grey and Coongan Rivers and Bedout and Lewis Islands (Hartert 1905, 1906).

Between 1908 and 1923, Frederick Bulstrode Lawson Whitlock collected specimens and made valuable observations on the De Grey and Condon

Rivers, at Nullagine (1910–11), on the Coongan R. and on Barrow Island (1917), again on Barrow and islands in Dampier Archipelago (1918) and the Fortescue R. including three and a half months at Millstream (July–November 1922) (Whitlock 1909, 1918, 1919, 1923).

In 1912 Paul Denys Montague of Cambridge University visited the Montebello Islands and later published an account of the 25 bird species he observed there (Montague 1914).

From 1923 to 1935 Angus Hargreaves Robinson gathered valuable distributional and breeding information from Wyloo and Ullawarra stations and from the Barlee Range area (Robinson 1939, 1955).

In April 1945 Kenneth Gordon Buller collected specimens around Nullagine and Marble Bar on his way to Wyndham, and in May 1947 and again in 1948 he collected for the American Museum of Natural History on the Ashburton, Fortescue and De Grey Rivers and their tributaries, sometimes as far as 100 km from their mouths.

In July and August 1958 a party from the WAM including K.G. Buller and Gerlof Mees collected specimens around Millstream and Coolawanyah. Mees published an annotated catalogue of a collection of bird skins from the west Pilbara (Mees 1961).

In May and June 1962 a party from the WAM including G.M. Storr made observations and collected specimens on Depuch Island (Ride

et al. 1964). During the period from 1934 to the 1960s, Ivan Clarence Carnaby collected eggs and breeding data from the Pilbara, especially from the Ashburton region (Carnaby 1954). Most of his data are lodged in the WAM.

The last 50 years have seen intensive field work in the region. It began in 1966 with the Fourth Harold Hall Australian Expedition, led by C.J.O. Harrison (Hall 1974). In 1970 the WAM, in collaboration with the Department of Fisheries and Wildlife, collected and observed birds in the Dampier Archipelago and Montebello Islands. This was followed by WAM surveys throughout the region in 1975; surveys of mangrove birds at Exmouth Gulf in 1978; surveys throughout the region in 1979; bird surveys of the entire region and especially mangrove areas and the Hamersley Range National Park in 1980 (Johnstone 1983b, 1990); surveys in the southern Pilbara in 1982. Distributional data to this time were summarised by Storr (1984). Further surveys followed, including the Woodstock-Abydos surveys in 1988, 1989 and 1990 (How *et al.* 1991); and the more recent surveys in collaboration with the Department of Environment and Conservation (DEC) to the region in 2004, 2005 and 2006 (Burbidge *et al.* 2010b). Around this time, a series of waterbird surveys by DEC examined the importance of wetlands in the area (e.g. Halse *et al.* 2005). Offshore, various workers gathered data on seabirds (e.g. Pocklington 1967; Abbott 1979) while others documented island biotas (e.g. Butler 1970; A.A. Burbidge *et al.* 2000; Pruett-Jones and O'Donnell 2004). These decades also saw efforts from a range of independent ornithologists, e.g. Fletcher (1980), Howard (1986) and Kolichis (1977, 1992), working on the mainland. Noteworthy also are the extensive unpublished field notes (incorporated into this paper) made by John Darnell between 1970 and 1992 in the northern Pilbara about Port Hedland, Shay Gap, Pardoo and Goldsworthy and especially from Port Hedland Saltworks.

In the last 40 years, mining activity has accelerated in the Pilbara (McKenzie *et al.* 2009), and there has been a concomitant increase in the enquiries received at the WAM concerning the distribution and ecology of the birds of the region. In order to answer the questions of conservationists, agriculturists, pathologists and other research workers and environmental consultants we have attempted to collate a reference to the avifauna of the region.

MATERIALS AND METHODS

This paper is based mainly on information held in the unpublished 'Storr-Johnstone, Western

Australian Bird Data Bank'. This data bank was compiled by G.M. Storr and R.E. Johnstone between 1970 and 2011 and formed the basis for a series of accounts on eight regional avifaunas covering WA (e.g. Storr 1984) and the *Handbook of Western Australian Birds* (Johnstone and Storr 1998, 2004). It contains details of specimens held in museum and private collections, extracts from the literature (not only the books and papers cited under references but also many notes in periodical journals and newsletters), notably the *Emu*, *Western Australian Naturalist* and *Western Australian Bird Notes*, and the unpublished data of many naturalists especially R.E. Johnstone, J.C. Darnell, G.M. Storr, J.R. Ford, W.H. Butler, N. Kolichis, G. Lodge, P. Stone, T. Kirkby, J. Dell, T.E. Bush, T.C. Allen, L.A. Smith, J.A. Smith, R.P. Jaensch, P. de Rebeira, G.P. Whitley, K.G. Buller, I.C. Carnaby, M. Sawle, A. Chapman, H. Esler, M. Howard, C. Gole, M. Gole, P. Griffin, R. Stranger, G. Harold, R.J. Teale, C.A. Stevenson, M. Morcombe, I. Morcombe, M. Massam, N. Waugh, M. Peterson, K. Coate and L. George. Data from Burbidge *et al.* (2010b) (13,500 records) and much opportunistic data from the Pilbara Biodiversity Survey (including waterbird data from A. Pinder) were added to the above data set. The full digital data set will be lodged in the WAM Bird Observation Data Base. Names, taxonomy and sequence follow Johnstone (2012).

The aim of the present work is to summarise for each species and subspecies our knowledge of local distribution, ecological status, relative abundance, habitat preferences, breeding season, movements and taxonomy. Distribution is usually given in broad terms, for example coast and coastal plain, central highlands or eastern zone, and a distribution map is given for each species recorded breeding in the region. Breeding and wintering ranges, when different from total range, are outlined in the species accounts. Status refers primarily to a bird's ecological status, i.e. whether it is a resident or a breeding or non-breeding visitor, sedentary, nomadic or migratory, and very common, moderately common, uncommon, scarce or rare. Habitat preferences are defined in terms of vegetation, and breeding seasons are defined by months in which eggs are laid. Season of occurrence of regular non-breeding visitors is indicated by months of earliest and latest records. For vagrants and rare visitors, records are cited individually.

The region covered by this paper is bounded in the north by the southern boundary of the Kimberley Division (latitude 19°30'S), in the south the Tropic of Capricorn (latitude 23°26'30"S) and in the east largely following longitude 121°24'E (i.e.

from Mandora south to the Oakover R. drainage). It includes the entire Pilbara biogeographic region but also the far south-west section of the Great Sandy Desert bioregion and the northern sections of the Carnarvon and Gascoyne Bioregions that lie north of the Tropic (Figure 1). It is essentially the Pilbara region of Storr (1984), covering the North-West Land Division. Records are also included from nearby seas.

The region lies entirely within the arid zone. McKenzie *et al.* (2009) and Burbidge *et al.* (2010b) describe aspects of the environment of the study area; a summary of features relevant to birds is provided below. Mean annual rainfall ranges from 230 mm in the lower parts of the Ashburton R. drainage to 400 mm in parts of Hamersley Range. Most rain falls in summer months, December to March. The western coastal margin of the region has a winter rain regime that changes eastwards along the coast and inland, with bimodal rain peaks, then into a late summer–autumn peak in the northern Pilbara.

Environment

The region is divisible into eight major habitat types, described below. Codes with three to five letters and two numerals such as 'DREO9' refer to quadrat locations from the Pilbara Biodiversity Survey (see McKenzie *et al.* 2009).

1. *Offshore and inshore seas* Essentially shallow seas, with the continental shelf extending 300–400 km offshore, except in the region of the Dampier Archipelago where it extends just 50–100 km. The tropical arm of the Indian Ocean

(= Timor Sea) is linked to the Pacific Ocean via the Indonesian throughway. The strong currents and deep water channels through the Lesser Sunda Islands provide turbulent, high-productivity conditions which are very attractive to seabirds. Although the birds utilising this area are not typically found in Pilbara seas they are at times displaced into it by cyclonic activity or events. The sea temperatures are consistently high (24–26°C being a typical range) and the salinity is also high, leading to low biomass and low productivity (Field *et al.* 1998). The region experiences three to five tropical cyclones per year, mainly between November and March. Some of these head westwards into the Indian Ocean but others veer south and south-east to cross the coast, mainly in the eastern and central region, before petering out as rain-bearing depressions inland. Noteworthy also is the Leeuwin Current which brings warm, low salinity, tropical water from the western Pacific, via the Indonesian Archipelago and Timor Sea down the outer continental shelf of WA to Cape Leeuwin. In general, pelagic birds are uncommon over most of the area (especially the central and eastern section) but in the south-west birds such as the Wedge-tailed Shearwater breed in high numbers and are common. The sea also attracts good numbers of migrating pelagic species including Hutton's Shearwater and Wilson's Storm Petrel.

2. *Islands of sand, sandstone or Precambrian rocks* Low sandy islands include Bedout, North Turtle, cays in Passage Group and off Onslow and Frazer Island near Point Cloates, which



Plate 1 Montebello Islands from the air (A.H. Burbidge).



Plate 2 Mangroves of *Avicennia* and *Rhizophora* at Point Walcott (J. Bush).

provide breeding sites for colonial nesting seabirds. Sandstone/limestone islands include the Montebello group, Barrow Island and its satellites including the Lowendal Islands, many islands in the Passage group and off Onslow and Legendre Island in the Dampier Archipelago, while many continental islands, including most islands in the Dampier Archipelago, are composed of Precambrian rocks.

3. *Coast* Tidal mudflats, beaches and mangal. The central and eastern coasts comprise predominantly extensive sandy beaches typically backed by dune systems (frequently a succession of dunes with intervening low plains), but also low-lying, gently sloping mudflats, backed by samphire flats or salt pans. Occasionally these are broken up by low sandstone caps or ridges and such areas are often breached and the resulting backing embayments harbour extensive mangal forests, e.g. Cape Keraudren, mouth of the De Grey R. and Cossack, but these occur only as disjunct, widely separated patches. The western and southern areas of the region comprise more extensive sandstone/granite cliffs, but still areas of coastal dunes, sandy beaches and more rarely mudflats occur. A large tidal range of

ca. 6 m (in the east of the region) to 3.5 m (in the south-west) results in extensive intertidal zones, particularly where mudflats occur, thus providing vast areas of suitable feeding habitat for waders. This is a key requirement for waders using the East Asian Flyway which has its Australian 'landfall' in this area, making these mudflats an internationally important area. Such large-scale movements of water results in 'dirty water' inshore coastal water zones, unsuitable for blue or 'clean water' species including some terns, shearwaters and boobies. Such species are, however, more abundant in the south-western areas of the region with a smaller tidal range and thus cleaner seas.

Habitats within this coastal zone are amongst the most stable in the region. Many species, particularly those inhabiting the mangal blocks, are locally resident. This has led to the evolution of local endemism in generally widespread species (e.g. the Pilbara subspecies of the Collared Kingfisher) and to the development of colour morphs, such as where plumages matching the intertidal substrate have evolved in the Striated Heron (Johnstone 1990).

The Port Hedland Saltworks (40 km ENE of Port Hedland), referred to in the species

accounts, comprise only the initial series of shallow solar evaporation ponds, not the final concentration and harvesting ones located much nearer to Port Hedland. They were developed on an extensive area of salt flat 500–1000 m inland. Seawater from a tidal creek is pumped at high tide periods and impounded by low levees. A further internal series of these walls promotes the water flow through a series of ponds of increasing salinity, the latter ones of the series being at hypersaline levels. Under normal operating conditions the water level and salinity of the individual ponds remains reasonably stable; only in the initial receiving pond does the water level regularly fluctuate as the pumps recharge the system during the high tide period. Even then the water level rise is quite modest, only a few cm at the actual entry point, and shortly after pumping ceases the original level is restored. Over the years, sediment drawn in by the pumps has led to the development of an estuarine mud delta of low tidal range, washed on a tide-cycle basis by a fresh supply of nutrient-rich seawater. This is regularly the most densely populated part of the saltworks, with several species virtually confined to it, e.g. Asiatic Dowitcher (not merely on a local or regional basis but at a national level). Conversely, the ponds of higher salinity produce masses of brine shrimp and other invertebrates and these are favoured by species such as the Banded Stilt and Red-necked Phalarope. The saltworks provide a very reliable, stable environment. As such they have enabled the development of essentially migratory movements, both for Australian (e.g. Banded Stilt and Black-winged Stilt) and even northern hemisphere (e.g. Broad-billed Sandpiper) birds. Furthermore, they function in an entirely different manner from, for example, the flooding events of Mandora Marsh which do not occur regularly and so, although important as drought refuges, cannot lead to the development of regular movements for either the Australian or northern hemisphere birds.

4. *Coastal plain* In the eastern and central regions the coastal plains are broad, gently sloping and generally featureless zones, although relieved by the occasional low ridge and mesa and, nearer the coast, by fossil dune systems. The plains narrow towards the south-west, while near the Dampier Archipelago the central highlands virtually extend to the coast. Fresh water is scarce, restricted in most months of the year to chains of permanent pools along the larger watercourses and local artesian springs. Rainfall

is unreliable and irregular and comes mainly from summer thunderstorms. A cyclonic event can change this situation radically, however, as the gently sloping topography and poor drainage can lead to extensive local flooding. An extreme rainfall event or closely successive cyclones can lead to flooding that can last for several weeks or months and provide a highly productive or attractive temporary habitat for waterbirds (see below and discussion). Such events can attract birds from well beyond the region, even beyond WA. This is particularly so when a flood is associated with adverse drought conditions elsewhere and the region can be a significant drought refuge for waterbirds on a continental scale (Halse *et al.* 2005). The coastal plain also provides a migration corridor between the south-west of the State and the Kimberley.

At the eastern end of the Pilbara region's coastal plain, immediately behind the Eighty Mile Beach, lies the Mandora Marsh. The marsh is dominated by samphire flats and grassy plains with patches of acacia scrub, melaleuca and eucalyptus on rises. Following heavy rains, the area functions as a large drainage basin since there is no direct outlet to the sea. The impounded water spreads out into a mosaic of interconnected or isolated lakes until seepage and evaporation dry them out. In most years, the area is a wetland in name only, with the main floods generally caused by more extreme cyclonic events. After a lengthy dry period, rainfall of more than 800 mm is required to initiate a flood, although lesser rainfall can replenish the system in subsequent years. Sometimes the interval between these flood events has extended to several decades. Such rain fall usually occurs during the January–March period. At its peak, the Mandora Marsh complex extends for about 150 km parallel to the coast and about 15 km inland. At such times, open water areas in excess of 900 km² have been recorded. These conditions recede rapidly, and by October–November of the same year the system is essentially dry. During this period the marsh can support exceptional numbers of waterbirds, mainly Australian ones, particularly when extensive drought conditions prevail over other regions of the continent. Conversely, even when extensive flooding has occurred here, the influx of birds is far lower if abundant rainfall has been experienced across Australia generally. Thus, the marsh functions as a major refuge but, as noted above, is too unreliable for the development of regular bird movements.



Plate 3 Coastal samphire (*Tecticornia* sp.) at sampling site DRE01, 45 km NNE of Whim Creek Hotel (A.H. Burbidge).



Plate 4 Coastal plain at sampling site DRC02, 4 km S of Karratha (A.H. Burbidge).



Plate 5 Cape Range (R. Fleming).



Plate 6 Yardie Creek (R. Fleming).

5. *Cape Range* A heavily dissected limestone plateau up to 315 m high forming the backbone of the peninsula leading south from North West Cape.
6. *Watercourses* None of the rivers within the region flows permanently. The raging torrents and extensive flooding resulting from cyclonic rains are short-lived, and even the larger rivers rapidly revert to chains of isolated pools. The broad valleys of the larger rivers (De Grey, Oakover, Shaw, Turner, Yule, Fortescue, Robe, Cane and Ashburton) support galleries of river gums (*Eucalyptus camaldulensis*) and coolibah (*E. victrix*) that extend deep into the interior. Although these river valleys have been heavily grazed by cattle, they still provide a refuge for birds, especially in the eastern desert zone.
7. *Central highlands* The Chichester Range, Hamersley Range, Ophthalmia Range and Barlee Range consist mostly of rugged, sparsely vegetated hills rising to 1250 m. In the Chichester and Hamersley Ranges many gorges contain permanent water which is otherwise scarce in the region. The gorges vary from wide, open-sided valleys (e.g. Vampire Gorge) to narrow gorges with precipitous cliffs (e.g. Hancock Gorge). The bottoms of many



Plate 7 Riverine woodland at TCMBE01, 17.5 km ENE of Mt Bruce (R.E. Johnstone).



Plate 8 Riverine woodland below Harding River Dam (R. Fleming).



Plate 9 Chichester Range from Panorama Lookout, Millstream-Chichester National Park (A.H. Burbidge).

gorges have woodlands of river gum, coolibah, melaleuca and acacia and in some areas thickets of fig (*Ficus brachypoda*). The central highland region also contains extensive mulga¹ communities that range from almost pure stands (e.g. on Mulga Downs) along creeks and gullies and on some valley plains, to low-open mulga and mulga-spinifex woodlands. In areas of dense mulga, other *Acacia* and *Eremophila* species occur and the ground cover is mostly spinifex or soft grasses. Mixed mulga-eucalypt woodlands also occur, the eucalypts being mainly *E. victrix*, *E. leucophloia*, mallees and bloodwoods.

8. *Eastern desert zone* The region is bordered to the north-east and east by the Great Sandy Desert and Little Sandy Desert. The vegetation here is predominantly hummock grassland of spinifex (*Triodia* spp.) with scattered shrubs and low trees, especially of the genera *Acacia*, *Hakea*, *Grevillea* and *Eucalyptus* on red sand plains and dunes.

¹ In this paper 'mulga' is used in the broad sense. A recent paper by B.R. Maslin & J.E. Reid, A taxonomic revision of Mulga (*Acacia aneura* and its close relatives: Fabaceae) in Western Australia, *Nuytsia* 22: 129–267 (2012) has recognised 12 species in the complex in WA, of which 10 occur in the Pilbara.

Recent impacts and variations to the natural environment

Pastoralism

Sheep were introduced into the Pilbara in 1866 (Ealey 1967). The first flocks relied on natural surface water, resulting in localised overgrazing, particularly in the major river valleys. Pumping with mills enabled the grazing area to be expanded and the population rose markedly to a peak of nearly 800,000 in the early 1930s. Thereafter followed a decline influenced by droughts, the arrival of the blowfly (*Lucilia cuprina*) in 1942 and the abandonment of dingo control with the subsequent shift from sheep to cattle. The introduction of cattle has led to further habitat destruction, especially in coastal wetlands.

Feral populations of pigs, goats and camels exist but generally are not a major threat to birdlife. Unfortunately, this is not the case with feral cats that are now widely established throughout the region. The introduction of exotic herbage such as Buffel Grass has resulted in the local breeding and expansion of range of some bird species.

Industrial impacts

Despite its remoteness and small human population, the Pilbara is experiencing a period of major industrial development. The main elements of this expansion comprise the petroleum-based



Plate 10 Hamersley Range from Mt Sheila (A.H. Burbidge).



Plate 11 Great Sandy Desert at PHYE01, 23 km NE of Warrawagine Homestead (A.H. Burbidge).

industries (natural gas and oil) and mining (principally iron ore) but in both cases the industries have developed little beyond the extraction and basic processing stages prior to export. The main potential threats to the environment will arise from the natural gas and petroleum-based developments. Although there are currently no offshore oil drilling platforms within the region it has recently been shown by the BP disaster in the Gulf of Mexico that catastrophic failures can occur, and that the ensuing contamination can be borne many hundreds of kilometres from the source. It will be evident from the species accounts that the coastal areas and beaches of the region (particularly those of the easternmost sector, nearest to the proposed Kimberley gas developments) are of international significance. These areas are staging or feeding points for many of the northern shorebirds that visit Australia annually. Contamination of their feeding areas may impair their capacity to carry out their long migration flights (often of several thousand km non-stop) with disastrous consequences since this is the main flyway used by all of those species breeding in Eastern Asia. There has already been an oil spill in 2009, at the offshore Montara Oil Rig in the Timor Sea.

Open-cut iron ore mining has resulted in extensive local scarring of the landscape. Pre-development environmental studies and post-mining rehabilitation have aimed to minimise the impacts of these projects. A number of mines in the region had a short life-span (e.g. Mt Goldsworthy, Shay Gap) and, apart from the quarried pits, these sites now show little evidence of mining activities.

There have been extensive changes on parts of the coastal plains with developments allied to the processing and export of natural gas and extracted minerals. Large industrial facilities, communities, ports, road and rail links have been established and are still expanding rapidly. Development of ports has necessitated extensive dredging and modification of estuarine embayments but these are of a relatively minor scale compared to the size of the Pilbara. The main environmental threats here are from shipping (e.g. oil spills) or accidental introduction of foreign species, including birds. Strict regulation of groundwater extraction, along with the construction of facilities such as the Harding Dam, has been instituted to avoid environmental damage to sensitive areas such as Millstream (Mitchell 2007). Recreational usage of beaches and islands could become a major threat to some seabird colonies in the future owing to disturbance of breeding sites by people, vehicles and dogs.

Not all industrial development has a negative impact on avian environments and in some cases it can be beneficial. The towns, for example, generate waste materials including sewage, and these ponds provide excellent habitat for many transient shorebirds, breeding ducks, rails and dotterels. The intake area of the Port Hedland Saltworks is

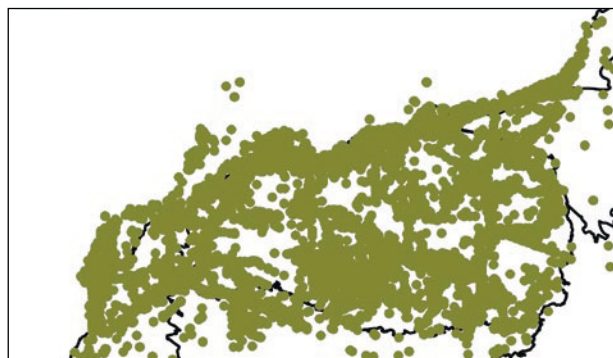
another example as it has now become a prime area for migratory shorebirds from the northern hemisphere and a regular destination and drought refuge for many Australian birds. The development of the Harding Dam has provided not only a water supply or source for industrial development but also a permanent habitat for waterfowl, a rare feature in this arid region.

Despite the immense scale of industrial development in the Pilbara over recent years, the environmental impact has been relatively small and is considered to be less than that of the pastoral industry (see McKenzie *et al.* 2009).

LIST OF BIRDS

Distribution maps are given for individual species known or thought to breed in the Pilbara. The first map combines all records to show the coverage provided by the data bank. While some gaps are evident, they tend to be relatively small, indicating that the individual species maps are likely to give a reliable estimate of species distributions.

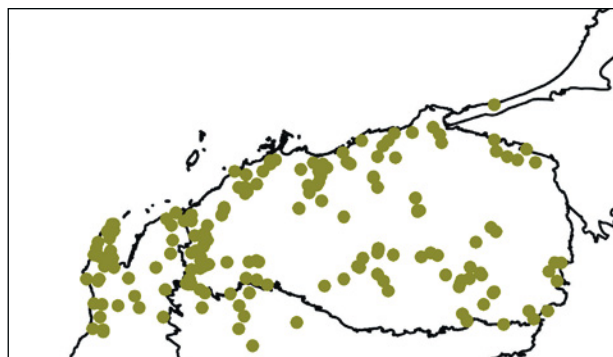
All species



Casuariidae

Dromaius novaehollandiae (Latham, 1790)

Emu



Throughout the region but scarce in far eastern desert country. Moderately common on densely wooded flats or riverine and coastal plains with

fresh grass and herbage. Scarce in hilly interior. Appears to move to river valleys and coastal plains (pastoral areas with water) in drier seasons or years. Usually in ones or twos or family parties. Breeds late April–early June.

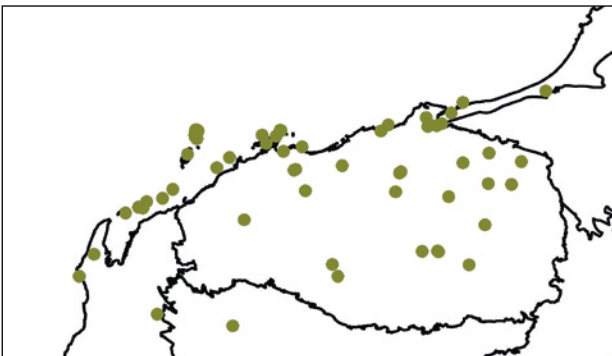
Phasianidae

Coturnix pectoralis Gould, 1837
Stubble Quail



Throughout the region, inland to upper De Grey R. and Newman, north to Pardoo. Nomadic, tending to move towards coast in summer and inland in winter. Uncommon to moderately common visitor to coastal and riverine plains including open samphire flats, in ones, twos or small parties (up to six), scarce or rare in hilly interior. Breeding recorded in coastal grassy flats near mouth of De Grey in April–May and at Point Cloates in Aug.–Sept. Appears to have increased in abundance in past 50 years.

Coturnix ypsilophora cervina Gould, 1865
Coturnix ypsilophora australis (Latham, 1802)
Brown Quail



Mainly coastal plains, Dampier Archipelago (Legendre, Rosemary, Angel and Lewis Is), Montebello Is (Hermite, Gardenia, Trimouille and Alpha), Barrow Is. and islands off Onslow (Airlie, Thevenard, Bessieres, Serrurier and Flat), also parts of central highlands e.g. Mt Florance, Mulga Downs, Python Pool. Common to moderately common in long grass and rank herbage of coastal

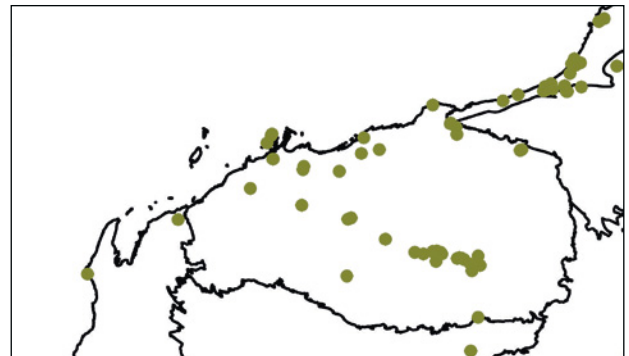
plain and in *Spinifex longifolius* and *Triodia* on islands; uncommon to locally moderately common further inland on riverside flats especially after rain, rare further inland. Breeding Jan.–Feb., ? March and April–May. Appears to have increased in range and abundance since introduction of Buffel Grass (*Cenchrus ciliaris*) and a spate of cyclones in 1990s. Most Pilbara birds are small and pale, perhaps justifying recognition of a single northern subspecies *cervina*, but further work is needed to clarify the status of both *cervina* and *australis* in the region.

Anatidae

Anseranas semipalmata (Latham, 1798)
Magpie Goose

Uncommon, infrequent visitor to the Pilbara (presumably from the Kimberley). Nearest breeding population Lake Eda (east of Broome). Appears in small numbers in some years e.g. Maud Landing, Sept. 1892; Lower Ashburton and flooded claypans near Winning in 1900; Lowendal Is, Roebourne, Millstream, the upper Sherlock, Coolawanyah and Hamersley in Aug.–Dec. 1952.

Dendrocygna eytoni (Eyton, 1838)
Plumed Whistling Duck



Nomadic. Coasts and coastal plains, also Rosemary Is. and Enderby Is. in Dampier Archipelago. Generally an uncommon visitor, in small to moderate flocks (up to 300) but locally and seasonally very common on Mandora Marsh. Mainly flooded claypans and coastal flats including samphire flats, Fortescue Marsh, also river pools, sewage ponds (e.g. at Mt Goldsworthy) and Harding Dam. Apparently much more numerous and widespread in the Pilbara before degradation of coastal and riverine grasslands. For example, in 1861 F.T. Carter saw 'countless numbers' on flooded flats east of Point Cloates and in 1922 F.L. Whitlock was informed that they used to visit Millstream. More recently, an estimated 14,070 were recorded at Mandora Marsh in Aug. 1999, 740 in June 2000 and 11,040 in Aug. 2000. Breeding recorded at Samphire in March 1982, Mandora Marsh in June 2000, near mouth of De Grey R. in May 2006 and at Mt Florance and Coolawanyah in Feb.–March 2009.

Dendrocygna arcuata (Horsfield, 1824)
Wandering Whistling Duck

Rare visitor. One observed at Tom Price sewage works on 18 July 1983. Records of an estimated 4,200 at Mandora Marsh in Aug. 1999 and 240 in June 2000 probably indicate drought refugee status.

Oxyura australis Gould, 1836
Blue-billed Duck

One record: five birds on Paraburdoo sewage ponds, 24 Nov. 1974 (Storr 1984).

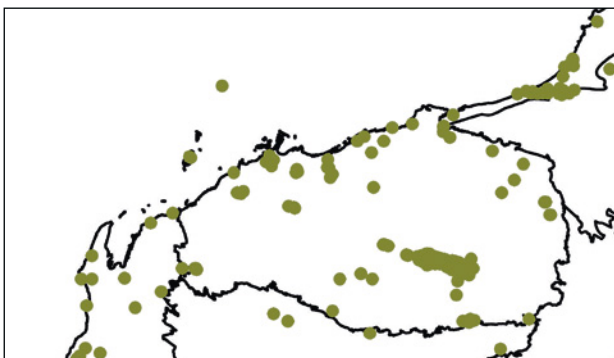
Biziura lobata (Shaw, 1796)
Musk Duck

Two records: a single bird on Cardabia Pool (Carter 1904) and one at Ophthalmia Dam in May 2005.

Stictonetta naevosa (Gould, 1841)
Freckled Duck

Rare visitor. A small flock observed at Cardabia Pool on 23 July 1900; one at Walyarta, Mandora Marsh in May 1999; 6 on Coolabah Claypan in Oct. 1999; up to 50 on Fortescue Marsh in June 2000; a group of 7 in deep water and lignum bushes on Mulga Downs on 7 Sept. 2006 and up to 30 birds on Ophthalmia Dam in 2006. Not known whether these birds were from southern WA or from eastern Australia.

Cygnus atratus (Latham, 1790)
Black Swan



Greater part of the region, north to Mandora and Pardoo and inland to the Nullagine R. (Pelican Pool), the Oakover R. (Carawine Gorge) and Savory Creek; vagrant on Barrow Is. Formerly a scarce visitor to region but now a moderately common to common and increasingly frequent visitor and breeding at numerous localities north to Mandora Marsh. Usually in pairs or small flocks (up to 20), sometimes larger flocks or aggregations (over 580).

Swamps, river pools, flooded claypans, marshes, samphire flats and sewage and saltwork ponds. Breeds April–Oct.

Tadorna tadornoides (Jardine and Selby, 1828)
Australian Shelduck

Uncommon or scarce visitor, usually in pairs or small parties. Reported more frequently since mid-1970s. Sewage and saltwork ponds, river pools, flooded claypans, samphire flats.

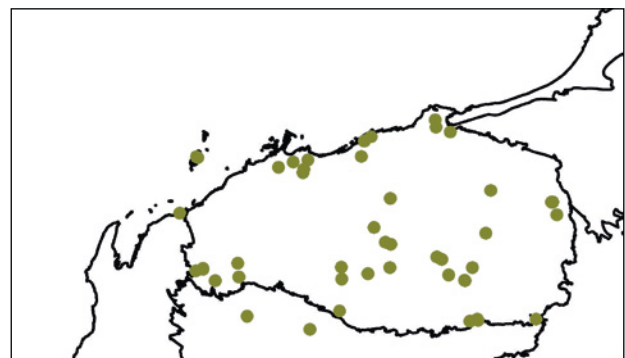
Tadorna radjah (Lesson, 1828)
Radjah Shelduck

One record from Woodstock/Abydos—three birds seen at Yule [R.?] in June 1978 by R. Johnston (Ranger).

Nettapus pulchellus Gould, 1842
Green Pygmy Goose

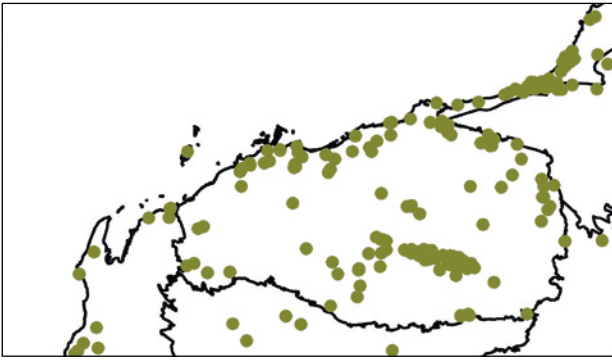
Rare visitor. Small parties observed by F.T. Gregory on Sherlock R. in July 1861; a pair seen on Waranoolar Pool, Harding R., from 30 July to 1 Aug. 1982; reported for Harding Dam in July 1982; a fresh corpse found on Pelican Is., Mandora Marsh, in Oct. 1999; a flock of 20 at Harding Dam on 26 Aug. and 2 Sept. 2009; recorded at Myaree Pool on 30 and 31 Oct. 2009 and a single bird at Carrawine Gorge from 8–10 July 2012.

Chenonetta jubata (Latham, 1802)
Australian Wood Duck



Throughout the region, north to De Grey R. and east to Oakover R. and Jigalong, vagrant to Barrow Is. Uncommon visitor from south-west of the State. Usually in pairs or small flocks (up to 30). Favours river pools, flooded claypans, sewage ponds, bore overflows and other ephemeral waters (two records for Harding Dam).

Anas gracilis Buller, 1869
Grey Teal

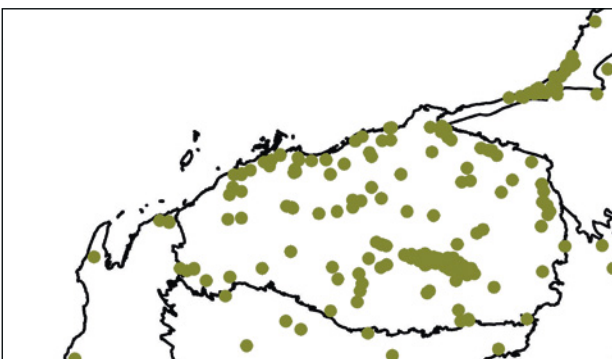


Throughout the region. Highly nomadic, numbers highly variable locally and seasonally. Moderately common to very common visitor from other parts of Australia; in ones, twos, small parties or flocks (up to 230), also large aggregations of many thousands (e.g. about 16,800 at Mandora Marsh in Aug. 1999 and 19,000 in Aug. 2000), and sometimes as part of large mixed flocks with Hardheads. River pools, flooded claypans, sewage ponds, saltwork ponds (even hypersaline ponds), freshwater swamps, floodwaters and other ephemeral waters, rarely tidal waters. Breeds Feb.–Oct. Several nests with eggs, on islands at Mandora Marsh in May 1999, an abandoned nest in a *Eucalyptus victrix* at Coolabah Claypan in Oct. 1999 and breeding also recorded at Mandora Marsh in Aug. 1999 and June 2000. Also many large young recorded on Fortescue Marsh (Mulga Downs) on 18 Oct. 1997 and large numbers breeding there (several nests checked, one with four eggs and another with nine eggs) on 3 Sept. 2006.

Anas castanea (Eyton, 1838)
Chestnut Teal

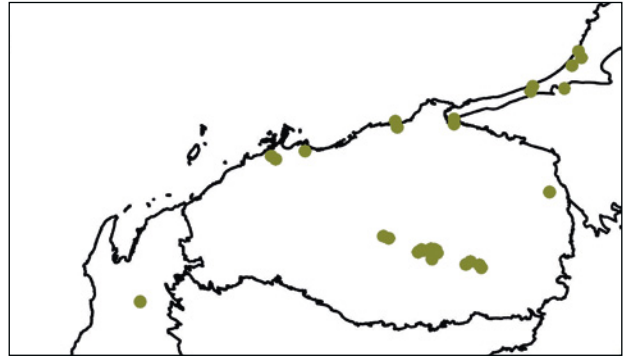
Rare and now possibly extinct in the region. Formerly resident at Mangrove Bay (Exmouth region) where T. Carter observed a large flock in June 1902 but in Aug he only found a pair (Carter 1904). Also a single male observed by L. George at Roy Hill on 18 May 2006.

Anas superciliosa Gmelin, 1789
Pacific Black Duck



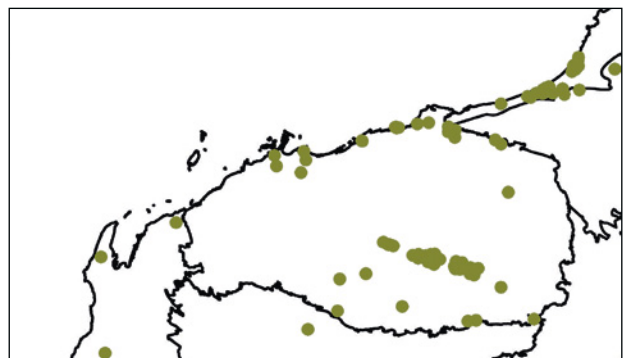
Throughout the region, north to Mandora and east to Rudall R. and Savory Creek. Nomadic and mostly visitors from other parts of Australia, occasionally breeding. Moderately common to common. Usually in ones or twos or small parties, sometimes flocks (up to 82) and aggregations (up to 4,000 at Mandora Marsh in Aug. 2000). River pools, swamps, freshwater springs and bores, sewage ponds, flooded claypans and samphire flats and flooded roadside ditches. Breeding Jan.–Feb. and June–Aug.

Anas rhynchotis Latham, 1802
Australasian Shoveler



Uncommon visitor, usually in ones, twos or small flocks (up to six). One reported at Winning on 30 Oct. 1900 (Carter 1904); one collected at Roebourne on 7 Aug. 1944; recorded on a large pool on Oakover R. near its confluence with the Davis on 22 June 1962; one observed at Goldsworthy sewage ponds on 4 March 1977; one on lower Maitland R. on 10 Jan. 1979; six on a larger dam south of Port Hedland in early Oct. 1983; 621 at Mandora Marsh in Aug. 2000 (Halse *et al.* 2005), up to 50 at Fortescue Marsh in Aug. 1999 and six at water treatment plant, South Hedland, on 8 July 2012. Flooded marshes, river pools and sewage ponds. Breeding reported by G. Lodge at Mulga Downs in Sept. 2006.

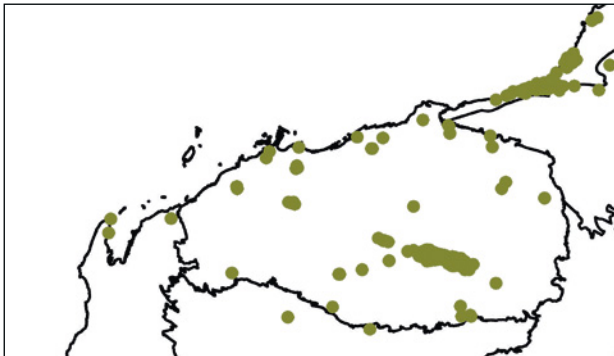
Malacorhynchus membranaceus (Latham, 1802)
Pink-eared Duck



Highly nomadic. Generally an uncommon visitor to many parts of the region. Usually in pairs or small parties, sometimes flocks (up to 250) and

larger aggregations (up to 3,000). Sewage and saltwork ponds, flooded claypans and samphire flats, also river pools. Few breeding reports; large numbers recorded breeding on Fortescue Marsh (Mulga Downs) in Oct. 1997 and Sept. 2006, mainly in hollows in Coolibahs; a nest without eggs found in a mangrove tree on Mandora Marsh in May 1999. Before the establishment of sewage ponds there were very few records of this duck in the Pilbara.

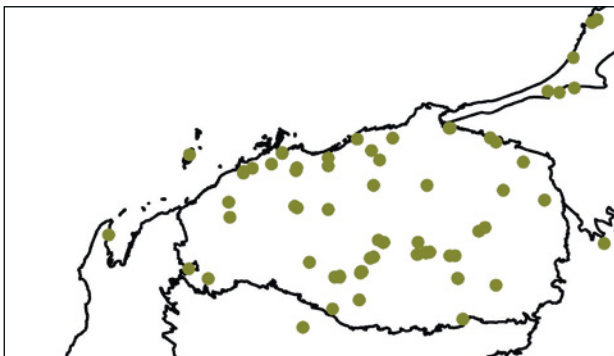
Aythya australis (Eyton, 1838)
Hardhead



Nomadic. Throughout the region. Mainly an uncommon visitor, in ones, twos or flocks (e.g. >200 in Carawine Gorge in winter 1986, up to 2,020 in Aug. 1999 and up to 450 in June 2000 in Fortescue Marsh. River pools, flooded claypans, sewage ponds and flooded samphire. The large numbers recorded on Mandora Marsh (98,750 in Aug. 1999, 1,940 in June 2000 and 26,070 in Aug. 2000) were likely visitors from drought-affected areas of eastern Australia. One or two pairs recorded breeding at Mandora Marsh in Aug. 1999 and June 2000.

Podicipediformes

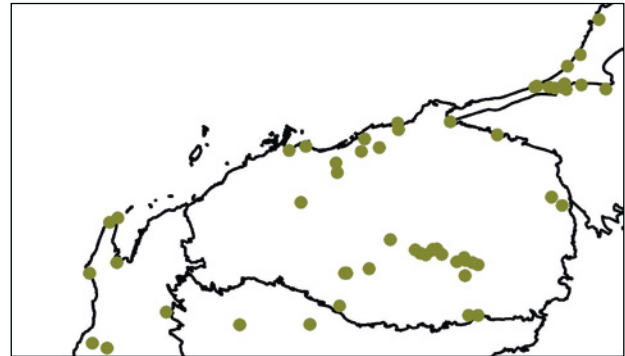
Tachybaptus novaehollandiae novaehollandiae
(Stephens, 1826)
Australian Grebe



Nomadic. Throughout the region. Mainly a visitor (all months), occasionally breeding. Uncommon; usually in ones or twos, occasionally in larger

aggregations e.g. groups of 43 and 84 recorded at Tom Price sewage works between 6 June and 23 Oct. 1977 and 140 at Mandora Marsh (Coolabah Claypan) in Oct. 1999. Flooded claypans, sewage ponds and river pools. Breeding reported at Mandora Marsh, Millstream and Paraburdoo in Jan., Feb. and June.

Poliiocephalus poliocephalus (Jardine and Selby, 1827)
Hoary-headed Grebe



Nomadic. Throughout the region. Mainly a visitor (all months) occasionally breeding. Seasonally common at some sites but generally uncommon, usually in ones or twos, occasionally larger groups, e.g. 50 on Tom Price sewage ponds in July 1977; occasionally hundreds and rarely thousands in areas flooded after summer rains, e.g. 2,600 at Mandora Marsh in Aug. 1999 and 220 at same site in June 2000, >600 in Fortescue Marsh in Aug. 1999. Mainly fresh waters (sewage ponds, river pools, flooded claypans and flooded samphire flats) but also tidal creeks, sheltered seas and saltwork ponds (mainly high salinity ponds). Breeding in Oct.

Podiceps cristatus australis Gould, 1844
Great Crested Grebe

Rare vagrant. Seven records: a single bird at Carawine Pool, Oakover R., on 26 Sept. 1978, five at the Fortescue Marsh on 2 June 2003, one on Fortescue R. (Brockman Bridge) on 29 Feb. 2004, one at Yule R. crossing on NW Coastal Highway on 4 Feb. 2004, one at Ophthalmia Dam in May 2005, four (two subadult and two immature) on De Grey R. (bridge on Great Northern Highway) on 4 Sept. 1978 and one on Harding Dam on 30 Oct. 2009.

Spheniscidae

Eudyptula minor novaehollandiae (Stephens, 1826)
Little Penguin

Rare vagrant. Not recorded in region but one observed and photographed swimming around RW2 Montara Oil Rig off the Kimberley coast in Timor Sea on 17 Dec. 2011. This bird would have likely passed through Pilbara seas on its way north.

Procellariidae

Macronectes halli Mathews, 1912
Northern Giant Petrel

One specimen found dead on Mandu Mandu Beach in March 1982 after having been banded as a chick 14 months earlier on Macquarie Is. (Storr 1984; *Corella* 6: 125). Also one photographed at sea NNW of North West Cape at 20°41'55"S, 113°23'43"E on 21 June 2009 and one found dead near Broome in Oct. 2011. Birds identified as *Macronectes* species are rare visitors to south-western seas in our study area. The possibility of some of these being Southern Giant Petrel, *M. giganteus*, cannot be ruled out.

Daption capense (Linnaeus, 1758)
Cape Petrel

Uncommon visitor to southern Pilbara seas (offshore) (north to just beyond 20°S), from the subantarctic and Antarctic islands in July–Sept. (e.g. single birds observed at Goodwyn A oil platform (130 km NW of Karratha) in Aug. and Sept. 1994, and one near Montebello Is on 15 Aug. 2009).

Pterodroma rostrata (Peale, 1848)
Tahiti Petrel

Rare visitor or rarely recorded from Pilbara seas but regularly recorded in northern and north-western Kimberley seas. Two observed off Delambre Is. on 17 April 1993 and one about 240 km NW of Barrow Is. on 12 Sept. 2007.

Pterodroma lessonii (Garnet, 1826)
White-headed Petrel

Rare visitor to southern Pilbara seas. One observed off Delambre Is. on 2 June 1962 (Storr 1984).

Pterodroma mollis mollis (Gould, 1844)
Soft-plumaged Petrel

Rare visitor to southern Pilbara seas. Two separate birds observed on 25 July 1965 about 60 km WNW of North West Cape (Pocklington 1967) and a small flock at 20°32'S, 113°56'E on 20 June 2009.

Pterodroma heraldica Salvin, 1888
Herald Petrel

Rare visitor. One observed in a circling display flight (possibly prospecting for a suitable nest site) over Varanus Is. (Lowendal Is) on 31 May 1992; the following day this bird was killed when it flew into the blades of a helicopter.

Bulweria bulwerii (Jardine and Selby, 1828)
Bulwer's Petrel

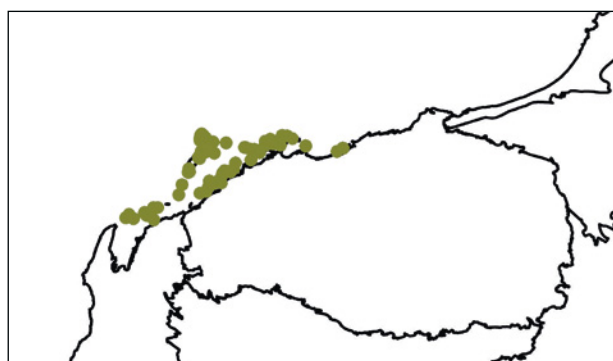
Rare visitor. Seven birds, possibly this species, observed by P. Harrison about 200 km W of North West Cape on 5 Nov. 1978, one taken into care

and later died at North West Cape in June 2012. Regularly recorded in Kimberley seas, mainly in Oct.

Calonectris leucomelas (Temminck, 1835)
Streaked Shearwater

Uncommon visitor to Pilbara seas (March–May). A band from a bird banded in Japan on 27 Aug. 1976 was located in a dry creek bed 30 km E of Nullagine on 21 July 2008. Five dead mummified birds found by W.H. Butler on Thevenard Is. on 12 Aug. 1998 and remains of a bird found by K. Coate on Flat Is. on 28 Oct. 2000.

Puffinus pacificus (Gmelin, 1789)
Wedge-tailed Shearwater



Very common breeding visitor to Pilbara seas west of 118°E, arriving in mid-August and leaving mainly in April. Breeding on Montebello Is (North West, Gardenia, Ah Chong, Gossypium, Alpha, Birthday, Beaufortia, Brooke, Flag, South East and Primrose), Lowendal Is (Abutilon, Varanus, Bridled, D, H² and Parakeelya), Forestier Is (Sable), island off Cape Lambert (Bezout), Dampier Archipelago (Elphick Nob, Malus, Kendrew, Goodwyn), Passage Is (North East Regnard, Fortescue, Sholl, Round, Long, Solitary, North Sandy, Great Sandy), islands off Barrow Is. (Mushroom, Double, Boodie), islands off Onslow (Airlie, Bessieres, Serrurier, North Muiron, South Muiron, Locker), Anchor, East, Flat, Mardie, Pup, Round¹, Round², South Passage and Steamboat. About 3% of the birds observed between Dampier and the Montebello Is by Start and Morris (1989) were white-breasted and were possibly visitors from Shark Bay.

Puffinus tenuirostris (Temminck, 1835)
Short-tailed Shearwater

Rare vagrant. One breeding adult tracked by J. Cleeland (pers. comm.) using geo-location technology from its breeding ground on Wedge

^{1,2} Unofficial island names (D, E, F, G, H, J, K, L, N, P) listed by Butler 1985 (Biological Survey – Lowendal Group, March 1985, for Bond Corporation Energy and Minerals Division).

Is., Tasmania, in 2010, moved across the Southern Ocean off WA, up west coast to vicinity of North West Cape, then struck out north-westerly to a point south of Cocos (Keeling) Is before it doubled back towards its Bass Strait breeding site. This is the first record of such a movement.

Puffinus huttoni Mathews, 1912
Hutton's Shearwater

Common passage migrant through Pilbara seas, generally well offshore (Halse 1981; Halse and Halse 1988). Generally avoids dirty inshore waters. A flock of 150–200 recorded in a feeding frenzy over a school of fish off Legendre Is. in Aug. 1988. Four observed at sea between Karratha and Montebello Is on 22 Oct. 2000 and a specimen collected from Hermite Is. on 4 Aug. 2010.

Puffinus assimilis Gould, 1838
Little Shearwater

Rare visitor to far south-western Pilbara seas. One found exhausted at Exmouth on 7 June 1977 (Storr 1984).

Diomedeidae

Diomedea chlororhynchos carteri (Rothschild, 1903)
Indian Yellow-nosed Albatross

Rare visitor to seas west of continental shelf. One record of a specimen washed up on west coast of Barrow Is. in Feb. 1977 and one on North West Is., Montebello Is in Oct. 2009.

Hydrobatidae

Oceanites oceanicus (Kuhl, 1820)
Wilson's Storm Petrel

Common winter visitor and passage migrant (May–Nov.) to all Pilbara seas. Usually single, occasionally in small parties or flocks (up to 75), with largest numbers corresponding to northward passage May–June but some remain in local seas throughout this period. North-east of Dampier Archipelago it is less common and restricted to offshore areas.

Oceanites marinus dulciae (Mathews, 1912)
White-faced Storm Petrel

Rare vagrant to south-western seas; a beach derelict found at Point Cloates on 31 July 1884 (Carter 1904) and one at Atwood Eagle Oil Rig off Dampier on 27 May 2009.

Oceanodroma leucorhoa (Vieillot, 1818)
Leach's Storm Petrel

Rare vagrant or uncommon visitor to north-western seas. A specimen collected from Goodwyn A platform in Jan. 1996.

Oceanodroma matsudariae Kuroda, 1922
Matsudaira's Storm Petrel

Status uncertain but appears to be a regular visitor to northern seas, e.g. a common visitor to the Timor Sea. One observed ca. 200 km NNW of Dampier Archipelago on 26 July 1965 (Pocklington 1967) and one landed on a ship ca. 100 km off Montebello Is on 25 Sept. 1968.

Phaethontidae

Phaethon rubricauda Boddaert, 1783
Red-tailed Tropicbird

Scarce visitor to southern Pilbara seas. Recorded off North Sandy Is. on 23 May 1978 and one collected at Point Cloates on 23 April 1891.

Phaethon lepturus Daudin, 1802
White-tailed Tropicbird

Rare visitor. One observed at Goodwyn A oil platform (130 km NW of Karratha) on 6 and 12 Sept. 1994, another on 29 Aug. 2012 and one at Exmouth on 1 Nov. 2000.

Sulidae

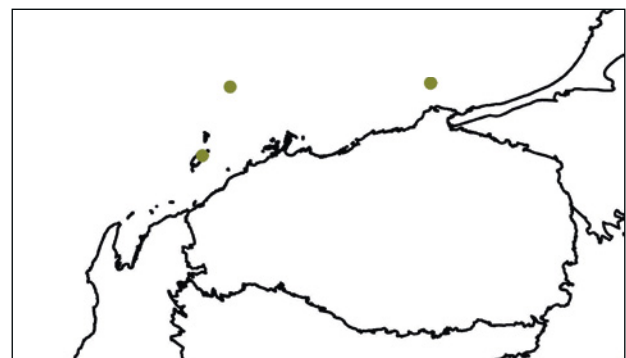
Sula abbotti Ridgeway, 1893
Abbott's Booby

Rare vagrant. Two observed at sea (one probable adult male and one possible sub-adult) over the Exmouth Plateau at 19°09'S, 113°10'E on 12 Sept. 2007 and one photographed 240 km NW of Barrow Is. on the same day.

Sula serrator (G.R. Gray, 1843)
Australasian Gannet

Rare visitor or vagrant (May–Sept.) to southern seas (south of 23°S). A beach derelict found at Point Cloates on 30 Sept. 1901 and one observed at Coral Bay in 2006.

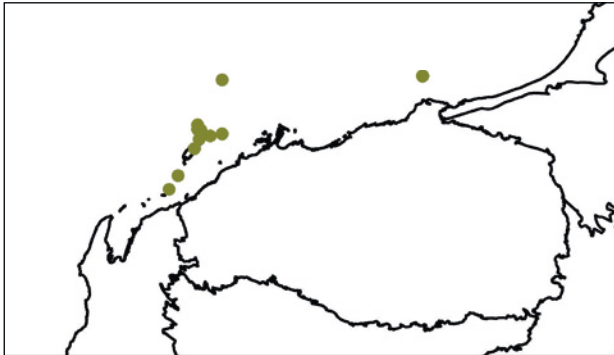
Sula dactylatra personata Gould, 1846
Masked Booby



Largely confined to the vicinity of Bedout Is., occasionally wandering well out to sea (e.g. up to 20 roosting at night on buoys at Goodwyn A

oil platform (130 km NW of Karratha) in Aug. and Sept. 1994). Breeding (400 pairs) on Bedout in March–May and Oct.

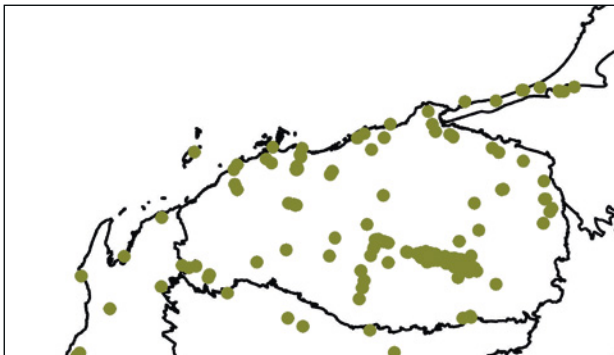
Sula leucogaster plotus (J.R. Forster, 1844)
Brown Booby



Common to very common near breeding and roosting islands, less frequent in open seas out to Barrow Is. and the continental shelf (e.g. up to 20 roosting on buoys at Goodwyn A oil platform in Aug. and Sept. 1994). Breeding in thousands on Bedout Is. March–Oct.

Anhingidae

Anhinga melanogaster novaehollandiae (Gould, 1847)
Darter



Nomadic. Throughout the region, north to Cape Keraudren and Mandora Marsh and east to Oakover R. Moderately common; in ones or twos. Mainly river pools, swamps, mangrove creeks. Breeding recorded in March–April, Aug. and Oct. In May 1985 at Harding River Dam, 16 nests contained young or had finished and at Coolabah Claypan in Oct. 1999, one nest contained four eggs, one three naked chicks and another four chicks and a fledged juvenile.

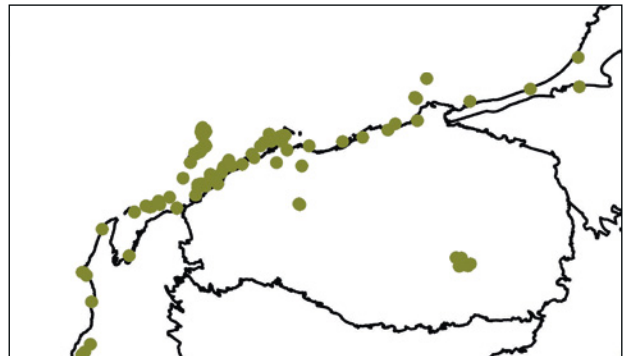
Phalacrocoracidae

Phalacrocorax carbo (Linnaeus, 1758)
Great Cormorant

Rare visitor. Single or in small parties. Mainly

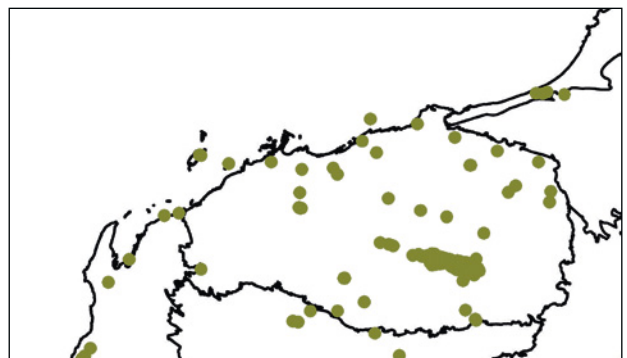
large pools on major rivers, e.g. De Grey, Yule, Fortescue and Ashburton.

Phalacrocorax varius hypoleucos (Brandt, 1837)
Pied Cormorant



Coast north to Mandora and as far offshore as Montebello Is. Moderately common in western seas; scarce or uncommon east of 118°E. Usually in ones or twos, occasionally resting flocks. Mainly sheltered seas and estuaries; also tidal creeks and saltwork ponds. Occasionally on larger water bodies inland, e.g. 50 at Fortescue Marsh in Aug. 1999 (S. Halse, pers. comm.). Breeding on North Turtle Is., Lowendal Is (Bridled, D, E, J, S, T and Varanus Is), rocky islet off north-east coast of Barrow Is., sandy cay near North Sandy Is., Mary Anne Reef and Frazer Is. Breeding April–July.

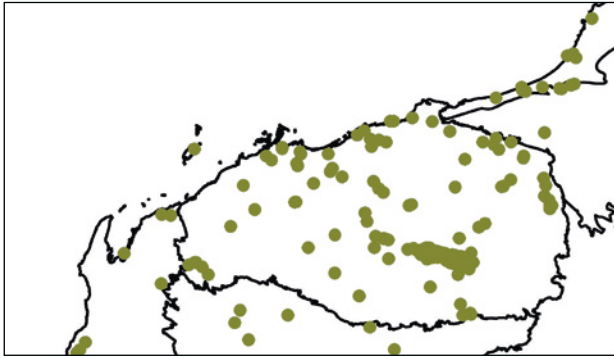
Phalacrocorax sulcirostris (Brandt, 1837)
Little Black Cormorant



Mainly coastal and near-coastal areas, especially about lower courses of major streams between the De Grey and the Yannarie, inland to the Talga, upper Shaw (at Hillside), middle Fortescue (Millstream) and middle Ashburton (Ashburton Downs). Scarce or uncommon at Mandora Marsh (Salt Creek, Walyarta) and casual visitor further inland (Tom Price and Paraburdoo sewage works) and claypans in far-south west of region, but can occur in hundreds at Fortescue Marsh when in flood. Uncommon, usually single or in small flocks (up to 80). River pools, sewage works, flooded

claypans and saltwork ponds. Breeding recorded in small colonies at Mt Vernon in April 1984, Pelican Pool, Sherlock R., in Aug. 1992 and on Mulga Downs in Sept.–Oct. 1997.

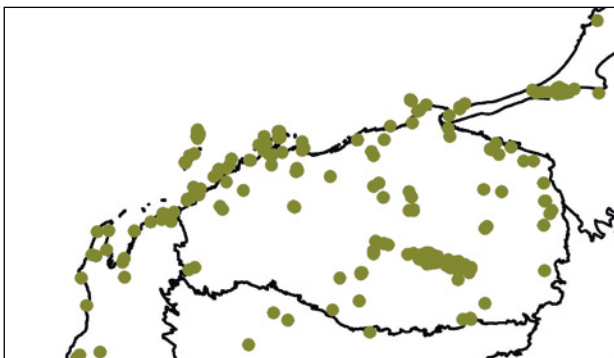
Phalacrocorax melanoleucos (Vieillot, 1817)
Little Pied Cormorant



Found throughout the region, north to Mandora Marsh, De Grey R. and east to Oakover R. Moderately common in ones, twos or small flocks (up to 10) on coastal plain (estimate of 220 on Mandora Marsh in Aug. 2000); uncommon in interior, but 60 nests at Fortescue Marsh when flooded in June 2000. Mainly river pools and flooded claypans, occasionally sewage and saltwork ponds. Breeding singly or in small colonies in trees around river pools.

Pelecanidae

Pelecanus conspicillatus Temminck, 1824
Australian Pelican



Nomadic (e.g. runners banded on North Turtle Is. and Mulga Downs have been recovered at Elliott, Northern Territory, and Mandurah, WA, respectively, and a runner banded on Pelican Is., Shark Bay, was recovered near Goldsworthy). Also a drought refugee into the Pilbara. Common to very common visitor to sheltered seas (as far offshore as Montebello Is), tidal creeks, saltwork ponds, flooded claypans and inundated samphire

flats and river pools. In ones, twos or small parties, occasionally large flocks (800–2,000) and rarely large aggregations of many thousands (e.g. over 7,500 at Mandora Marsh (Halse *et al.* 2005) and over 2,000 (many breeding) at Fortescue Marsh in June 2000). Breeding reported on North Turtle Is., Little Rocky Is. and Gndaroo Is. in Exmouth Gulf, and on mainland at Mandora Marsh (small numbers in 1996 and huge colonies from early April 1999–Oct. 1999), and at Mulga Downs (Fortescue Marsh) in March–July and possibly earlier.

Fregatidae

Fregata ariel (G.R. Gray, 1845)
Lesser Frigatebird



Mainly northern seas from Mandora Creek west and south to Dampier Archipelago, accidental further inland and south (during tropical cyclones Jan.–March), observed at Shay Gap and as far south as Point Cloates. Moderately common, in ones, twos or small groups. Breeding on Bedout Is. March–Aug.

Fregata andrewsi Mathews, 1914
Christmas Island Frigatebird

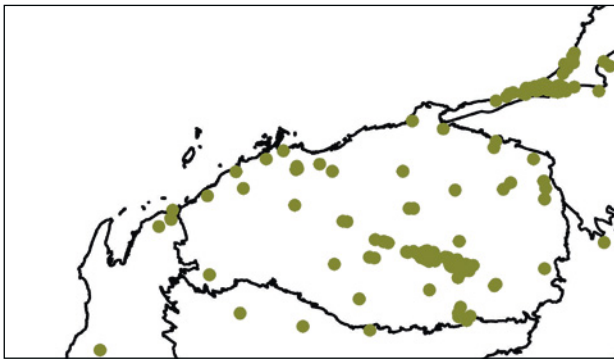
Rare visitor: one record of a single bird observed at Port Hedland in Jan. 1990, following passage of a cyclone.

Ardeidae

Ardea sumatrana Raffles, 1822
Great-billed Heron

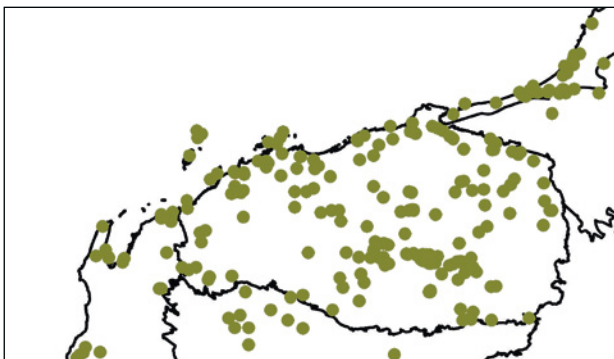
Rare vagrant. Two records, a single bird feeding in shallow water at Cape Keraudren on 20 May 1994 and one flying over mangroves and mud flats at Nickol Bay on 20 October 2012. Their region of origin is unknown. In the Kimberley this species favours dense mangroves whereas in eastern Indonesia it often feeds well away from cover on exposed reefs and in shallow bays and often wanders between islands; this suggests that the Cape Keraudren and Nickol Bay birds may have come from Indonesia.

Ardea pacifica Latham, 1802
White-necked Heron



Throughout the region. Uncommon to moderately common visitor, the population varying markedly from year to year. Usually single, occasionally in small parties on river pools, flooded claypans and sewage ponds, occasionally in larger aggregations, e.g. hundreds on inundated samphire flats east of Sandfire in May 1980; and estimates of 200–1,760 at Mandora Marsh in 1996 and 1999–2000 (Halse *et al.* 2005) and more than 250 at Fortescue Marsh in June 2000. Breeding recorded in Feb.–March, June and Aug.–Oct. Thirty nests at Pump Well and two at Man O' War Pool on the Fortescue R., Mt Florance, in March 2009.

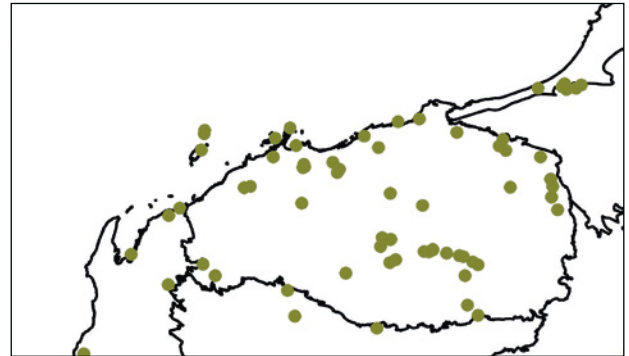
Ardea novaehollandiae Latham, 1790
White-faced Heron



Throughout the region, including many islands (as far offshore as Montebello Is and Barrow Is.). Nomadic. Moderately common to very common visitor, usually in ones or twos or small parties, occasionally in much larger aggregations, e.g. many hundreds at Mandora Marsh in Aug. 1999, June 2000 and Aug. 2000 (Halse *et al.* 2005) and more than 300 at Fortescue Marsh in June and Aug. 2000. Flooded claypans, river pools,

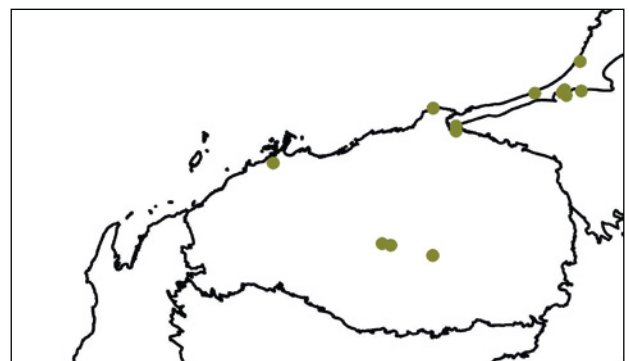
paperbark swamps, sewage ponds, bore overflows and roadside ditches, less frequently on saltwork ponds. Breeding recorded in July, Aug. and Sept.

Ardea modesta J.E. Gray, 1831
Eastern Great Egret



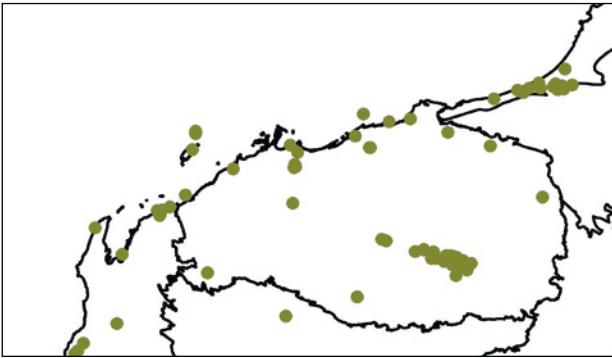
Throughout the region. Uncommon to very common visitor. Usually in ones, twos or small parties, occasionally in very large aggregations (up to 1,200), e.g. in Mandora Marsh in Oct. 1999 and June 2000 and Fortescue Marsh in June 2000. Flooded claypans, flooded samphire (inundated by rain or high tides), river pools, sewage ponds, mangrove creeks and saltwork ponds. Breeding recorded on Fortescue Marsh at Mulga Downs and at Mandora Marsh (June 2000).

Ardea intermedia Wagler, 1829
Intermediate Egret



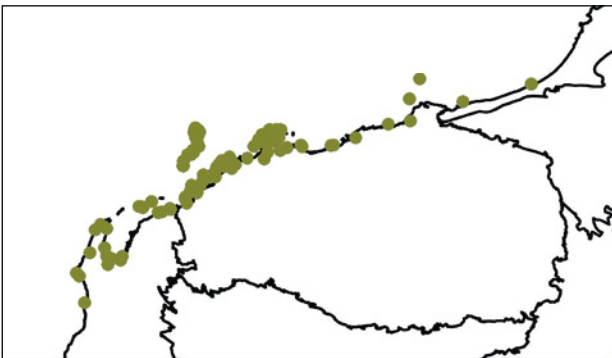
Uncommon or rare autumn–winter visitor to the far north-east, i.e. Mandora Marsh, vicinity of lower De Grey R., Goldsworthy and Miaree Pool on Maitland R. Occasional at Fortescue Marsh when flooded. Breeding reported on Mandora Marsh in June 2000.

Ardea garzetta nigripes Temminck, 1840
Little Egret



Uncommon to common. Ones, twos and small parties, occasionally large aggregations of hundreds and rarely thousands (e.g. estimate of 4,690 at Mandora Marsh in June 2000). Flooded claypans and samphire flats, mangrove creeks, tidal mudflats and saltwork ponds, less frequently pools on lower courses of rivers (e.g. De Grey, Yule, Harding and Lyndon). Birds have black feet and yellow soles, a characteristic of the so-called 'immaculata' of Australia, now placed in the synonymy of *A. g. nigripes*. Breeding recorded on Mandora Marsh in June 2000.

Ardea sacra sacra Gmelin, 1789
Eastern Reef Heron



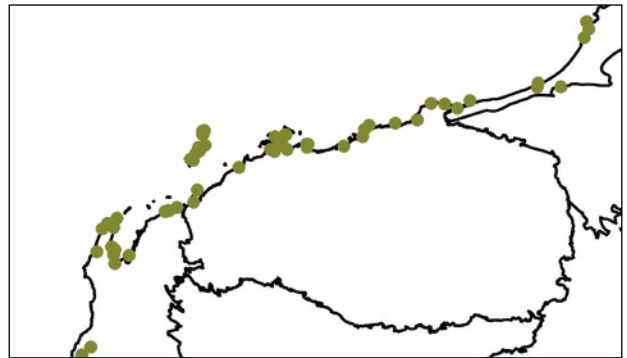
Coasts north to Mandora Creek and islands as far offshore as Trimouille, Legendre and Bedout Is. Common; usually in ones or twos, occasionally in small parties (up to six). Tidal reef and mudflats, also mangrove creeks, rocky shores and saltwork ponds. Breeding July–Sept. Throughout the region grey phase birds predominant, e.g. on Barrow Is. frequency of white phase is 29% but elsewhere averaging only 14% of population.

Ardea ibis coromanda (Boddaert, 1783)
Cattle Egret

Very rare visitor. Recorded at Millstream (one in 1949), Mt Edgar (two in May 1961), Goldsworthy

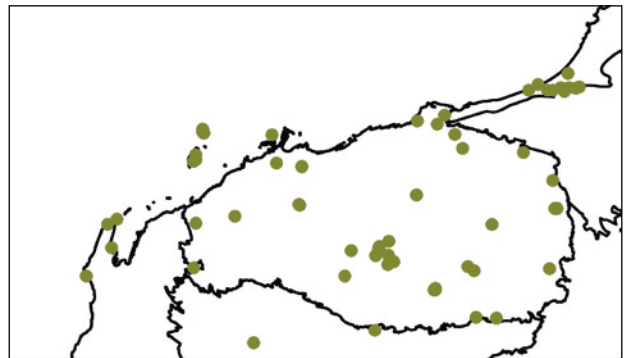
Aug. 1976, Sandfire (one in July 1978) and at Ophthalmia Dam in May 2005.

Butorides striatus stagnatilis (Gould, 1847)
Striated Heron



Mainland coast from Mandora Creek southwest to Yardie Creek, also Dolphin, Barrow and Lowendal Is. Common, usually single, occasionally in small parties (up to six) at food-rich sites. Mainly vicinity of mangroves and adjacent tidal mudflats and reef flats, also saltwork ponds. Birds from Devil Creek to Exmouth are reddish, matching the reddish substrates in this area (Johnstone 1990). Breeding Aug.–Oct.

Nycticorax caledonicus hilli Mathews, 1912
Rufous Night Heron



Throughout the region, north to Mandora Creek and inland to Oakover R., also Montebello Is (Gardenia) and Barrow Is. Uncommon to very common. Appears to be an uncommon resident with numbers greatly augmented by winter visitors and migrants. Usually single or in small parties (up to 30); occasionally larger numbers, e.g. about 100 pairs breeding at Mandora Marsh in June and Aug. 2000 and 120 birds (with 10 nests) at Fortescue Marsh in June 2000. Locally very common, e.g. 250 in flooded samphire east of Sandfire in late March and early April 1982, 300 at Mandora Marsh in May 1999, over 100 in Oct. 1999 and over 700 in June 2000. Flock of 11 on Barrow Is. mangroves on 23 Aug. 1976 and 25 in mangroves near Shark Point on 29 July 2012.

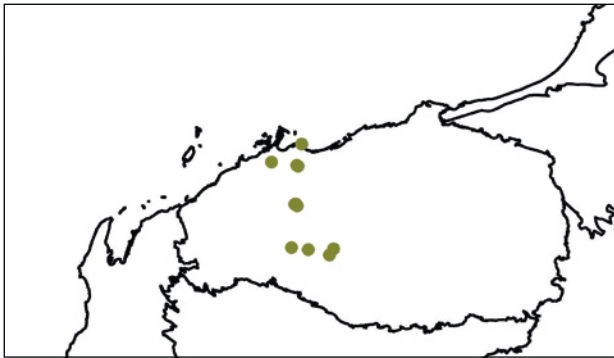


Plate 12 Striated Heron (*Butorides striatus*) adult of reddish form from Point Walcott (J. Bush).



Plate 13 Striated Heron (*Butorides striatus*) juvenile of reddish form from Point Walcott (J. Bush).

Ixobrychus flavicollis australis (Lesson, 1831)
Black Bittern



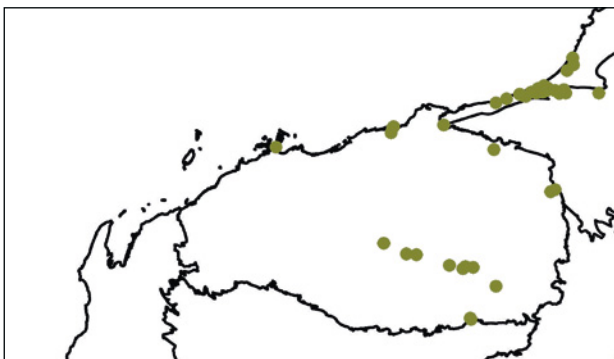
Uncommon resident of dense riverine forest, e.g. Millstream, Harding R. at Lockyer Pool, Wackilina Creek and Maitland R. at Miaree Pool. One breeding report in Sept.

Threskiornithidae

Plegadis falcinellus (Linnaeus, 1766)
Glossy Ibis

Nomadic. Rare to very common visitor or drought refugee. Usually in small parties (up to 20), occasionally in large aggregations, e.g. 250 at Fortescue Marsh in June 2000, over 800 at Mandora Marsh in Aug. 1999, over 5,000 in June 2000 and over 26,000 in Aug. 2000. Sewage ponds, river pools, freshwater soaks, flooded claypans.

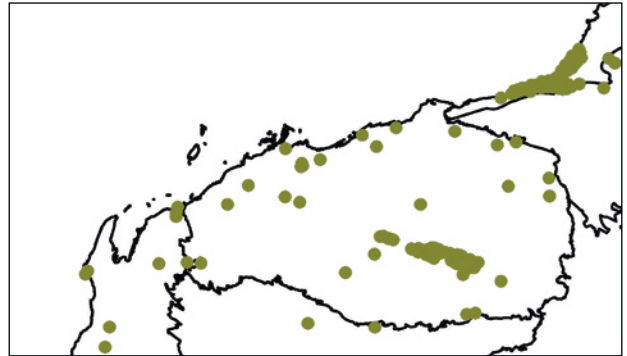
Threskiornis molucca (Cuvier, 1829)
Australian White Ibis



Nomadic. Locally common visitor on far northern-eastern coastal plain (e.g. Mandora Marsh in some years), but generally rare or uncommon. Usually single, occasionally in small parties, rarely in hundreds or thousands, e.g. estimate of 2,100 at Mandora Marsh in Aug. 1999, 1280 in June 2000 and 1520 in Aug. 2000. Mainly flooded claypans and flooded samphire flats, also mangrove creeks and

adjacent mud flats, saltwork ponds, sewage ponds, river pools and freshwater soaks. Few breeding records; a nest with one fresh egg found in mangroves at King Bay on 5 Sept. 1974 and several nests with eggs in Coolibahs on Mulga Downs on 12 Sept. 2006.

Threskiornis spinicollis (Jameson, 1835)
Straw-necked Ibis

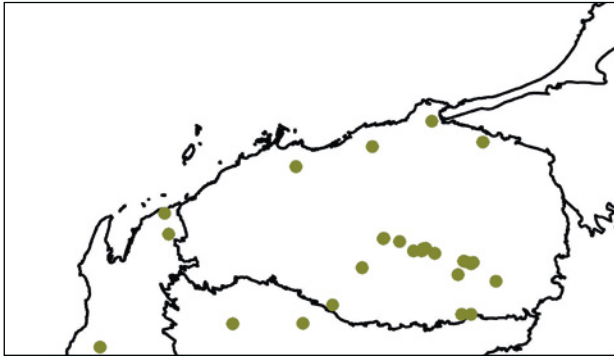


Throughout the region north to the Mandora Marsh and inland to Callawa and Newman. Highly nomadic, e.g. a runner banded near Gingin recovered eight months later on the Yannarie. Generally an uncommon visitor in ones, twos or small parties; occasionally erupting in flocks of many hundreds or thousands, e.g. on Cardabia Creek in spring 1900, at Fortescue Marsh (more than 800 in Aug. 1999 and Aug. 2000) and at Mandora Marsh in autumn 1982 and estimates of 36,200 there in Aug. 1999, 31,860 in June 2000 and 48,630 in Aug. 2000. Recorded breeding on Mulga Downs on 18 Oct. 1997 (four nests each with two young on an island in Fortescue Marsh at edge of Pelican colony) and in Mandora Marsh in Aug. 1999 and June 2000.

Platalea regia Gould, 1838
Royal Spoonbill

Mainly a rare visitor to region in small parties (up to 15), but also a regular visitor (in flocks up to 40) at Port Hedland Saltworks including juveniles and adults (some in breeding plumage). No breeding records but small groups (up to 15) recorded on Mulga Downs (Fortescue Marsh area) in Oct. 1997 and Sept. 2006 among breeding colonies of Yellow-billed Spoonbills and Little Pied Cormorants. Sewage ponds, river pools, freshwater soaks and flooded claypans and samphire flats.

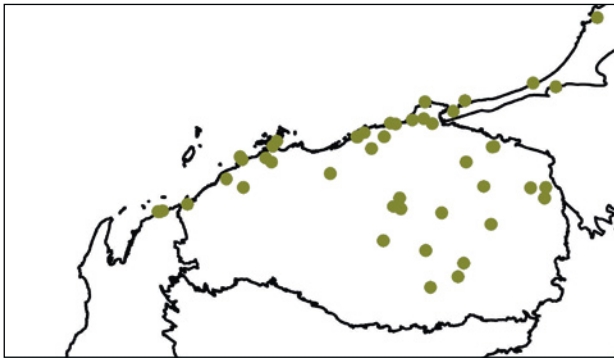
Platalea flavipes Gould, 1838
Yellow-billed Spoonbill



Rare or uncommon visitor usually in ones, twos or small parties (up to five), rarely larger aggregations, e.g. >40 birds at Fortescue Marsh in Aug. 2000. Pools on larger rivers and sewage ponds, e.g. one at Telfer Sewage Dam on 1 Aug. 1984. Breeding recorded at Fortescue Marsh, Mulga Downs.

Ciconiidae

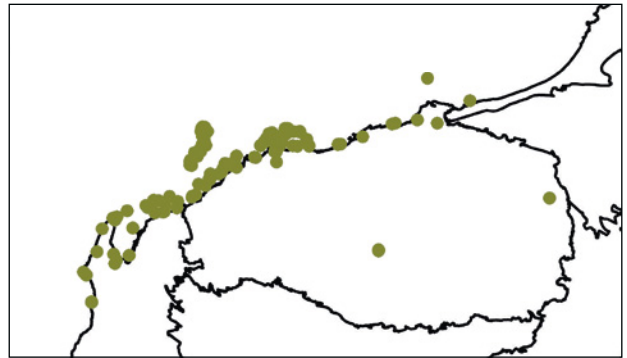
Ephippiorhynchus asiaticus australis (Shaw, 1800)
Black-necked Stork



Mainly northern coast and coastal waters, from Mandora Creek south-west to Ashburton estuary, occasionally inland on larger rivers, e.g. Oakover (Carawine Gorge) and Coongan (25 km N of Marble Bar). Formerly rare in the region and probably only a vagrant from the Kimberley, but gradually increasing in last 50 years and now a moderately common resident. More numerous near coast than inland and in north than south. Usually in ones or twos and larger aggregations at food-rich sites, e.g. 14 at Port Hedland Saltworks intake channel on 20 Sept. 1975. Tidal creeks and mudflats, saltwork ponds and river pools. Breeding in April south to Cape Preston.

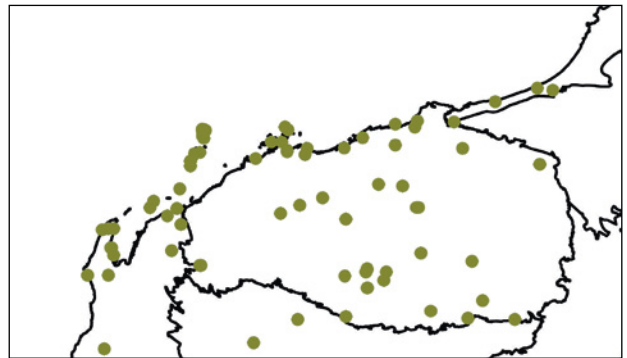
Accipitridae

Pandion haliaetus cristatus (Vieillot, 1816)
Osprey



Coast and islands north to Cape Keraudren and including Depuch Is., Jarman Is., Bezout Is., Delambre Is., Dampier Archipelago (Legendre, Dolphin, Angel, Rosemary, Goodwyn, Enderby, West Lewis), Passage Is (Fortescue, Sholl, Long, Passage, Middle Passage, Great Sandy), Montebello Is (North West, Trimouille, Hermite, Gardenia), Lowendal Is (E, F, G, H, J, K, Parakeelya, N, P, Varanus, Bridled, T), Barrow Is. (including Mushroom, Double, Boodie), North Sandy Is., Mary Anne Reef, North Mangrove Is., Direction Is., Thevenard Is., Bessieres Is., Round Is., Serrurier Is., Locker Is. and Frazer Is., also lower courses of larger rivers, e.g. De Grey, Maitland, Ashburton. Rare visitor to interior along larger rivers, e.g. Wittenoom Gorge, Carawine Gorge. Common, usually in ones or twos. Mainly sheltered seas around islands, tidal creeks, estuaries and saltwork ponds, also large river pools. Breeding mainly on islands, also on mainland in mangroves and occasionally in man-made structures, e.g. buoys in harbours, towers and poles, jetties and a wreck off North West Cape. Breeding from June to early Sept.

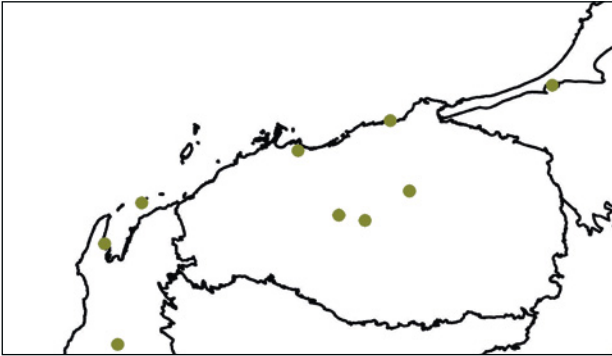
Elanus caeruleus axillaris Latham, 1802
Australian Black-shouldered Kite



Throughout the region, including Montebello Is, Barrow Is. and Dampier Archipelago. Scarce to moderately common (generally more numerous in winter than summer and in wetter than drier

regions. Usually single, occasionally in twos, rarely small groups. Mainly lightly wooded country, especially on coastal plain. In Dampier Archipelago attracted to warrens of *Rattus tunneyi*. Breeding north to De Grey R. in June and Aug.

Elanus scriptus Gould, 1842
Letter-winged Kite



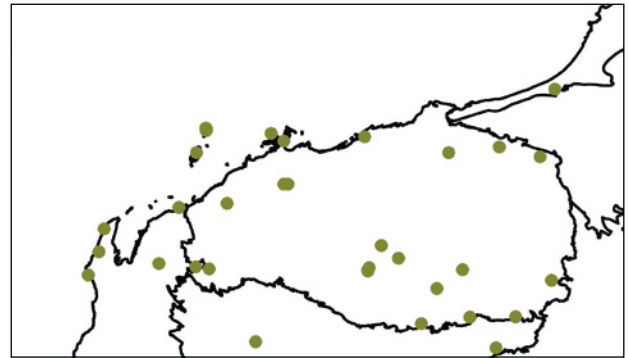
Rare, infrequent visitor. Usually rare or absent but present during periods of drought in eastern arid Australia. I.C. Carnaby saw three pairs at Learmonth in 1943 and found two nests. D.L. Serventy and others saw four single birds and a pair at Abydos, Hedley, Coolawanyah and between Roebourne and Onslow in Oct. 1951, and three birds were flushed from dead acacia bushes on

south end of Serrurier Is. and five from the north end on 11 July 1977.

Hamirostra isura (Gould, 1838)
Square-tailed Kite

Rare visitor. A male collected on Fortescue R., 80 km NW of Wittenoom on 17 March 1967; also recorded near Sandfire, Indee Station, Woodstock, Marandoo, Millstream, Fortescue Marsh, Tom Price, Roy Hill and an unconfirmed record from Barrow Is.

Hamirostra melanosternon (Gould, 1841)
Black-breasted Buzzard



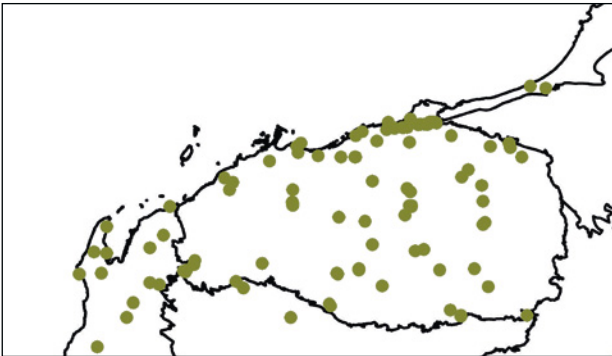
Throughout the region, north to Oakover R. and east to Balfour Downs, also islands including



Plate 14 Black-breasted Buzzard (*Hamirostra melanosternon*), Yannarie River (J. Bush).

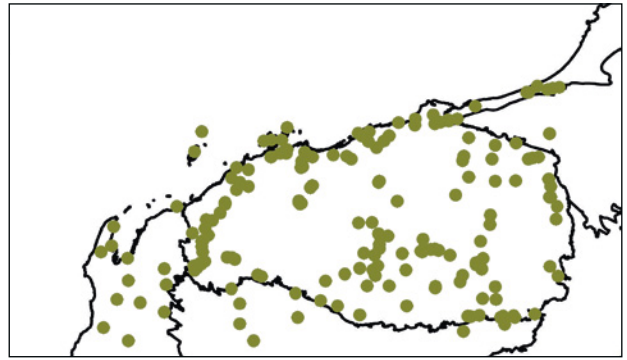
Rosemary, Montebello Is and Barrow Is. Previously scarce or rare in the region (i.e. between 1900 and late 1980s) but now uncommon to moderately common (1990s to 2009), the increase in abundance probably due to decline in pastoralists poisoning dingoes. Mainly lightly wooded country including coast and coastal plain, also river gums along watercourses, rare in eastern dune country. Breeding north to Oakover R. in Aug.–Sept. irrespective of rainfall. Few breeding reports between 1930–1950 but by late 1980s more widespread and over 50 nests reported between 1993 and 2003.

Milvus migrans affinis Gould, 1838
Black Kite



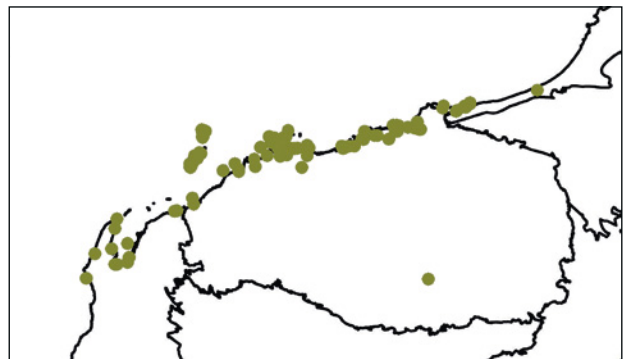
Originally a scarce to uncommon visitor from Kimberley (mainly in winter), sometimes breeding. Now uncommon to moderately common throughout the region, usually single, occasionally in small parties (up to 50). Also a very common dry-season visitor or drought-refugee, erupting in thousands in some years (e.g. 1900, 1952, 1978, a large exodus in 1979 but numbers still relatively high until late 1981, 1997, 1999, 2002 and 2005). Favours lightly wooded country around homesteads, towns, camps, roads and airfields, cattle musters and sources of carrion, attracted to fires and grasshopper plagues, garbage, sewage and road kills. Breeding reported in early April, Aug. and Sept.

Haliastur sphenurus (Vieillot, 1818)
Whistling Kite



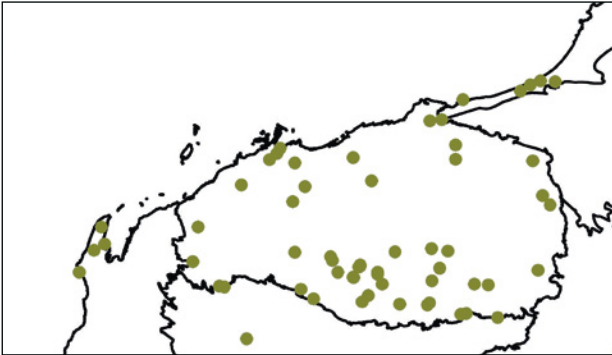
Throughout the region, including Dampier Archipelago (Legendre, West Lewis and Enderby), Montebello Is and Barrow Is., but scarce or absent in waterless sandy country. One of the most widespread and numerous raptors in the region. Common in ones, twos or small parties (up to 12). Favours lightly wooded country near water (including mangroves); also attracted to carrion (mainly on roads, especially kangaroos), dead nestlings in colonies of waterfowl and seabirds, fires, homesteads and occasionally saltwork ponds and edges of mangroves. Breeding in March–Sept. (including in mangroves).

Haliastur indus girrenera (Vieillot, 1822)
Brahminy Kite



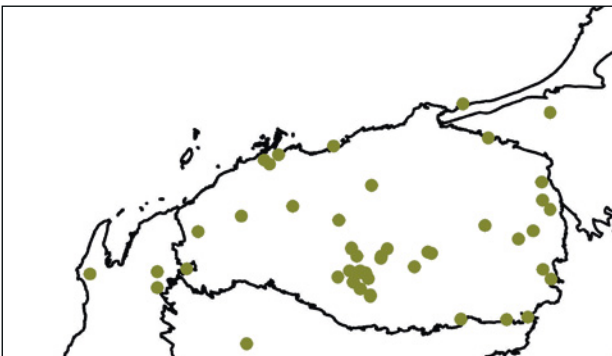
All coasts from Mandora Creek south-west to Yardie Creek and Point Cloates; also Depuch Is., Jarman Is., Dampier Archipelago (Legendre, Dolphin, Angel, Rosemary, West Lewis), Montebello Is (Trimouille, Hermite) and Barrow Is. (including Double and Boodie). Moderately common, usually in ones, occasionally twos, rarely small parties (up to five). Mainly in and near mangroves. Recorded scavenging around ships at anchor well outside Port Hedland harbour. Breeding from June to early Sept.

Accipiter fasciatus fasciatus
(Vigors and Horsfield, 1827)
Brown Goshawk



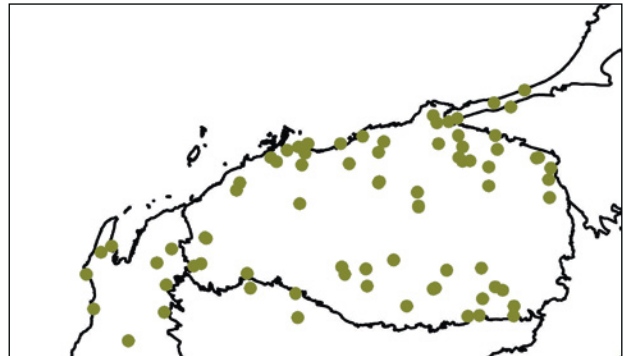
Throughout the region, a resident and visitor. Mainly a non-breeding visitor from the south-west of WA. Moderately common in autumn and winter, scarce in spring and summer. Usually single, occasionally in twos. All well-wooded country including mangroves. Breeding recorded north to Mandora Marsh in July and Oct.

Accipiter cirrocephalus cirrocephalus (Vieillot, 1817)
Collared Sparrowhawk



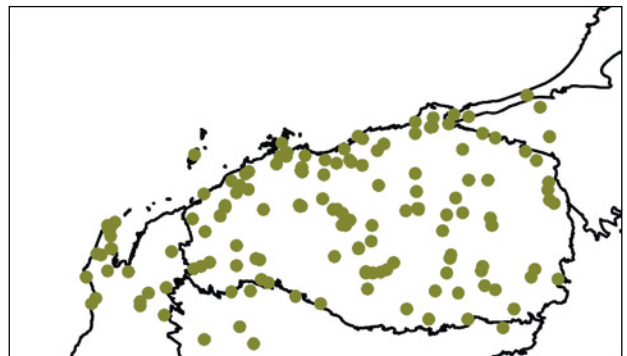
Recorded through most of the region. Uncommon to moderately common in ones and twos. Resident and visitor (possibly a small influx in numbers in autumn–winter with south-west migrants). Favours well-wooded country, especially about water, also mulga woodland. Breeding in Oct.

Aquila morphnoides morphnoides Gould, 1841
Little Eagle



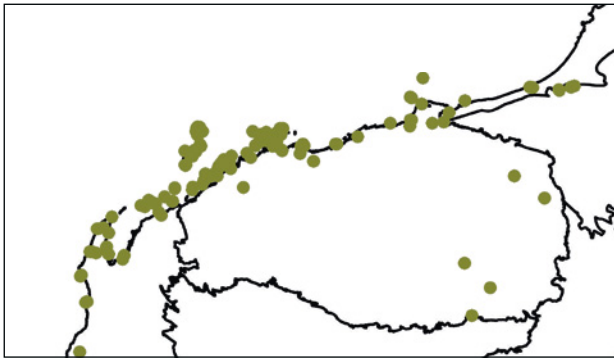
Throughout the region, north to Wallal and also Depuch Is. but rare or absent in far eastern desert zone. Uncommon to moderately common, usually single, occasionally in twos. Favours well-wooded country near water. Attracted to kangaroos killed on roads. Breeding July–Sept.

Aquila audax (Latham, 1802)
Wedge-tailed Eagle



Throughout the region. Moderately common on sheep stations and about main roads (where attracted to road kills), uncommon elsewhere. Usually in ones or twos, occasionally in small parties (up to nine). Breeding late May–early July. Judging from historical records appears to have increased in abundance since 1960s.

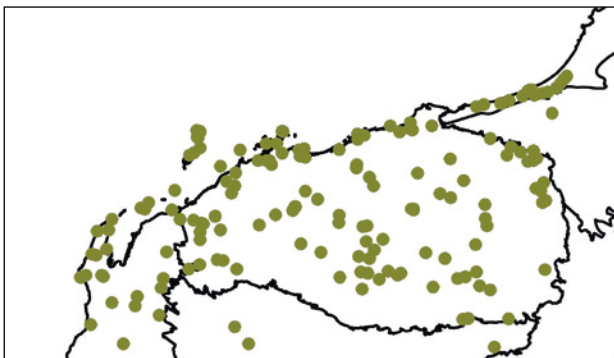
Haliaeetus leucogaster (Gmelin, 1788)
White-bellied Sea-Eagle



Coasts north to Mandora (including Mandora Marsh), including North Turtle Is., Depuch Is., Jarman Is., Dampier Archipelago (Legendre, Gidley, Dolphin, Angel, Rosemary, Enderby), Montebello Is (Trimouille, Hermite, small rocky islet), Lowendal Is (Abutilon, E, F, G, H, J, K, P), Barrow Is. (including Double and Boodie), Passage Is (Passage, North Sandy, Great Sandy) and islands off Onslow (Airlie, Thevenard, Direction, Bessieres), Anchor Is., East Is., Tortoise Is. and West Is. Occasionally ascending the larger rivers for hundreds of kilometres (e.g. the Nullagine to Mt Edgar and the Fortescue to Ethel Creek).

Moderately common, usually in ones or twos. Mainly sheltered seas, tidal creeks, estuaries, saltwork ponds and pools on larger rivers. Observed feeding on wallabies on islands. Breeding mainly on islands, also on transmission tower at Karratha, and formerly on south-western mainland at Qualing Pool, Mangrove Bay, Yardie Creek, Point Cloates and Point Maud, late May–early Aug.

Circus assimilis Jardine and Selby, 1828
Spotted Harrier



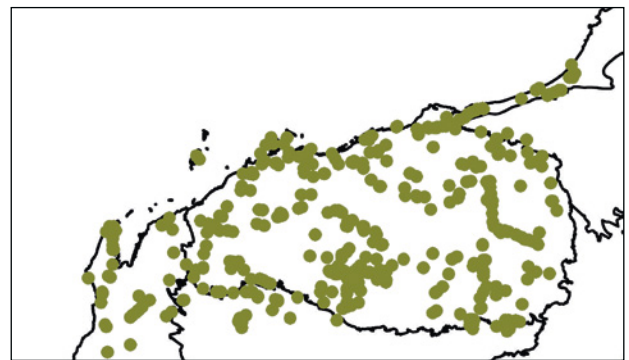
Throughout the region and also islands including Dampier Archipelago (Legendre, West Lewis), Gardenia Is., Lowendal Is, Barrow Is., Airlie Is. and Bessieres Is. Moderately common, usually single. Favours open or sparsely wooded grasslands. Breeding April–Sept.

Circus approximans Peale, 1848
Swamp Harrier

Rare but regular non-breeding visitor and possibly passage migrant from the south (Feb.–Sept.) mainly to coastal plain north to Mandora Marsh, also Montebello Is (Hermite, Bluebell and Ah Chong). Usually single, occasionally in small groups at food-rich sites (e.g. 10 at Mandora Marsh in Aug. 2000). Favours flooded grasslands and samphire flats, *Typha*-fringed river pools and sewage ponds also mangrove areas on passage.

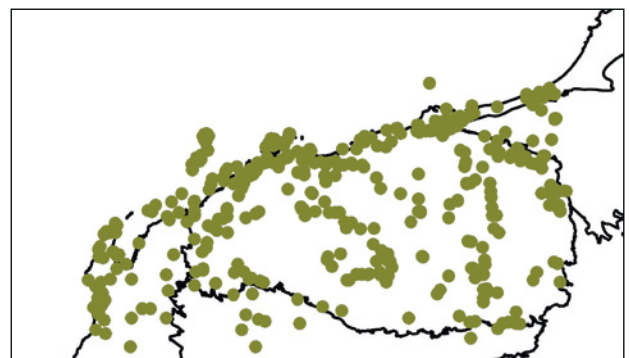
Falconidae

Falco berigora berigora Vigors and Horsfield, 1827
Brown Falcon



Throughout the region, including (in winter) some islands, e.g. Jarman, Dolphin, West Lewis, Rosemary, Enderby and Barrow. Common, usually single, occasionally in twos. Favours lightly wooded country, attracted to road kills and grass fires. Breeding June–Sept.

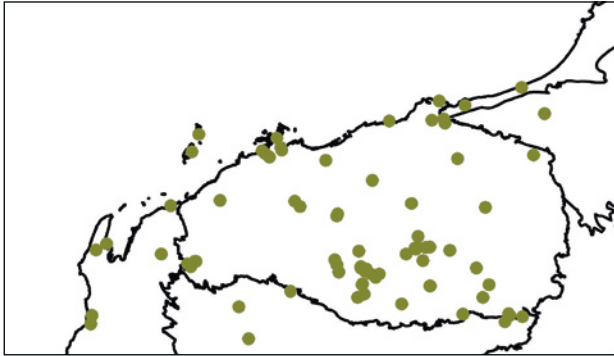
Falco cenchroides cenchroides
Vigors and Horsfield, 1827
Australian Kestrel



Throughout the region including numerous islands, e.g. Bedout (in autumn passage from south of State), Depuch, Jarman, Dampier Archipelago, Montebello Is, Lowendal Is, Simpson Is., Barrow (resident), North Sandy, Great Sandy, Airlie,

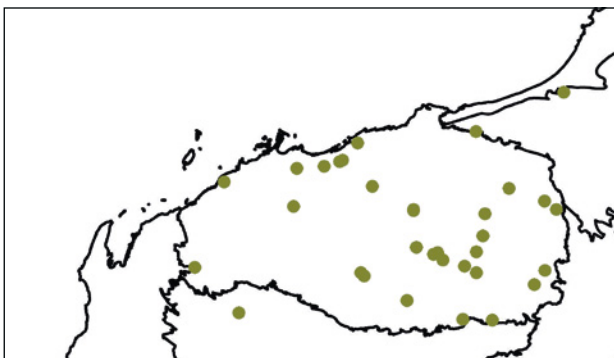
Thevenard and Bessieres. Common resident and very common autumn–winter visitor; usually single, occasionally in twos or small parties (up to 15). Favours treeless or lightly wooded country (especially coastal plain). Breeding on mainland and Barrow Is., July–Oct. Appears to have increased in abundance in the past century. Recent colonists of Christmas and Cocos (Keeling) Is may have originated from birds departing this region.

Falco longipennis Swainson, 1837
Australian Hobby



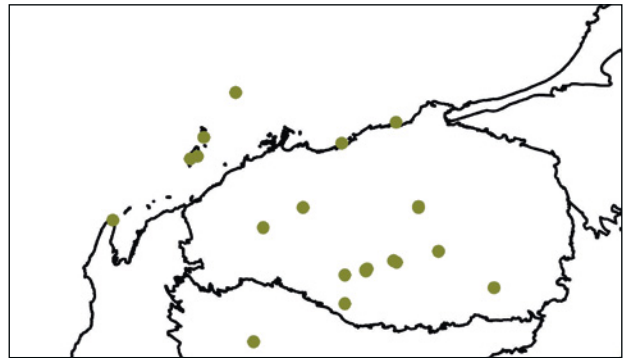
Throughout the region, including Barrow Is. Uncommon to moderately common resident and autumn–winter visitor (less frequent in eastern desert areas). Numbers augmented by passage migrants and winter visitors from the south. Favours lightly wooded country especially near water. Breeding Aug.–Sept.

Falco hypoleucos Gould, 1841
Grey Falcon



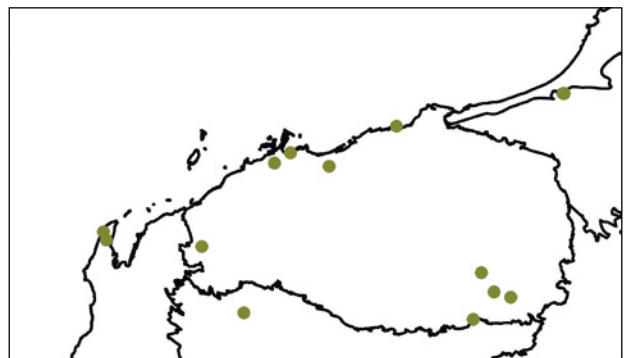
Greater part of the region but mainly coastal plains (between De Grey and Ashburton Rivers) and large river valleys, e.g. De Grey, Yule, Oakover (Woodie Woodie) and Fortescue around Newman. Resident and visitor. Usually single, occasionally in small parties or family parties (up to five). Breeding July–Aug.

Falco peregrinus Tunstall, 1771
Peregrine Falcon



Mainly southern parts of region, but ranging north to De Grey R. and Depuch Is. and east to Ethel Creek. Also one recorded by T. Kirkby on the Goodwyn A oil platform (130 km NW of Karratha) from 30 Oct. to 2 Nov. 1994, feeding on Wilson's Storm Petrels and Sacred Kingfishers and one recorded from Barrow Is. on 23 and 30 May 2010. Scarce, mainly a visitor (March–Aug.). Usually single, occasionally breeding Aug.–Sept. Some recent sightings suggest that some migratory northern hemisphere taxa may occur in the region, e.g. a first year bird observed by J. Darnell near Port Hedland in Nov. 1988 was most like the Asian form *F. p. calidus* or *F. p. japonensis*.

Falco subniger G.R. Gray, 1843
Black Falcon



Rare visitor to region, mainly recorded at Cape Range National Park, southern interior, Port Hedland Saltworks and Mandora Marsh area. Breeding in Aug.

Gruidae

Grus antigone gillae Schodde, 1988
Sarus Crane

Rare vagrant. One photographed in *Typha* 28 km WSW of Karratha in Feb. 1988.

Grus rubicunda (Perry, 1810)
Brolga

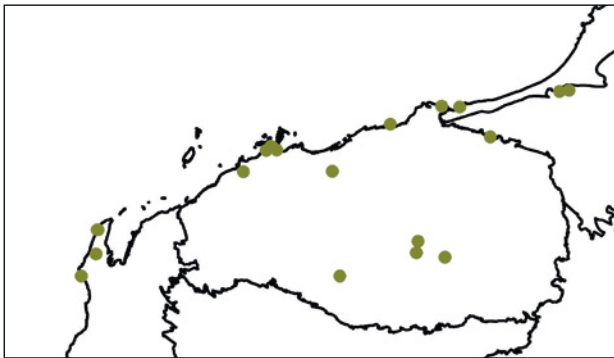
Coastal plain from Mandora Marsh and Pardoo south-west to Urala and Warroora (Lyndon R. floodout). Non-breeding (although courtship displays occasionally observed) dry-season visitor (late July–early Nov), presumably from Kimberley. Uncommon to locally common, in small parties (up to 30), rarely flocks (up to 150), e.g. >80 at mouth of Fortescue R. and 56 at Lyndon R. crossing on North West Coastal Highway in July 2009; and loose aggregations or concentrations (of several thousands), e.g. over 2,000 at Mandora Marsh in Aug. 1999 and over 3,600 in Aug. 2000. Mainly flooded gums and samphire flats, river pools, waterholes and ephemeral waters including flooded claypans. Appears to have increased in range and abundance.

Rallidae

Rallina fasciata (Raffles, 1822)
Red-legged Crake

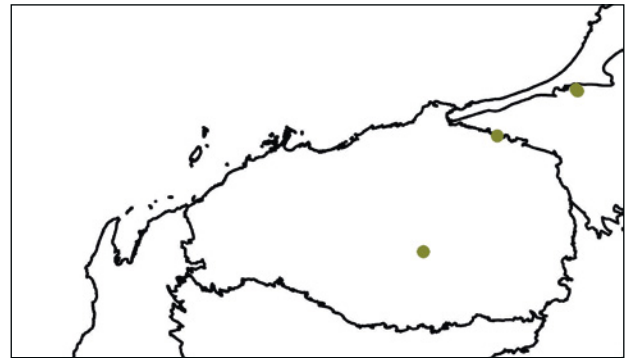
Vagrant from south-east Asia. One at Whim Creek from 29 May to 11 June 2007.

Gallirallus philippensis mellori (Mathews, 1912)
Buff-banded Rail



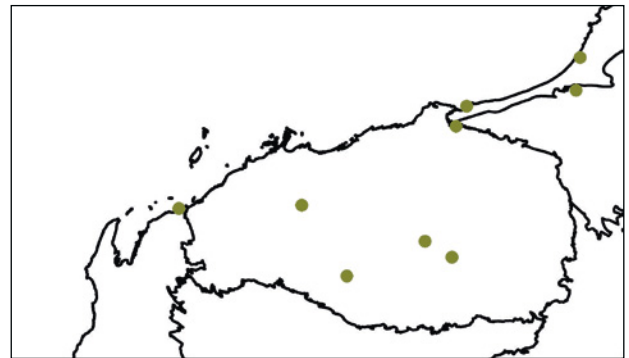
Mainly coastal areas from Mandora Marsh and Pardoo (Banningarra Spring) south-west to Point Cloates and also rare or casual inland (e.g. Shay Gap and Tom Price) and on East Intercourse Is. Nomadic. Moderately common, in ones or twos. Mangroves and adjacent flats, *Typha*-fringed creeks and soaks, swamps, sewage ponds, flooded claypans and long grass. Breeding in July and Sept. (nest with eggs at Mulga Downs on 11 Sept. 2006).

Porzana pusilla palustris Gould, 1843
Baillon's Crake



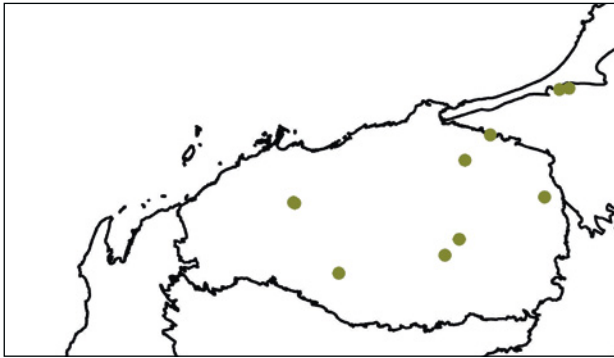
Rare. Recorded at Shay Gap sewage ponds; three recorded at Mandora Marsh (Eil Eil Spring) in Oct. 1999 and breeding reported at Mulga Downs (nests with eggs on 9 and 11 Sept. 2006).

Porzana fluminea Gould, 1843
Australian Spotted Crake



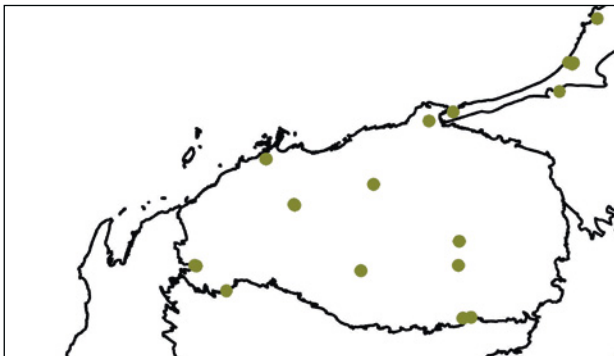
Throughout the region, north to Mandora Marsh and Pardoo, south to Onslow and inland to Goldsworthy, Shay Gap and Tom Price. Uncommon in ones or twos. Mainly freshwater swamps and soaks fringed with *Typha* and sedges, also flooded claypans and sewage ponds. Breeding in late July or early Aug.

Porzana tabuensis (Gmelin, 1789)
Spotless Crake



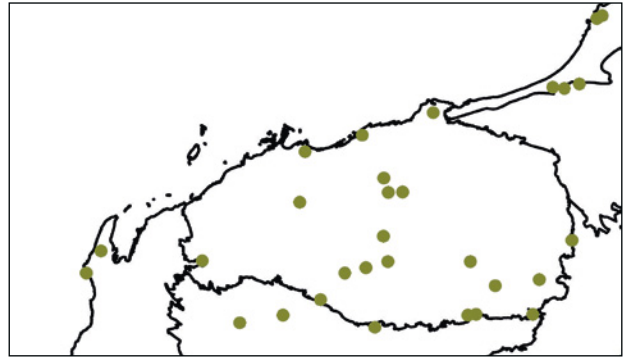
Rare. Recorded at Mandora Marsh, Shay Gap, Millstream, Tom Price, Carawine Gorge and Cooks Pool on the Fortescue Marsh. Mainly flooded samphire flats and claypans and *Typha*-fringed swamps and springs. Breeding reported at Shay Gap.

Porphyrio porphyrio melanotus Temminck, 1820
Purple Swamphen



Patchily distributed over much of the region. Recorded at Mandora Marsh, Pardoo, De Grey, Millstream, Nanutarra, Marandoo, Newman, Miaree Pool and Glenflorrie. The only permanent and fairly numerous population inhabits the extensive *Typha* beds about the Fortescue R. immediately below Millstream homestead. Locally common (at Millstream) but generally scarce and patchily distributed and partly nomadic, e.g. locally and seasonally common at some sites such as Mandora Marsh (estimate of 1,780 in Aug. 2000) in flood years. Mainly freshwater swamps and river pools with dense beds of *Typha*. Its habitat in many areas has been adversely affected by cattle grazing (e.g. *Typha* pools on Pardoo). Breeding recorded at Millstream (nest with four eggs) on 28 Aug. 1970.

Gallinula ventralis Gould, 1837
Black-tailed Native Hen

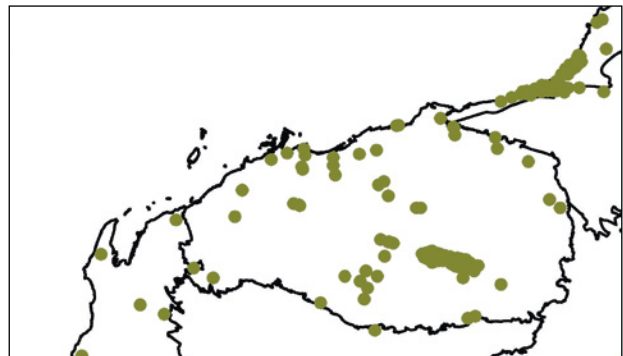


Throughout the region, north to Sandfire and Mandora Marsh and east to Balfour Downs and Jigalong. Highly nomadic. Locally common in good years (following winter and summer rains) but generally scarce. In ones, twos or small parties (up to 14). Mainly inundated flats and other ephemeral waters, also swamps, claypans, sewage ponds and river pools. Breeding in July.

Gallinula tenebrosa tenebrosa Gould, 1846
Dusky Moorhen

Rare visitor to far south of the region. Recorded at Tom Price sewage ponds on several occasions between 6 June and 13 Nov. 1977, three at Newman sewage ponds on 5 Nov. 1981 and one at Ophthalmia Dam in May 2005.

Fulica atra australis Gould, 1845
Eurasian Coot

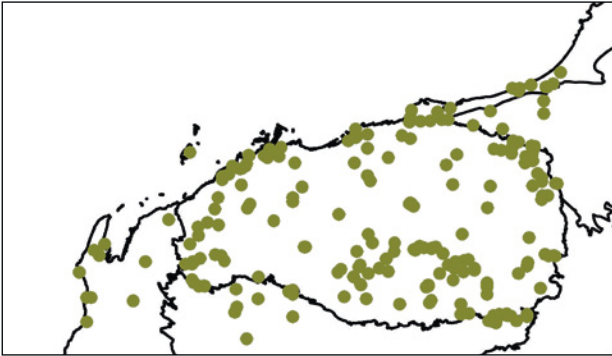


Throughout the region north to Mandora Marsh and Sandfire and east to Shay Gap, Woodie Woodie and Newman. Nomadic. Formerly an infrequent or irregular visitor and although now recorded more regularly its status remains that of a dry-season visitor or drought refugee, highly variable in numbers and seldom breeding. Normally rare but occasionally very common (more plentiful on coastal plain than in interior). Usually in small parties, occasionally in flocks (up to 120), rarely flocks of many thousands (e.g. over 40,000 at Mandora Marsh in Aug. 1999 and over 20,000 in Aug. 2000). Favours

flooded claypans and samphire flats, interdunal desert lakes with ephemeral vegetation, sewage ponds and river pools. Breeding in Feb.–March, June and Aug. This species is involved in large-scale movements following extensive drought. Such events can involve massive aggregations as recorded on the Mandora Marsh in 1999 and 2000.

Otididae

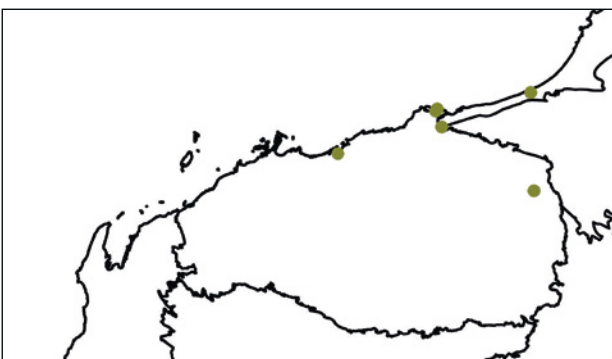
Ardeotis australis (J.E. Gray, 1829)
Australian Bustard



Throughout the region, casual on Barrow Is. Nomadic. Locally and seasonally varying from scarce to common when abundant green herbage builds up numbers of grasshoppers and other insects especially on coastal plain and spinifex sandplains in far east of region. Usually in ones or twos, commonly small flocks (up to 35). Mainly treeless or lightly wooded plains, samphire flats, spinifex plains and one flock of 30 observed foraging over recently burnt ground. Breeding in March–Sept.

Turnicidae

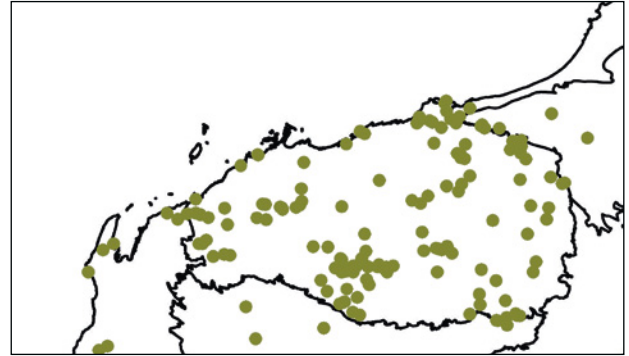
Turnix pyrrhоторax (Gould, 1841)
Red-chested Button-quail



Coastal plains from Mandora south to Balla Balla. Highly nomadic. Locally and seasonally very common (e.g. at De Grey in May 2006) but generally scarce or absent. In ones, twos or small parties. Plains with long grass (especially Buffel) and rank herbage, also *Spinifex longifolius* and lightly wooded country with scattered grasses and herbage

including spinifex. Appears to have increased in range and abundance since the introduction of Buffel Grass and a spate of cyclones in 1990s. Breeding April–May.

Turnix velox (Gould, 1841)
Little Button-quail



Throughout the region but no records from islands. Highly nomadic and irregular. Common in good seasons (only to be then absent for several years) especially on coastal plain but generally uncommon. In ones, twos or small parties (up to five). Mainly lightly wooded grasslands, including spinifex, usually on flats near coast and along watercourses in interior. Breeding recorded in Aug.

Scolopacidae

Gallinago hardwickii (J.E. Gray, 1831)
Latham's Snipe

Rare vagrant or (from the few records from south-west WA) a rare visitor from north-east Palaearctic. Single birds netted at Mt Goldsworthy sewage ponds in Oct. and Nov. 1972 and Feb. 1975. On both occasions the bird was in company of Pin-tailed Snipe.

Gallinago stenura (Bonaparte, 1830)
Pin-tailed Snipe

Uncommon to locally moderately common (even regular at some sites), visitor from the northern hemisphere (late Sept. to early April but most records from late Oct. and Nov. onwards). Mainly northern coastal plains from Pardoo (Banningarra Spring) south-west to the lower Maitland (Whyjabby Pool) and inland to Shay Gap and Newman. Usually single but occasionally in small parties (up to six). Freshwater springs and overflows, river pools, sewage ponds, irrigated areas and areas inundated with floodwaters especially those near cover (e.g. taller grasses). About 80% of snipe occurring in the Port Hedland, Goldsworthy and Shay Gap region belong to this species.

Gallinago megala Swinhoe, 1861
Swinhoe's Snipe

Scarce or rare migrant from northern hemisphere but regular at favoured locations (Oct.–March), mainly to freshwater wetlands in far north-east (but also on coastal plains south to Sherlock). A specimen collected at Mt Goldsworthy sewage ponds on 19 Oct. 1977 with others netted at that site. This species progressively replaces the Pin-tailed Snipe (as the most common species) in regions east of Pilbara, i.e. most snipe recorded in Kimberley are Swinhoe's.

Limosa limosa melanuroides Gould, 1846
Black-tailed Godwit

Regular migrant from northern hemisphere. Most of coast from Pardoo south-west to Mangrove Bay, also Barrow Is. Scarce or uncommon visitor (mainly late Aug. to mid to late April) from northern Palaearctic. No records of wintering birds. In ones, twos or small flocks (up to 35) at favoured sites, e.g. Port Hedland Saltworks. Recorded mainly at saltwork ponds (only low salinity ponds) but also rocky and muddy coasts especially where deep mud substrate is present, rarely sandy beaches (but frequently those for roosts or loafing at high tide). Despite being one of the more numerous wader species visiting Australia, this species is rarely recorded in the region (and in WA generally). Although all birds visiting Australia are considered to be of the subspecies *melanuroides*, the Pilbara birds appear to differ consistently from those in eastern Australia, having (in non-breeding plumage) medium brownish grey (cf. darker cold grey) upper parts. In this character they resemble birds from the Malay Peninsula. It is possible that birds visiting WA are from a more westerly area of the species' disjunct Eurasian breeding range and the Pilbara could represent a significant non-breeding area for this population.

Limosa lapponica menzbieri Portenko, 1936
Bar-tailed Godwit

Regular migrant from northern hemisphere. All coasts including Montebello and Barrow Is. Common visitor (mainly Sept.–April, but some remaining all months) from Palaearctic. Usually in ones, twos or small flocks (up to 50) over most of the region, but occasionally flocks of 300–500 occur regularly along coastline, particularly from Port Hedland northwards. This area, combined with that of the adjacent Kimberley, is estimated (by the Australian Wader Study Group) to hold around 100,000 birds, a major non-breeding ground

for this species. Although most birds depart in mid to late April, in some locations the number of stay-over birds is almost as high as that at other times, suggesting that some birds may move into the region from sites further south. Tidal mudflats, beaches and saltwork ponds (but not high-salinity ponds). Recent ringing records and telemetry tracking indicate that Pilbara–80 Mile Beach birds originate in the mid-eastern Siberian region. Also there are sight records of birds having plumage characters of the more westerly breeding nominate taxon.

Numenius minutus Gould, 1841
Little Curlew

Coast and coastal plains from Mandora south to Point Cloates. Regular visitor from northern hemisphere. Uncommon to moderately common in north-east, scarce south-west of Port Hedland. Usually in ones, twos or small parties, occasionally flocks (up to 150) and can gather into large flocks just before departure. Mainly near-coastal samphire and grass flats, also tidal mudflats. Arrivals in mid Sept.–Oct., largely restricted to coastal and near-coastal areas (e.g. coastal plains, samphire flats, mudflats, sports ovals), appear to remain for a few weeks after which (particularly following rainfall or cyclonic events) most depart as far fewer are recorded from Nov. onwards. No inland records. Large pre-departure flocks recorded in early to mid April from some near-coastal locations (e.g. Pardoo) but these appear to be irregular as in some years very few are recorded even when species with which they typically congregate (e.g. Oriental Plover, Oriental Pratincole) are there in high numbers.

Numenius phaeopus variegatus (Scopoli, 1786)
Whimbrel

All coasts and many of the larger islands (e.g. Legendre, West Lewis, Enderby and Barrow). Common visitor (all months) from northern hemisphere. Usually in ones, twos or small flocks (up to 25). Mainly tidal mudflats, less frequently sandy beaches and saltwork ponds (but not high-saline ponds). Numbers are augmented by post breeding and juvenile (first year birds) late Aug.–Sept. but after their return in April some locations are deserted, while at others the population changes little (e.g. Port Hedland harbour), probably due to southern birds moving north into the region during winter months. Some sight records of birds having white rump-upper tail coverts and underwing coverts indicate that occasional nominate subspecies birds may occur in the Pilbara.

Numenius arquata (Linnaeus, 1758)
Eurasian Curlew

Rare vagrant from the northern hemisphere. One recorded just outside the region on the Eighty Mile Beach in Nov. and Dec. 2007 and Dec. 2008.

Numenius madagascariensis (Linnaeus, 1766)
Eastern Curlew

All coasts including Barrow Is. Moderately common visitor from northern hemisphere (but some present all months). In ones, twos, occasionally small parties (up to eight). Mainly tidal mudflats near mangroves, also saltwork ponds (only the lower salinity ponds).

Tringa erythropus (Pallas, 1764)
Spotted Redshank

Rare vagrant from northern hemisphere. One observed at Port Hedland Saltworks on 24 Oct. 1956. Recorded just outside the region in Roebuck Bay in June 1993.

Tringa totanus (Linnaeus, 1758)
Common Redshank

Rare visitor to coastal areas from northern hemisphere. Most records of single birds; from Port Hedland Saltworks on two occasions in Sept. and Oct. 1975 and Nov. 1993, at Mangrove Bay on 22 June 1902, and at muddy edge of salt lake 1 km E of Coral Bay on 2 Sept. 1974. Also four on salt fields at Dampier on 15 Dec. 1984 and odd birds recorded scattered along north-west coast during wader studies expedition in March–April 1985. Mainly saltwork ponds and tidal flats. All birds observed have been in non-breeding plumage and no specimens have been collected so subspecific identity of Pilbara birds not established.

Tringa stagnatilis (Bechstein, 1803)
Marsh Sandpiper

Regular migrant from northern hemisphere. Northern coast and coastal plains from Mandora south-west to Dampier and inland to Shay Gap. Visitor (late Aug.–Sept. to mid–late April but odd records through to early June) from northern hemisphere. Uncommon to moderately common; usually in ones, twos or small parties, occasionally flocks (up to 200). Near-coastal brackish lagoons and freshwater soaks, flooded samphire flats and saltwork and sewage ponds. At Port Hedland Saltworks 100–200 regularly observed; occasionally frequents hypersaline ponds where some recorded picking from the surface (from swimming position) in light wind conditions.

Tringa nebularia (Gunnerus, 1767)
Common Greenshank

Throughout the region from Mandora south to Yardie Creek and east to Mandora Marsh, Shay Gap and Newman. Visitor (late Aug. to early June) from northern hemisphere. Moderately common on northern coast and at Mandora Marsh following cyclonic inundation (e.g. hundreds at the Mandora Marsh in April 1982 and estimates of 920 in Aug. 1999, 230 in June 2000 and 1290 in Aug. 2000, C. Hassell); uncommon south of Dampier and in interior generally in ones, twos or small parties, occasionally flocks (up to 200) especially at roosts. The large Aug. numbers at Mandora Marsh correspond with their peak arrival period and at this time it is estimated that the Eighty Mile Beach and Roebuck Bay have a population in excess of 3,000 birds. Tidal mudflats, mangrove creeks, flooded samphire flats, beaches, river pools, and saltwork and sewage ponds. At Port Hedland Saltworks frequently feeds in hypersaline ponds, often from a swimming position but occasionally up-ending.

Tringa guttifer Nordmann, 1835
Nordmann's Greenshank

Rare vagrant from northern hemisphere. One recorded just outside the region on the Eighty Mile Beach (Anna Plains) on 29 Dec. 2009.

Tringa glareola Linnaeus, 1758
Wood Sandpiper

Throughout the region, north to Mandora and east to Goldsworthy and Newman. Summer visitor (Aug.–April) from northern hemisphere. Probably essentially a passage migrant with peak numbers along Port Hedland-Shay Gap area in Sept. after which several locations in that area are less commonly utilised. Uncommon in ones, twos or small flocks (up to 30). Mainly river pools, sewage ponds, flooded claypans, freshwater lagoons and bore overflows. Unknown if numbers in this region have decreased in parallel to that in the south-west of WA.

Tringa cinerea (Güldenstädt, 1774)
Terek Sandpiper

Northern coast from Mandora south-west to Dampier, also Barrow Is. Uncommon to scarce summer visitor (Aug.–May but mainly Sept.–April) from the northern hemisphere. No over-wintering records. Usually in ones, twos or small flocks (up to 40). Favours tidal mudflats and saltwork ponds (mainly intake pond). Relatively common on the Eighty Mile Beach (Lane 1987) at extreme eastern limit of this region.

Tringa hypoleucos Linnaeus, 1758

Common Sandpiper

Throughout the region, north to Mandora (including Mandora Marsh) and inland to Shay Gap, Oakover R. (Carawine Gorge) and Newman, also some islands including Barrow and the Montebellos. Moderately common visitor (late Aug.–early May but mainly mid Sept. to mid–late April) from northern hemisphere. Also odd records of over-wintering birds. Usually in ones or twos, occasionally in small parties. Favours tidal and reef flats, beaches, saltwork ponds, river pools, flooded claypans, freshwater soaks and ephemeral waters.

Tringa brevipes (Vieillot, 1816)

Grey-tailed Tattler

All coasts (including Mandora Marsh) and including islands as far offshore as Legendre and the Montebellos. Moderately common visitor (all months but mainly Sept.–June) from northern hemisphere. In ones or twos, occasionally flocks (up to 100). Most frequent in far north-eastern section of coast from Mandora to Cape Keraudren. The adjacent Eighty Mile Beach area has the largest numbers in Australia (8,500 birds; Lane 1987). Recorded all months but numbers augmented by post-breeding juvenile birds in late Aug.–Sept., the migrants departing in early to mid-April. The numbers of wintering birds can locally comprise a significant percentage of the summer population (up to 50% at Finucane Is.), but this is not typical. Departing birds (recognisable by development of breeding plumage) are probably replaced by birds (all in basic or at most with only limited development of breeding plumage) from elsewhere, possibly southern coasts. Tidal mudflats, reef flats, mangrove creeks, sandy beaches and saltwork ponds, also near-coastal sewage ponds and brackish lagoons.

Arenaria interpres interpres (Linnaeus, 1758)

Ruddy Turnstone

All coasts (including Mandora Marsh) and many islands including West Lewis, Enderby, Passage, North West, Trimouille, Hermite, Gardenia, Alpha, Primrose, Barrow, Boodie, North Sandy, Great Sandy, Airlie, Thevenard, Serrurier and Flat. Moderately common to common visitor (all months) from northern hemisphere. In ones, twos or small flocks (up to 15). Tidal mud and reef flats, beaches and saltwork ponds, also near-coastal sewage ponds (Port Hedland and Wickham). Recorded throughout the year, mainly late Aug.–Sept. to mid–late April, the numbers augmented in Aug.–Sept. by post-breeding juvenile birds. The high wintering

population probably represents a movement into the area, in part at least, from more southerly areas.

Limnodromus semipalmatus (Blyth, 1848)

Asian Dowitcher

Far north-eastern coasts from Mandora south-west to Port Hedland. Rare visitor from northern hemisphere. Mainly Sept. to early–mid April but with odd birds remaining throughout winter months. Regular at Port Hedland Saltworks and favouring the low salinity pond with deep mud substrate pump-fed only at high tide conditions approximating to a low-range tidal situation, the only one of its type in the region. Usually in ones, twos or small flocks (up to 35). Mudflats, tidal creeks and saltwork ponds (lower salinity ponds only). A total of 130 at Port Hedland Saltworks on 4 April 1982 and 185 in 2005. Possibly increasing in numbers. Associates regularly with godwits. The population at Port Hedland Saltworks has shown a steady increase from 6 (in 1975/76) to 185 (2005) and has expanded into Roebuck Bay and adjacent areas. Overall this region now holds a significant percentage of the total world population.

Calidris canutus piersmai Tomkovich, 2001*Calidris canutus rogersi* Mathews, 1913

Red Knot

Most of the coast from Mandora south-west to the Ashburton estuary, also Barrow Is. Uncommon to moderately common visitor (mainly Aug. to early April) from northern hemisphere. Usually in ones, twos or small flocks, occasionally large flocks (hundreds), also huge aggregations of thousands upon arrival or just before departure, e.g. on Eighty Mile Beach. Peak numbers coincide with arrival of post-breeding and juvenile birds late Aug. to early–mid Sept. Ringing data suggest that many of these subsequently (after restoring body mass lost during the migration flight) move further south or cross the continent. A return movement of these birds (although less pronounced) occurs in early April. On the Eighty Mile Beach (Anna Plains–Mandora), regular flocks of up to 200 accumulate into aggregations of thousands as the rising tide concentrates the smaller flocks. Recent research by D. Rogers and colleagues (Battley *et al.* 2005; Piersma *et al.* 2005) has demonstrated that, although *piersmai* is the more common, both taxa are present in the area with, in both cases, some individuals remaining whilst others extend their migratory flights to south-eastern Australia and even New Zealand in some instances. Although arrival dates for both are similar, their departure dates (i.e. back to their breeding areas) differ; *piersmai* leaving some

10–14 days later than *rogersi*.

Calidris tenuirostris (Horsfield, 1821)

Great Knot

Mainly northern coasts from Mandora, south-west to Port Hedland, also Barrow Is. Moderately common to common visitor (mostly Aug.–May) from northern hemisphere. Recorded all months, post breeding birds arrive in late Aug.–early-mid Sept. with peak numbers present until Oct.–Nov. Pre-breeding birds depart in mid March to mid April but in some areas (e.g. Port Hedland harbour) the numbers of over-wintering birds form almost 70% of the peak summer numbers. This suggests that birds from further south may move into this region over the winter months. Usually in ones, twos or small flocks (up to 40), occasionally in large flocks (of many hundreds or thousands) usually soon after arrival or just before departure (e.g. at southern end of Eighty Mile Beach and Mandora Creek). The Australian Wader Study Group (AWSG) surveys have provided estimates of populations of up to 160,000 (Lane 1987) for the Eighty Mile Beach, making this a major non-breeding area for this species. Favours tidal mud and sand flats and saltwork ponds (only low salinity ponds).

Calidris alba (Pallas, 1764)

Sanderling

Most of the coast from Mandora south-west to Point Cloates, also some islands including North West, Trimouille, Barrow, Boodie, Serrurier and Flat. Visitor (all months) from northern hemisphere. Mainly arrive in Sept. and pre-breeders depart in March or mid-April but non-breeding birds present over all months. Observations elsewhere suggest that many post-breeding arrivals move on to south-eastern Australia shortly afterwards. Locally common (e.g. Eighty Mile Beach, Point Cloates) but generally uncommon, usually in small flocks (up to 30). Restricted to coastal habitats, mainly open beaches, also sandy inlets and saltwork ponds, less frequently mudflats (usually the drier margins).

Calidris ruficollis (Pallas, 1776)

Red-necked Stint

All coasts including the Mandora Marsh and extensive samphire flats east of Sandfire, also the Montebello Is and Barrow Is. Very common visitor from northern hemisphere (present all months, but mainly late Aug.–Sept. to mid-March–late April). Many newly arrived, post-breeding juvenile birds soon move further south, but a corresponding northward movement (returning birds) appears to be of a lesser scale, the birds either using a

different route or over-flying the area. Usually in small flocks, occasionally aggregations of hundreds, thousands or tens of thousands, especially soon after arrival or just before departure. Non-breeding or wintering population possibly augmented by southern Australian birds. Mainly intertidal mudflats, beaches (less commonly), reef platforms, saltwork ponds (including hypersaline ponds), inundated samphire flats and near-coastal sewage ponds, brackish lagoons and freshwater soaks. The AWSG surveys have provided estimated maxima of Eighty Mile Beach (60,000) and Port Hedland Saltworks (23,000), indicating that these sites are more important than the remainder of the Pilbara coast (1,360; Lane 1987). Thunderstorms and cyclonic flooding open up transient feeding areas and some new arrivals head further south, hence population figures for major sites decrease markedly. For example a typical population estimate for the Port Hedland Saltworks over the summer months is 6–8,000. The decrease along the remaining Pilbara coast does not appear to be so great. Despite birds over-flying the area and feeding opportunities becoming available, very few inland records have been reported.

Calidris minuta (Leister, 1812)

Little Stint

Rare migrant from northern hemisphere. One, in full breeding plumage, at Port Hedland Saltworks in April 1992 and one also in breeding plumage at Dampier Saltworks on 4 Nov. 2005.

Calidris subminuta (Middendorff, 1853)

Long-toed Stint

Scarce or uncommon visitor (but regular in small numbers) from northern hemisphere (late Aug. to late March); no wintering records. Usually in ones, twos or small parties (up to 18) at arrival period. Recorded at Mandora Marsh (18 in Oct. 1999), Pardoo, also freshwater pools on Petermarer Creek and the Yule and Sherlock Rivers, and at Shay Gap, Goldsworthy, Port Hedland, Karratha and Newman sewage ponds. Restricted to freshwater habitats (river pools, soaks, ephemeral flooding, sewage ponds, and slightly brackish flooded areas, e.g. Mandora Marsh, but not saline areas).

Calidris melanotos (Vieillot, 1819)

Pectoral Sandpiper

Rare visitor from northern hemisphere to fresh waters. Three records, viz. one observed with three Sharp-tailed Sandpipers at a small pool on the Harding R. near Roebourne on 11–12 Jan. 1959, one collected from a mixed flock of *ca.* 10 Pectoral and

40 Sharp-tailed Sandpipers at Newman sewage ponds on 29 Nov. 1981 and one at tailings pond on Finucane Is. (Port Hedland) on 17 March 1983. Recent surveys have shown that this species occurs in small numbers annually in the south-west of WA.

Calidris acuminata (Horsfield, 1821)

Sharp-tailed Sandpiper

Throughout the region, north to Mandora Creek and inland to Mandora Marsh, Sandfire, Goldsworthy and Newman, also on Barrow Is. during southward passage. Common visitor (mid Aug.–late April, early May) from northern hemisphere. Peak numbers occur over the Port Hedland-Mandora area in Sept.–Nov., as newly arrived birds feed prior to continuing their migration across central Australia. There appears to be very little increase in numbers prior to their departure, suggesting that most southern birds either over-fly this area or use different routes. Along the coastal areas south and west of Port Hedland, numbers fall off markedly and the passage effect is not apparent. Much less common but widespread inland with most records associated with areas of temporary flooding (e.g. cyclonic rains). No over-wintering records. The peak population numbers obtained by AWSG were Eighty Mile Beach 25,000 and Port Hedland Saltworks 20,000, but only very low numbers elsewhere. At the latter location typical peak numbers are as high as 12,000 but dropping to 700–1,200 by Nov. or even less if local rains or flooding have occurred. In some years the population in Jan.–Feb. is only about 100 birds. Numbers increase again prior to departure (mid Feb. to mid March) but only to numbers well below those of the Sept.–Nov. arrival, typically 1,500–2,000. Apart from the concentrations noted above, usually in small parties (5–30), occasionally flocks of many hundreds (e.g. 615 at Mandora Marsh in Oct. 1999). Very catholic in feeding requirements ranging from freshwater to hypersaline. Favours flooded samphire flats and grasslands, mangrove creeks, mudflats, beaches, river pools, saltwork ponds (where commonly located on hypersaline ponds) sewage ponds, and freshwater soaks.

Calidris alpina (Linnaeus, 1758)

Dunlin

Rare visitor or vagrant from northern hemisphere. One record, a single bird in non-breeding plumage, observed at Port Hedland Saltworks on 25 Feb. 1977. Its subspecific identity is not established.

Calidris ferruginea (Pontoppidan, 1763)

Curlew Sandpiper

Mainly northern coast from the easternmost extent of the region (Mandora including Mandora Marsh), south-west to Nickol Bay, being particularly common (locally abundant) north and east of Port Hedland but rare inland and on offshore islands. Visitor (mainly mid-Aug.–late-April) from northern hemisphere but recorded, although less commonly, throughout the year. Surveys by AWSG give peak numbers as: Eighty Mile Beach 60,000, Port Hedland Saltworks 25,000 and Pilbara coast south and west of Port Hedland 600. These figures again illustrate the preponderance of records and importance of the north-eastern section of the coastline to wader migration and how rapidly the numbers decrease over the remainder of the Pilbara coastline south-west of Port Hedland. As with other species (e.g. Sharp-tailed Sandpiper), peak numbers coincide with the arrival of post-breeding birds in late Aug.–late Sept. After refuelling on the abundant coastal food resources, many continue their southwards migratory flights. Results from ringing, flagging and colour-dyeing confirm that many of these fly on to south-eastern Australia. The remaining populations remain relatively stable until their numbers are augmented by returning (now northbound) migrants (from south-eastern Australia). The numbers at this period (early March to early–mid April) are, however, less than those at arrival. Typical population records from the Port Hedland Saltworks are, over the arrival period 15–19,000; over the mid (summer) period 5–6,000; and at the pre-departure period 8–11,000; even over the winter (northern breeding) period some 400–1,000 birds are recorded regularly, i.e. in contrast to Sharp-tailed Sandpipers the mid-period numbers remain high, there is a more recognisable pre-departure influx and a substantial population remains over the winter period. As also noted with Sharp-tailed Sandpiper the effect of such passage movements is lessened or not apparent in areas south-west of Port Hedland. On tidal mudflats and sandflats, flooded samphire flats, saltwork ponds and occasionally near-coastal sewage ponds. Favours saline areas and regularly recorded at Port Hedland Saltworks in flocks up to 300, feeding while swimming (picking food from surface or just below) in the high-salinity ponds. They appear able to do this only with wind strength below force 3 (this in contrast to the capability of Red-necked Phalarope with its broad-body waterline profile that gives it increased stability; see Cramp [1983]). This species seems little influenced by local flooding except for major, near coastal events such as those at Mandora Marsh, and most of the

few inland records appear to be associated with overland passage movements, as are most island records, e.g. Barrow Is. (southward ones only). Usually moderately common, in ones, twos or small parties, on passage aggregating in hundreds or thousands over major feeding grounds. More recent AWSG surveys have indicated an alarming decrease in numbers of this species in line with that of many other shorebirds. One bird with the features of Cox's Sandpiper was recorded at Port Hedland Saltworks in Oct. 1979. These birds are now accepted as being hybrid Pectoral X Curlew Sandpiper (Christidis *et al.* 1996).

Limicola falcinellus sibiricus Dresser, 1876
Broad-billed Sandpiper

Most coasts and coastal plains. Visitor (late Aug. but most arrive late-Sept.–Oct. and depart in mid–late April) from northern hemisphere. Some birds over-winter in the region with records from all months. Locally common (e.g. flocks up to 3,000 at Port Hedland Saltworks), but generally rare in ones, twos or small parties, occasionally flocks (up to 600). Apart from Port Hedland Saltwork ponds, rare or uncommon and confined to coastal mudflats, mangal fringes and creeklines. They join communal roosts or loafing areas at high tides, even on sandy beaches although rarely feeding there. At Port Hedland Saltworks recorded only in intake area and low-salinity pond. Although recorded from fresh and brackish water habitats in south-western WA there are few such records from the Pilbara region. At Port Hedland Saltworks the summer population is regularly 600–1,200, with a peak of 3,000 recorded by AWSG. Although maximum numbers occur in Oct.–Nov., these do not have the pronounced decrease noted for species undertaking further southward movements and suggest dispersal rather than a mass exodus. The populations even in adjacent areas to this site do not build up significantly or at all. The over-wintering population at Port Hedland Saltworks is generally in the order of 50–60 birds.

Philomachus pugnax (Linnaeus, 1758)
Ruff

Rare visitor from the northern hemisphere, recorded only from Port Hedland Saltworks and Finucane Is. (Port Hedland) in April.

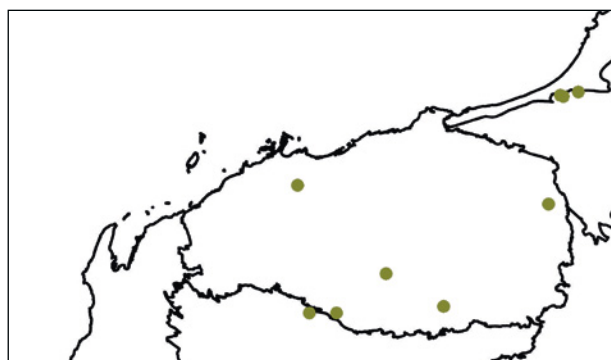
Phalaropus lobatus (Linnaeus, 1758)
Red-necked Phalarope

Rare visitor in Aug.–April from northern hemisphere. On mainland recorded only at Port Hedland Saltworks where recorded annually since 1976 and over this period numbers have increased

from 12 to 45. The group includes juveniles (first year) and adult male and female birds. Although occasionally noted in low-salinity ponds, virtually confined to the hypersaline ones which are particularly productive in brine shrimps. Few records at sea; a flock of 33 and another of 70–100 resting on water between Boodie and Airlie islands on 27 Oct. 2000. This open sea wader almost certainly occurs more frequently offshore, as many thousands occur in the Indonesian flow-through area and are fairly regularly recorded from various locations along the west coast of WA, mainly at sea, but also from Rottne Is.

Rostratulidae

Rostratula benghalensis australis (Gould, 1838)
Painted Snipe



Rare irregular summer visitor mainly to southern wetlands. Recorded at Paraburdoo sewage pond on 14 Dec. 1974, at an artificial pond at Rhodes Ridge Exploration Camp (50 km WNW of Newman) in Jan. 1987, one in flooded samphire at Mandora Marsh area in May 1999, a pair at Western Creek crossing (50 km S of Karratha) in Sept. 2011 and a female photographed at Rangers HQ, Karijini National Park on 29 Feb. 2012. Although not recorded as breeding in the region, recent records of an influx of birds with subsequent breeding from the Broome area indicate that breeding could occur in areas such as the Mandora Marsh.

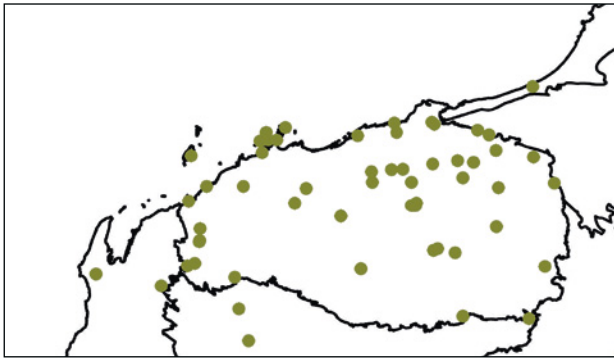
Jacanidae

Hydrophasianus chirurgus (Scopoli, 1786)
Pheasant-tailed Jacana

Vagrant from south-east Asia. One observed by J.A. Smith at Paraburdoo sewage pond on 22 December 1974 (Storr and Johnstone 1975). This is the only Australian record.

Burhinidae*Burhinus grallarius* (Latham, 1802)

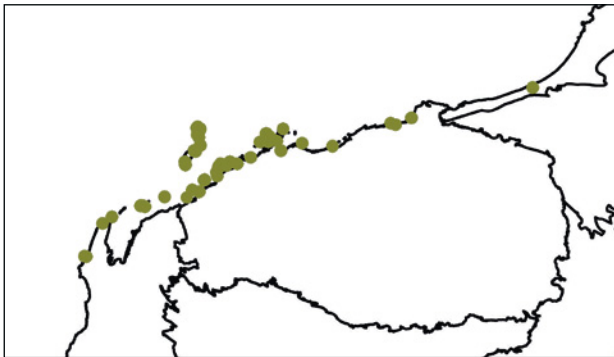
Bush Stone-curlew



Throughout the region, north to Mandora and east to Shay Gap, the Oakover (Braeside) and Jigalong, also islands in Dampier Archipelago (Legendre, Rosemary, West Lewis and Enderby) and Barrow Is. Uncommon resident, in ones or twos. Lightly wooded country near adequate daytime shelter. Breeding in Sept. Its numbers have probably declined as a result of overgrazing by domestic stock and predation by feral cats.

Esacus neglectus Mathews, 1912

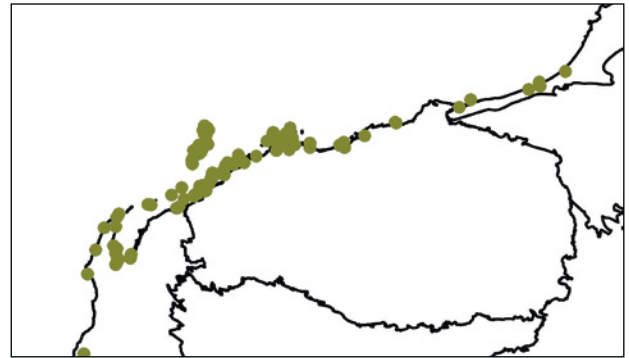
Beach Stone Curlew



Coast from Mandora south-west nearly to Point Cloates (Sandy Point), also many islands including Rosemary, West Lewis, Enderby, Great Sandy, Trimouille, Lowendal Is, Barrow, Weld, Thevenard, Serrurier and Flat Is. Moderately common on islands, rare on mainland (probably more plentiful in the past before advent of feral cat), in ones, twos or threes. Favours sandy or shingly beaches, also tidal reef flats. Breeding mainly on islands but occasionally on mainland, in Aug.–Oct.

Haematopodidae*Haematopus longirostris* Vieillot, 1817

Pied Oystercatcher



All coasts, including most islands as far offshore as Legendre and North West in Montebello Is. Common resident, usually in pairs, family groups, occasionally flocks (up to 50) at high-tide roost sites. Mainly tidal mud and reef flats and sandy beaches, also less frequently saltwork ponds (the less saline ponds) and near-coastal grassy areas. Breeding from early July–early Sept.

Haematopus fuliginosus ophthalmicus

Castelnau and Ramsay, 1877

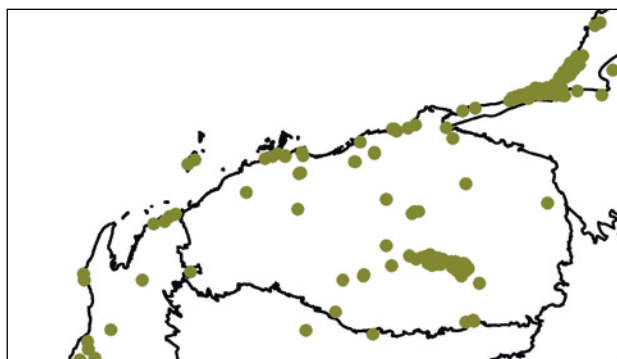
Sooty Oystercatcher



All coasts north to Eighty Mile Beach, including many islands from Depuch south-west to Simpson and as far offshore as North West in Montebello Is. Moderately common resident, usually in pairs or small parties (up to 10). Mainly tidal reef and mudflats and sandy beaches. Breeding in Aug.–Sept.

Recurvirostridae*Himantopus himantopus leucocephalus* Gould, 1837

Black-winged Stilt



Throughout the region, north to Sandfire and Mandora Marsh and east to Marble Bar, Roy Hill and Newman. Nomadic, principally drought-driven. Scarce to locally very common in wet years. Usually in ones, twos or small parties, occasionally flocks of many hundreds, and rarely large or huge aggregations of many thousands (e.g. estimates of over 10,000 at Mandora Marsh in June 1997 and around 180,000 and 220,000 birds there in Aug. 1999 and 2000, respectively). Large numbers are attracted to the region after cyclonic rains, especially when drought is extensive elsewhere in Australia. Even when drought conditions are not so extensive or severe it is apparent that as the productivity of their inland breeding sites declines some birds may move into this region regardless of local conditions. This type of movement could account for the regular influxes noted at Port Hedland Saltwork ponds which are now of an essentially migratory pattern. Recorded from a wide range of habitats but mainly inundated samphire flats, claypans, grass flats, also river pools and saltwork (saline and hypersaline), sewage and mining ponds. The extent of immigration can be seen from counts from Mandora Marsh, resulting from the combination of a transient flood event there and extensive, prolonged drought conditions over much of inland eastern Australia. With flooding but no co-incident drought conditions the populations there are significantly lower, and in dry years the Mandora Marsh does not flood and no birds are present. The origin of these vast numbers (180,000–220,000) is not known. The estimate of such concentrations out of the total Australian population of this scattered widespread breeder is problematic and numbers will vary according to prevailing conditions. The peak numbers recorded there represent a significant percentage of the total Australian population, estimated at 266,000 (HANZAB). The situation at Port Hedland

Saltworks is quite different. There permanent conditions have resulted in a regular movement to and from this location, although again the origin of these birds, none breeding here, is unknown. Some birds remain throughout the year but the highest numbers, around 800–1,200 occur in Aug. to Feb.–March. Unfortunately no records corresponding to the peak years at Mandora Marsh are available. In contrast to Banded Stilt (*q.v.*) these new arrivals comprise typical proportions of adults and juveniles, with some still behaving as family groups. Breeding recorded from Jan.–Sept. usually in areas where temporary flooding is prolonged, e.g. Mandora Marsh (following the March 2000 flooding *ca.* 3,500 pairs bred in June) (Halse *et al.* 2005).

Cladorhynchus leucocephalus (Vieillot, 1816)

Banded Stilt

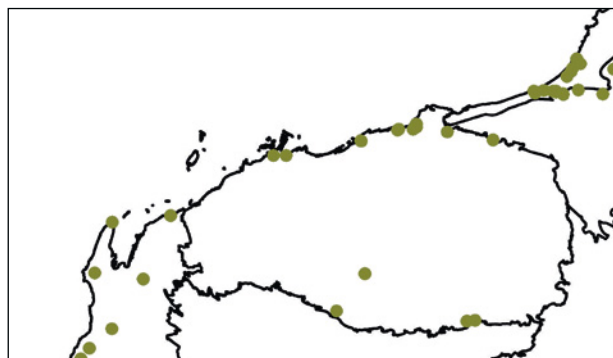
Northern coastal plains from Mandora southwest to Mundabullangana, accidental or vagrant on Barrow Is., rarely at Fortescue Marsh. Nomadic. Uncommon to very common visitor (Sept.–May) usually in small flocks, occasionally large flocks or aggregations (up to 60,000). Flooded samphire flats and saltwork ponds. Although locally regular and common (occasionally abundant) at Port Hedland Saltworks, over most of the region it is scarce to uncommon, its appearances being erratic. In contrast with the Black-winged Stilt (*q.v.*) the movements of this species seem to be only little influenced by local rains and flooding. When such events extend into more southerly and central parts of the State, i.e. affect the inland lakes within their breeding range, however, few birds remain here, returning later, as these dry out or as the food resources dwindle. The origin of local birds is not known. Possibly the irregular groups may contain (at least an element) of Australia-wide origin especially when drought is widespread. Although not continuously present at Port Hedland Saltworks, small numbers frequently remain between annual influxes, Aug.–Sept. to Feb.–April. The timing of their arrival and departure (particularly the latter) is much less fixed or regular than that of the northern hemisphere waders. This seems to correlate to those cyclonic events that bring heavy rainfall (with ensuing flooding) into the mid-central regions of WA. The Port Hedland Saltworks birds usually depart shortly after such an occurrence. Typically this late spring–summer influx comprises 800–1,700 birds, with the peak numbers occurring shortly after the first wave of arrivals which contains a very high percentage, about 90%, of juvenile first year birds, although this imbalance is restored by later arrivals. The

chicks gather into crèches and remain until fledged. Observations at Port Hedland Saltworks suggest that such groups may well depart from their natal areas independently and ahead of the adult breeding birds. The wintering population normally comprises 20–40 birds. This regular pattern is occasionally disrupted by the arrival of far greater numbers, during late spring–summer, but only once did such an arrival coincide with that of the regular birds. By far the largest such group comprised *ca.* 60,000 in Dec. 1982. Numbers built up rapidly, the birds remained for a short period and almost just as rapidly moved on, leaving behind what appeared to be the regular group. Such flocks appeared independent and their movements were superimposed on those of the local or regular birds. These massed flocks appear to have a more normal balance of adult and juvenile–first year birds.

At Mandora Marsh the situation is quite different. This wetland is not permanent and so no regular movement is possible or has developed, and sometimes even when favourable flooding events occur the species may not be present, e.g. Aug. 1999. On other occasions, e.g. Aug. 2000, flocks of 2,600 have occurred (Halse *et al.* 2005). Such utilisation gives the impression of being opportunistic or irregular. Unfortunately no data corresponding to this peak is available for the Port Hedland Saltworks site. It is interesting to note that unlike the situation at Port Hedland Saltworks, this large flock amounted to just 1% of the corresponding Black-winged Stilt numbers. These sites illustrate markedly differing usage patterns. Port Hedland Saltworks, with a seasonally cyclic, but annually relatively constant regime (food source), has resulted in the development of a regular movement of this species, similar to that occurring on the coastal plains of south-west WA. Mandora Marsh, a temporary irregular source, is used by nomadic flocks that disperse towards the coast when drought conditions prevail inland and augment the numbers at Port Hedland Saltworks. Apart from the large numbers recorded from the above two locations, those from nearby even adjacent sites are minimal (only 23 birds were recorded in 18 years in the Port Hedland–Cape Keraudren area). There are no breeding records.

Recurvirostra novaehollandiae Vieillot, 1816

Red-necked Avocet

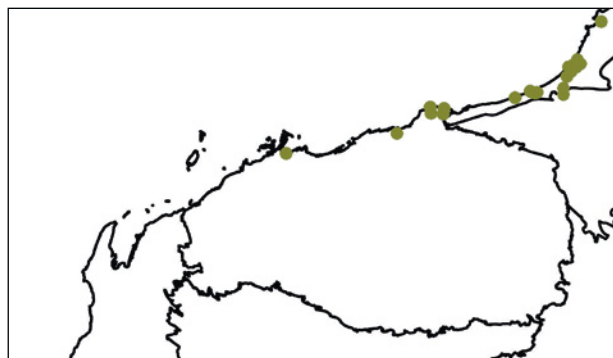


Throughout the region, north to the Mandora Marsh and east to Newman. Nomadic, rare to common, usually in ones, twos or small parties, occasionally in flocks (of many hundreds) and rarely in larger aggregations under drought conditions (of several thousand, e.g. estimate of over 3,500 at Mandora Marsh in Aug. 1999). Inundated samphire flats and claypans, brackish near-coastal lagoons, saltwork and sewage ponds and roadside puddles. Breeding in March–April.

Charadriidae

Vanellus miles miles (Boddaert, 1783)

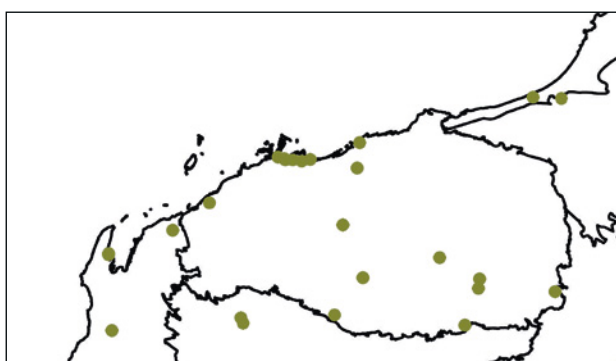
Masked Lapwing



Nomadic. Formerly a rare or infrequent visitor (presumably from Kimberley) to far northern coastal plain, now locally and seasonally varying from rare to moderately common. Usually in pairs or small parties, occasionally larger aggregations, e.g. 60 at Mandora Marsh in June 2000, increasing to 1,170 individuals at the same site in Aug. 2000 (C. Hassell). Its status in the region is significantly distorted by flooding events at Mandora Marsh and the origin of these birds is unknown. Mainly flooded samphire flats, river pools, claypans, sport ovals, sewage ponds and bore overflows. Breeding recorded by G. Lodge on De Grey R. in May 2007, the first breeding record for the region. Appears to be expanding its range and abundance. Prior

to 1980s only one record for the region, i.e. one collected by F.T. Gregory at the De Grey estuary on 28 Sept. 1861. No further records until a single bird (showing intermediate characters between *miles* and *novae-hollandiae*) was observed at the South Hedland sewage ponds in Nov. 1984 and remained there until Jan. 1985. Whether there is a correlation between the increased number of sightings of this species in the region and in the south-west of WA over the past 20 years is not known, but it is considered that the recent increase in population on the eastern coastal plains of the Pilbara, including the more recent breeding records, emanate from Mandora Marsh flooding events of 1999 and 2000.

Vanellus tricolor (Vieillot, 1818)
Banded Lapwing



Mainly western and northern parts, north to Cape Keraudren, Roebourne, Coolawanyah, Roy Hill and Old Talawana. Mainly a winter visitor (mostly May–July), occasionally breeding in extreme south of region and north-west coastal mainland. Uncommon, usually in pairs or small parties (up to eight), rarely larger aggregations—up to 30 once at Mandora Marsh, coincident with the 2000 flood, unusual in occurring at a wetland, whereas other records in the Mandora area have been from open or dry grasslands, and no birds were recorded there in the June survey when most of the other local records occur, but in Aug. (when no local records have been). This may imply a different origin of these birds. Sparsely vegetated plains, generally avoiding areas with taller vegetation. Breeding recorded in Sept. (Fortescue floodplain) and Feb.

Pluvialis squatarola (Linnaeus, 1758)
Grey Plover

All coasts, including some islands (e.g. Barrow, Hermite). Ordinarily uncommon visitor from northern hemisphere (but some non-breeding birds present all months), in ones, twos or small parties (these usually at high-tide roost areas). Locally common at some sites soon after arrival (e.g. two Sept. reports of flocks of some hundreds at Mandora Creek, presumably birds on southward

passage). Peak numbers in Sept.–Oct. and by Nov. numbers have generally fallen to levels maintained until departure of breeding birds in March. In some locations, e.g. Finucane Is., low numbers of wintering birds can be augmented in May–June. These may be birds from more southerly regions of WA. No inland records. Some coastal sites such as Port Hedland Saltworks average only 3–5 over the summer months, compared with 1,000 from nearby Eighty Mile Beach. Favours tidal mudflats, beaches and, more rarely, saltwork ponds, rocky reefs and coasts.

Pluvialis fulva (Gmelin, 1789)
Pacific Golden Plover

All coasts, including some islands (e.g. Barrow Is.). Scarce or uncommon non-breeding visitor from northern hemisphere (most months but mainly summer, Oct. to mid-April with generally higher numbers in Oct.–Dec.). Usually single, occasionally in small parties (up to 7). No indication of a return pre-departure build up in numbers which supports comments (Lane 1987) that birds from southern Australia overfly this region on their northward migration, if indeed they return by this route. This may also explain the lack of inland records. Favours tidal mudflats, flooded grassy coastal plains (where often associates with Oriental Plover, also sewage and saltwork ponds (only lower salinity ponds).

Pluvialis dominica (Müller, 1776)
American Golden Plover

Rare visitor or vagrant from northern hemisphere. One observed near Port Hedland on 1 Nov. 1990.

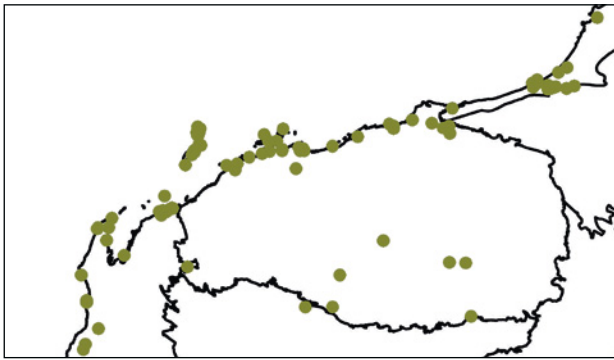
Charadrius dubius curonicus Gmelin, 1789
Little Ringed Plover

Rare visitor from northern hemisphere, all records in Oct.–April. Two recorded at Mt Goldsworthy sewage pond on 18–22 Oct. 1972, also reports from Port Hedland, Shay Gap and two at Mandora Marsh in Oct. 1999, all being freshwater locations on the coastal plain.

Charadrius alexandrinus Linnaeus, 1758
Kentish Plover

Rare vagrant from northern hemisphere. One report, a male in breeding plumage observed at Port Hedland Saltworks on 4 April 1993.

Charadrius ruficapillus Temminck, 1822
Red-capped Plover



Most of coast north to Mandora including many islands (e.g. Rosemary, West Lewis, Trimouille, Hermite, Varanus, Bridled, Barrow, Thevenard), also casual inland. Common to moderately common resident, usually in ones, twos or small parties, or occasionally aggregations of 80–500 at Mandora Creek, Port Hedland Saltworks, Dampier Salt and Mangrove Bay. Mainly mudflats, beaches, near coastal saltmarshes and saltwork and sewage ponds. Also recorded on inland fresh water (e.g. pools on lower Harding, lower Maitland and lower Ashburton, and Paraburdoo and Goldsworthy sewage ponds), only in summer. Movements within the area complex and poorly understood, but probably similar to those on the Swan Coastal Plain, which suggests that birds move there from inland areas as they dry out. Certainly numbers recorded from Port Hedland Saltworks area (where most birds resort to adjacent flats rather than salt concentration ponds) increase markedly from an average winter population of 25–40 birds to 4–500 in summer (a peak of 1,000 given by Lane [1987]). A concentration of locally breeding birds may be involved but this effect would not lead to or result in such a significant increase. Similar concentrations (up to 500) noted at Dampier Salt, Mangrove Bay and Mandora Creek, the last site noteworthy because, despite the flood of 1999–2000, few birds were recorded there (peak 58 in June 2000). Although this is a winter record and no corresponding summer data are available, it suggests that even at favourable locations the wintering population is significantly lower. Breeding reported on mainland coasts, Mandora Marsh, and on West Lewis and Barrow Is., in May–Sept. and occasional breeding in summer, e.g. a few runners recorded at Port Hedland Saltworks in Dec.–Feb.

Charadrius mongolus mongolus Pallas, 1776
Lesser Sand Plover

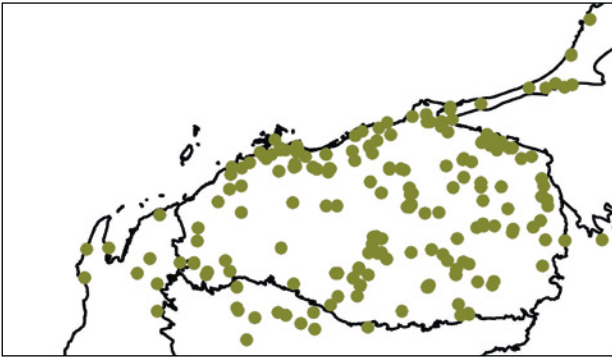
Coast north to Mandora and Eighty Mile Beach and south-west to Yardie Creek, also reported from

Bedout Is. on northward passage and Hermite, Trimouille, Boodie, Serrurier and Flat Islands on southward passage. Uncommon to moderately common visitor from northern hemisphere (July–late May) with odd birds overwintering. Usually single, but larger aggregations (up to 80) at Port Hedland Saltworks in autumn. Post-breeding juvenile birds arrive in late Aug.–early Oct. Breeding birds depart in April, leaving only small numbers of wintering birds. Many pre-departure birds have developed extensive breeding plumage, with most showing characteristics of the *mongolus* group, consistent with the morphometric examination of handled birds being predominantly nominate *mongolus*. Some show characters of *schaeferi* (*atrifrons* group). This may indicate that an element of the population may arrive via the Malay Peninsula–Greater Sundas route rather than the normal north-south East Asia Flyway through central Indonesia. Tidal mudflats, beaches and saltwork ponds (restricted to low-salinity ponds).

Charadrius leschenaultii leschenaultii Lesson, 1826
Greater Sand Plover

All coasts, including Mandora Marsh and Montebello Is, Barrow Is., Boodie Is., Great Sandy Is. and Serrurier Is. Common visitor (but present all months) from northern hemisphere. Usually in ones, twos or small parties, occasionally in flocks (up to 50). Favours tidal mudflats, beaches, reef flats and saltwork ponds (low-salinity ponds). First post-breeding adult and immature birds arrive early Aug. and juveniles (first year birds) 2–3 weeks later. Peak numbers occur in mid–late Sept.–Oct. Departure starts in mid–late March and by mid-April only non-returning birds remain; these are largely first year birds. In some locations the numbers of over-wintering birds seems to increase in May–June. Whether this is due to arrivals of birds previously wintering in southern areas of WA is not known. Importance of Eighty Mile Beach as a non-breeding feeding area shown by extensive surveys by AWSG (Lane 1987), with total population for that area and adjacent Roebuck Bay of ca. 60,000 birds, compared with ca. 5–6,000 for remainder of Australia, i.e. these areas support ca. 90% of the birds spending summer in Australia. The surveys also reveal an abrupt change in the relative abundance of this species in the Pilbara. To the east of Cape Keraudren (along Eighty Mile Beach) some 30,000 birds have been recorded; in AWSG surveys to the remainder of the Pilbara coast (i.e. west of Cape Keraudren) the corresponding counts were 230 individuals (less than 1%). All Australian records are attributed to the nominate taxon.

Charadrius melanops Vieillot, 1818
Black-fronted Dotterel

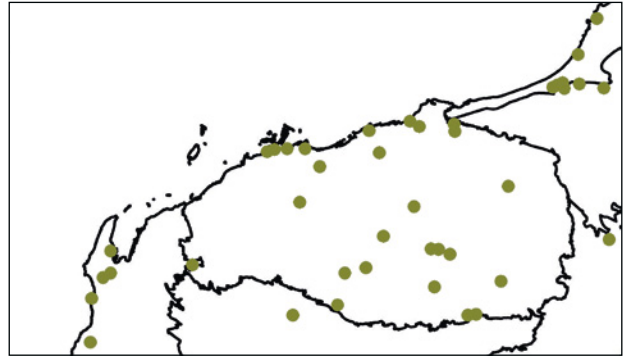


Throughout the mainland but not recorded from even the nearer islands. Common to moderately common resident. Usually in ones or twos, occasionally small flocks (up to 21). Mainly bare margins of fresh waters, river pools, lagoons, swamps, claypans, springs and sewage ponds. Breeding reported in Jan.–July and Aug.–Sept. This species has benefited from the provision of sewage ponds and overflows from artesian wells.

Charadrius veredus Gould, 1848
Oriental Plover

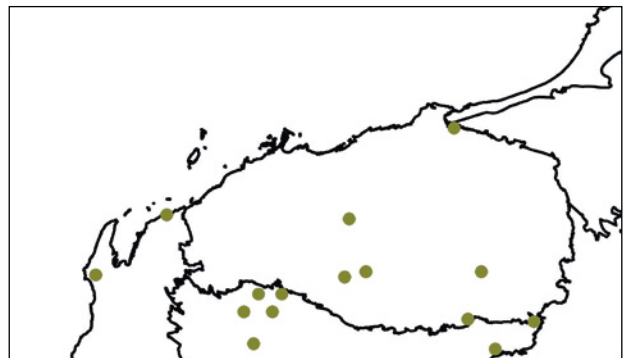
Mainly coastal plains south to Cardabia but also Barrow Is. on southward passage, casual in interior. Common summer visitor from northern hemisphere (late Aug.–early April). Usually in small flocks, occasionally large flocks (up to 200) and occasional reports of many thousands (usually soon after or just before departure, but once in late Dec). Newly arrived migrants appear to remain in coastal areas, often building to flocks of 2–300, at least some of which appear to commute regularly between feeding areas and a water source. Seasonal or cyclonic rains appear to trigger departure from these areas, but even in years when no local rains have fallen numbers decrease markedly after early Dec. Some birds remain, sometimes augmented by others returning in response to local rains or conditions. Generally these lower numbers prevail until their northwards departure, suggesting that most of the population commences its return migration directly from these inland areas. Occasionally pre-departure flocks appear to be delayed by adverse weather conditions. This results in concentrations, often also involving Oriental Pratincoles and Little Curlews, with many thousands of birds in tight, compact flocks located immediately inland of coastal dunes. As the weather improves they depart. No birds overwinter here. Mainly near-coastal samphire and grass flats, also beaches, tidal creeks, saltwork ponds and sewage ponds as far inland as Newman.

Erythrogonys cinctus Gould, 1838
Red-kneed Dotterel



Throughout the region north to Sandfire and Mandora Marsh and inland to Newman. Nomadic. Uncommon, usually in ones and twos or small flocks (up to 20), occasionally in larger aggregations of many hundreds, e.g. 500 at Mandora Marsh in June 2000, when the area provided a refuge from adverse conditions elsewhere. Mainly flooded near-coastal samphire flats, claypans, river pools and sewage ponds. Forages mainly in shallow water, rather than dry margins and preferably a muddy rather than sandy substrate. Breeding late Feb.–early April and June (of 500 at Mandora Marsh in June, 20 pairs were recorded as breeding).

Peltohyas australis (Gould, 1841)
Inland Dotterel

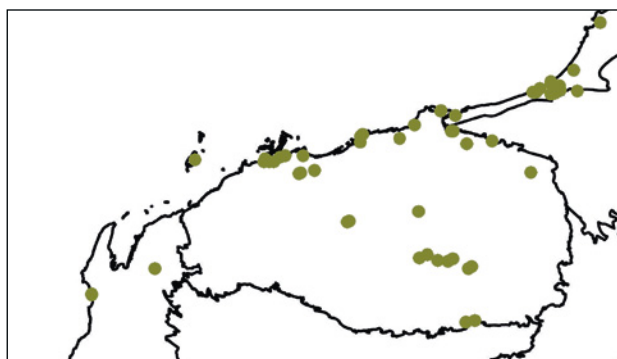


Mainly far southern interior of the region, north to the middle Ashburton R. (10 km SE of Kooline), vagrant further north at Mt Goldsworthy. Moderately common visitor (April–early Sept.), usually in small parties (up to 35). Sparsely vegetated plains, stony flats and dry claypans. Breeding in March–July (e.g. four nests with three eggs at Mt Florance on 5 July 1993 and two nests with three eggs and two pairs with runners on Hooley Creek plains on 14 March 1995).

Glareolidae

Stiltia isabella (Vieillot, 1816)

Australian Pratincole



Throughout the region, north to Mandora and east to Mandora Marsh (east of Sandfire), Shay Gap, Warrawagine and Newman. Common to moderately common on far north-eastern coastal plains, in ones, twos or flocks (up to 60) and larger aggregations (up to 290), e.g. at Mandora Marsh in Aug. 1999 and June 2000, and around lower De Grey R., scarce or uncommon south of the De Grey and casual in interior. Origin of larger flocks unknown, but Mandora Marsh records were coincident with widespread drought across both the major breeding range (inland south-east and mid-east Australia) and their more northerly non-breeding area. Mainly samphire and grass flats (especially when flooded), also sewage ponds and bore overflows. Breeding reported north to Mandora and south to Yanrey. Three nests with two eggs at Mt Florance on 31 March 2004. Not recorded in region until 1960s and appears to be increasing in range and abundance. Although the species is recorded as a non-breeding migrant to islands north of Australia (Wallacea and Borneo) and has been recorded on Christmas Is. (Johnstone and Darnell 2004), there is no evidence of passage movement through the Pilbara region.

Glareola maldivarum J.R. Forster, 1795

Oriental Pratincole

Mainly coastal plain from Mandora south-west to Exmouth Gulf, but extending south-east inland via De Grey and Talga Rivers to Coppins and Mt Edgar. Common to very common visitor from northern hemisphere, arriving in late Oct. to early Nov. and departing mainly in late March or early April but occasionally some remain until May. No records of birds over-wintering here. Usually in small parties, occasionally flocks of hundreds or thousands (e.g. 10,000 at Port Hedland Saltworks on a wet tidal flat on 14 Feb. 1985) and rarely huge aggregations of hundreds of thousands at roosts, during thunderstorms and ahead of cyclones (see

below). Unlike the other two northern grassland wader species visiting Australia (Little Curlew and Oriental Plover), this species usually disperses rapidly beyond the coastal fringe, although it is usually present there in relatively small numbers (around 20–30,000 between Port Hedland and the eastern boundary of region). Highly reactive to weather conditions, often concentrating in large flocks as cyclones and thunderstorms move through. For example hundreds of thousands were recorded between 20 km E of Port Hedland and the Pardoo turn off on 19 Feb. 1983 and in Jan.–Feb. 2004 when the weather pattern over northern Australia (combined with a local plague of locust hoppers) resulted in spectacular numbers estimated at 2.88 million birds concentrated along coastal plain just inland of Eighty Mile Beach (Minton *et al.* 2004; Sitters *et al.* 2004), far more than the previously estimated total of 75,000 utilising the East Asia flyway. Although these large flocks have been recorded only in the Pilbara between Port Hedland and the Eighty Mile Beach, anecdotal evidence from Feb. 2001 suggests that they occurred as far south as Mardi (Minton and Rogers 2004). Sometimes such concentrations remain in an area for several days (even weeks) but in other instances the birds hawk over the area for a few hours, and then move on. Faced with adverse migrating conditions, large pre-departure flocks (up to 1.25 million) have also been recorded as scattered local concentrations along the coastal plain between Port Hedland and the eastern boundary of the region and, once the weather pattern changes, they depart. Favours open grassy plains (including airfields and sports ovals), samphire and open mudflats and beaches although these seem to be used mainly as roosting sites during the heat of the day and birds returning to feeding areas by late afternoon or evening. This extreme heat avoidance strategy is at times offset by birds settling on wet (but firm) mudflats. Small numbers also recorded at mill overflows, artesian soaks and sewage ponds but usually in very dry conditions. As described above their distribution appears to be influenced mainly by weather conditions and the appearance of locust hoppers.

Laridae

Catharacta antarctica lonnbergi (Mathews, 1912)

Brown Skua

Rare winter visitor. One observed at Cape Keraudren on 24 June 1974, and one at Bedout Is. on 28 May 1978 (Abbott 1979).

Field identification of *Catharacta* skua species poses significant problems; each taxon has a range of plumage variation, they often hybridise freely, and the taxonomy is still controversial. The only species known to make extensive migratory

flights is the South Polar Skua, *C. maccormicki*, which migrates from Antarctic areas to the higher latitudes of both the Pacific and Atlantic Oceans, probably mainly or only as immature birds. The status of this species in the Indian Ocean is poorly known but since Brown Skuas rarely range beyond the Tropic of Capricorn, any *Catharacta* skua seen in tropical waters should be carefully examined.

Stercorarius pomarinus (Temminck, 1815)
Pomarine Skua

One record, an adult light morph in non-breeding plumage observed at Finucane Is. in Feb. 1982 shortly after passage of a cyclone. Probably a rare but regular non-breeding visitor over summer as it has been regularly reported from Kimberley seas during Ashmore Reef pelagic surveys. The latter records fall between late Sept. and early Nov., the limiting period for these surveys. Occasional distant sightings of *Stercorarius* skuas from the Pilbara in Oct.–Feb., always of single birds, could apply to this species or the Arctic Skua.

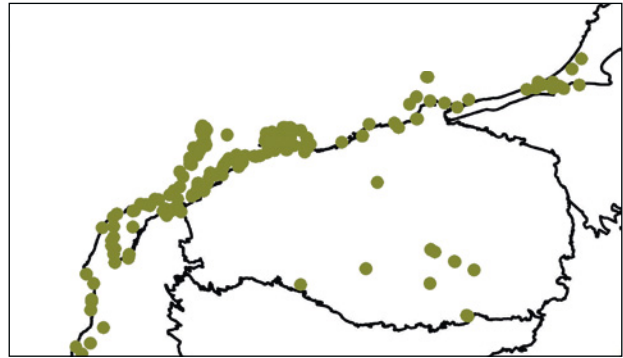
Stercorarius parasiticus (Linnaeus, 1758)
Arctic Skua

Rare winter visitor from northern hemisphere but the few records probably underestimate its true status. One immature dark phase observed at Cape Keraudren in Oct. 1980, two (one dark and one intermediate phase) at Finucane Is. in Feb. 1989, just before and one the day following a cyclone. Also one adult dark phase at Shay Gap in Jan. 1984, a bird driven inland overnight by cyclonic winds, seen at first light the following day with a mixed party of Silver Gulls, Crested Terns and various shorebirds and a Lesser Frigatebird holding position in updraft of an adjacent hill—as the wind abated the group moved back towards the coast. Has been fairly regularly recorded (although not as frequently as Pomarine Skua) in the Ashmore Reef region in Sept.–Nov. Almost certainly some unidentified skuas seen off the Pilbara coast would be this species and the Long-tailed Skua, *Stercorarius longicaudus*, which has been recorded from the Ashmore Reef region and would almost certainly occur here.

Larus pacificus georgii King, 1826
Pacific Gull

Former visitor (presumably from the Shark Bay region) to the far south-west coast of Pilbara region. Tom Carter observed some at the former whaling station near Point Cloates on 6 Sept. 1913. He believed that they were attracted to the hundreds of dead whales that lay along the beach from Point Maud to North West Cape in 1913. No recent records.

Larus novaehollandiae novaehollandiae
Stephens, 1826
Silver Gull



All coasts, as well as Mandora Marsh and many islands as far offshore as Bedout, Legendre, the Montebello Is and oil platforms up to 150 km offshore. Uncommon to common about islands and on mainland at towns, saltwork and sewage ponds and at Mandora Marsh (when flooded), elsewhere scarce or uncommon. Mainly coasts and sheltered seas, occasionally extending inland to freshwater pools on lower courses of rivers and to flooded near-coastal samphire flats, e.g. Mandora Marsh, Pardoo Flats and about 75 birds on Fortescue Marsh in Aug. 1999. Also a rare visitor from south-eastern Australia to fresh waters of the interior, e.g. one collected from a flock of four at Newman sewage ponds on 5–6 Nov. 1981 was from the far south-east of Australia (Johnstone 1982). Origin of birds at Mandora Marsh in June and Aug. 2000 (230 and 240 birds, respectively) not known but may have come from south-eastern Australia. Breeding reported on islands in Dampier Archipelago, Montebello Is, Lowendal Is and islands off Barrow Is., mainly in summer and autumn.

Larus pipixcan Wagler, 1831
Franklin's Gull

Rare vagrant from North America. An adult in non-breeding plumage observed and photographed by C. Surman 20 km SW of Barrow Is. on 11 Nov. 2005 and one photographed by N. Waugh at Dampier on 17 Feb. 2008.

Larus sabini Sabine, 1819
Sabine's Gull

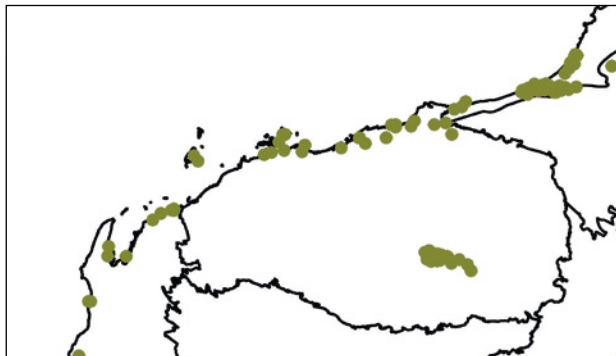
Rare visitor or vagrant from northern hemisphere. An immature observed at Finucane Is. on 23 Feb. 1989 and a non-breeding adult at same location on 28 Jan. 1990. Both records followed cyclonic events.

Other *Larus* species

Other northern hemisphere gulls have been

recorded from adjacent areas, e.g. Black-tailed Gull, Lesser Black-backed Gull (Baltic Gull) and Black-headed Gull, and will almost certainly occur in this region.

Sterna nilotica macrotarsa Gould, 1837
Australian Gull-billed Tern



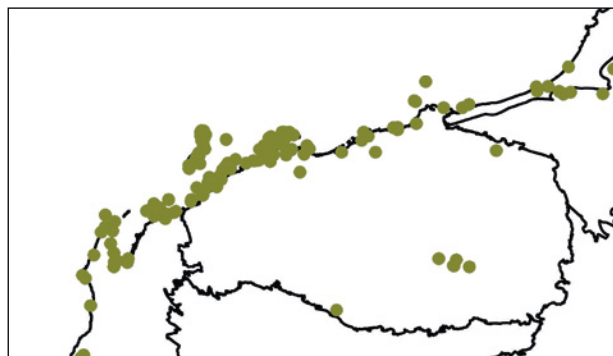
Coast and coastal plains from Mandorla (including Mandorla Marsh) south-west to Cardabia, also Fortescue Marsh after widespread flooding, casual on Barrow Is. Nomadic visitor (mostly May–Nov.), occasionally breeding. Common in wet years in far north (e.g. Mandorla Marsh), uncommon to moderately common between De Grey and Fortescue Rivers, seldom recorded further south. Usually in small parties, occasionally hundreds and in some years aggregations of thousands (e.g. estimates of 2,200 and 6,950 at Mandorla Marsh in June and Aug. 2000 respectively). Most birds seen at Mandorla Marsh in June 2000 were breeding (Halse *et al.* 2005). These major flooding events do not automatically ensure such large numbers, however, as in Aug. 1999 the corresponding survey recorded only 70 birds. In that year the actual extent of the flooded area was only slightly less than that of the corresponding 2000 survey but to nowhere near the pro-rata reduction in numbers of approximately 1%. Favours inundated samphire flats, tidal creeks, saltwork ponds, river pools, sewage ponds and sheltered seas. Breeding recorded in late April, June, July and Aug.

Sterna nilotica affinis Horsfield, 1821
Asian Gull-billed Tern

The above account refers to the endemic Australian subspecies *macrotarsa*. There are occasional records attributed to the migratory Asian forms including *affinis* (that is recorded for Kimberley), and other subspecies could occur here that are not separable in the field (Johnstone 1977). Trapping and ringing carried out by the AWSG in the Broome area has determined that *affinis* occurs fairly regularly and it may be more often present in at least far eastern Pilbara seas than the few records suggest. A single adult of the Asian form (in basic

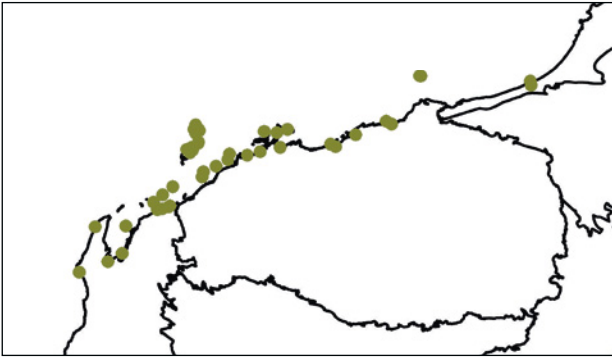
plumage) recorded at Port Hedland Saltworks in Nov. 1987 and another in Jan. 1993.

Sterna caspia Pallas, 1770
Caspian Tern



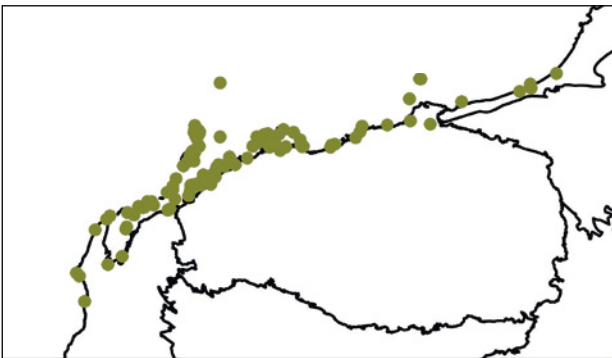
All coasts, including many islands (as far offshore as Bedout, Legendre and Montebellos); rare or accidental inland, e.g. >30 birds at Fortescue Marsh, Aug. 1999. Moderately common, usually in ones, twos or small flocks, occasionally larger flocks (up to 250). Favours sheltered seas (including estuaries and tidal creeks), flooded coastal samphire flats, brackish pools on lower courses of rivers and saltwork ponds (lower-salinity ponds). Generally prefers areas with clear rather than turbid water. Recorded also from some near-coastal freshwater sites including sewage ponds and tailings ponds, although these are only used as loafing or roosting sites. Breeding (nests solitary or in colonies of up to 52) mainly on islands including North Turtle, Jarman, Enderby, Cormorant, Great Sandy, Trimouille, Weld, Mushroom, Thevenard and Frazer, occasionally on mainland coasts, e.g. Cape Preston, Yardie Creek and Point Cloates, from late March to early Nov. Some post-breeding birds probably return to adjacent mainland coast. Peak numbers at Port Hedland Saltworks regularly showed higher numbers including juvenile birds (although this species does not breed there) over the late Nov.–Feb. period. Movements within the area generally unknown, but almost certainly affected by cyclonic events, not only by high winds but also by flood plumes of silt-laden water making foraging conditions more difficult. One observed by J.A. Smith at the Paraburdoo sewage pond on 20 Feb. 1975 immediately after cyclone Trixie moved down the north-west coast. It is noteworthy that, unlike the Gull-billed Tern, the numbers recorded from the Mandorla Marsh during the 1999–2000 flooding events, were quite modest, peaking at 70, this number being very similar to that at the smaller Port Hedland Saltworks area (peak 106 in April 1994, normally 8–35), thus illustrating their different capacities to exploit transient flooding conditions even as a refuge.

Sterna bengalensis Lesson, 1831
Lesser Crested Tern



All coasts and islands as far offshore as Bedout, Rosemary, North West and Barrow. Moderately common resident, usually in small flocks (up to 60) or mixed with Crested or Roseate Terns. Recorded mainly from inshore, clear blue-water environments, especially where there are sandy beaches. Breeding in April–May on Bedout Is., North West Is., Lowendal Is and Thevenard Is. Appears to be increasing in numbers and expanding south as are some other tropical species.

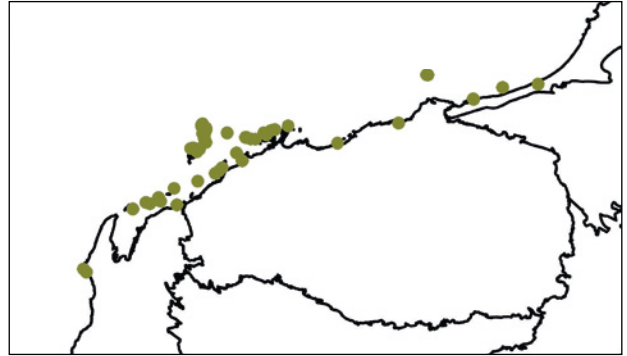
Sterna bergii Lichtenstein, 1823
Crested Tern



All coasts including many islands as far offshore as Bedout, Legendre and Montebellos. Also recorded at Goodwyn A oil platform (130 km NW of Karratha). Moderately common to common, resting in flocks (up to 180) but usually fishing singly. Mainly resident but some local or seasonal movements possibly due to cyclonic disturbances (e.g. up to 200 observed by T. Kirkby each day from 17–24 July 1994 flying east past the Goodwyn A oil platform). Favours sheltered seas, also estuaries and saltwork ponds. Rarely crosses the coastline and inland records generally involve birds driven by a storm or cyclone (e.g. ca. 60 at Shay Gap in Jan. 1984). Breeds on islands from late March to May, when numbers on mainland coast decrease. At Cape Keraudren numbers build up again (including juvenile birds) in Aug. indicating a return of breeding birds. Whether the local

population is augmented by migrants from Asia or southern areas is not known but some birds with upperparts noticeably darker than the local resident birds have been recorded.

Sterna dougallii gracilis Gould, 1845
Roseate Tern



Coast and islands as far offshore as Bedout, Rosemary and Barrow Is. Very common in far northern blue-water seas off southern end of Eighty Mile Beach, around Bedout Is. and Lowendal Is, scarce further south. Usually in small flocks, occasionally larger flocks (up to 300) and rarely huge flocks (up to 50,000), e.g. on Varanus Is. in Sept. 1996. These large numbers are likely to be passage migrants moving north, especially the Dampier Archipelago area, from the south-west and central west coast. Essentially a blue-water tern, normally avoiding more turbid in-shore conditions caused by tidal movements over mud flats. Non-breeding birds usually found in small flocks but in favourable areas (these being of only a transient nature depending on local abundance of fish schools) larger foraging flocks of 100–200 birds are regularly recorded. In the south-west of the region such feeding groups can amalgamate into roosting or loafing flocks of thousands. In comparison along the central and northern portion of the Eighty Mile Beach records are mainly of ones and twos and small groups and even at high tide roosts (where it associates with other terns and waders) the numbers rarely exceed 20–30 birds and most roosts contain few or no birds. Whether the birds present in the Eighty Mile Beach area originate from west coast breeding grounds or from the Kimberley region is not known. Breeding reported in Pilbara in May–June and Oct. Possibly increasing in the region.

The above data refer to the endemic WA subspecies *gracilis* and it is now known that individuals of the northern subspecies *bangsi* (breeding from temperate Asia to the south-west Pacific) are recent colonists to the Kimberley and could also occur in the Pilbara. Records to date suggest that some birds could be non-breeding northern migrants.

Sterna sumatrana Raffles, 1822

Black-naped Tern

Rare visitor. One report of several birds in Exmouth Gulf in 2007. Recent records from the Kimberley region suggest that this species is extending its range westwards and further records from the blue-water seas of the eastern section of the Pilbara may be expected.

Sterna hirundo longipennis Nordmann, 1835

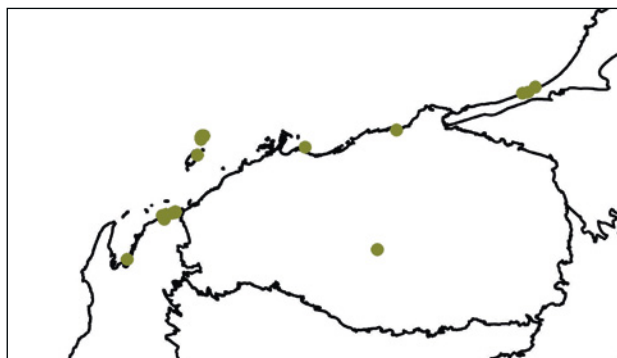
Common Tern

Most coasts as far offshore as Barrow Is. Regular summer visitor (late Aug.–late April) from northern hemisphere. No records of over-wintering birds. Moderately common to locally very common in ones, twos or flocks up to 300, larger flocks (from 3–5,000) prior to departure. Inshore seas especially estuaries and near-coastal saltwork and sewage ponds. Tolerates turbid conditions and is more frequently recorded from inshore inter-tidal areas and embayments. Port Hedland Saltworks and sewage ponds often used as roosting or loafing sites and there are no inland records. Frequently uses high tide roost sites joining with other tern species and waders. Movements within the region are poorly understood and no doubt affected by cyclonic events, but in general they are most common from the eastern boundary of the region to the Port Hedland inshore area and from the Dampier Archipelago to the south-western boundary of the region including many islands.

The above notes refer to the taxon *longipennis* but there have been odd records of birds, in almost full breeding plumage, which show the red base to the bill, brighter red legs and generally pale plumage of the more westerly breeding subspecies *tibetana* or *minussensis*, although the latter is considered by some workers (Vaurie 1965) to be an intergrade between the nominate form and *longipennis*. Similar plumaged birds are regularly recorded from seas around Malaya.

Sterna (albifrons) sinensis Gmelin, 1789

White-shafted Little Tern

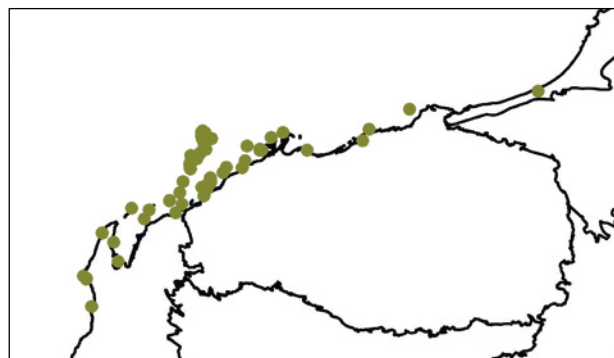


Northern coasts from Mandora (Eighty Mile Beach) south to Onslow, accidental in interior.

Uncommon to moderately common visitor from Kimberley and north-east Asia, Sept.–April. Usually in ones, twos or small flocks, more plentiful during passage. Population is derived from two geographic zones, eastern Asia and the Kimberley where the local breeding population appears to be increasing and extending southwards. Recorded breeding in recent years on Eighty Mile Beach (south to Wallal) and expected to colonise the Pilbara within a few years. The moult strategy and assumption of breeding plumage (March–April) seen in most birds corresponds to that of northern hemisphere populations. Mainly mangrove creeks, sheltered seas and saltwork ponds. Although almost exclusively a saltwater tern, it is not restricted to blue-water habitats but favours inshore, intertidal areas as well as sandy beaches. One found dead at Wittenoom in early Oct. 1978. At Port Hedland Saltworks the population is typically 20–30 birds and is essentially resident over Sept.–April, but elsewhere birds are usually seen as singles or small groups (up to five) with larger flocks during passage or at pre-departure times. Regularly associates with other terns and waders at high-tide roosts. Appears to be increasing in abundance.

Sterna nereis nereis Gould, 1843

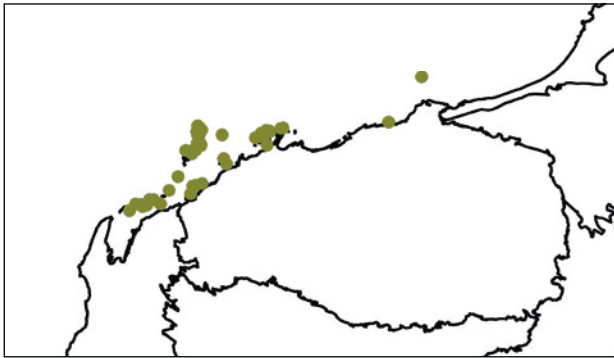
Fairy Tern



Southern Pilbara seas, north to the Dampier Archipelago and as far offshore as Rosemary Is. and Montebello Is. Common around islands, usually in flocks up to 100, occasionally larger flocks (hundreds) during migration, generally scarce or uncommon close to mainland. Essentially a blue-water tern favouring sheltered inshore waters. Breeding reported on islands in Dampier Archipelago, Montebello Is, islands off Barrow Is., Thevenard Is. and on mainland at Cape Preston and Low Point. Eggs are laid in late July to early Sept., somewhat earlier than in more southerly breeding colonies. Birds appear to be present around these sites throughout the year but numbers augmented by winter visitors from the south. Rarely recorded north of the Dampier Archipelago with only occasional records from the Port Hedland area. Possibly decreasing in abundance in the Pilbara. Its decline elsewhere in Australia has been attributed among

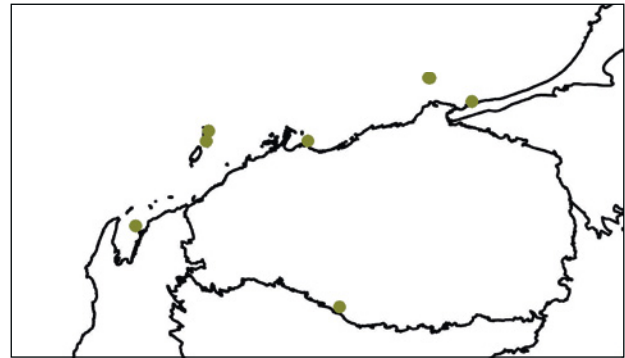
other factors to direct competition from the Little Tern and reduced breeding success as a result of beach developments, but this is not the case within this region.

Sterna anaethetus anaethetus Scopoli, 1786
Bridled Tern



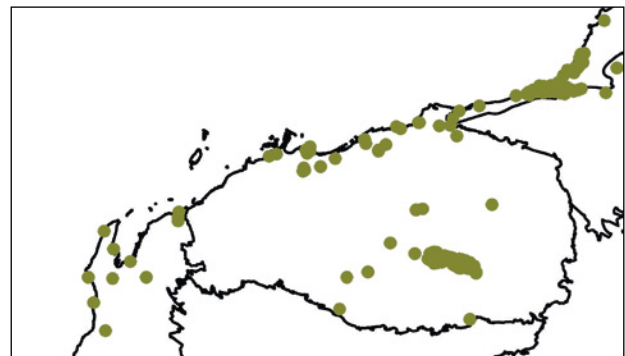
Islands, especially Dampier Archipelago and Montebello Is., and blue-water seas. Common summer breeding visitor (Sept.–April). Breeding reported on Dampier Archipelago (Collier Rocks, Nelson Rocks, Brigadier Is., Lady Nora Is., Goodwyn Is., Bare Rock, Haycock Is., Elphick Nob and Kendrew Is.), Montebello Is. (Ah Chong and other islets south of Hermite Is.), Lowendal Is. (including Abutilon Is., Bridled Is. and Parakeelya), Passage Is. (including Mardie Is., Round Is., East Is., Large Is., West Is. and Little Rocky Is.) and islands off Onslow (including Ashburton Is., Anchor Is., Flat Is. and Round Is.) in Dec.–Feb. Much less frequent north-east of Dampier Archipelago where most records associated with severe cyclonic events (e.g. a steady trickle of birds 10–25/h recorded heading west past Finucane Is., following passage of a cyclone in Feb. 1982. A blue-water tern typically foraging well offshore, usually in ones and twos occasionally in small groups and less frequently in larger aggregations (hundreds) during migration or at food-rich sites. The migration and local movements of Pilbara breeding birds unknown, but virtually all populations in WA leave Australian seas in the cooler months and winter north of the Equator in the seas off Sulawesi and the Philippines, e.g. a bird banded on Fisherman Is. near Jurien Bay and recovered in Sabah in Aug. Also some Bridled Terns recorded from eastern Pilbara seas probably originate from Kimberley breeding colonies.

Sterna fuscata nubilosa Sparrman, 1788
Sooty Tern



Mainly northern seas west to 117°E, accidental in interior. Scarce or uncommon. Breeding in small numbers on Bedout Is. (possibly no longer utilised) and Eva Is. (Exmouth Gulf) in April–May. An exhausted bird found at Paraburdoo by J.A. Smith on 25 Feb. 1975, a few days after cyclone Trixie passed down the north-west coast. Most records are probably referable to dispersive non-breeding visitors from west Kimberley and Ashmore Reef where large colonies occur.

Sterna hybrida javanica Horsfield, 1821
Whiskered Tern



Throughout the region, north to Mandora (Mandora Marsh and Sandfire) and inland to Newman. Uncommon to very common visitor, numbers varying with extent of floodwaters on coastal plain. Usually in ones, twos or small parties, occasionally hundreds or thousands (see below). Favours inundated near-coastal samphire flats and claypans, mangrove creeks and other sheltered inlets, river pools and saltwork and sewage ponds, also Harding Dam. Breeds at Mandora Marsh in Feb., March and June.

In dry years the species is recorded essentially as a summer visitor (over the Aug.–May period), mainly in sheltered embayments, tidal creeks and saltwork ponds with lesser numbers in more open coastal habitats. At Port Hedland Saltworks there

appeared to be a resident population of typically 50–100 birds which fed over the intake channels and the intake pond (not the higher salinity ponds), but no birds have been recorded breeding there. Seems to be much more transient in other areas.

In wet years marine habitats are generally abandoned, the birds (their numbers typically increased) then recorded predominantly from flooded samphire flats, inundated coastal plains and claypans, e.g. >400 on Fortescue Marsh in June 2000 and 5,500 on Fortescue Marsh in June 2003. Where these temporary habitats are extensive, opportunistic breeding takes place. Even in these years, the Port Hedland Saltworks population, although smaller (20–50 birds) persists and birds may also occur in flooded areas further inland.

In exceptional years, where extensive local flooding occurs co-incidentally with widespread drought over much of central and southern Australia, remarkable numbers and breeding events occur. Two such events, documented by Halse *et al.* (2005), occurred at Mandora Marsh when flooding occurred in both 1999 and 2000. Populations were estimated as 4,920, 27,360 and 20,710 in Aug. 1999, June 2000 and Aug. 2000, respectively. These results are probably conservative since in each case considerable numbers were recorded as unidentified terns (57,420, 85,380 and 36,830, respectively). Probably the most significant of these is that of June 2000, when two species most likely to be confusing among unidentified terns (White-winged Black Tern and Common Tern) would have been absent, as both are northern hemisphere breeding species; thus, a high percentage of unidentified birds were probably Whiskered Terns. Even if, conservatively, only 50% of these were Whiskered Terns, the population would be increased to 70,000. It was also noted at the time of the survey that most adults probably bred. Although no date concerning the buildup of the population is available, the Mandora Marsh complex underwent two discrete successive years of flooding; the initial inundation commenced in Feb. 1999 but the whole complex had dried out by Dec. of that year. Flooding occurred in March 2000 but again the system dried out by Dec. In both cases, the influx must have been rapid and occurred over the late summer–autumn period. These comments demonstrate the ability of this species to respond to and exploit such opportunistic events.

Sterna leucoptera Temminck, 1815
White-winged Black Tern

Coasts and near-coastal waters and flats south to the Ashburton R. Irregular summer visitor from north-east Asia (late Sept.–late May, but mostly from mid–late Oct. to mid–late April). Usually in ones, twos or small flocks (up to 160), occasionally

in thousands on eve of departure. Mainly estuaries and other sheltered seas and saltwork ponds, also claypans and flooded samphire and grassy flats. Following cyclonic rains it is regularly recorded from areas such as flooded coastal flats and often at these times penetrating further inland than usual. Where such conditions persist concentrations of several hundred can occur.

Not all concentrations or aggregations are of this kind, the largest recorded to date, conservatively estimated at 30,000 in early Feb. 2004, comprised smaller groups (5–10,000) feeding on hopper-stage locusts over the plains immediately inland of the Eighty Mile Beach (mainly from Anna Plains south to Mandora). A concentration of 6,000 was recorded from the same area in April 1979. One of about 15,000 in March–April 1982 included some birds in partial and full breeding plumage and is assumed to be a pre-departure gathering. Also affected or displaced by cyclones (e.g. after one in Feb. 1989 a movement of 250 birds/h was recorded at Finucane Is., lasting at least six hours). Roost sites are generally bare margins of islands within flooded areas, sometimes on earthworks, e.g. levee walls at Port Hedland Saltworks, but also associates with other tern species at beaches.

Anous stolidus pileatus (Scopoli, 1786)
Common Noddy



Recorded only at Bedout Is., the Montebello Is and Frazer Is. Very common on Bedout Is., but numbers apparently fluctuating, the birds usually returning in May and laying towards the end of the month (at least in 1901, 1968 and 1972, but evidently not in 1975 or 1979), only 12 birds and no nests seen in Oct. 1949. Great numbers observed about Frazer Is. in April 1902 (Carter 1904). Only rarely recorded from shoreline and then usually associated with intense cyclones, but apparently present all year in offshore areas. These could include birds from adjacent breeding sites including Houtman Abrolhos and Ashmore Reef. One found alive and photographed at Christmas Creek minesite (110 km N of Newman) after a cyclone on 28 Jan. 2011.

Anous tenuirostris (Temminck, 1823)
 Lesser Noddy

Rare vagrant. One found dead at a light on a drilling rig on Barrow Is. in June 1970.

Columbidae

Columba livia Gmelin, 1789
 Domestic Pigeon



Established exotic. Apparently recently (within the past 10 years) established in Port Hedland. Occasional records from Karratha, Dampier, Port Samson, Roebourne, Panawonica and Exmouth.

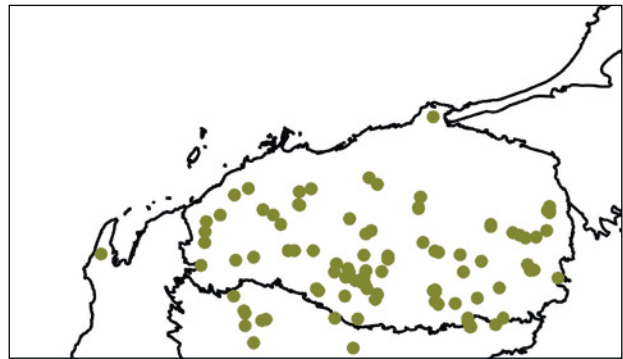
Streptopelia chinensis (Scopoli, 1786)
 Spotted Turtle Dove



Established exotic. Appeared at Karratha in winter–spring of 2006 and was soon well established there (Burbidge and Massam 2006). Also at least two Eurasian Collared Doves (*Streptopelia decaocto*) have been reported in Karratha (Burbidge and Massam 2006) but apparently have not become established.

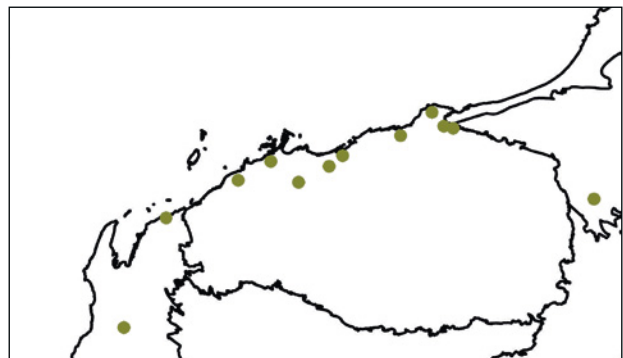
[A recent report of a Laughing Turtle-Dove (*Streptopelia senegalensis*) in the western Hamersley Range is well beyond its normal range and its status in the region is unknown.]

Phaps chalcoptera (Latham, 1790)
 Common Bronzewing



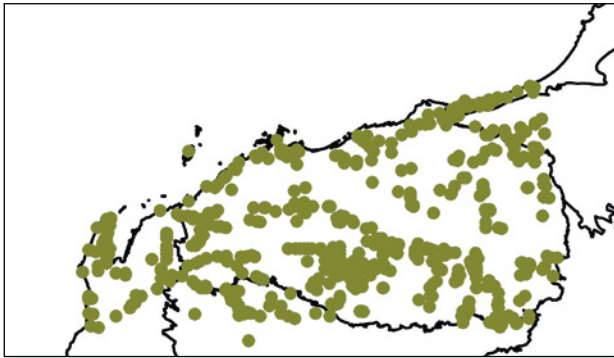
Mainly hilly southern interior of the region, north to the De Grey R. and east to the upper Oakover R. and Jigalong, rare or casual on coastal lowlands. Locally moderately common, but generally uncommon. Usually in ones or twos, occasionally larger aggregations (up to 20) at water. Favours wattle thickets, especially *Acacia citrinoviridis*, along minor watercourses, also *Melaleuca*, *Santalum*, *Cassia*, *Cleome* and other shrubbery near water. Breeding Feb.–Sept.

Phaps histrionica (Gould, 1841)
 Flock Bronzewing



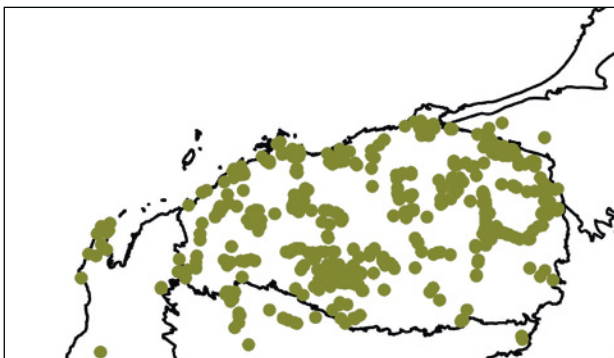
Mainly coastal plains north to the De Grey, scarce or casual in hilly interior. Very irregular visitor, highly nomadic. Usually in ones, twos or small flocks (up to 120) but in some years (e.g. 1901, 1958, 1966 and 2011) much larger flocks (400–2,000) about the lower Maitland, lower Fortescue, lower Ashburton and lower Lyndon Rivers. Locally and seasonally common but generally scarce or uncommon.

Ocyphaps lophotes (Temminck, 1822)
Crested Pigeon



Throughout the region including Barrow Is. Originally local and uncommon. Now common except in waterless eastern desert areas. Usually in ones, twos or small parties, but aggregations up to 80 at water. Favours lightly wooded grasslands near water. Breeding all year round. Has greatly expanded its range and numbers since European settlement. In 1904 T. Carter described it as 'not common, and apparently decreasing' in the Point Cloates district (Carter 1904). In Aug.–Oct. 1908, Whitlock (1909) recorded it only on the lower Coongan during a visit to Marble Bar and lower De Grey and noted it as 'far from common', and did not record it during visit to Millstream in July–Nov. 1922. In 1933, Robinson (1939) found it to be very common in the Ullawarra district. Appears to have benefited from the provision of water supplies for domestic stock.

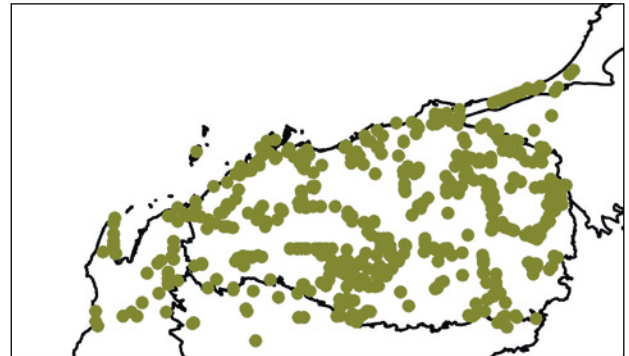
Geophaps plumifera Gould, 1842
Spinifex Pigeon



Throughout the region except far eastern sandy deserts, north to Pardoo Creek (at Great Northern Highway), Shay Gap and Warrawagine, and west to Burrup Peninsula, lower Fortescue, Peedamulla and Barradale, also an isolated population in Cape Range. Moderately common to very common; by far the commonest columbid in hilly country but outnumbered by Crested Pigeon and Diamond Dove in most flatlands. Usually in ones, twos

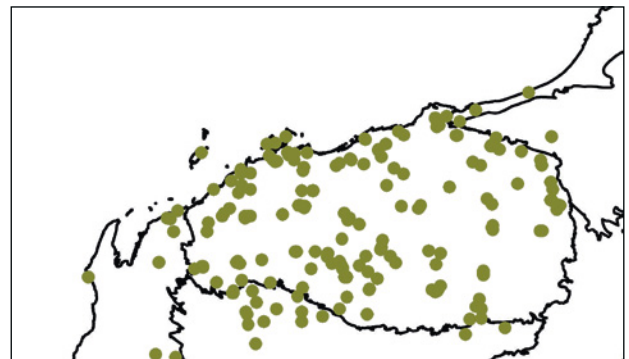
or small parties but occurs in aggregations of up to 100 birds at water or feed-rich sites and during times of drought. Favours lightly wooded grasslands, especially *Triodia* in stony or rocky country, in vicinity of water. Breeding recorded May–Feb.

Geopelia cuneata (Latham, 1802)
Diamond Dove



Throughout the region, including sandy deserts and Enderby, West Lewis and Barrow Is. Partly nomadic, scarce to very common, numbers varying locally with seasonal conditions. Usually in pairs or small parties (up to 30), flocks (up to 50) and also aggregating in much larger numbers (100s) at height of dry season or during droughts at permanent water. Breeding reported July–April.

Geopelia striata placida Gould, 1844
Peaceful Dove



Throughout most of the region north to De Grey R. and Mandora, south-west to lower Ashburton and Barlee Range, and east to Oakover R. and upper Fortescue R. near Newman. Locally common, but generally uncommon and patchily distributed. Usually in pairs or small parties (up to 20). In and near riverine forests of *Melaleuca leucadendra* and *Eucalyptus camaldulensis*, especially around permanent pools on major watercourses. Breeding Sept.–April.

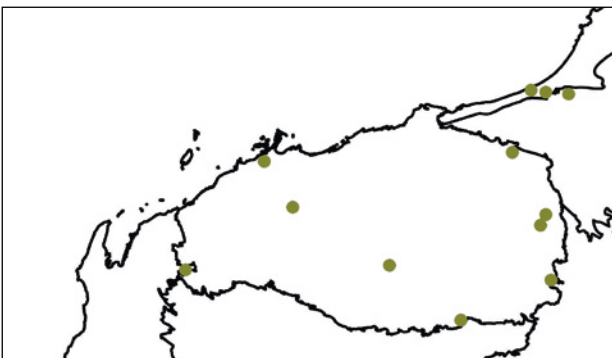
Geopelia humeralis Temminck, 1821
Bar-shouldered Dove



Most coasts from Mandora south-west to Mangrove Bay, including Dampier Archipelago, Montebello Is, Barrow Is. (including Mushroom, Double and Boodie), North Sandy, Great Sandy and Bessieres Is. Locally common. Usually in ones, twos or small parties (up to 12) occasionally larger aggregations (up to 40) at food-rich sites. Mainly mangroves and nearby, especially dune scrub with *Acacia coriacea* and other acacias, *Melaleuca acacioides* thickets, and tussock grassland with *Spinifex longifolius* and *Triodia* spp. Breeding July–Oct.

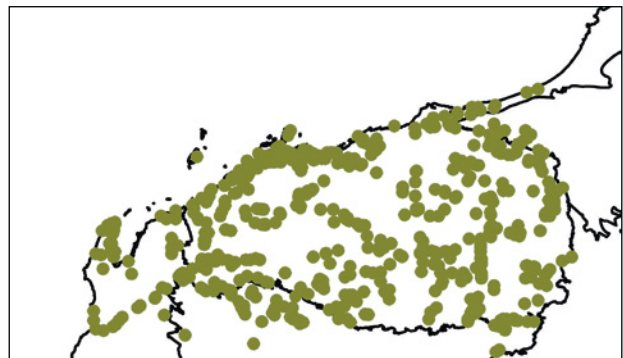
Psittacidae

Calyptorhynchus banksii samueli Mathews, 1917
Red-tailed Black Cockatoo



Throughout the region, north to Mandora, east to the Oakover R. and near Newman but absent from far south-west corner (i.e. west of about 115°E). Most sightings are of pairs or small flocks near river pools. While Ford (1987) suggested that Pilbara birds belonged to the southern subspecies *samueli*, and this has been followed by subsequent authors, there are two autumn observations of birds possibly moving between the Pilbara and the Kimberley, viz. a flock of 30 flying north-east above the Eighty Mile Beach at Mandora on 19 May 1975, and two flying over Sandfire on 26 March 1982. Possibly a small resident population in Mandora area. Breeding recorded in large paperbark hollows at Eil Eil Spring, Mandora, in 1996 (C. Hassell).

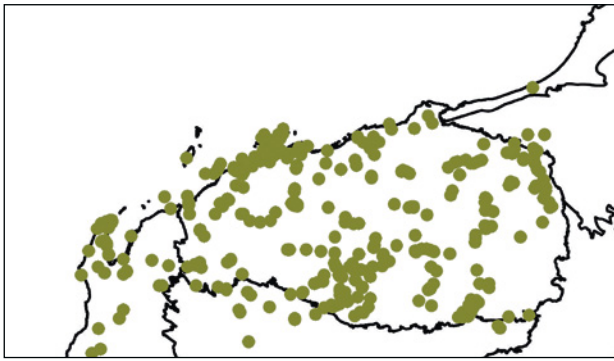
Cacatua roseicapilla assimilis (Mathews, 1912)
Galah



Throughout the region north generally to Pardoo Creek and the De Grey R. but regularly following the coastal plain north to Mandora, and into the fringes of the Great Sandy Desert near Callawa, also casual on Barrow Is. Generally common, but scarce or uncommon on desert fringes and pastorally unoccupied sections of Hamersley Range. Usually in pairs or small parties, commonly flocks (up to 500). Favours lightly wooded grasslands near water and stands of trees suitable for nesting and shelter. Breeding July–Sept. Now much more plentiful and widespread than in early 1900s, presumably due to provision of artificial water sources and introduction of seeding exotic grasses and annuals. In 1904 T. Carter noted that it was never seen on the coast but fairly common inland in the North West Cape region (Carter 1904) and F.L. Whitlock in 1909 noted that it was found in scattered pairs throughout the district (in Pilbara Goldfields) (Whitlock 1909). From the 1930s to the 1950s benefited greatly from expansion of pastoral country.

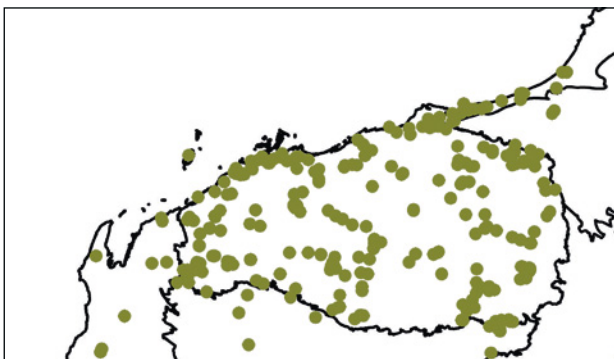
The species was described by Vieillot in 1817 as *Cacatua roseicapilla* from a specimen collected during the Baudin expedition which traversed the southern coasts of Australia in 1800–1803. The specimen was labelled 'dans les Indies', leaving its actual location open to interpretation—Mathews (1912) considered it to be New South Wales, while Schodde (1988) believed it to be from WA, probably the Shark Bay area. Although members of the Baudin expedition made notes on other birds encountered at Shark Bay, they did not mention the Galah, which seems surprising as to them it would have been a beautiful, spectacular bird. Furthermore, the species was not recorded in the Shark Bay region prior to the 1920s. Study of photographs of the type by one of us (REJ) suggests that it was not from WA but appears to match birds from south-eastern Australia. We therefore use the subspecific epithet *assimilis* for WA birds south of the Kimberley.

Cacatua sanguinea westralensis (Mathews, 1917)
Little Corella



Throughout the region, north to Mandora and east to Oakover R. and Jigalong, also commonly visiting inshore islands including Picard Is., Dampier Archipelago (Legendre, Dolphin, Angel, Rosemary, Goodwyn, East Lewis, West Lewis), Passage Is (Long, Passage, North Sandy), Barrow Is. and Thevenard Is. Locally common, usually in pairs or small flocks, occasionally large flocks (up to 3,000). Mainly along watercourses and coasts, also towns and homesteads. Breeding July–Sept., nesting in holes in river gums, paperbarks, mangroves, cliffs (including those on islands) and occasionally in termitaria.

Nymphicus hollandicus (Kerr, 1792)
Cockatiel

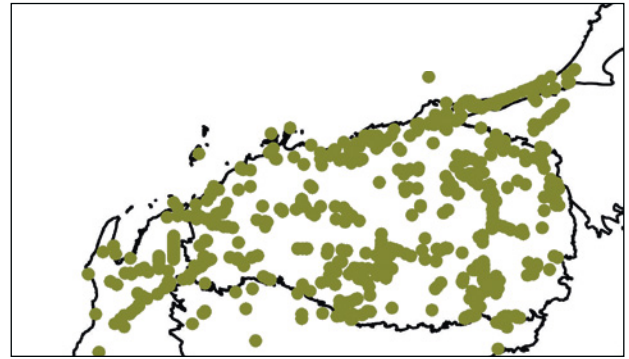


Throughout the mainland part of the region, also casual on Barrow Is. Nomadic. Common in wet years but generally uncommon. Usually in pairs or small flocks (up to 30), occasionally larger flocks (up to 200). Mainly lightly wooded grasslands (including *Triodia*), especially on riverine plains. Breeding Jan.–April and July–Sept.

Aprosmictus erythropterus (Gmelin, 1788)
Red-winged Parrot

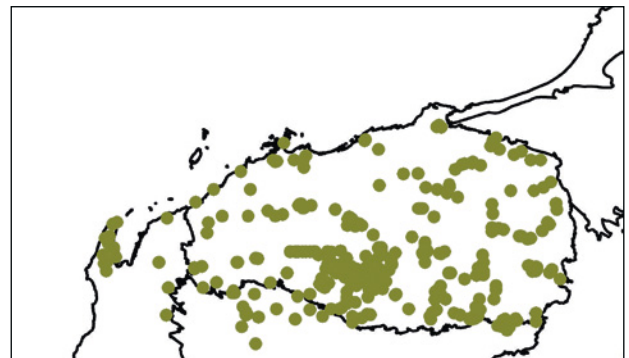
Only recorded on far north-eastern coastal plain at Mandora and Wallal. Uncommon, ones, twos and small flocks (up to 17). Visiting pindan scrub in search of leguminous seeds (especially of *Acacia* spp.).

Melopsittacus undulatus (Shaw, 1805)
Budgerigar



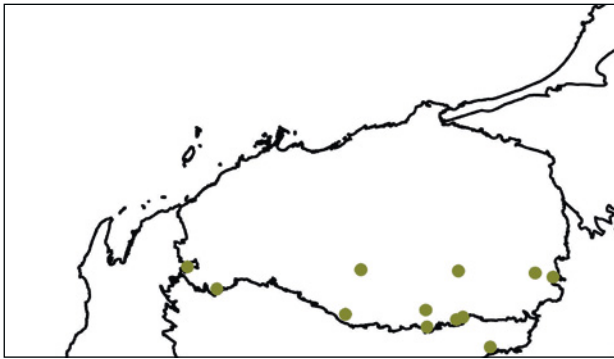
Throughout the region, also casual on some islands (e.g. Jarman, Legendre and Rosemary). Highly nomadic. Abundance extremely variable, ranging locally from scarce or absent after long dry periods, to very common and breeding in wet years. Usually in small flocks, occasionally flocks of several hundreds or thousands. Favours lightly wooded grasslands (including *Triodia*), especially on riverine plains. Breeding March–Sept., i.e. after winter as well as summer rains.

Platycercus zonarius zonarius (Shaw, 1805)
Australian Ringneck



Throughout the region, north to lower De Grey R., Shay Gap and Warrawagine, and east to upper Oakover R. and Jigalong. Locally common, e.g. in Chichester, Hamersley and Barlee Ranges, but generally uncommon to moderately common. Usually in pairs or family parties. Favours well-wooded country, riverine forests with *Eucalyptus camaldulensis* and *Melaleuca argentea*, also mulga and eucalypt woodlands of *E. microtheca* and *E. leucophloia*. Breeding in July–Aug.

Platycercus varius (Clark, 1910)
Mulga Parrot

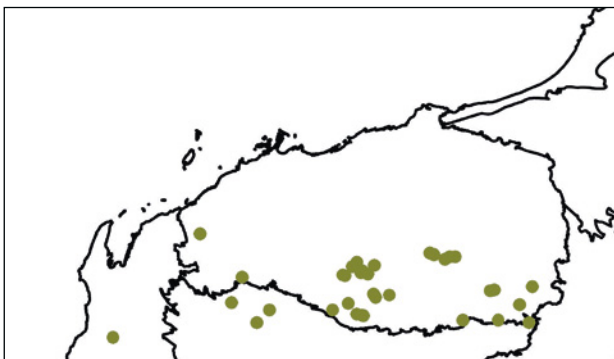


Mainly the far south-east of the region, north to Roy Hill and upper Oakover R. and west to Coondiner Pool and Newman; casual further west. Scarce or uncommon. Mainly in pairs or family parties. Favours stands of mulga.

Neophema elegans (Gould, 1837)
Elegant Parrot

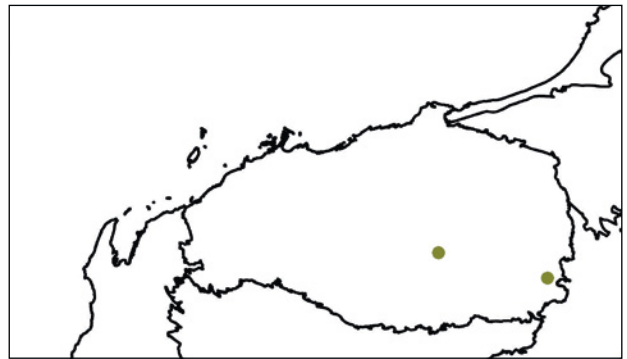
Rare autumn–winter visitor, presumably from south-western Australia, to grassy flats along watercourses and bore overflows. Most sightings are in the southern Pilbara (Davis and Burbidge 2008), although recorded as far north as Point Samson.

Neophema bourkii (Gould, 1841)
Bourke’s Parrot



Mainly the southern interior of region, west to Minilya–Exmouth road and north to middle Cane R. area, Wyloo, Mt Bruce and Ethel Creek. Moderately common in south-eastern portion of Hamersley Range (e.g. Juna Downs area), but generally uncommon. Usually in ones, twos or small flocks (up to 20). Favours mulga and other *Acacia* scrubs. Has only recently colonised region. First recorded in 1959 by E. Lindgren at Jigalong and first recorded in Gascoyne region in 1960.

Pezoporus occidentalis (Gould, 1861)
Night Parrot



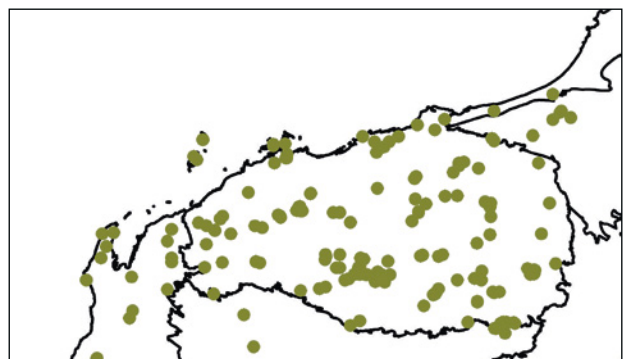
Status uncertain. A number of unconfirmed records from eastern interior, the most plausible being a freshly built nest found by N.L. Ives in a tussock of *Triodia* 16 km NE of Balfour Downs on 14 July 1970 (Ives 1971) and a more recent record by R. Davis and B. Metcalf of two birds drinking near Fortescue Marsh on 12 April 2005 (Davis and Metcalf 2008). Some recent reports from Chichester Range in May and Skull Springs Road in June 2010 are probably based on Elegant Parrots. The type specimen of the Night Parrot was collected by the Austin expedition in Sept. 1854 near Mt Farmer in the Murchison region.

Cuculidae

Cuculus saturatus Blyth, 1843
Oriental Cuckoo

Rare summer visitor (mainly Oct.–April) from northern hemisphere. Reports of single birds from Goldsworthy, Roebourne, Karratha, Dampier and Barrow Is. Both grey and hepatic plumage noted.

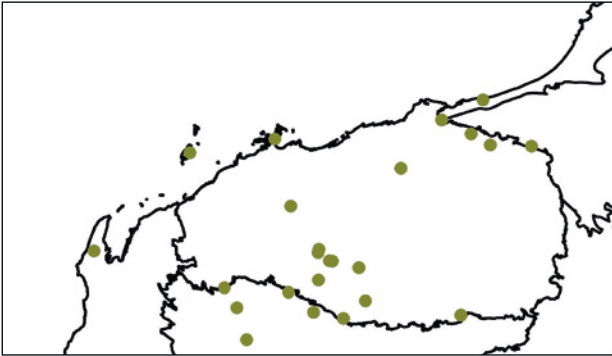
Cuculus pallidus (Latham, 1802)
Pallid Cuckoo



Throughout the region including eastern desert areas, also in passage on West Lewis, Barrow and Montebello Is. Visitor and passage migrant from southern parts of the State, mostly May–Sept., occasionally through to Feb. Moderately common.

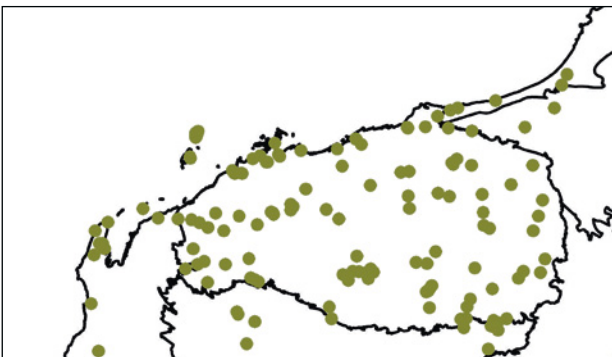
Usually single, occasionally in twos. Most kinds of wooded country. Breeding recorded in Aug. and recorded parasitising *Artamus cinereus* and *Lichenostomus* spp.

Chrysococcyx osculans (Gould, 1847)
Black-eared Cuckoo



Mainly southern part of the region but recorded north to Wallal and Nimingarra, also on Barrow Is. Breeding visitor and passage migrant (April–Sept.). Scarce or uncommon, usually single. Mainly waterside thickets. Breeding recorded in July, parasitising *Pyrhrolaemus brunneus*.

Chrysococcyx basalis (Horsfield, 1821)
Horsfield's Bronze Cuckoo



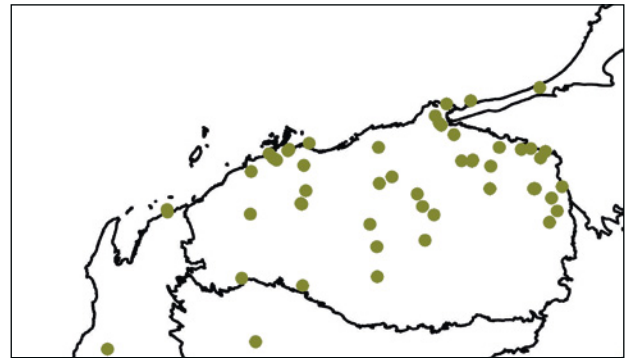
Throughout the region, including Hermite Is. and Barrow Is. and eastern desert areas. Breeding visitor and passage migrant (mostly April–Nov.). Moderately common in south of region and on Barrow Is., uncommon in north. Usually single. Mainly thickets and scrubs of mulga and other acacias, also eucalypt woodlands, mangroves and scattered shrubs in *Triodia* grasslands. Breeding recorded in March–May and Aug.–Sept., parasitising *Aphelocephala nigricincta*, *Calamanthus campestris*, *Malurus lamberti assimilis*, *Malurus leucopterus leuconotus* and *Epthianura tricolor*.

Chrysococcyx lucidus plagosus (Latham, 1802)
Shining Bronze Cuckoo

Rare passage migrant from south of State. A specimen collected near Roebourne in July, also records from Goldsworthy, Karratha, Fortescue R. at NW Coastal Highway, Mundiwindi and Learmonth.

Centropodidae

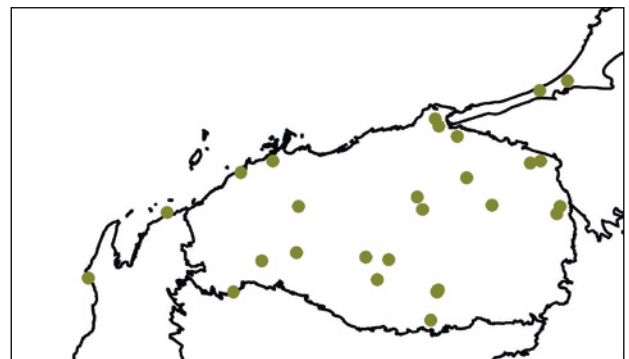
Centropus phasianinus highami (Mathews, 1922)
Pheasant Coucal



Throughout region, north to Mandora and Cape Keraudren, south-west to lower Ashburton R. and inland to upper De Grey R. (Yarrie), Mt Edgar and upper Nullagine R. Formerly moderately common, now uncommon. Relatively sedentary, but probably some withdrawal from seasonally dry places. Usually in ones or twos. Largely confined to rank herbage and thickets along major watercourses, also mangroves, paperbark swamps and long grass behind coastal plains and at artesian bore overflows. Breeding recorded in Jan. The type specimen of this subspecies was collected by J.B. Higham on Glenflorrie Station on 4 Sept. 1921.

Strigidae

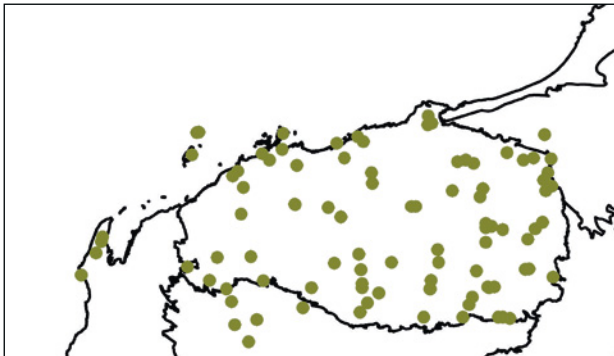
Ninox connivens connivens (Latham, 1802)
Barking Owl



Throughout region, north to Mandora, south to lower Ashburton R. and east to Davis R. and Weeli Wolli Spring. Uncommon, usually in pairs. Favours

dense waterside forests of *Melaleuca argentea* and *Eucalyptus camaldulensis*.

Ninox novaeseelandiae boobook (Latham, 1802)
Boobook Owl



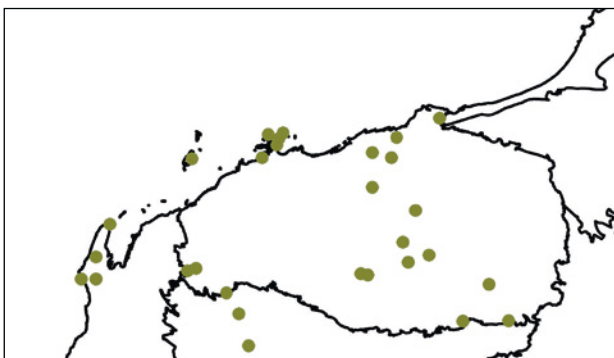
Throughout region north to De Grey R. and east to Oakover R. and Jigalong, also Depuch, Dolphin, Barrow and Montebello Is. Resident and winter visitor from south-western Australia. Generally common but scarce in sparsely wooded areas. Usually in ones or twos. Road casualties in Goldsworthy–Shay Gap area peak in late April–June. Favours riverside forests and woodlands, also tall mulga. Breeding recorded Aug.–Sept.

Ninox scutulata japonica
(Temminck and Schlegel, 1844)
Brown Hawk Owl

Rare or casual visitor from northern hemisphere. One observed at Goldsworthy in Dec. 1985.

Tytonidae

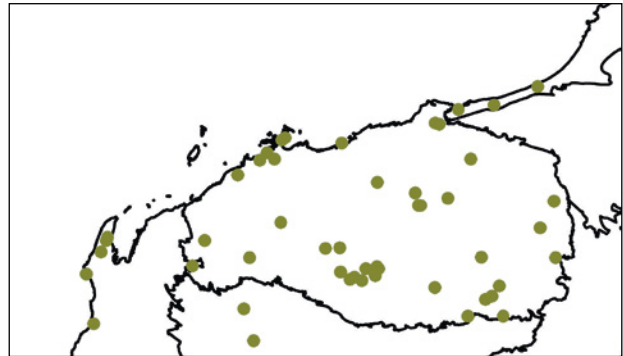
Tyto alba delicatula (Gould, 1837)
Barn Owl



Throughout region, including Angel, Lewis and Barrow Is. Uncommon, most are probably autumn–winter visitors. Breeding recorded in far south of region at Ullawarra and inland from Point Cloates in Aug.–Sept. Also juvenile birds observed in industrial facilities at Port Hedland and may have bred there.

Podargidae

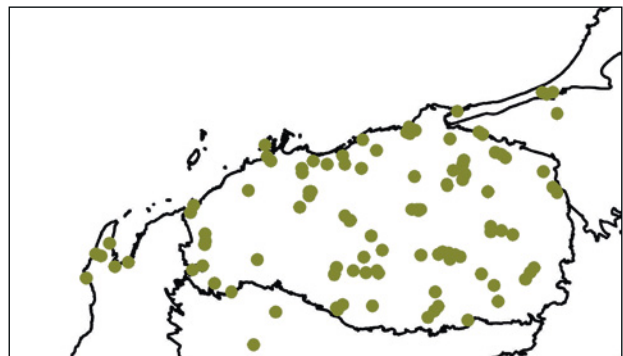
Podargus strigoides brachypterus Gould, 1841
Tawny Frogmouth



Throughout region, north to Mandora and east to fringe of Great Sandy Desert and Oakover R., also Depuch Is. Moderately common. Usually single, occasionally in twos. Most kinds of wooded country. Resident and presumably an autumn–winter visitor to region (road casualties in Goldsworthy–Shay Gap area peak in late April–mid-June). Breeding in July–Oct. and Jan.–Feb.

Caprimulgidae

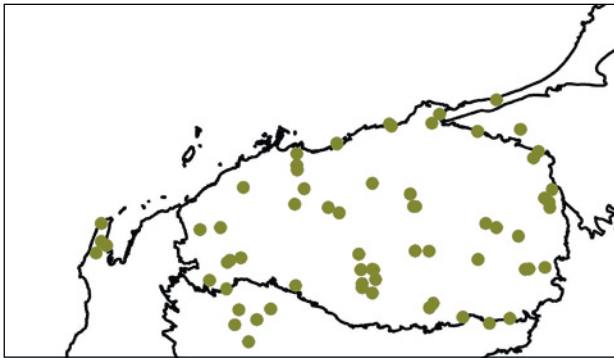
Eurostopodus argus Hartert, 1892
Spotted Nightjar



Throughout region, including sandy desert areas, also Enderby Is. in winter. Resident and presumably an autumn–winter visitor to region (road casualties in Goldsworthy–Shay Gap area peak in April–May). Common in hilly interior, scarce or uncommon on coastal plains. Favours sparsely wooded stony country. Breeding in July–Oct.

Aegothelidae

Aegotheles cristatus cristatus (Shaw, 1790)
Australian Owlet Nightjar



Throughout region, north to Mandora and east to fringe of Great Sandy Desert and Oakover R., also Depuch Is. Uncommon to moderately common. Most wooded habitats. Breeding in Feb.–April and Aug.–Sept.

Apodidae

Hirundapus caudacutus caudacutus (Latham, 1802)
White-throated Needletail

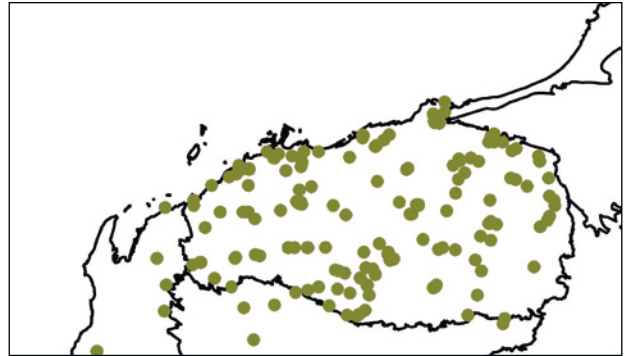
Rare visitor from northern hemisphere. Recorded at Goldsworthy on 20 Nov. 1972, listed by W.H. Butler for Barrow Is. (Butler 1970), and a flock of 50 recorded near Karratha on 21 March 2007.

Apus pacificus pacificus (Latham, 1802)
Fork-tailed Swift

Irregular summer visitor (Nov.–early April) from northern hemisphere (north-east Asia) to greater part of region including Barrow Is. and Montebello Is. Numbers highly variable, mostly in small flocks (10–50), occasionally large flocks. Usually appears ahead of cyclones or during thunderstorms.

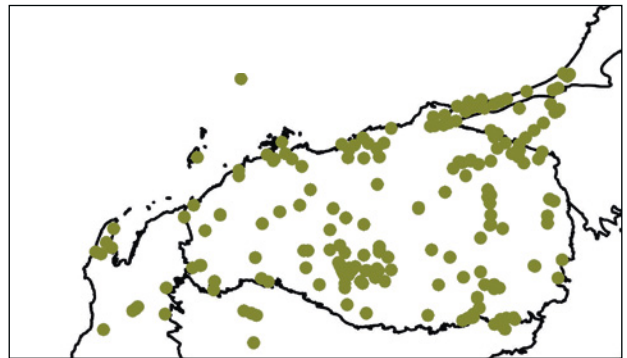
Halcyonidae

Dacelo leachii leachii Vigors and Horsfield, 1826
Blue-winged Kookaburra



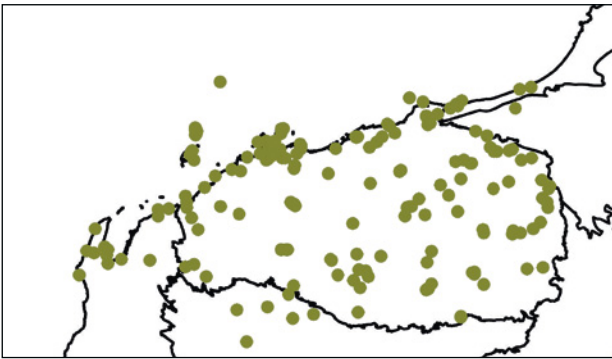
Found throughout region, north to De Grey R. and Shay Gap, west to lower Ashburton, lower Yannarie and lower Lyndon Rivers, and inland to Oakover R., Weeli Wolli Spring and Turee Creek. Moderately common. Usually in ones, twos or family parties. Largely confined to major watercourses. Mainly forests of *Eucalyptus camaldulensis* and *Melaleuca argentea*. Breeding in Sept.–Dec.

Todiramphus pyrrophygius (Gould, 1841)
Red-backed Kingfisher



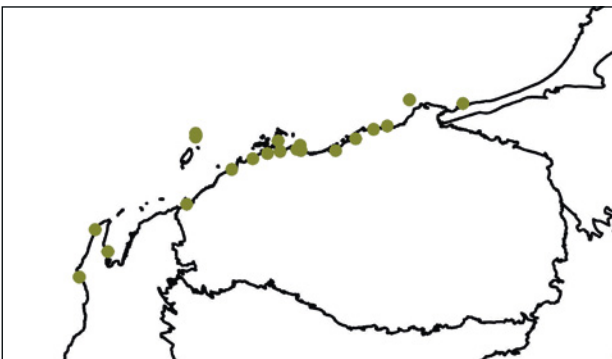
Throughout region, including Depuch Is. (vagrant on Barrow Is.) and eastern desert areas but not coastal areas south of Yardie Creek. Common to moderately common, usually single, occasionally in twos. Favours lightly wooded country, especially about minor watercourses with nest sites (exposed banks). Breeding Aug.–Oct.

Todiramphus sanctus sanctus
(Vigors and Horsfield, 1827)
Sacred Kingfisher



Throughout region north to Mandora and including (in winter or in passage) North Turtle Is., Legendre Is., Dolphin Is., West Lewis Is., Enderby Is., Montebello Is, Barrow Is. and oil platforms up to 150 km out to sea (e.g. Goodwyn A), but not eastern desert areas or coastal areas south of Point Cloates-Yardie Creek area. Breeding visitor, winter visitor and passage migrant. Common. Usually in ones or twos, occasionally in small parties. Favours well-wooded country near water, especially riverside forests in breeding season and mangroves in passage or in winter. Breeding in Sept.–Jan.

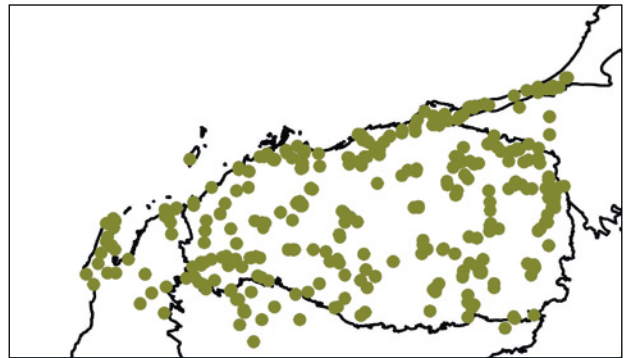
Todiramphus chloris pilbara (Johnstone, 1983)
Collared Kingfisher



Estuaries and sheltered inlets from Port Hedland and mouth of Turner R. south-west to Bay of Rest, also Montebello Is. Locally common (e.g. mouth of Turner R., Dampier and mouth of Cane R.) but generally uncommon to moderately common. Usually in ones or twos. Favours blocks of mangal with forest or woodland of *Avicennia marina*. Breeding in Sept.–Oct. This subspecies is confined to the Pilbara region.

Meropidae

Merops ornatus Latham, 1802
Rainbow Bee-eater



Throughout the region. Resident, winter visitor and passage migrant. Locally scarce, e.g. in eastern desert areas and coastal areas south of Yardie Creek, but generally moderately uncommon to common. Migrants mainly arriving in Aug.–Oct. and leaving in Feb–March. Two recorded near southern tip of Barrow Is. on 14 May 2010 (Burbidge *et al.* 2010a). Usually in ones, twos or small parties, occasionally small flocks (up to 30) in passage. Favours lightly wooded country, especially at water. Breeding in Aug.–Nov.

Coraciidae

Eurystomus orientalis pacificus (Latham, 1802)
Dollarbird

Scarce visitor. Recorded at Mt Edgar in Dec. 1960, Shay Gap in Dec. 1972, Point Samson in late Nov. and early Dec. 1977, Karratha in Jan. 1979 and Winning in June 1953, also Coral Bay, Miaree Pool and Roebourne in 2010.

Pittidae

Pitta sordida cucullata (P.L.S. Muller, 1776)
Hooded Pitta

Rare vagrant. One record, a bird found dead on Barrow Is. on 23 Jan. 2010.

Pitta moluccensis (Müller, 1776)
Blue-winged Pitta

Rare summer visitor from south-east Asia. Two records: a bird found dead at Mandora in Jan. 1927 (WAM A2921) (Storr 1984) and one live bird on Burrup Peninsula, 6 Nov. 1994 (Johnstone and Hamilton 1995).



Plate 15 Black-tailed Treecreeper (*Climacteris melanura wellsi*), Mulga Downs (J.Bush).

Climacteridae

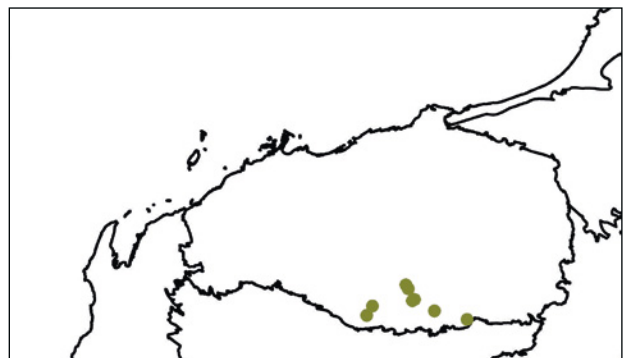
Climacteris melanura wellsi Ogilvie-Grant, 1909
Black-tailed Treecreeper



Mainly interior of region, north to De Grey R., east to Oakover R., west to Millstream, lower Ashburton R. and south to Barlee Range. De Grey R. is the northern limit for this subspecies in WA. Uncommon to moderately common, in ones, twos or small parties. Mainly eucalypt woodlands (river gum, snappy gum, coolabah and bloodwoods), also tall mulga. Breeding in Aug. and possibly early Sept.

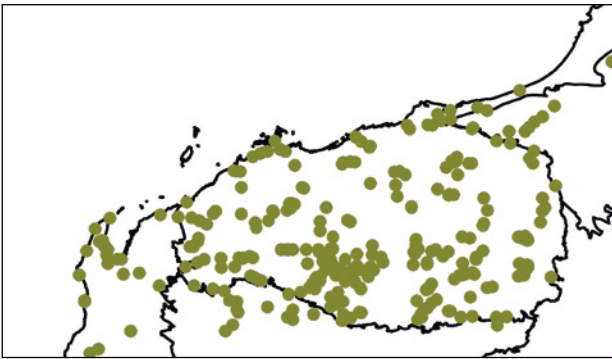
Maluridae

Malurus splendens splendens
(Quoy and Gaimard, 1830)
Splendid Fairy-wren



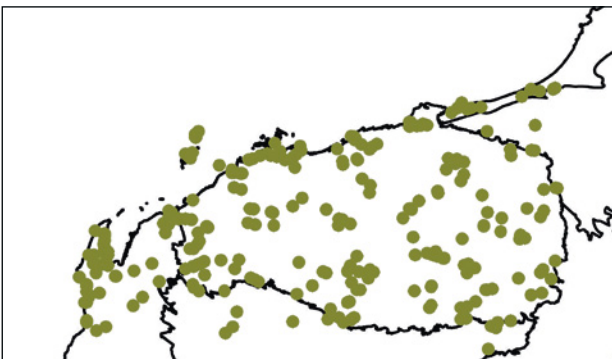
Only recorded in far south-east of region north to Mt Robinson and Newman. Uncommon, usually in family parties. Favours mulga and other bushy acacias.

Malurus lamberti assimilis North, 1901
Variegated Fairy-wren



Throughout region, north to Mandora and eastern desert areas. Generally common but scarce or uncommon on some open coastal plains between De Grey and Ashburton Rivers. Usually in family parties. Found in all kinds of shrubland, thicket and scrub including paperbark swamps, *Acacia* thickets and mangal. Breeding in Feb–March and July–Aug. Parasitised by *Chrysococcyx basalis*.

Malurus leucopterus leuconotus Gould, 1865
White-winged Fairy-wren



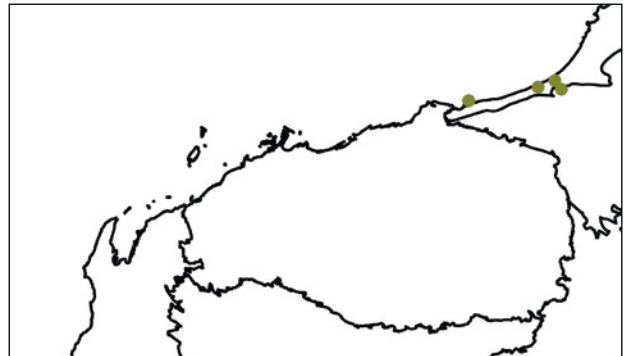
Throughout region, north to Mandora and saltmarsh 16 km NE of Sandfire. Moderately common on plains, uncommon in hilly country. Usually in pairs or family parties. Favours low vegetation, *Triodia*, samphire, coastal heath and other low shrublands, *Spinifex longifolius*, *Salsola kali*, and long grass. Breeding from early March to early Nov. Parasitised by *Chrysococcyx basalis*.

Malurus leucopterus edouardi Campbell, 1901

Confined to Barrow Is., where the population has been estimated at ca. 8,000 birds (Pruett-Jones and O'Donnell 2004). Formerly on Trimouille Is. (Montebello Is) reported by Sheard (1950) but not seen by Hill (1955); 37 birds were translocated to Hermite Is. in May 2010 and June 2011 and have since been recorded breeding there (A.H. Burbidge *et al.*, unpubl. data). Moderately common. Favours

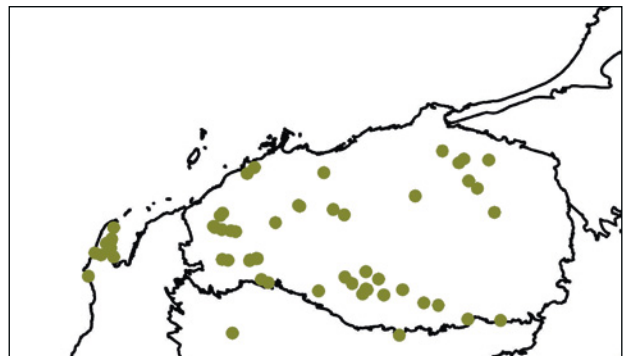
open hummock grasslands of *Triodia* and *Triodia* mixed with *Spinifex longifolius*. Breeding April–Sept.

Malurus melanocephalus cruentatus Gould, 1839
Red-backed Fairy-wren



Far north-eastern coastal plains at Mandora and Pardoo. Moderately common at Cape Keraudren, but generally scarce and patchily distributed. Usually in ones, twos or family parties. Favours *Triodia* mixed with shrubs especially *Acacia* and *Melaleuca*, *Spinifex longifolius* in coastal dunes and less frequently in mangroves.

Stipiturus ruficeps ruficeps Campbell, 1899
Rufous-crowned Emu-wren

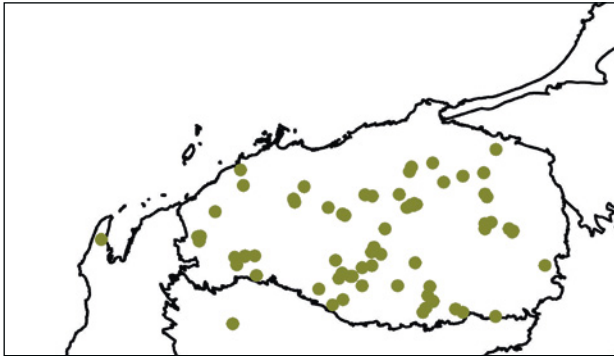


Largely confined to southern interior of region, north to Pyramid and Abydos, east to Mt Meharry and Turee Creek and west to Red Hill and Barlee Range, also an isolated population on Cape Range peninsula, south to Yardie Creek and Learmonth. Locally moderately common, e.g. at Tambrey, Mt Stuart and Learmonth, but generally uncommon and patchily distributed. Usually in pairs or family parties. Favours large dense clumps of *Triodia*, usually on drainage lines and watercourses and often mixed with shrubs especially *Acacia* and *Senna*. Breeding in Aug.–Sept. and probably Oct.



Plate 16 Striated Grasswren (*Amytornis striatus whitei*), Newman. Endemic to the Pilbara region (J. Bush).

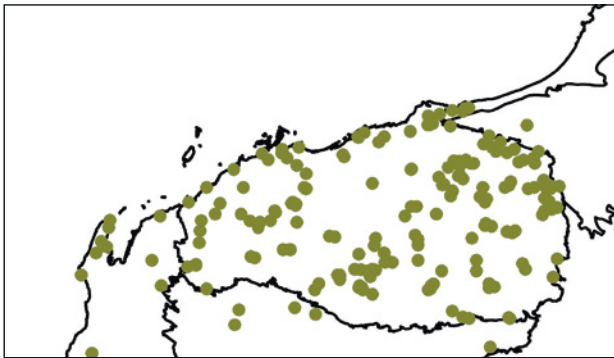
Amytornis striatus whitei Mathews, 1910
 Striated Grasswren



Hilly interior of the region, north to Mt Herbert, upper Turner and upper Coongan Rivers, east to Marble Bar, Wickham Creek (90 km ESE of Nullagine) and Mt Newman, and west to western Hamersley Range, Parry Range and Barlee Range (Barlee Range possibly isolated), also an isolated population in the Cape Range about sources of Yardie Creek. Locally moderately common but generally uncommon and patchily distributed. Usually in pairs or family parties. Favours *Triodia* in rocky or stony country. Breeding in March–Aug.

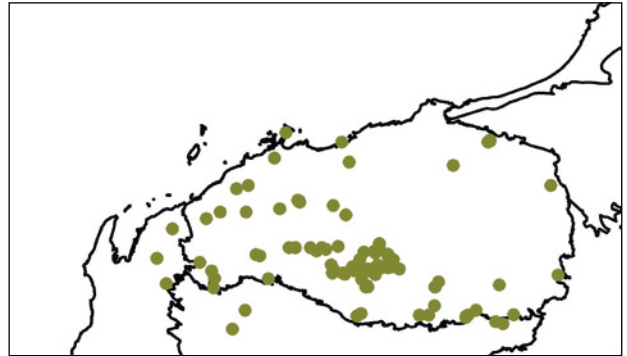
Pardalotidae

Pardalotus rubricatus Gould, 1838
 Red-browed Pardalote



Throughout most of the region but absent from eastern sandy deserts and far south-western coastal areas south of Yardie Creek. Moderately common to common. Usually in ones or twos. Canopy of eucalypts, especially river gums. Breeding June–Oct.

Pardalotus striatus murchisoni Mathews, 1912
 Striated Pardalote



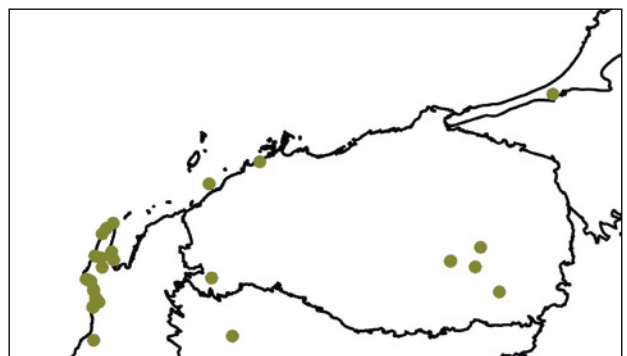
Throughout the region, north to De Grey R., lower Ashburton R. and lower Yannarie R., also Depuch Is. Locally common, e.g. in Hamersley Range but generally uncommon to moderately common. Usually in ones, twos or small parties (up to eight). Favours canopy of eucalypts, especially river gum (*Eucalyptus camaldulensis*), snappy gum (*Eucalyptus leucophloia*) and coolibah (*Eucalyptus victrix*). Breeding in April–May.

Pardalotus striatus westraliensis Mathews, 1912

Status uncertain, probably a scarce winter visitor to southern interior of region from south-western Australia. A specimen collected at Tambrey on 28 Aug. 1958 and another from Wittenoom Gorge on 15 July 1981, are tentatively identified with this subspecies, although a little paler than typical specimens. Northern breeding limit of subspecies is upper Murchison R. where it intergrades with *P. s. murchisoni*.

Acanthizidae

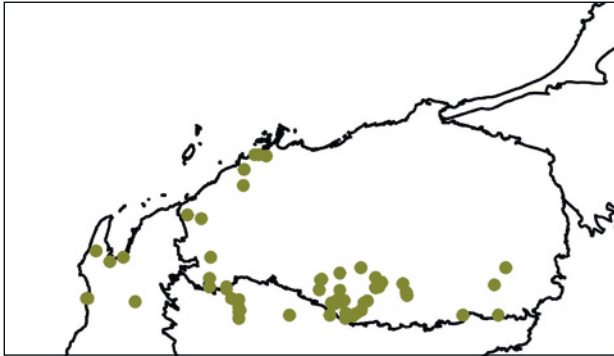
Calamanthus campestris (Gould, 1841)
 Rufous Fieldwren



Coast and coastal plains of Cape Range peninsula east to Minilya-Exmouth Road, also patchily distributed in southern interior about lower Henry R., also east of Bonney Downs and at Jigalong. Common in coastal areas, rare in interior. Usually

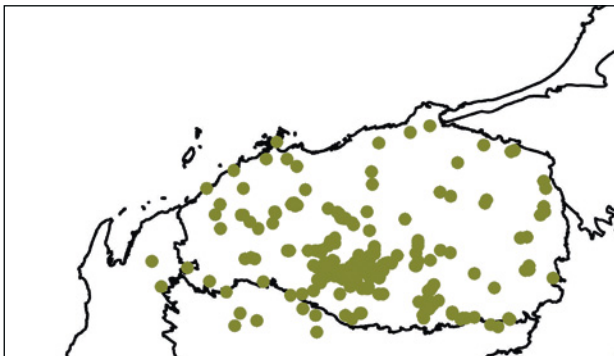
in ones or twos. Low dune scrub, *Triodia* and samphire and *Triodia* on gibber plains at Jigalong. Breeding June–late Aug. Parasitised by *Chrysococcyx basalis*.

Pyrholaemus brunneus Gould, 1841
Redthroat



Far south-west, north to Point Maud, Winning, Nanutarra, Tom Price, Juna Downs and Jigalong, also isolated populations around south end of Exmouth Gulf (Gales Bay and Giralia Bay) and south of Regnard Bay (see map). Moderately common on coast and locally in interior (e.g. Wannery Creek 22°47'S, 115°43'E; Bellary Creek 23°11'S, 117°42'E), but generally scarce and patchily distributed. Usually in pairs or small parties. Favours *Acacia* scrubs and thickets on coastal dunes and along watercourses. Breeding in March and July. Parasitised by *Chrysococcyx osculans*.

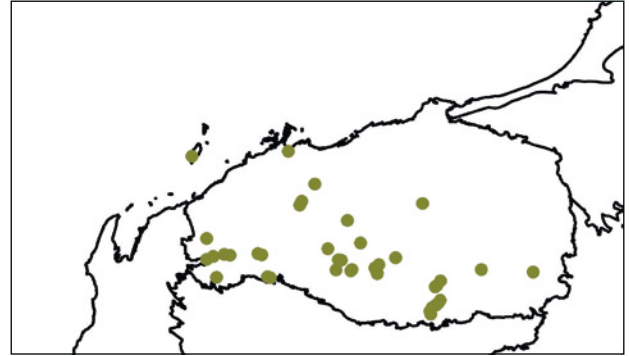
Smicrornis brevirostris (Gould, 1838)
Weebill



Throughout most of region, north to De Grey R., east to Oakover R. and Jigalong and west to lower Turner R. (at North West Coastal Highway), lower Fortescue and lower Robe Rivers and lower Yannarie R. at Barradale, but absent from much of middle and lower Ashburton R. Common in well-watered highlands (e.g. Hamersley and Chichester Ranges), otherwise scarce to moderately common. Usually in pairs or small parties. Favours river gum forests and woodlands, also eucalypt woodlands

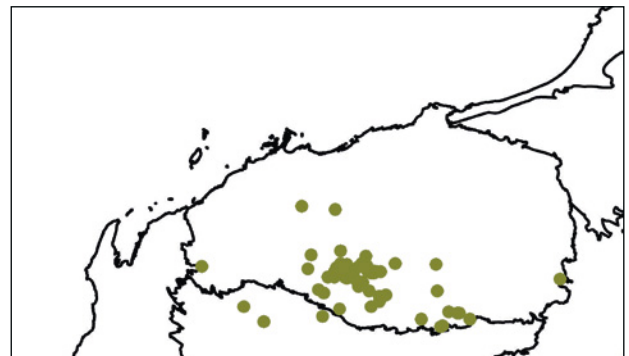
of snappy gum (*Eucalyptus leucophloia*), white gum (*Eucalyptus* sp.), coolabah (*Eucalyptus victrix*) or bloodwood (*Corymbia* sp.) and mulga (*Acacia*) flats with emergent eucalypts. Breeding in Aug.

Gerygone fusca fusca (Gould, 1838)
Western Gerygone



Mainly interior of region, north to far western fringe of Great Sandy Desert, west to Millstream, Duck Creek and Wannery Creek, and east to upper Oakover R., also accidental (one record) for Barrow Is. (Burbidge *et al.* 2010a). Autumn–winter visitor and passage migrant (April–Aug.) from southwestern Australia. Common in higher central and south-eastern parts of Hamersley Range (e.g. around Mt Brockman, Mt Bruce and Mt Trevarton), scarce or uncommon elsewhere. Most kinds of well-wooded habitat including mulga and other acacia thickets and the denser eucalypt woodlands. Overall its habitat preferences are much the same as those of the resident *G. f. mungi*, with which it commonly co-exists in winter.

Gerygone fusca mungi Mathews, 1912
Desert Gerygone



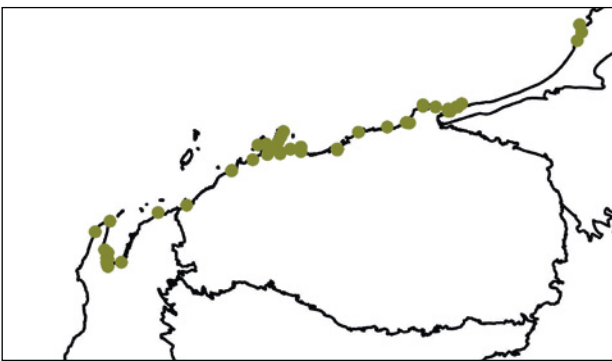
Mainly southern interior, north to central and eastern sectors of Hamersley Range and upper Oakover R., and west to upper Hardey R. (Rocklea), and Paraburdoo. Common resident in Hamersley Range region but uncommon and patchily distributed in drier parts of its range. Usually in ones, twos or small parties. Mainly tall mulga scrub



Plate 17 Dusky Gerygone (*Gerygone tenebrosa*) at nest, Point Walcott. This species is confined to mangroves throughout the region (J. Bush).

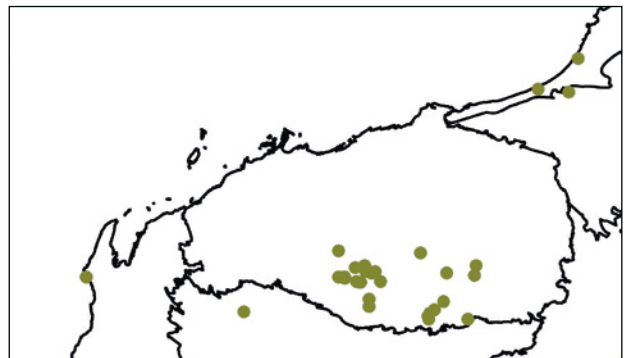
and woodlands, also mulga–coolabah woodlands and *Acacia citrinoviridis* and other wattle thickets along watercourses. Breeding in July and Sept.

Gerygone tenebrosa (Hall, 1901)
Dusky Gerygone



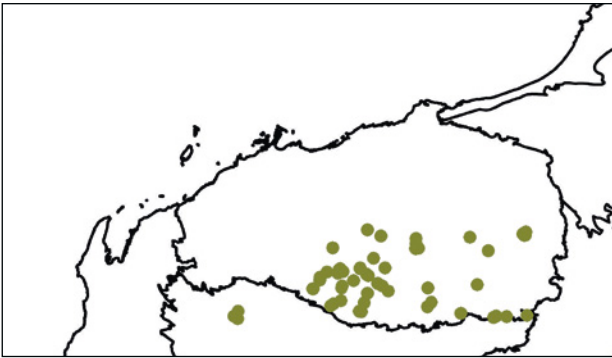
North-west coast from Cape Keraudren south-west to Exmouth Gulf, including Dampier Archipelago (including Legendre Is., Enderby Is. and West Lewis Is.). Also upper west coast at Mangrove Bay. Common, usually in ones or twos. Confined to mangroves and in this region favouring forests and woodlands of *Rhizophora* and *Avicennia* in pure or mixed stands and thickets of *Avicennia* and *Ceriops*. Breeding in Sept.–Oct.

Acanthiza apicalis Gould, 1847
Broad-tailed Thornbill



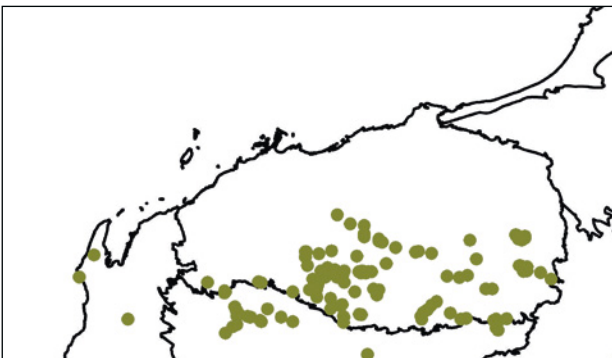
Southern interior, Hamersley and Ophthalmia Ranges from Hamersley east to Rhodes Ridge, and with an isolated population in far north-west at Mandora (inland to the floodout) and just outside region at Anna Plains. Moderately common, usually in pairs. Favours dense mulga, also wattle and melaleuca thickets along watercourses. Mandora–Anna Plains population is mainly in tall *Melaleuca* thickets. Breeding recorded 30 km N of Newman in July.

Acanthiza robustirostris Milligan, 1903
Slaty-backed Thornbill



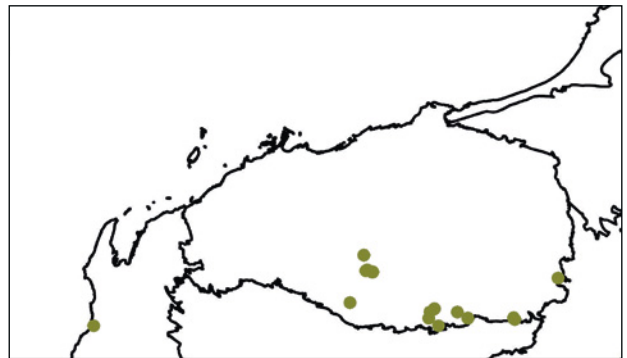
Mainly southern interior, north to Hooley and lower Davis R. and west to Hamersley, Rocklea and head of Wannery Creek (Ullawarra). Moderately common in pairs and small parties. Favours canopy of tall mulga, especially along watercourses and on flats. Breeding in July–Aug.

Acanthiza uropygialis Gould, 1838
Chestnut-rumped Thornbill



Mainly southern interior of region, north to Glen Florrie, Mt Brockman, Hooley and lower Davis R. and west to Cardabia Creek. Common, in pairs or small parties, also commonly forming feeding flocks with other small insectivores. Mainly mulga and other acacia scrubs and thickets, especially along watercourses and drainage lines. Breeding in Aug.–Sept.

Acanthiza chrysorrhoa (Quoy and Gaimard, 1830)
Yellow-rumped Thornbill



Mainly south-eastern part of region, Hamersley Range, Ophthalmia Range and around Newman and Sylvania. Uncommon and patchily distributed. Usually in pairs or small parties. Mainly lightly wooded or open country especially grassy mulga-coolibah flats.

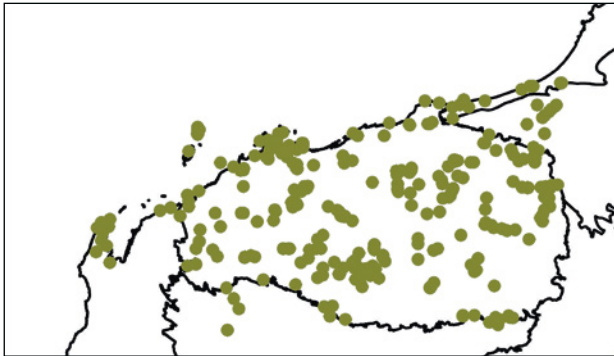
Aphelocephala nigricincta (North, 1895)
Banded Whiteface



Only recorded from far south-east of region, north to upper Oakover R. and west nearly to Newman. Scarce, probably nomadic, usually in pairs or small parties. Mainly open shrubbery on heavy or stony soils. Breeding in March and Aug.

Meliphagidae

Lichmera indistincta indistincta
(Vigors and Horsfield, 1827)
Brown Honeyeater

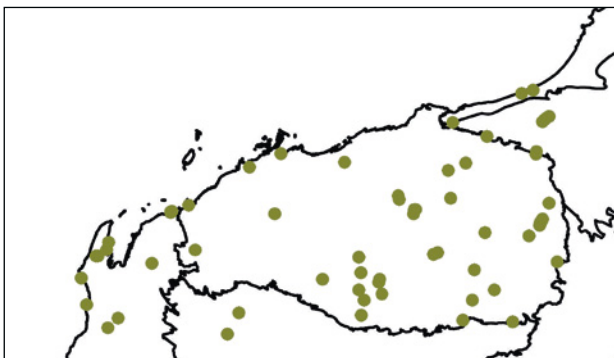


Throughout region, north to Mandora, including Dampier Archipelago (e.g. Dolphin, Angel, Enderby and West Lewis Is.), Barrow Is. and Montebello Is (Hermit and Gardenia), but not south-western lowlands south of Yardie Creek, Exmouth and Nanutarra. Locally common, but generally uncommon to moderately common and patchily distributed in ones, twos or small parties. Favours well-wooded habitats, especially mangroves, riverside forests and creekside thickets. Attracted to flowering trees, shrubs, mistletoes and herbs especially *Melaleuca*, *Eucalyptus*, *Corymbia*, *Bruguiera*, *Ceriops*, *Erythrina*, *Grevillea*, *Acacia*, *Gardenia*, *Senna*, *Crotalaria* and *Swainsona*. Breeding in March and Sept.–Oct.

Myzomela erythrocephala erythrocephala Gould, 1840
Red-headed Honeyeater

Rare visitor from Kimberley. Single record from Cape Keraudren in May 1975 when mangroves flowering profusely. Nearest breeding population to the north at Whistle Creek (northern end of Eighty Mile Beach).

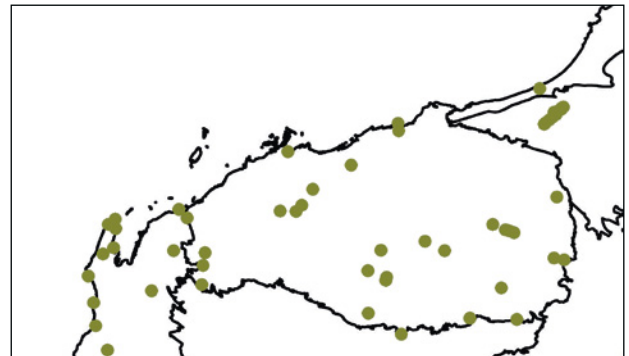
Sugomel niger (Gould, 1838)
Black Honeyeater



Mainly eastern half of region north to Mandora. Highly nomadic, irregular visitor (April–Nov, mostly in winter). Locally and seasonally common in some

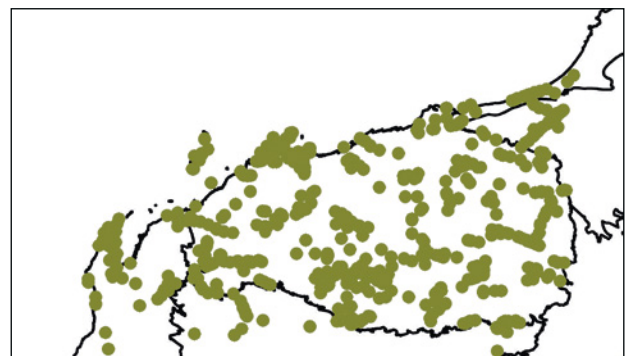
years (e.g. 1902, 1923, 1970, 1979), but generally scarce. Usually in ones or twos, occasionally flocks (up to 30). Attracted to flowering *Acacia*, *Grevillea*, *Eucalyptus* and *Corymbia*. Like many blossom nomads, does not necessarily appear as a result of an abundant or good flowering season but sometimes appears where conditions are less than optimum but may be better than elsewhere. Breeding recorded in July–Aug. and ? May.

Certhionyx variegatus Lesson, 1830
Pied Honeyeater



Mainly southern and eastern parts of region, north and west to North West Cape, Koordarie, Parry Range, Millstream, Chichester Range, Port Hedland, Goldsworthy, near Nullagine, Mandora and far western fringe of Great Sandy Desert. Nomadic. Locally and seasonally common in some years (e.g. 1902, 1916, 1979 and 1980), but generally uncommon. Usually in ones, twos or family parties, occasionally flocks (up to 50). Favours lightly wooded habitats especially dune scrub. Attracted to flowering *Grevillea* and *Corymbia*. Breeding from late June–Aug.

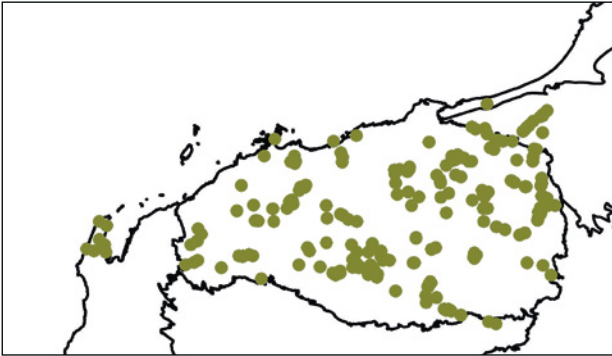
Gavicalis virescens (Vieillot, 1817)
Singing Honeyeater



Throughout region including many islands, e.g. Depuch Is., Dampier Archipelago (Legendre Is., Dolphin Is., Angel Is., Rosemary Is., Enderby Is., West Lewis Is.), Great Sandy Is., Barrow Is. (including Mushroom and Double) and Hermit

Is. Common, usually in ones or twos, occasionally small parties. Found in all kinds of thicket and scrub, including mangroves. Attracted to flowering *Grevillea*, *Hakea*, *Pittosporum* and *Corymbia*. Breeding in Jan.–March and June–Oct.

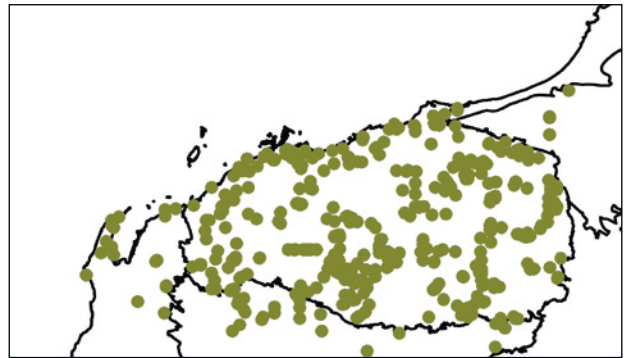
Ptilotula keartlandi (North, 1895)
Grey-headed Honeyeater



Mainly interior of region, west to Bulgamulgardy Soak, Shay Gap, lower Strelley R., Whim Creek, Withnell Bay, Deepdale and Cane R., and south to Nanutarra, Tom Price and Newman. Also isolated population on Depuch Is. and in Cape Range south to Yardie Creek and Learmonth. Locally common, but generally uncommon or moderately common and patchily distributed. Usually in ones or twos, occasionally small flocks (up to 20). Favours low eucalypt woodland (snappy gums, bloodwoods and stunted river gums), copses of eucalypts and tall shrubs along minor watercourses and in stony gullies in hilly country, also well-wooded sandplains. Attracted to flowering *Grevillea*, *Hakea*, *Eucalyptus*, mistletoe and to fruiting *Ficus brachypoda*. Breeding in March–April and July–Sept.

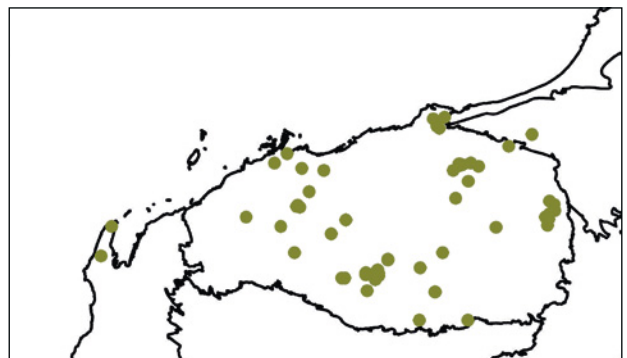
There are no convincing or confirmed records for the Pilbara of Grey-fronted Honeyeater (*Ptilotula plumulus*) and we believe that the few scattered reports of this species are based on imperfect sightings of Grey-headed Honeyeater.

Ptilotula penicillatus Gould, 1837
White-plumed Honeyeater



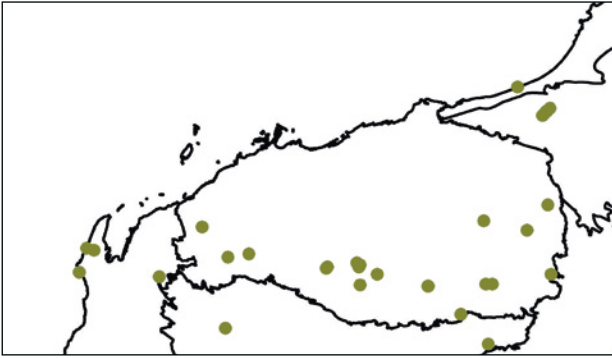
Generally north to Pardoo Creek and De Grey R., and east to Oakover R. and Jigalong but also in soaks and claypans in far western fringe of Great Sandy Desert north to Mandora (e.g. Coolabah claypan and Bulgamulgardy Soak). Very common, in ones, twos or small flocks. Mainly river gums, but also paperbarks around wetlands and commonly visiting other woodlands near watercourses. Attracted to flowering river gums, bloodwoods, *Hakea* and *Erythrina*. Breeding in Feb.–Oct.

Melithreptus gularis laetior Gould, 1875
Black-chinned Honeyeater



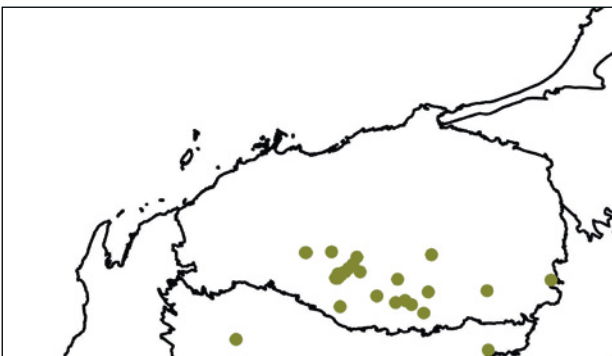
Throughout region but mainly the interior, north to western fringe of Great Sandy Desert, Shay Gap, lower Shaw R., lower Harding R. and lower Maitland R. (to Karratha homestead), south to lower Robe R. and Hamersley and Ophthalmia Ranges and east to the Oakover and Davis Rivers. Also an isolated population in far north of Cape Range peninsula. Nomadic, locally moderately common, but generally uncommon and patchily distributed. Usually in small parties. Favours waterside thickets of *Melaleuca*, *Eucalyptus* and *Acacia*. Attracted to flowering river gums and bloodwoods. Breeding in June.

Purnella albifrons (Gould, 1841)
White-fronted Honeyeater



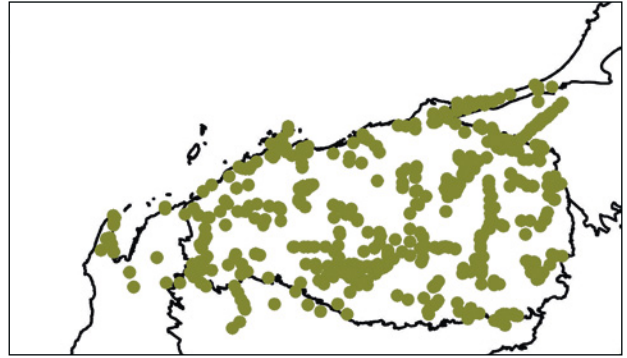
Mainly southern and eastern part of region, north and west to Yardie Creek, Barradale, Cane R., Mt Lionel, Mt Bruce, Nullagine and Wallal. Irregular visitor (April–Nov.). Locally common in some years but generally scarce, in ones, twos or small parties. Favours shrublands especially on sandplains, also lightly wooded country with flowering herbs, shrubs, mistletoes and trees. Attracted to flowering *Grevillea*, *Hakea*, *Acacia*, *Eremophila*, *Trichodesma* and bloodwoods. Breeding in July.

Lacustroica whitei North, 1910
Grey Honeyeater



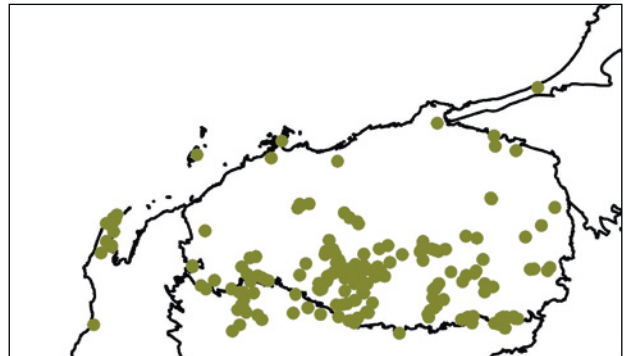
Southern interior of region, north to Hamersley Range and upper Oakover R., and west to Mt Brockman homestead and Barlee Range near Edmund. Locally moderately common, e.g. around Tom Price, Mt Bruce and Mt Robinson, but generally scarce. Usually in ones or twos. Favours thickets of mulga, also *Acacia citrinoviridis* and other *Acacia* species. Breeding from Aug.–Nov. and in May after autumn rains (see also Start and Fuller 1995).

Manorina flavigula (Gould, 1840)
Yellow-throated Miner



Throughout region, north to Mandora including Dolphin Is. Common, usually in pairs or small parties (up to 12). Found in all well-wooded habitats including town and homestead gardens. Attracted to flowering *Eucalyptus*, *Corymbia*, *Erythrina*, *Grevillea* and *Acacia*. Breeding March–Sept.

Acanthagenys rufogularis Gould, 1838
Spiny-cheeked Honeyeater

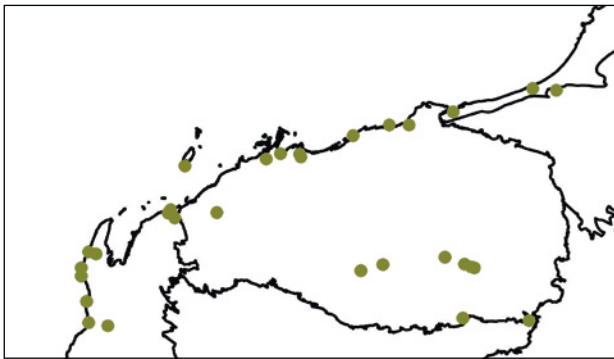


Throughout region, north to lower De Grey R., Mandora and Shay Gap, accidental on Barrow Is. Locally moderately common especially in south in the Cape, Barlee, Hamersley and Ophthalmia Ranges, but generally scarce. In ones, twos or small flocks. Favours mulga and other *Acacia* scrubs, mangal, and teatree thickets. Attracted to flowering *Erythrina*. Breeding in Feb–April and July–Sept.

Epthianura albifrons (Jardine and Selby, 1828)
White-fronted Chat

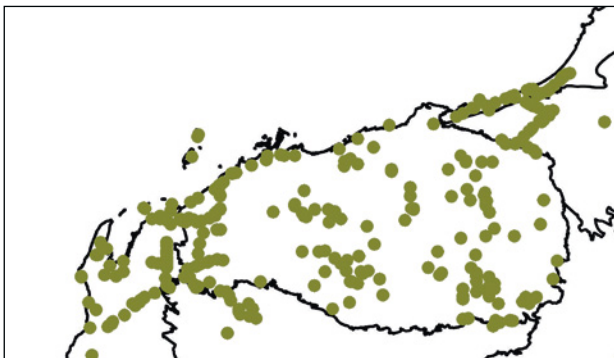
Rare visitor to far south-west. Flocks recorded at Point Cloates from 14 Feb. to 10 May 1899 (Carter 1903).

Epthianura aurifrons Gould, 1838
Orange Chat



Mainly coastal plains, north to Mandora and Pardoo and inland to Roebourne, Karratha HS, 17 km SSE of Onslow and Minilya-Exmouth road near Warroora. Also far south-east at Newman and Jigalong, accidental on Boodie Is. Locally common, but generally uncommon or scarce. Usually in pairs or small flocks (up to 20). Favours samphire flats, claypans and edges of sewage ponds. Breeding in July–Aug.

Epthianura tricolor Gould, 1841
Crimson Chat



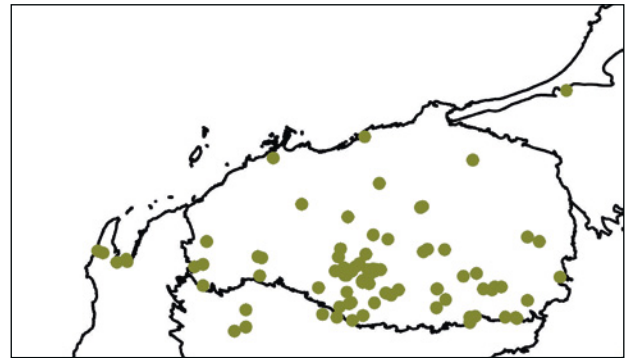
Throughout mainland part of region, also casual on Hermite, Barrow and Serrurier Islands. Nomadic, numbers varying according to rainfall. Common in wet years but generally uncommon. Usually in pairs or small flocks (up to 40). Favours sparsely wooded country, especially short grass flats, *Triodia* plains regenerating after fire, samphire flats and claypans. Breeding in Jan.–April and July–Sept.

Petroicidae

Microeca fascinans (Latham, 1802)
Jacky Winter

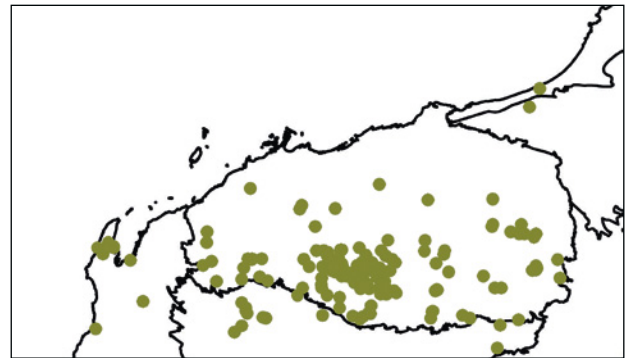
Vagrant or possibly a rare inhabitant of far northern pindan country. One unconfirmed record: a single bird observed by J.R. Ford 36 km WSW of Wallal turn-off on Great Northern Highway on 1 July 1976.

Petroica goodenovii (Vigors and Horsfield, 1827)
Red-capped Robin



Mainly southern interior of region, north to Millstream, Hooley and upper Coongan R., also Mandora Marsh, and west to Barlee Range. Also a winter visitor to south-western areas north to Exmouth Gulf. Resident and winter visitor. Uncommon to moderately common. In ones, twos or small parties. Mainly mulga thickets, also other acacia scrub. Breeding May–Sept.

Petroica cucullata (Latham, 1802)
Hooded Robin



Mainly southern interior of region, north to Millstream, Woodstock and lower Davis R., also at Mandora, and west to Barlee Range, and an isolated population on Cape Range peninsula. Moderately common in ones or twos. Mainly open scrub and woodland of mulga and other acacias. Breeding in March and July–Aug.

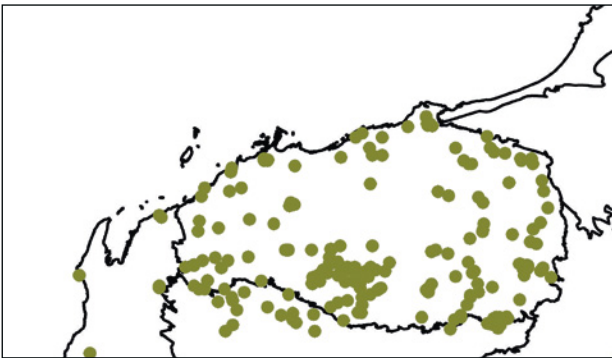
Eopsaltria pulverulenta (Bonaparte, 1850)
Mangrove Robin



Coast from Cape Keraudren south-west to Gales Bay including some islands in Dampier Archipelago (Legendre, Enderby and West Lewis). Formerly occurred at Mangrove Bay on west coast of Cape Range peninsula. Locally common, e.g. Balla Balla, Popes Nose Creek, Point Samson, mouth of Cane R. and Gales Bay, but generally scarce. Usually in pairs. Favours mangal with *Rhizophora stylosa* forest, occasionally in other mangroves. Breeding in Aug.–Sept. and possibly in May.

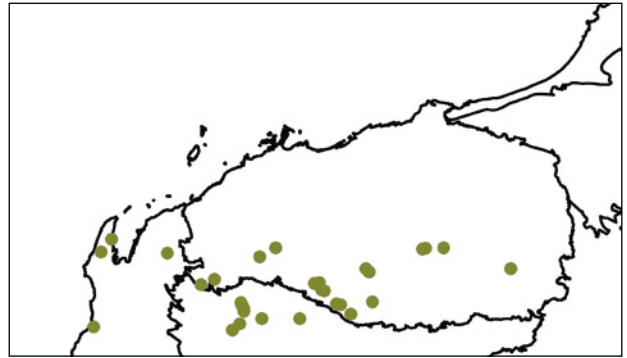
Pomatostomidae

Pomatostomus temporalis rebeculus Gould, 1839
Grey-crowned Babbler



Throughout most of region, north to De Grey R., east to Shay Gap, Warrawagine, upper Oakover R. and Jigalong and west to lower Stanley and Turner Rivers, Whim Creek, lower Maitland R., lower Ashburton R. (15 km SSE of mouth), lower Yannarie R. and lower Lyndon R. Uncommon to moderately common. Usually in small parties (up to 10). Mainly river gums and tall mulga and other woodlands on riverine flats. Breeding late March–early Sept.

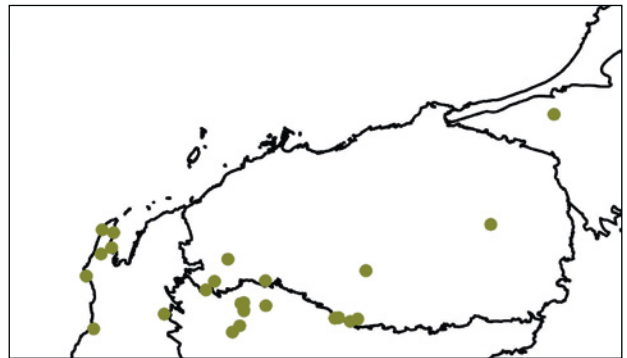
Pomatostomus superciliosus
(Vigors and Horsfield, 1827)
White-browed Babbler



Southern interior of region, north to Hardy R., west to upper Wannery Creek and east to Paraburdoo and Marandoo. Scarce. Usually in pairs or small parties. Mainly acacia thickets and scrubs, especially mulga. Breeding in March–April.

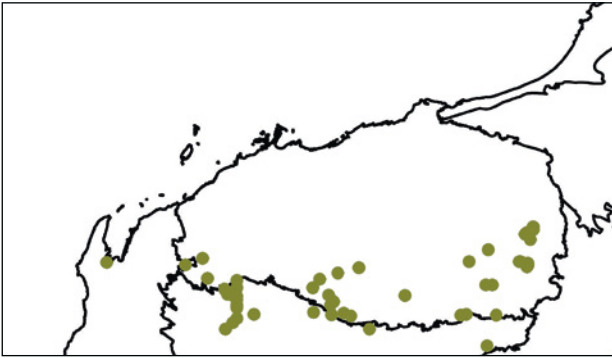
Cinclosomatidae

Psophodes occidentalis (Mathews, 1912)
Western Wedgebill



Southern and eastern parts of region, west coast and hinterland, north to Low Point and east to Qualing Pool, Learmonth and lower Lyndon R., southern interior about Wannery Creek and middle Ashburton R. and eastern interior near Nullagine; one unconfirmed record from far north-east near Kidson–Callawa Junction. Locally common but generally uncommon and patchily distributed. Usually in ones or twos. Mainly open *Acacia* thickets and scrub especially in stony country. Breeding in Feb.–April and July–Aug.

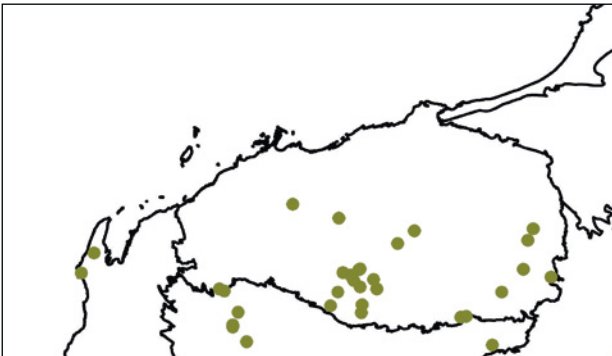
Cinclosoma marginatum Sharpe, 1883
Western Quail-thrush



Southern part of region, north to Glen Florrie (Wannery Creek), Rocklea and lower Davis R. Moderately common, especially in pairs or family parties. Favours stony country in scattered thickets of acacia (especially mulga), *Eremophila* and *Spinifex*. Breeding late April–July.

Neosittidae

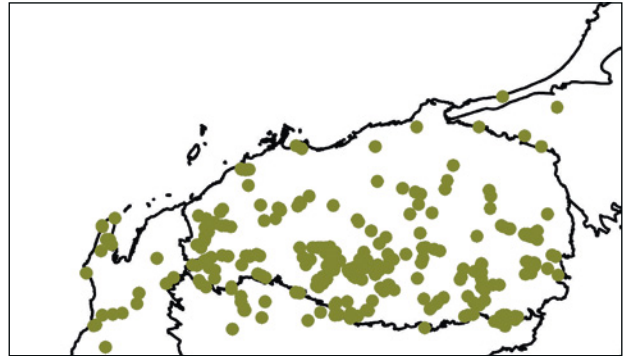
Daphoenositta chrysoptera pileata (Gould, 1838)
Varied Sittella



Mainly southern interior of region, north to Millstream, upper Coongan R. and lower Davis R. and west to Ningaloo. Moderately common in Hamersley Range but generally uncommon and patchily distributed. Usually in pairs or small parties. Favours tall mulga, mulga–eucalypt woodlands and mallee. Breeding in March–April and Sept.–Oct.

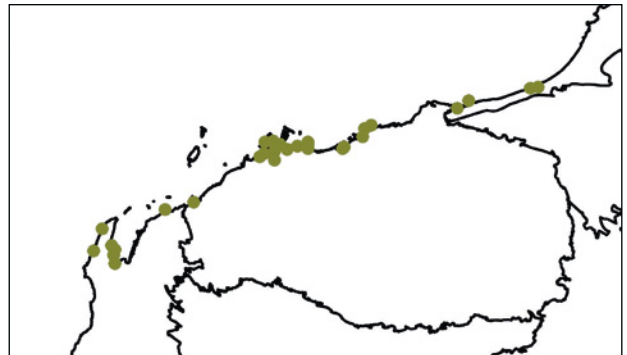
Pachycephalidae

Oreoica gutturalis (Vigors and Horsfield, 1827)
Crested Bellbird



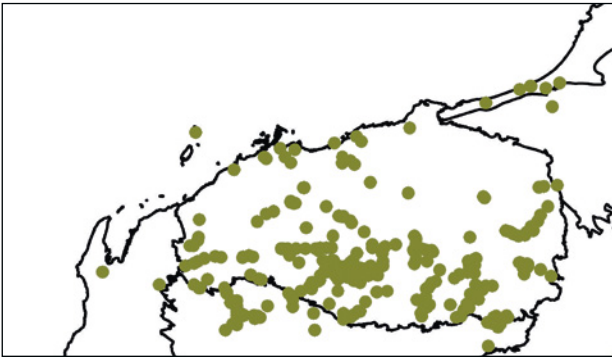
Throughout most of region but absent from much of north-west coastal plain north of Marrilla and Barradale or west of Callawa, Caralindie, lower Yule R., lower Fortescue (at North West Coastal Highway) or west of Cane R. Moderately common in ones or twos. Mainly mulga and other thickets. Breeding in March–April and June–Sept.

Pachycephala melanura melanura Gould, 1843
Mangrove Golden Whistler



North-west coast from Cape Keraudren southwest to Exmouth Gulf (Gales Bay) including islands in Dampier Archipelago (e.g. Enderby and West Lewis), casual or rare visitor further east at Mandora Creek. Also formerly on upper west coast of Cape Range peninsula; specimens collected there in 1902 (Carter 1903). Common, usually in ones or twos. Mainly confined to mangal, especially blocks with extensive *Rhizophora stylosa* forests, rarely in adjacent acacia scrub. Breeding recorded in Sept. and specimens collected with enlarged gonads in Oct.

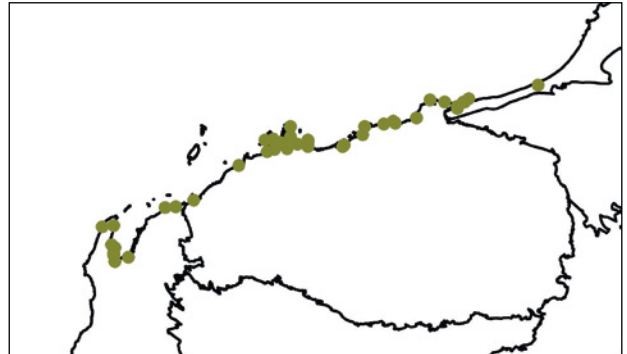
Pachycephala rufiventris rufiventris (Latham, 1802)
Rufous Whistler



Mainly southern and eastern interior of region, north to Millstream, Abydos, 28 km ESE of Nullagine and lower Davis R., and west to Uaroo, also casual or autumn–winter visitor to coastal plain at Bullara, Barradale and Nickol Bay and islands including Depuch and Montebellos and far north-eastern coastal plain at Mandora and Wallal (probably an extension of Kimberley population). Common, usually in ones, twos or small parties. In far north-east mainly in pindan scrub and *Melaleuca* scrubs and elsewhere all kinds of well-wooded

habitats, especially tall open mulga. Breeding in Dec.–Feb. and April–Aug.

Pachycephala lanioides Gould, 1840
White-breasted Whistler



North-west coast from Cape Keraudren south-west to Exmouth Gulf (Giralia Bay), also Mangrove Bay on upper west coast of Cape Range peninsula, and on islands in Dampier Archipelago (e.g. West Lewis and Enderby Is); rare visitor to Mandora Creek (one record). Common. Usually in pairs. Confined to mangroves. Breeding from late Aug.–Oct.

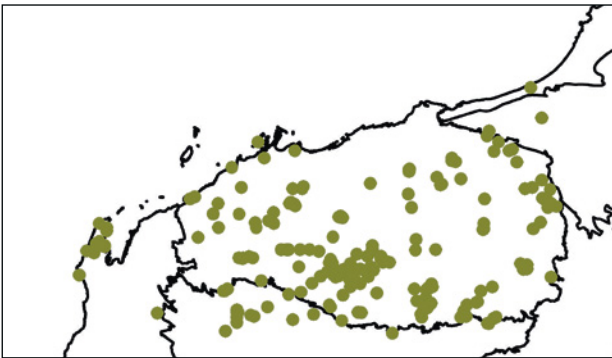


Plate 18 White-breasted Whistler (*Pachycephala lanioides*). This species is confined to mangroves in the region (J. Bush).



Plate 19 Mangrove Grey Fantail (*Rhipidura phasiana*) at nest, Balla Balla. This species is confined to mangroves throughout the region (J. Bush).

Colluricincla harmonica rufiventris Gould, 1841
Grey Shrike Thrush



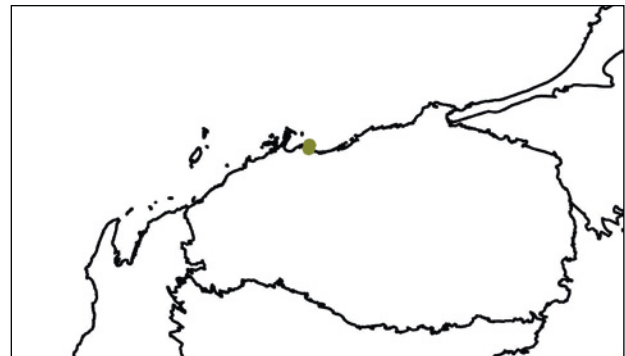
Throughout region, north to Mandora and western fringe of Great Sandy Desert and west to Shay Gap, Abydos, Mt Herbert and lower Maitland R. Moderately common in southern interior, uncommon and patchily distributed in northern half of its range. Most wooded habitats, especially mulga and river gums. Breeding from March–early April and from June–early Oct.

Colluricincla harmonica kolichisi Ford, 1982

Confined to Cape Range as far south as Yardie Creek and Learmonth. Moderately common, in ones or twos. Favouring wooded habitats in gullies and canyons. Breeding in July, Aug. and Oct.

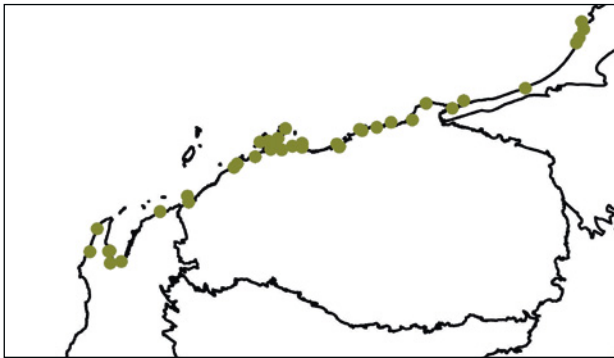
Dicruridae

Myiagra alecto melvillensis (Mathews, 1912)
Shining Flycatcher



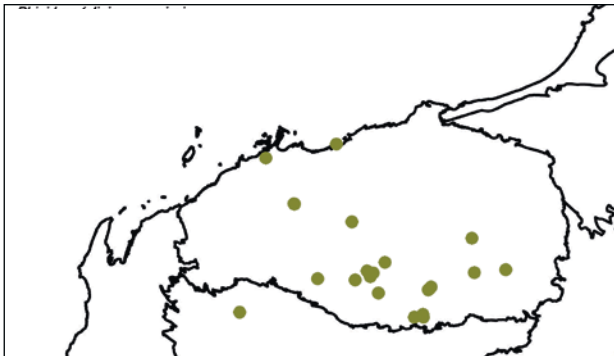
Confined to dense stands of mangal in a small sector of coast near Cossack and Point Samson. Ones and twos (pairs). I.C. Carnaby reported a female at Cossack in 1960s; T.E. Bush observed a female at Point Samson on 10 Sept. 1976 and on 13 Sept. a pair at Cossack. On 7 Oct. 1975 R.E. Johnstone heard one calling from mangal 2 km SW of Cossack. There are no other Pilbara records. Favours dense low closed forest of *Rhizophora*, *Rhizophora-Avicennia* and *Bruguiera*. Status uncertain but probably resident.

Rhipidura phasiana De Vis, 1884
Mangrove Grey Fantail



North-west coast from Mandora Creek south-west to Exmouth Gulf and upper west coast of Cape Range peninsula (Mangrove Bay) and islands in Dampier Archipelago (Legendre, West Lewis and Enderby). Uncommon to very common, more frequent in some blocks of mangal than others, e.g. uncommon at Mandora Creek, common at Cape Keraudren, Balla Balla Harbour, Point Samson, mouth of Fortescue R. and mouth of Cane R. and very common at Cowrie Creek and Mangrove Bay. Usually in ones or twos. Largely confined to stands of mangroves, especially *Avicennia marina*, rarely in adjacent acacia thickets. Breeding from Sept.–March.

Rhipidura fuliginosa preissi Cabanis, 1851
Grey Fantail

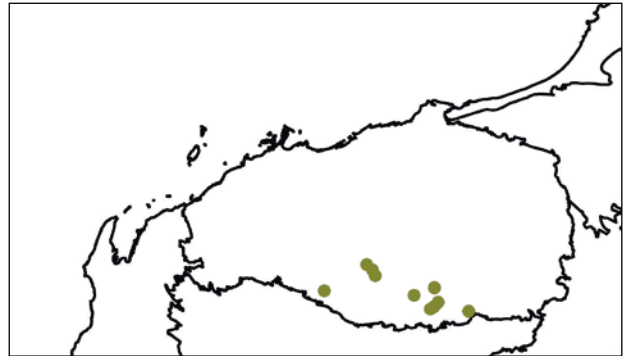


An autumn–winter visitor (late March–early Aug.) from south-western Australia. Mainly in southern–western half of region but ranging north to Depuch Is., Millstream and 38 km SE of Tom Price. Usually single, occasionally twos. Favours dense mulga, also other thickets, riverine forests and mangroves.

Rhipidura fuliginosa alisteri Mathews, 1911

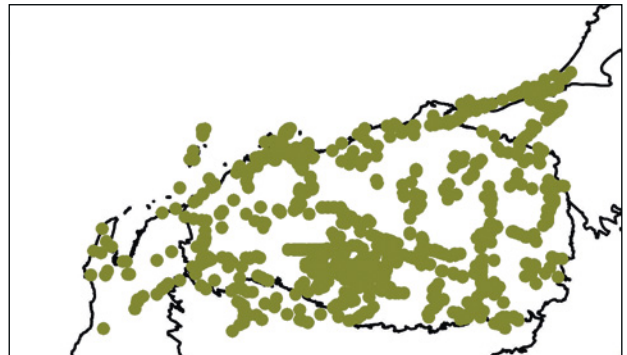
A rare winter visitor from south-eastern Australia. One collected in dense mulga 6 km E of Mt Bruce on 27 Aug. 1980.

Rhipidura (fuliginosa) albicauda North, 1895
White-tailed Fantail



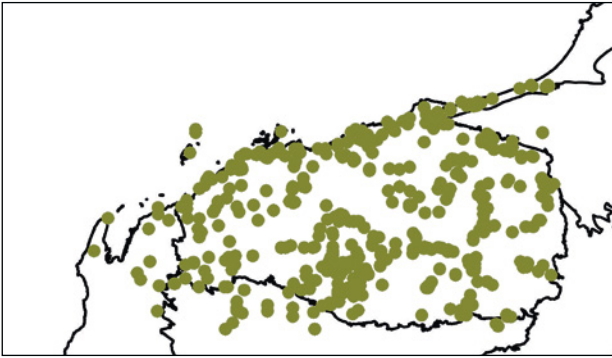
Mainly south-eastern sector of Hamersley Range, about Mt Bruce, Mt Meharry, Mt Robinson and Weeli Wolli Creek, also Ophthalmia Range west of Newman. Probably resident, judging from records in Sept.–Nov. Uncommon, mainly in ones or twos. Favours dense mulga with emergent eucalypts.

Rhipidura leucophrys leucophrys (Latham, 1802)
Willie Wagtail



Throughout the region. As a resident, uncommon and largely confined to the southern interior of the region, north to the lower Fortescue R. and upper Coongan R. As a winter visitor and passage migrant (April–Oct), common and occurring throughout region including western edge of Great Sandy Desert, Depuch Is., Dampier Archipelago (Legendre, Gidley, Dolphin, Angel, West Lewis and Enderby), Montebello Is., Barrow Is., Great Sandy Is. and Airlie Is. Mainly in ones or twos, occasionally in small parties on migration. Favours lightly wooded country, especially near water. Breeding Sept.–Feb.

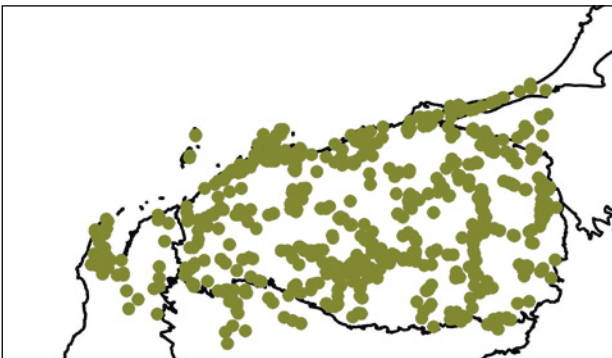
Grallina cyanoleuca (Latham, 1802)
Magpie Lark



Throughout mainland, north to Mandora, except far north-eastern interior or western fringe of Great Sandy Desert, also in passage Dolphin, Montebello and Barrow Is. Moderately common to common, resident and passage migrant with a considerable influx of visitors in the autumn–winter (from southern WA). In ones, twos or small parties. Open or lightly wooded areas, riverine flats and bare or short grass flats near water including station bores and mills, vicinity of mining infrastructure (where it breeds), also claypans, swamps and edges of sewage ponds. Breeding late Aug.–May.

Campephagidae

Coracina novaehollandiae novaehollandiae
(Gmelin, 1789)
Black-faced Cuckoo-shrike

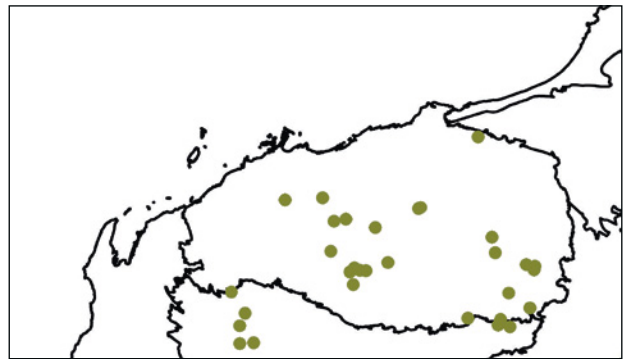


Throughout region including Depuch Is., Dampier Archipelago (e.g. Legendre, Dolphin, Angel, Rosemary and West Lewis Is) and Barrow Is. Moderately common passage migrant and winter visitor (Feb.–Oct.) from southern WA. Usually in ones or twos, occasionally flocks (up to 20, consisting mostly of immatures). Mainly well-wooded habitats.

Coracina novaehollandiae subpallida Mathews, 1912
Black-faced Cuckoo-shrike

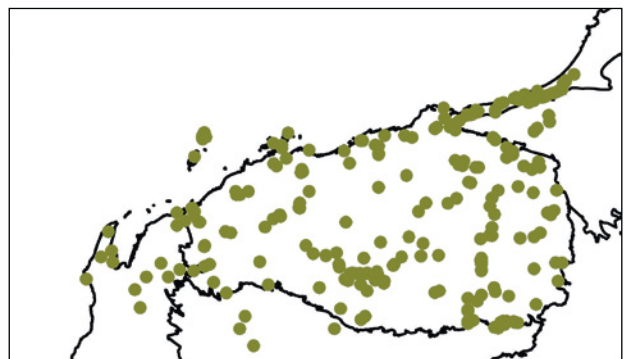
Throughout region, north to Mandora and Pardoo and western fringe of Great Sandy Desert, and east to Oakover R. and Jigalong but scarce or absent from far south-western coastal areas south to Yardie Creek and west of Cardabia Creek. Common resident, usually in ones or twos. Mainly waterside forests and woodlands with river gums, also coolabahs and *Ficus brachypoda* thickets at granite rock piles. Breeding from June–Jan. and March.

Coracina maxima (Rüppell, 1839)
Ground Cuckoo-shrike



Mainly southern interior, north to Coolawanyah, Woodstock and Nullagine and west to Ullawarra, also a record from Nimingarra. Uncommon visitor (mostly April–Sept.) and scarce or uncommon resident. Breeding recorded in far south in Feb., April, July and Sept.

Lalage tricolor (Swainson, 1825)
White-winged Triller



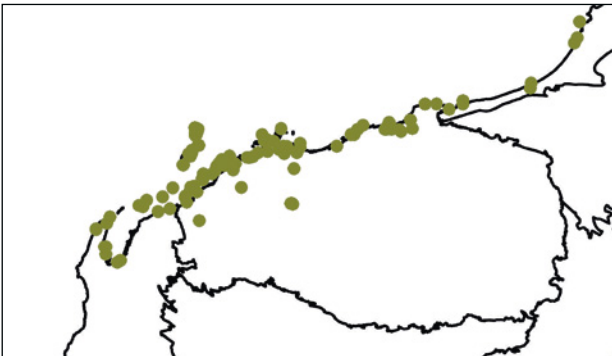
Throughout region, also on Jarman Is., Legendre Is., Montebello Is and Barrow Is. in passage. Breeding visitor and passage migrant. Locally common in wet years, scarce in dry years, but generally uncommon to moderately common. Usually in ones, twos or small flocks (up to 20) in northward autumn passage. Most wooded habitats especially tall mulga and river gums with lush herbage. Also attracted to flowering *Grevillea refracta* and bloodwoods. Breeding in Dec.–March and May–Sept.



Plate 20 White-breasted Woodswallow (*Artamus leucorhynchus*), Cleaverville (J. Bush).

Artamidae

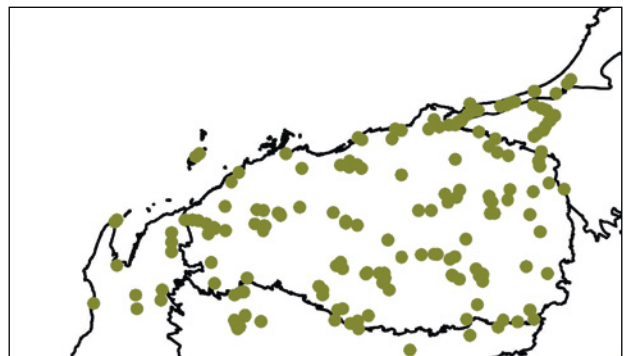
Artamus leucorhynchus leucopygialis Gould, 1842
White-breasted Woodswallow



Mainly vicinity of coast from Mandora Creek south-west to Exmouth Gulf, including tidal creeks, lower courses of rivers and islands including Legendre, Rosemary, West Lewis, Montebello Is, Lowendal Is, Barrow, Boodie, North Sandy, Great Sandy, Serrurier, Airlie, Thevenard and Bessieres Is, also west coast of Cape Range peninsula at Mangrove Bay. Also large river pools on Oakover R. and middle Fortescue R. at Millstream. Moderately common to common. Usually in ones, twos or family parties, occasionally small flocks (up to 20).

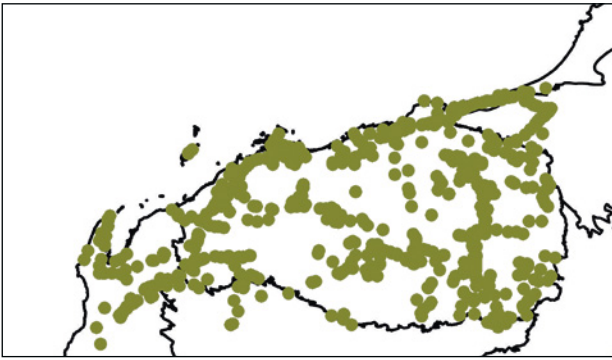
Mainly in and near mangroves, also tall river gums and *Melaleuca* at permanent pools, and in towns and around homesteads. Breeding in Sept.–Oct.

Artamus personatus (Gould, 1841)
Masked Woodswallow



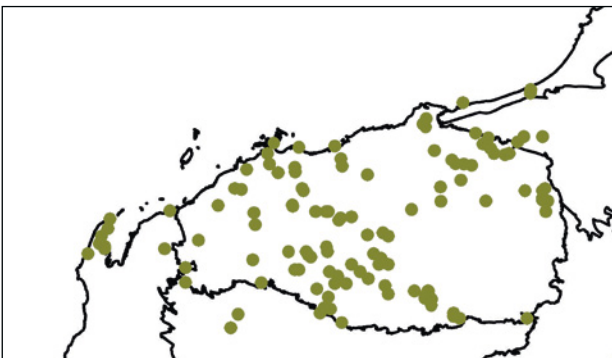
Throughout region north to Mandora, also on Barrow Is. Nomadic visitor. Locally and seasonally uncommon to very common and breeding in good years. Usually in small flocks (up to 100) occasionally large flocks (up to 1,000). Favours lightly wooded country, attracted to flowering shrubs and trees (e.g. *Grevillea*, *Hakea*, *Eucalyptus*, *Corymbia*). Breeding in March, Aug.–Oct., Dec. and Jan.

Artamus cinereus melanops Gould, 1865
Black-faced Woodswallow



Throughout region north to Mandora and on Barrow Is. and Dolphin Is. Very common (one of the most wide-spread birds in the region, judging from frequency of observations and numbers recorded exceeded in abundance only by Zebra Finch). Usually in ones, twos or small parties, occasionally small flocks (up to 30). Favours lightly wooded country, especially on coastal plain. Attracted to flowering bloodwoods. Breeding in July–Oct. and Dec.–April.

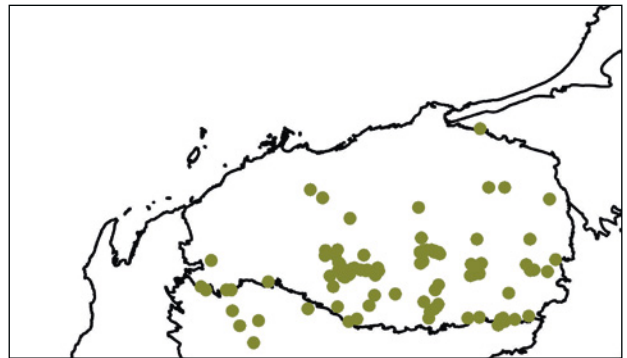
Artamus minor Vieillot, 1817
Little Woodswallow



Throughout region north to Mandora, west to Cape Keraudren, Ord Ranges, Depuch Is., Point Samson, Dampier, Yarraloola, Uaroo and Barlee Range, with an isolated population further west in Cape Range. Moderately common in hilly and range country, about cliffs, in gorges and breakaways, granite outcrops and on rocky coasts; uncommon and patchily distributed on coastal plain and flatlands. In ones, twos or small parties. Breeding Aug.–Oct. and Dec.–Jan.

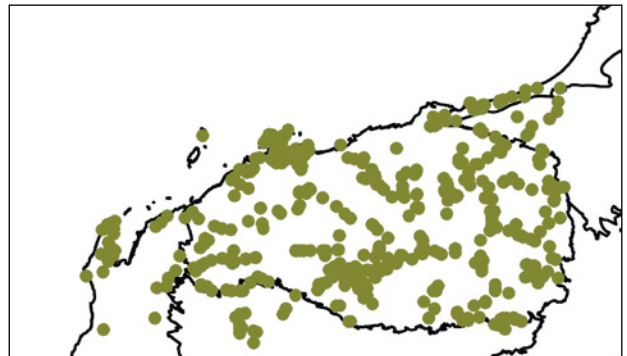
Cracticidae

Cracticus torquatus torquatus (Latham, 1802)
Grey Butcherbird



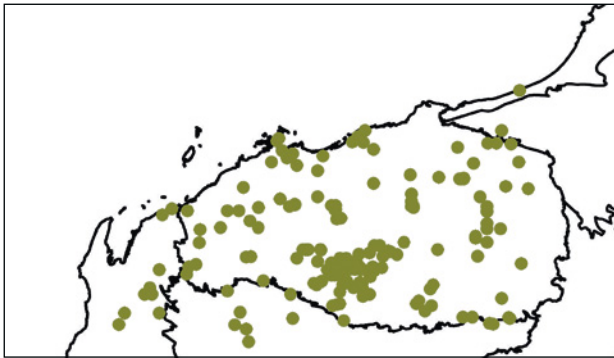
Mainly southern interior of region, north to Glen Florrie, Hamersley, eastern Chichester Range and Wickham Creek and west to Barlee Range. Uncommon to moderately common. In ones or twos. Favours tall dense mulga. Breeding in July–Aug.

Cracticus nigrogularis (Gould, 1837)
Pied Butcherbird



Throughout region including Depuch Is., many islands in Dampier Archipelago (e.g. Dolphin, Angel, Rosemary, Elphick Nob, Goodwyn, Enderby and West Lewis) and Montebello Is, but scarce or absent in much of coastal plain. Scarce on coastal plain, but generally moderately common. Usually single, occasionally in twos or family groups. Mainly lightly wooded country. Breeding in July–Oct.

Cracticus tibicen tibicen (Latham, 1802)
Australian Magpie



Throughout region, north to Mandora and Callawa and west to Burrup Peninsula, Yarraloola, Nanutarra, 22 km SW of Barradale and lower Lyndon R. Scarce to moderately common. Scarce or absent from most of coastal plain but moderately common in hilly southern interior and uncommon to moderately common in hilly country north of the Fortescue and scarce on inland riverine plains. Usually in pairs or family parties. Favours lightly wooded country with bare ground or low, sparse, ground cover, including burnt areas and near mills and homesteads. Breeding late June–Oct.

Corvidae

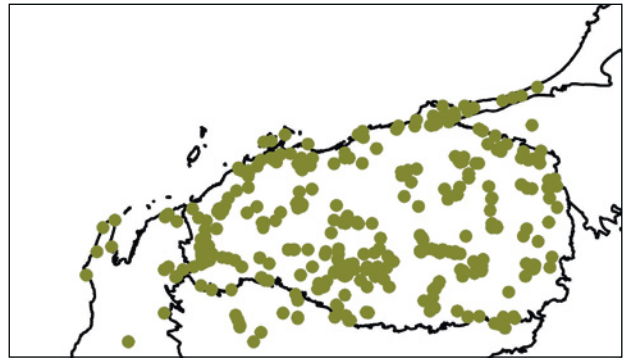
Pica pica (Linnaeus, 1758)
Eurasian Magpie

Two records, almost certainly both ship assisted: one at Port Hedland in Nov. 2007 and another in April 2012.

Corvus splendens Vieillot, 1817
House Crow

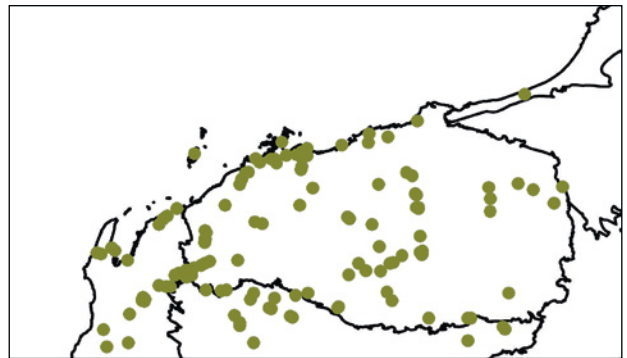
Occasionally reaches Pilbara ports on ships from southern Asia, e.g. one shot at Port Hedland on 2 Nov. 2006; about six noted near Karratha on 31 July 2008; two on Angel Platform off the Pilbara on 1 Dec. 2008; one at Cape Lambert on 18 Aug. 2008; two at Karratha on 15 Dec. 2009 and one shot at Karratha on 8 March 2010. With increased shipping to the Pilbara there has been a marked increase in the reporting rate of this species.

Corvus orru ceciliae Mathews, 1912
Torresian Crow or Western Crow



Throughout region, north to Mandora and east to Oakover R. and Jigalong, also possibly on islands in Dampier Archipelago (identification uncertain). Common along major watercourses and in well-wooded country, uncommon to moderately common in sparsely wooded areas, e.g. far south-east. Usually in ones or twos, occasionally small parties, rarely aggregations around homesteads or other sources of carrion. Mainly vicinity of tall trees for nesting and water, attracted to road kills. Breeding late June–Nov. We tentatively recognise this subspecies for western populations as they differ in nest, eggs and voice from those in eastern Australia. Probably increased in numbers due to pastoralism.

Corvus bennetti North, 1901
Little Crow



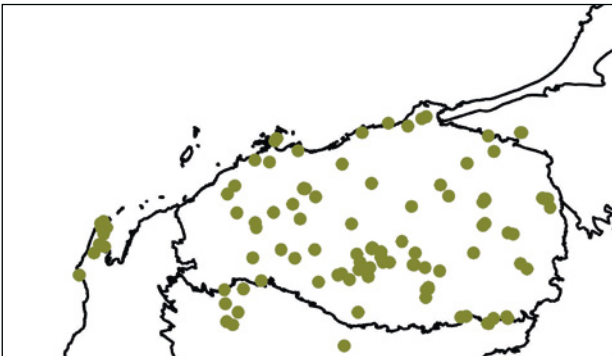
Throughout region, north to Mandora; casual visitor to Depuch and Barrow Is. Nomadic (birds banded at Jigalong recovered near Laverton and Menzies, 650 km SSE and 720 km S, respectively). Uncommon to common. Usually in ones, twos or flocks (up to 80). Favours lightly wooded country, especially open mulga near water. Attracted to road kills and thermals. Breeding March–Sept. It appears that this species has benefited from pastoralism and mining infrastructure where it breeds in otherwise treeless areas, e.g. on power poles and towers.



Plate 21 Western Bowerbird (*Ptilonorhynchus maculatus guttatus*) at a bower, Weeli Wolli (J. Bush).

Ptilonorhynchidae

Ptilonorhynchus maculatus guttatus (Gould, 1862)
Western Bowerbird



Throughout region, north to lower De Grey R. (near De Grey HS), Shay Gap and western fringe of Great Sandy Desert (29 km NE of Callawa), east to Oakover R., lower Davis R. and west to Burrup Peninsula, Deepdale and Barlee Range, and with an isolated population on Cape Range peninsula. Uncommon and patchily distributed. Usually in ones, twos or small parties. Mainly thickets or copses of trees especially *Ficus*, *Santalum*, *Flueggea* and *Acacia* in rocky gullies, usually near water. Commonly visits fruiting trees in homestead gardens. Breeding in July–Sept. The Western

Bowerbird *P. m. guttatus* is sometimes treated as a full species *P. guttatus* and the isolated Cape Range population is sometimes treated as a separate subspecies *P. g. carteri*.

Muscicapidae

Muscicapa sibirica sibirica Gmelin, 1789
Sooty Flycatcher

Rare vagrant from eastern Palaearctic. One record—a bird observed and sketched by J.C. Darnell at Shay Gap sewage ponds on 15 Oct. 1983 was the first Australian record.

Ficedula narcissina narcissina (Temminck, 1835)
Narcissus Flycatcher

Rare vagrant from eastern Palaearctic. Two recorded on Barrow Is. for several days (26–28 Nov.) and one (probably one of the same birds) about 5 km away on 20 Dec. 1995 were the first Australian records (Doig and Fritz 1996). These sightings were made shortly after cyclone Frank brought strong winds and over 150 mm of rain to Barrow Is.

Ficedula cyanomelana cyanomelana (Temminck, 1829)
Blue and White Flycatcher

Rare vagrant from Asia. One found dead on Settlers Beach near Cossack on 5 Dec. 1995 was the first Australian record (Johnstone and Darnell 1996).

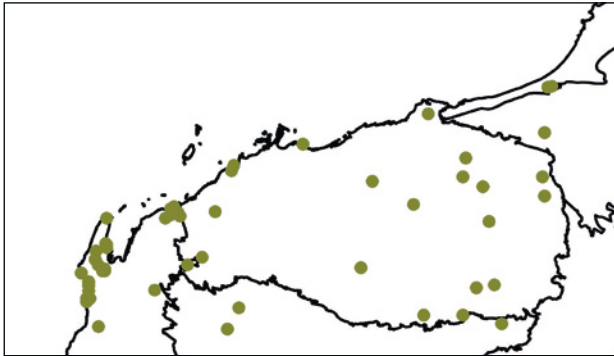
Sturnidae

Acridotheres tristis (Linnaeus, 1766)
Common Myna

Rare vagrant from Asia. Probably ship assisted. One reported at Port Hedland in early 1991 and two destroyed by authorities on a boat at Dampier in early 1994.

Hirundinidae

Cheramoeca leucosternus (Gould, 1841)
White-backed Swallow



Throughout region, but largely absent from much of the hilly interior including Chichester and Hamersley Ranges Resident and winter visitor from southern parts of State. Moderately common in southern coastal and near-coastal sandy country north to Onslow; uncommon, scarce or absent in rest of region. Usually in ones, twos or small parties (up to six). Breeding north to Sandfire in April and Aug.–Sept.

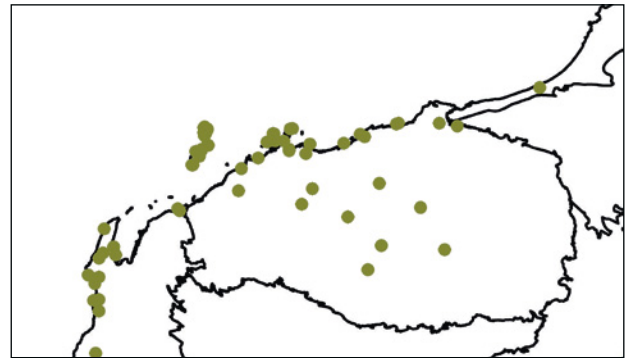
Hirundo rustica gutturalis Scopoli, 1786
Barn Swallow

Mainly coastal plain from Mandora south-west to Learmonth and inland to Goldsworthy. Moderately common visitor (Sept.–Feb.) from north-east Asia. In ones, twos or small flocks (up to 15), sometimes attached to large migrating flocks of Tree Martins and Welcome Swallows. Favours areas near water (e.g. freshwater soaks, swamps, sewage ponds, tidal creeks, saltwork ponds). Appears to have increased in abundance. A small number of birds observed at Cooke Point sewage ponds near Port Hedland between 1989 and 1993 had underparts strongly washed or tinged with cinnamon rufous characteristic of the subspecies *H. r. tytleri* of central Siberia and northern Mongolia.

Hirundo tahitica Gmelin, 1789
Pacific Swallow

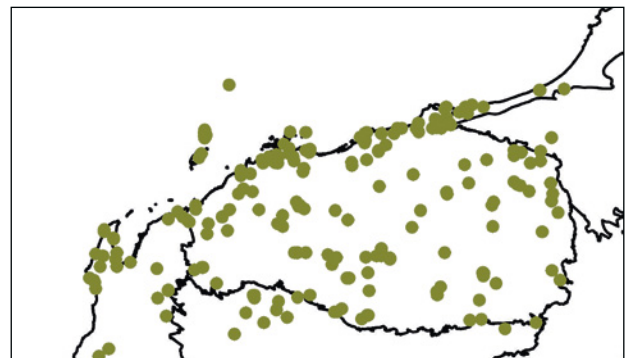
Rare vagrant. One observed by J.C. Darnell in a mixed flock of Barn Swallows, Tree and Fairy Martins at Cooke Point sewage ponds near Port Hedland on 18 Dec. 1989.

Hirundo neoxena Gould, 1842
Welcome Swallow



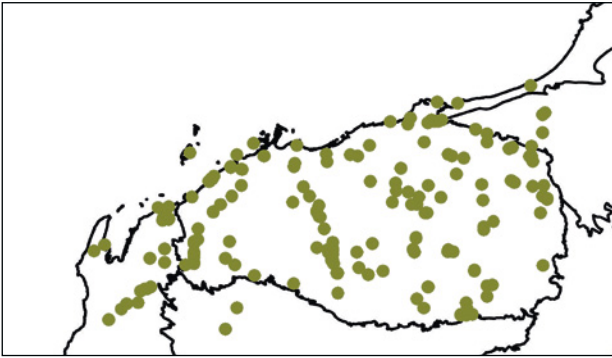
Mainly coastal areas north to Mandora, including Depuch Is., Dampier Archipelago (Legendre, Rosemary, Elphick, Nob, Enderby and West Lewis Is), Montebello Is, Lowendal Is and Barrow Is (including Mushroom and Boodie). Moderately common in ones, twos or small parties in area north-east to Point Samson and further east, mainly a scarce winter visitor. Favours towns and homesteads around cliffs. Breeding north to Onslow and Barrow Is., in March–April and July–Sept.

Hirundo nigricans nigricans Vieillot, 1817
Tree Martin



Throughout region, including Montebello Is and Barrow Is. but scarce or absent in far eastern desert areas. Also recorded well offshore at Goodwyn A Oil Platform. Resident, winter visitor and passage migrant. Common, usually in small parties, occasionally flocks (up to 100) or rarely larger aggregations (up to 1,000). Migratory, moving north from south-west of State in autumn and south in winter and early spring. Favours open country near water (river pools, mangrove creeks, swamps, freshwater soaks, saltwork ponds, sewage ponds). Breeding north to Pardoo Creek April–Sept.

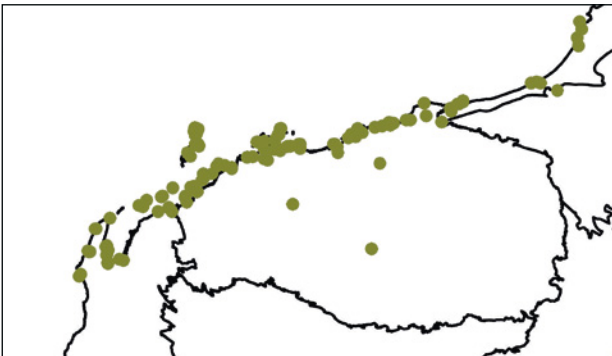
Hirundo ariel (Gould, 1842)
Fairy Martin



Throughout region north to Mandora and including Barrow Is. and eastern desert areas. Formerly scarce to moderately common, now common to very common (at least around bridges and culverts). Usually in small parties or flocks (up to 100). Mainly open country near fresh water and nest sites (cliffs, caves, breakaways, rock piles and especially bridges, culverts, tanks and buildings that have proliferated in the past 50 years. Provision of artificial water points and nest sites has resulted in a large increase in this species. Breeding July–Sept.

Zosteropidae

Zosterops luteus Gould, 1843
Yellow White-eye



Most coasts north to Mandora Creek and including Depuch Is., Dampier Archipelago (including Legendre, Dolphin, Enderby and West Lewis Is), Montebello Is (Hermite, Gardenia, Trimouille, Primrose), Lowendal Is (Abutilon, Varanus, Bridled, D, Parakeelya), Barrow Is., Weld Is., Airlie Is., Thevenard Is. and Bessieres Is. Occasionally wandering inland, e.g. Salt Creek on Mandora and ascending larger rivers, e.g. Yule R. to North West Coastal Highway, Maitland R. to Karratha homestead, and Fortescue R. to Millstream. Common, usually in ones, twos or small parties, occasionally flocks (up to 50). Favours mangroves, especially pure and mixed stands of *Avicennia* and *Rhizophora*, also

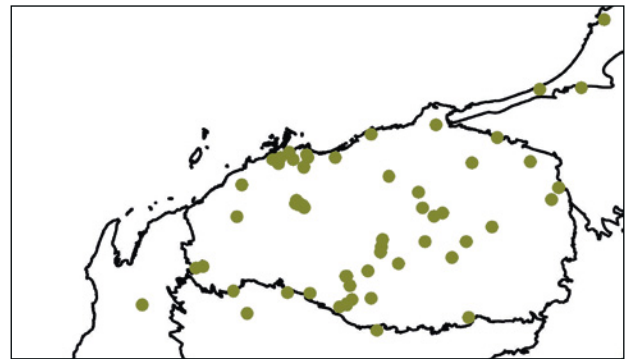
occasionally wandering into other near-coastal habitats including thickets and woodlands of *Acacia*, *Ficus brachypoda*, flowering *Eucalyptus brevifolia* and riverine woodlands of *Melaleuca* and *Sesbania formosa*. Breeding in late May, June, August and Sept. Grey morph birds (with pale cream belly, grey flanks and grey back) recorded at Port Hedland, Dampier and Hermite Is. At Dampier Salt grey morphs made up about one third of the population.

Zosterops lateralis gouldi Bonaparte, 1850
Grey-breasted White-eye

Rare visitor to far south-west of region, north to Point Cloates. T. Carter observed it once or twice in early 1900s (Carter 1903) and A.M. Douglas and G.F. Mees collected a specimen at Point Cloates on 10 Aug. 1959. Also a record from way beyond Point Cloates at Goldsworthy in June 1972.

Sylviidae

Acrocephalus australis gouldi (Dubois, 1901)
Australian Reed Warbler



Mainly coastal and riverine plains north to Mandora and east to Shay Gap, Oakover drainage (130 km E of Marble Bar), Wittenoom Gorge, Tom Price, Paraburdoo and Newman and west to North West Coastal Highway (at Yule R. and Sherlock R.), Roebourne, Karratha, lower Maitland R. (near Karratha homestead), lower Ashburton R. (near Nanutarra) and Winning. Locally common, e.g. at Millstream and Karratha sewage ponds, Tom Price and Newman, but generally uncommon and patchily distributed. Some birds are probably winter visitors from south-west of State. Favours areas of *Typha* and sedges around permanent river pools, also sewage ponds (first appeared at Shay Gap sewage ponds when *Typha* margins developed), springs and claypans. Breeding in Oct. and probably early Nov. (pair carrying food on 20 Nov.).

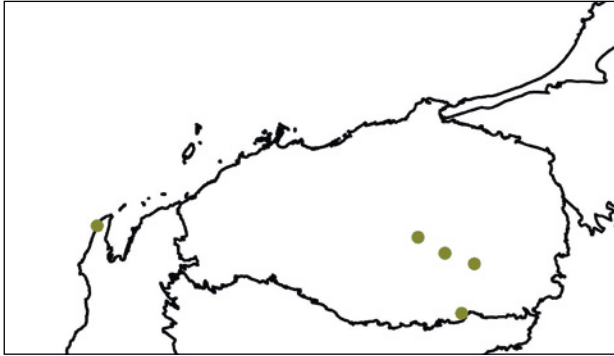
Phylloscopus borealis (Blasius, 1858)
Arctic Warbler

Rare visitor from northern hemisphere. One collected from North Rankin A Oil Platform (19°35'S, 116°08'E) on 31 Dec. 1985.

Megalurus timoriensis Wallace, 1864
Tawny Grassbird

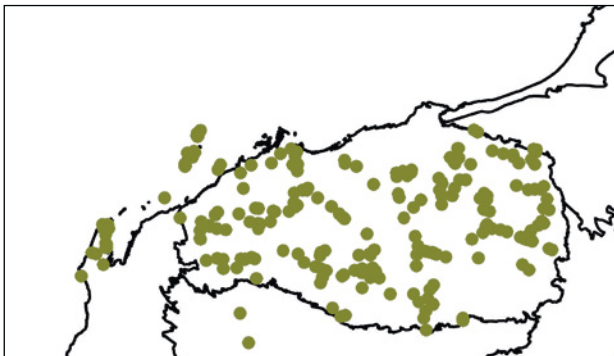
Rare vagrant from Kimberley. One observed by A. and B. Buchanan at Coppin Gap in 1986.

Megalurus gramineus (Gould, 1845)
Little Grassbird



Status in region uncertain, probably a rare non-breeding visitor (from north or south of WA). On 16 and 17 July 1980 one was heard calling from samphire at Mangrove Bay; on 5 Nov. 1981 one was collected from a flock of *ca.* eight birds in inundated dead rolypoly (*Salsola kali*) at Newman sewage ponds; on 29 Nov. 1981 one heard in same area was collected, an immature male. Also recorded at Cook Pool, Fortescue Marsh, on 13 Nov. 2006 and at a pool by BHP rail line north of the marsh on 7 Dec. 2006. This species has established in both south and east Kimberley since 1980s.

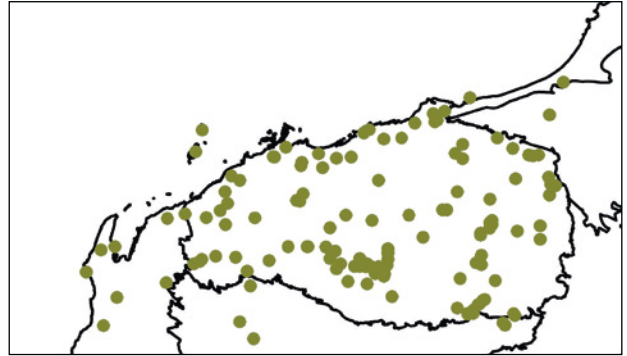
Eremiornis carteri North, 1900
Spinifex-bird



Mainly central interior and eastern parts of region, north to fringe of Great Sandy Desert (but absent from lower De Grey R. and Port Hedland areas), south to Deepdale, the Tropic, Barlee Range and Newman. Also Cape Range peninsula (south to Yardie Creek and Rough Range), Montebello Is, Barrow Is (including Double Is) and Thevenard Is. On Barrow Is. the population has been estimated at about 20,000 birds (Sedgwick 1978; Pruett-Jones and O'Donnell 2004) but in May 2010 and June 2011, 47 birds were translocated to Montebello Islands where

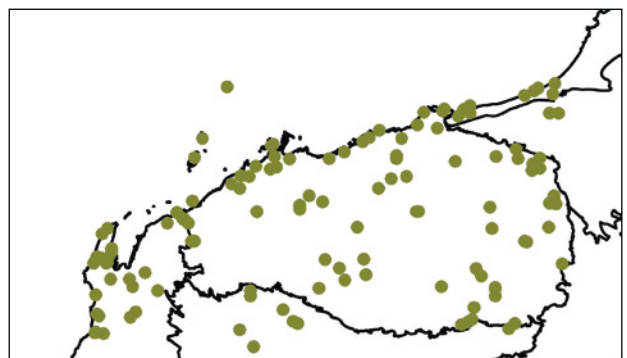
they had become extinct (A.A. Burbidge *et al.* 2000), and have since been recorded breeding there (A.H. Burbidge *et al.*, unpubl. data). Moderately common, usually in pairs. Favours dense spinifex (*Triodia*) and shrubs, especially *Acacia*, also *Spinifex longifolius* in coastal dunes. Breeding in March–Sept.

Cincloramphus mathewsi Iredale, 1911
Rufous Songlark



Throughout region, including eastern and northern desert areas but absent from far southwestern coastal areas west of Bay of Rest (Exmouth Gulf) and Cardabia Creek. Also one record for Barrow Is., a single bird on 15 March 2010. Locally common in wet years but generally uncommon to moderately common visitor (generally outnumbering *C. cruralis* in hilly better-wooded country). Usually in ones or twos. Favours lightly wooded grasslands including *Triodia*, especially edges of watercourses with good cover of grass and herbage. Breeding Feb.–July.

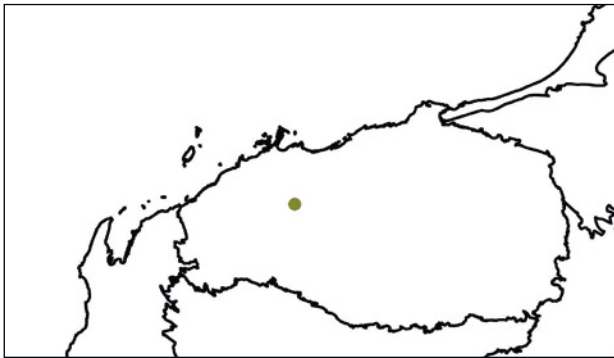
Cincloramphus cruralis (Vigors and Horsfield, 1827)
Brown Songlark



Throughout region, north to Mandora and including West Lewis and Barrow Is. Also on Goodwyn A oil platform (two observed by T. Kirkby from 25 Dec. 1994 to 2 Jan. 1995). Uncommon to common visitor or migrant (more frequent in wet years). Generally outnumbering *C. mathewsi* on coastal plain and broad riverine plains. Usually in ones or twos. Favours treeless or sparsely wooded grassy plains (including *Triodia*), and especially

coastal and riverine plains, also samphire around claypans. Breeding Feb.–Aug.

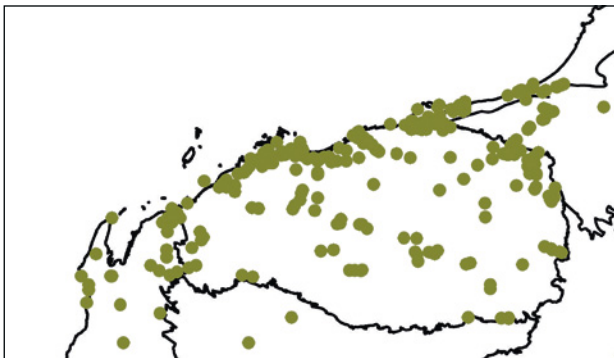
Cisticola exilis (Vigors and Horsfield, 1827)
Golden-headed Cisticola



Only recorded at Millstream on Fortescue R. F.L. Whitlock collected eight specimens (including immatures) in reedbeds below spring between 25 Aug. and 10 Sept. 1922 and G.F. Mees collected two specimens on 22 and 24 July 1958.

Alaudidae

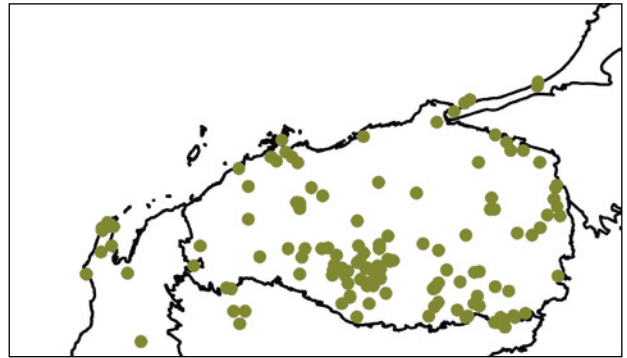
Mirafra javanica horsfieldii Gould, 1847
Horsfield's Bushlark



Throughout region. Moderately common to very common on coastal and riverine plains, but uncommon, patchily distributed or absent from hilly country in interior. Usually in ones, twos or small parties. Favours treeless or sparsely wooded flats with open low grasses, especially Buffel Grass (*Cenchrus ciliaris* and other *Cenchrus* spp.), also samphire flats, and sandy plains dominated by *Triodia*. Breeding Aug.–May.

Dicaeidae

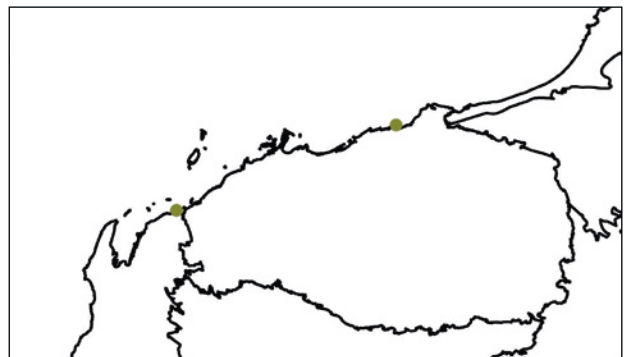
Dicaeum hirundinaceum hirundinaceum (Shaw, 1792)
Mistletoebird



Throughout region north to Mandora but absent from eastern sandy desert areas and most of far south-western coastal areas south of Yardie Creek. Moderately common in Hamersley, Barlee and Cape Ranges and in most mangroves, uncommon elsewhere. Usually in ones or twos. Found in most well-wooded habitats. Breeding July–late Aug. or early Sept.

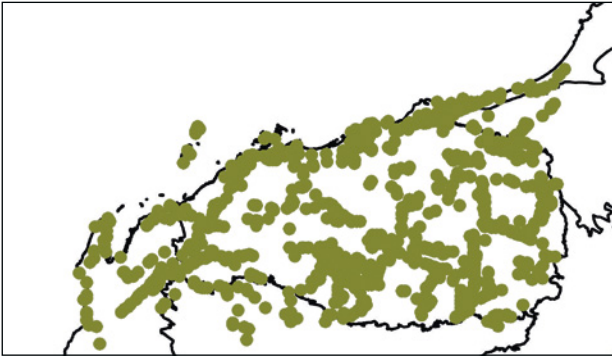
Passeridae

Passer montanus (Linnaeus, 1758)
Eurasian Tree Sparrow



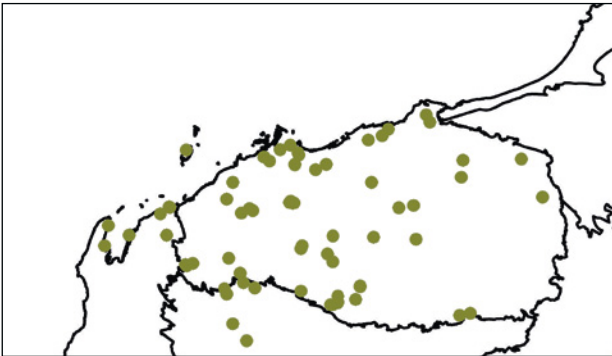
Mainly an uncommon ship-assisted vagrant from Asia. Possibly breeding at Port Hedland in a light tower in Nov. 1986 and in *Cocos* palms in Nov. 2002–03; also possibly at Onslow in Sept. 2012 (female collected with convoluted oviduct). Mainly ones, twos and threes, one flock of seven at Port Hedland on 1 Nov. 2007 and a flock of about 50 at Port Hedland on 25 June 2002.

Taeniopygia guttata castanotis (Gould, 1837)
Zebra Finch



Throughout region including far western fringes of Great Sandy Desert, as well as West Lewis Is., Montebello Is, South East Is. and Barrow Is. Very common, by far the most plentiful bird in the region. Usually in pairs or small flocks, often large aggregations of hundreds at water. Favours treeless or lightly wooded grassland country (including *Triodia*) near water, especially stock watering troughs. Breeding Feb.–Nov.

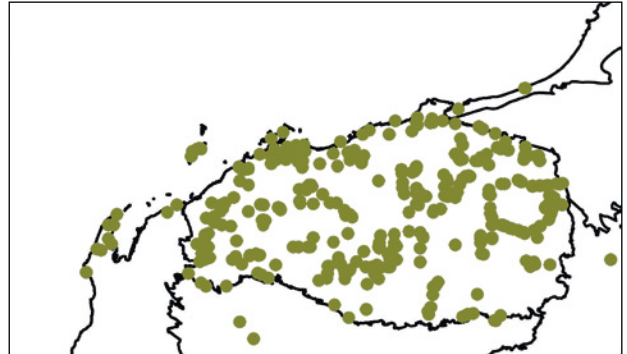
Neochmia ruficauda clarescens (Hartert, 1899)
Star Finch



Throughout region, north to De Grey and Oakover Rivers, south-west to lower Ashburton R., Barlee Range and Cape Range peninsula and east to Oakover R. (Carawine Gorge), upper Coongan R., Newman and Turee Creek. Vagrant or casual on Barrow Is., where a flock of nine was recorded on 20 May 2010 (Burbidge *et al.* 2010a). Locally common, but generally uncommon and patchily distributed. Usually in pairs or small flocks (up to 50). Mainly areas of *Typha*, rushes, long grass, *Phragmites* and lush shrubs about permanent pools on larger watercourses, e.g. De Grey, Oakover, Coongan, Turner, Yule, Sherlock, Harding, Maitland, Fortescue (upstream to Millstream), Peter Creek, Robe (Yalleen), Ashburton, Kookhabinna Creek, Wackilina Creek, Hardey R., Bellary Creek and Turee Creek; also at Karratha and Paraburdoo sewage ponds and in rank herbage at Onslow and

Exmouth. Breeding in March–July and possibly early Aug.

Emblema pictum Gould, 1842
Painted Finch



Throughout region, north to Mandora but scarce or absent from far north-eastern interior (i.e. western fringe of Great Sandy Desert, west to coast but absent from far south-west corner except an isolated population on Cape Range peninsula (south to Yardie Creek and Learmonth); on rocky inshore islands, e.g. Depuch, Angel and West Lewis, casual on Barrow Is. Common, usually in pairs or flocks and often large aggregations (up to 500) at water. Favours rocky hills or stony country with *Triodia*, especially in stony gullies, but commonly visiting or dispersing to adjacent plains to water during dry periods. Breeding late Feb.–Sept.

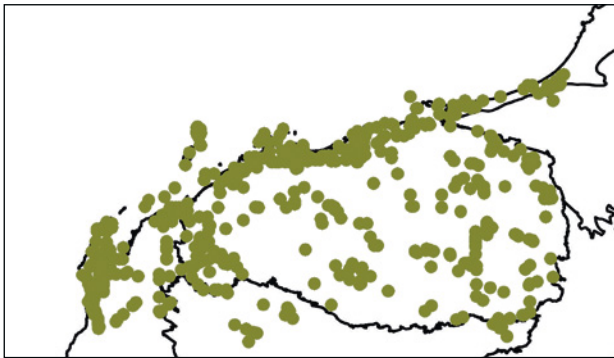
Heteromunia pectoralis (Gould, 1841)
Pictorella Mannikin

Status in region uncertain, probably only an uncommon visitor from Kimberley. A flock of 12 recorded at Carawine Gorge on 2 and 3 Aug. 1995; recorded at Yarrie in Dec. 2004; two adults and three immatures observed at Pardoo Creek, 5 km S of Goldsworthy, on 28 July 2006; recorded at Miaree Pool in May and Old Onslow in June 2008; three observed at Point Samson on 17 June 2010, four at South Hedland in Feb. 2012 and three at Roebourne on 27 Feb. 2012. Judging from these records and reports from southern Kimberley this appears to be another species expanding its range southwards into the Pilbara.

Motacillidae

Anthus australis australis Vieillot, 1818

Australian Pipit



Throughout region including sandy desert areas and many islands (e.g. North Turtle, Dampier Archipelago, Passage Is, Montebello Is, Lowendal Is, Barrow Is., North Sandy Is., Airlie Is., Thevenard Is. and Bessieres Is. Locally scarce or rare (e.g. in Hamersley Range) but generally very common to moderately common. Usually in ones, twos or small parties. Favours sparsely vegetated country, especially coastal beaches and dunes, samphire and grass flats (especially Buffel Grass flats), edges of claypans, road edges, airfields and bare areas around stock watering points, homesteads and woolsheds. Breeding March–Sept.

Motacilla flava simillima Hartert, 1905

Yellow Wagtail

Uncommon but regular visitor Nov.–April from north-east Asia. Recorded mainly from north of region, especially Port Hedland, Goldsworthy and Shay Gap, but also Newman and Barrow Is. Usually in ones, twos or small parties. Favours edges of fresh waters, especially sewage ponds. Also observations of *M. f. taiwana* and *M. f. macronyx* from Port Hedland. Some recent workers have split the western and eastern Eurasian taxa into two super species, a western *M. flava* and an eastern *M. tschutschensis* (the latter including *M. f. taiwana*, *M. f. simillima* and *M. f. macronyx*) (see Christidis and Boles [2008] for a summary). Should this concept be adopted, the above records would be referable to the Eastern Yellow Wagtail and the Green-headed Wagtail.

DISCUSSION

The avifauna and its distribution

A total of 325 species (227 non-passerine and 98 passerine) has been recorded from the region considered here. This number can be compared with 279 species (184 non-passerine and 95 passerine) recorded in the Carnarvon Basin

(Johnstone *et al.* 2000) south of the Pilbara, and 317 species (201 non-passerine and 116 passerine) in the Kimberley (Storr 1980).

Few additional passerine species could be expected for the Pilbara, but further work in the seas and along the coast may add seabirds and shorebirds to the list and probably also some migrant Asian passerines. Some additional wetland birds could also be expected during visits after good seasons.

The extreme harshness of the environment over the region, with arid-adapted vegetation and unpredictable climate varying from desert-like conditions to flooding after cyclones, means that it contains a depauperate resident fauna. It contains about 142 non-pelagic species (*ca.* 50%) compared to the Kimberley region to the north (about 223 species; 74% [from Storr 1980]) but similar to that in the Carnarvon Basin to the south (about 150 species, 61% [from Johnstone *et al.* 2000]), where the climate is more similar to the Pilbara. However, the high number of species overall is an indication of the importance of the region as a refuge for migrants and visitors. This richness is due not only to the large number of species that visit the region but also its admixture of species from the three major Australian zoogeographical subregions—the Torresian to the north, arid Eyrean to the east, and the subhumid Bassian to the south (see summaries and discussion of biogeographic regions in Serventy and Whittell [1967] and Schodde [1982]).

Much of the diversity in the avifauna is also due to the large size of the region and the wide variety of habitats but especially those on or near the coast including mangroves. Noteworthy is the Eighty Mile Beach; with broad tidal flats rich in invertebrates, this area provides a major migration corridor and staging ground for shorebirds on their way to and from their northern hemisphere breeding grounds (Bamford *et al.* 2008). Of the 225 non-passerines, 44 are migrant waders from the northern hemisphere. The coast and coastal marshes also provide important habitat for many resident waders and waterfowl. The seabirds are also a mixture of residents (18 species that largely breed on islands in the region) and non-breeding visitors (19 species from tropical and southern seas).

Generally the coastal strand and inter-tidal zones, river pools, rock pools, artesian flows and, to some extent, mill overflows provide the only consistently reliable habitat in the region. Elsewhere, the random occurrence and tracking of cyclonic events and the variable rainfall lead to a high degree of environmental variation: rivers flood and wetlands develop, only to diminish (often within weeks), resulting in chains of river pools or hard-baked claypans, sometimes remaining so for several years. Following good rain, exceptional flowering and

seeding usually occur but these events are also transitory and may not recur for many years. Some of the more hardy avian residents can overcome the instability of these irregular conditions, but in many instances they resort to nomadic lifestyles, moving into the Pilbara from adjacent areas to exploit the ephemeral favourable conditions. As noted above, however, despite the development of locally advantageous conditions, numbers and even species of birds occurring the region may vary greatly (see note on Mandora Marsh). The so-called 'pull factor' of favourable conditions is not, by itself, always sufficient to ensure utilisation of the resource – in many instances seemingly abundant resources are poorly exploited.

Conversely, influxes and unusual, extralimital species have been recorded in years when conditions were no more than average. Such events appear to be due to poor conditions elsewhere as birds seek better conditions.

On occasions these two influences, both the push and pull environmental factors, occur concurrently, and at such times the result can be spectacular. For instance, the 1999 and 2000 flooding event at Mandora Marsh (a pull factor) coincided with exceptional, extensive drought conditions across much of Australia (a push factor). The resultant numbers of waterbirds present as drought refugees due to this phenomenon was exceptional. Since those events, Mandora Marsh has again flooded, but on this occasion there were flood conditions over much of Australia and thus the push factor was not present and neither were the high numbers of waterbirds.

Thus, we can see an overlying pattern of utilisation of the region, one of nomadic movements to exploit locally favourable conditions, or at least conditions more favourable than those occurring elsewhere. Also, many species regularly move into the Pilbara or pass through it as passage migrants, but in most instances such species tend to roam nomadically across the region. Within the species accounts given here, many instances can be seen of odd birds occurring at regular intervals, far beyond their normal range. As such it is difficult to assess such data as indicating species range. In some instances locally improved conditions may occur for longer periods and nomadic species may even breed, but such instances cannot be construed as extension of range.

Overall, only the coastal habitats and, of course, the seas themselves, have the degree of regularity necessary to sustain long-distance migratory movements. The Port Hedland Saltworks also function under this regime, making them very different functionally from the Mandora Marsh. Such long-distant migratory movements still operate with both a pull and push effect into

intertidal zones, providing an abundant food supply whilst their northern breeding grounds are untenable. The seasonally stable conditions pertaining to the Port Hedland Saltworks appear to have become a regular destination for a number of Banded Stilt which may now use this site as a regular migratory destination.

Important habitats of the Pilbara

Eighty Mile Beach

This unbroken stretch of dune-backed shoreline extends from the north-eastern limit of the Pilbara to the southern Kimberley. This feature, combined with a tidal range of approximately 5.5–7 m, has led to the development of extensive, broad, silty, intertidal flats of high biological productivity. The area is characterised by its stability and regularity as distinct from most other areas of this region. Because the tidal flats have very gentle gradients, it is only for a short time at peak tide that no feeding areas are available to these shorebirds; indeed, over the neap-tide period access to parts of the feeding area can be virtually continuous as birds are able to forage both day and night. For most northern hemisphere shorebirds using the East Asian Flyway (a narrow migratory pathway), this area is their first landfall in Australia and, conversely, their last feeding ground before departure to their remote breeding grounds. For some species, e.g. Great Knot, this flyway accommodates almost all the world's population of the species (Bamford *et al.* 2008). Many of these species remain in the Pilbara region throughout this non-breeding period, but for others it is a refuelling opportunity before continuing their migratory flights, southwards across the inland areas to coastal south-east Australia (or beyond to as far as New Zealand). Many of these latter species return here on their northward flights prior to embarking on their final stages of migration. As a result of ringing and flag-marking studies, the migration routes are relatively well known (Minton *et al.* 2011) but recent satellite tracking and geolocation devices have revealed that some of the larger shorebirds carry out prodigious non-stop migratory flights of 8,000–11,000 km (e.g. Gill *et al.* 2005, 2009). Such flights are fuelled by burning up body fat reserves that are built up in the immediate pre-departure period and can amount to some 20–30% of the birds' normal weight (e.g. Barter and Barter 1988; Piersma *et al.* 2005). This necessitates an abundant, reliable food resource along the migratory flight path and this requirement is met at the Eighty Mile Beach (Wade and Hickey 2008), making it an area of international significance for shorebirds. It is the only RAMSAR site in the Pilbara (Environment Australia 2001).

Although the above comments refer to shorebirds

utilising intertidal feeding areas, corresponding circumstances occur with those utilising grassland, e.g. Little Curlew, Oriental Plover and Oriental Pratincole. Along the coastal plain immediately inland of the Eighty Mile Beach, concentrations of up to 2,000,000 of these species have been recorded (Minton *et al.* 2004; Piersma and Hassell 2010). At times, large numbers occur there as a result of cyclonic rains providing favourable conditions or as a result of the emergence of locusts, but the largest numbers occur as birds wait for the right weather conditions for their northward migration. The main reason for such concentrations is not the rains or food supply, as these regularly occur elsewhere, but the location in the path of the East Asian-Australasian Flyway.

Despite the area's capacity to support such immense numbers of migratory northern hemisphere shorebirds, the intertidal and the coastal plain habitats appear not to be utilised or exploited by Australian waterbirds. Even during extreme drought conditions, when the area might be a refuge, Australian nomadic species do not concentrate in the area, with only the odd exception, e.g. Australian Pelican. Some species that habitually feed in saline, even hypersaline, conditions (e.g. Banded and Black-winged Stilts and Red-necked Avocets) are similarly rarely seen on the beach areas whether drought conditions prevail or not, and yet all three occur regularly and in large numbers at Port Hedland Saltworks. Even when cyclonic events caused significant damage to the saltworks, so that these species were virtually absent, they were not recorded from nearby beach locations.

The Australian counterparts of the northern hemisphere grassland-inhabiting waterbirds utilise the coastal plain in a similar manner, reacting to local flooding and emerging locust concentrations, but they do not normally achieve the numbers of the Asian immigrants (by a factor of 3 or 4). Only after a cyclonic event sufficient to flood the Mandora Marsh area do those species arrive in large numbers (Halse *et al.* 2005).

Port Hedland Saltworks

In essence the saltworks ponds provide a series of long-term, slightly varied and relatively stable habitats. The complex has become an important shorebird site for both Australian and migratory northern hemisphere birds. Apart from the occasional rarity, the same species are recorded from the saltworks and the Eighty Mile Beach. There are, however, some interesting differences in the status of some species. For example, more Asiatic Dowitchers, Broad-billed Sandpipers and Mongolian Sand Plovers have been recorded from a single intake pond than from the whole

Eighty Mile Beach, indeed, from the remainder of the region. It is interesting to speculate on the migration development that this stable habitat has allowed. In the period from 1975 to 1992 the Asiatic Dowitcher population increased by a factor of about 20, rendering this one of the most important non-breeding areas known worldwide (Bamford *et al.* 2008). In contrast to the situation pertaining to the open shoreline habitat of the Eighty Mile Beach, this saltworks is also an important non-breeding site for some Australian shorebirds. Large numbers of Banded and Black-winged Stilts and Red-necked Avocets regularly visit the ponds, commonly with highest numbers of birds in the highest salinity ponds with high concentrations of invertebrates. In all three species the numbers seem to reflect breeding cycles or events elsewhere and suggest that for these species the site is known and that a regular movement or migration to this area has already developed. The irregular influxes also suggest that drought-affected or displaced birds also occur here. Of the remaining Australian waterbirds, only the Australian Pelican and to a lesser extent the Little Black Cormorant seem to utilise the ponds in times of inland drought. Although non-breeding Royal Spoonbills, egret species and Hoary-headed Grebes also occur there in small numbers, they are considered regular visitors. Only two species of duck (Grey Teal and Australian Shelduck, the latter a casual visitor) have been recorded here and species such as ibis are unrecorded. This contrasts with the Mandora Marsh, an important drought refuge for many of these species (Halse *et al.* 2005). Overall, the saltworks are a recently developed habitat but one that now provides relatively stable conditions year-round. As such it has become a regular non-breeding destination for both northern hemisphere and a limited range of local Australian shorebirds. Despite its abundant food supplies, however, it is barely utilised by the latter as a drought refuge.

Mandora Marsh

The results of surveys on this marsh carried out in the flooding events of 1999 and 2000 have been documented by Halse *et al.* (2005). These illustrate the large differences between this wetland area and the two others discussed here (Eighty Mile Beach and Port Hedland Saltworks). Since the water at Mandora comes from direct rainfall it is a fresh to brackish wetland, tending towards the latter as the floodwaters decrease, especially the last remnants east of the Great Northern Highway. Following flooding there is usually a lag before high levels of water-bird food supply are reached. This abundance of food is then concentrated as a result of shrinkage of the water bodies, e.g. for the two events noted above only some 35% of the open water area remained

in early August compared with that of the corresponding surveys in early April. Such was the productivity, however, that both August surveys resulted in estimates of approximately 500,000 birds. Allowing for some unidentified terns and even more unidentified waders that may be non-breeding or early-returning northern hemisphere birds, Australian inland waterbirds comprised over 95% of this population. This is virtually the opposite of the situation in the other two wetland sites discussed here. The other major difference is that large numbers of these birds breed here. Following substantial rains in early 2000, the population of Black-winged Stilts built up rapidly. By June over 100,000 birds were present and by August this figure had increased to approximately 220,000, a figure somewhat higher than that obtained in the August 1999 survey (176,000). This is a substantial percentage (70–80%) of the total estimated Australian population. Just where these birds dispersed to after the system dried out at the end of 1999 is not known. Unfortunately, no corresponding records are available for the Port Hedland Saltworks for this period, but it is unlikely that many birds relocated to that area. It was estimated that most of the 200,000 Black-winged Stilts on the marsh in both 1999 and 2000 bred there. This is in direct contrast to this species' status at Port Hedland Saltworks where no breeding has been reported despite birds being continuously present. In contrast to the utilisation of the marsh by this species, its usage by the two allied Australian species (Banded Stilt and Red-necked Avocet) seems very limited. In neither case did peak numbers exceed 2% of the Black-winged Stilt population; in fact, in the 1999 event no Banded Stilts were recorded at all. In both cases their numbers recorded here are only comparable with, or less than, those regularly recorded from the relatively small Port Hedland Saltworks. Both of these species regularly frequent fresh/brackish water bodies elsewhere, so it would appear that the Black-winged Stilts were attracted to the Mandora Marsh on these occasions, rather than being drought-driven refugees.

In 2010–11 extensive flooding over much of eastern and central regions of Australia provided extensive habitat for water birds and, as a result, although Mandora Marsh was also flooded in a similar state to when these high numbers of birds had appeared in other years, virtually none arrived there. This suggests that most of these birds are drought-driven refugees or drought-escaper species.

Mangal

Mangroves occur in creek mouths and reef-sheltered embayments along the coast from Cape

Keraudren at the southern end of the Eighty Mile Beach to Yardie Creek on the western side of the Cape Range peninsula (Johnstone 1990). The Eighty Mile Beach is almost devoid of mangroves. The exceptions are two small tidal creeks on Mandora Station and an inland stand of *Avicennia* along a creek running into a salt lake 40 km from the coast. Along the Pilbara coast the largest and most luxuriant blocks of mangal are found at the mouths of rivers and large creeks and in sheltered bays. Twelve species of bird are virtually confined to mangal in the Pilbara: Striated Heron, Bar-shouldered Dove, Collared Kingfisher, Dusky Gerygone, Red-headed Honeyeater, Mangrove Robin, Mangrove Golden Whistler, White-breasted Whistler, Shining Flycatcher, Mangrove Grey Fantail, White-breasted Woodswallow and Yellow White-eye. This compares to 16 species essentially confined to mangal in south-west Kimberley (Johnstone 1990).

The absence of mangroves along the Eighty Mile Beach has prevented four northern mangrove birds from colonising the Pilbara—the Little Bronze Cuckoo, Broad-billed Flycatcher, Mangrove Gerygone and Red-headed Honeyeater. The single record of the Red-headed Honeyeater from Cape Keraudren presumably represents a vagrant or rare visitor as the nearest breeding population is at Whistle Creek at the northern end of the Eighty Mile Beach. This beach also separates the northern subspecies of the Collared Kingfisher *T. c. sordidus* from *T. c. pilbara*. Due mainly to the number of rivers and a more dissected coast, the Pilbara has a greater variety of mangrove habitats than most of the south-west Kimberley. It is, however, much more arid than the southern Kimberley, has fewer species of mangrove, and most stands of mangal are backed by samphire flats and/or *Acacia* thickets. The Mangrove Golden Whistler and Mangrove Robin are associated with *Rhizophora* forest that occurs south to Exmouth Gulf, and this is also the southern limit of these birds. Noteworthy is the isolated population of Shining Flycatcher in mangal between Cossack and Point Samson which is one of the most extensive and luxuriant blocks of mangal in the Pilbara; there are no other records of this species in the region.

Other noteworthy birds include the reddish form of the Striated Heron that occurs on reddish substrates especially red mud between Devil Creek and Exmouth Gulf and the Bar-shouldered Dove that is confined largely to mangal in the Pilbara but occurs in a range of inland habitats in the south-west Kimberley. Compared to landward habitats, mangal provides a relatively stable environment and the often-lower daytime temperatures within the mangal may provide a refuge from the heat for some species. Many other birds frequently visit

mangal to feed, nest or shelter and in the Pilbara these include the Darter, Little Egret, Black-necked Stork, Sacred Ibis, Brahminy Kite, Buff-banded Rail, Horsfield's Bronze Cuckoo, Pheasant Coucal, Sacred Kingfisher, Tree Martin, Variegated Fairy-wren, Mistletoebird, Brown Honeyeater and Singing Honeyeater.

Pindan

The far north-east is essentially an extension of the semi-arid pindan and melaleuca scrubs of the south-west Kimberley, forming a narrow strip of well-wooded country between the Great Sandy Desert and the sea. It provides a north-south corridor between the Kimberley and the Pilbara. A few northern species including the Black Kite, Red-winged Parrot, Red-backed Fairy-wren and Jacky Winter extend south in a narrow zone into this area. A few southern species including the Red-tailed Black Cockatoo (mid-western population *Calyptorhynchus banksii samueli*) extend north into this area and an isolated population of the Broad-tailed Thornbill occurs at Anna Plains and Mandora, the northern limit of this species.

Coastal samphire

Coastal samphire flats, vegetated mostly by *Tecticornia* shrubs, support mainly ground-dwelling species including the Australian Bustard, Little Button-quail, Masked Lapwing, White-winged Fairy-wren, Horsfield's Bushlark and Australian Pipit.

Watercourses

The major watercourses, especially the De Grey, Oakover, Shaw, Turner, Yule, Fortescue, Robe, Cane, Ashburton Rivers and many larger creeks such as Turee Creek, have tall fringing forests of river gums and a number of species are more common along these watercourses than in other habitats. They include Black Bittern, Peaceful Dove, Australian Ringneck, Blue-winged Kookaburra, Black-tailed Treecreeper (subspecies *wellsi*), Red-browed Pardalote, White-plumed Honeyeater, Black-faced Cuckoo-shrike (subspecies *subpallida*), Torresian Crow and Star Finch. Like riverine sites elsewhere in arid areas, these woodlands are relatively rich in bird species (Burbidge *et al.* 2010b) and require better protection than is currently the case.

Central highlands

The central highlands or hilly interior support a number of species that are rare elsewhere, including the Striated Grasswren (subspecies *whitei* confined to this region, also with possibly isolated populations in the Barlee Range and Cape Range), the Rufous-crowned Emu-wren, Grey-headed Honeyeater, Western Bowerbird, Spinifex-bird and Painted Finch. The ranges are also rich in diurnal birds of prey including the Peregrine Falcon that

roost and nest on the steep walls of some gorges.

The mulga woodlands

The mulga woodlands (see also Burbidge *et al.* 2000, 2010b) are important habitat for the Desert Gerygone (*Gerygone fusca mungi*), Broad-tailed Thornbill, Slaty-backed Thornbill, Chestnut-rumped Thornbill, Yellow-rumped Thornbill, Grey Honeyeater, Spiny-cheeked Honeyeater, Red-capped Robin, Hooded Robin, White-browed Babbler, Crested Bellbird, White-tailed Fantail and Grey Butcherbird. The Slaty-backed Thornbill, Chestnut-backed Thornbill, Yellow-rumped Thornbill, Grey Honeyeater, White-browed Babbler, White-tailed Fantail and Grey Butcherbird (subspecies *torquatus*) are all at their northern limit in the Pilbara, perhaps because mulga is also at its northern limit here (Miller *et al.* 2002). The Desert Gerygone has isolated populations in the Kimberley and in the far eastern arid zone (desert near WA/NT border). The Broad-tailed Thornbill is mainly confined to the highlands of the southern interior of the region but there is an isolated population in pindan scrubs at Anna Plains and Mandora. The Spiny-cheeked Honeyeater ranges north to the lower De Grey R. and has an isolated population in southern Kimberley around Broome. The Red-capped Robin breeds north to about the central Pilbara but is a winter visitor to the northern Pilbara and southern Kimberley. The Redthroat is of interest, as it also favours *Acacia* scrubs and thickets, is at its northern limit in southern Pilbara and has two isolated populations on the coast at Exmouth Gulf and the south end of Regnard Bay in coastal *Acacia* scrubs.

Desert zone

The eastern desert zone contains a small number of residents including the Red-backed Kingfisher, Rufous Fieldwren and Zebra Finch, but also contains a large component of nomads and breeding and non-breeding visitors including Banded Whiteface, Black Honeyeater, Pied Honeyeater, White-fronted Honeyeater and Crimson Chat.

Regions with irregular climate usually show a high frequency of nomadism in their avifauna (e.g. Allen and Saunders 2002), and the Pilbara is similar. The following species are overtly nomadic: Emu, Stubble Quail, anatids, Australian Grebe, Hoary-headed Grebe, Darter, Australian Pelican, Glossy Ibis, Australian White Ibis, Straw-necked Ibis, Buff-banded Rail, Black-tailed Native Hen, Eurasian Coot, Australian Bustard, Red-chested Button-quail, Little Button-quail, Black-winged Stilt, Banded Stilt, Red-necked Avocet, Red-kneed Dotterel, Flock Bronzewing, Diamond Dove, Cockatiel, Budgerigar, Banded Whiteface, Black Honeyeater, Pied Honeyeater, White-fronted Honeyeater, Crimson Chat, White-winged Triller and Masked Woodswallow.

Composition of the avifauna by habitat

The avifauna associated with each main habitat type (see Methods) is given below (where the status of a species is similar in two or more habitats it is included in each of them).

1. Seas: 51 species
2. Islands: 123 species (39 passerine)
3. Coasts, tidal mudflats, beaches: 60 species; mangal: 12 species (9 passerine)
4. Coastal plain: 79 species (8 passerine)
5. Cape Range: 82 species (37 passerine)
6. Watercourses: 86 species (25 passerine)
7. Central highlands: 135 species (61 passerine)
8. Eastern desert zone: 110 species (47 passerine)

The visitors to the region make up 56% of the fauna, and can be divided into eight main groups:

1. Non-breeding summer visitors from the northern hemisphere, e.g. Pin-tailed Snipe, Bar-tailed Godwit, Whimbrel, Great Knot, Red-necked Stint, Greater Sand Plover, Oriental Pratincole, Common Tern, Fork-tailed Swift and Barn Swallow.
2. Breeding summer visitors from the north, e.g. Wedge-tailed Shearwater, Bridled Tern.
3. Non-breeding visitors from the south of WA, e.g. Australian Wood Duck, Square-tailed Kite, Swamp Harrier, Elegant Parrot, Shining Bronze Cuckoo, Western Gerygone, Grey Fantail and Black-faced Cuckoo-shrike (subspecies *novaehollandiae*).
4. Non-breeding visitors from the north of State, e.g. Magpie Goose, Green Pygmy Goose, Brolga, Flock Bronzewing, Red-winged Parrot and Pictorella Mannikin.
5. Passage migrants, e.g. Wilson's Storm Petrel and many waders.
6. Resident species whose numbers are greatly augmented by visitors in winter, e.g. Brown Goshawk, Collared Sparrowhawk, Australian Kestrel, Pallid Cuckoo, Striated Pardalote, Magpie Lark and Tree Martin.
7. Vagrants (irruptions) and rare visitors from elsewhere in Australia, e.g. Freckled Duck, Hardhead and Letter-winged Kite. This type of vagrancy (for these species at least) is often characterised by movements involving many individuals in one season. These long-distance irruptive species are presumably abnormal in both direction and distance from their region of origin. The single Sarus Crane, on the other hand, may have originated from Queensland or Asia.
8. Vagrants and rare visitors from northern hemisphere; of these, the Red-legged Crake, Pheasant-tailed Jacana, Blue-winged Pitta, House Crow, Sooty Flycatcher, Narcissus Flycatcher and Blue and White Flycatcher all occur regularly in the Indo-Malay-Greater Sunda region, but are unknown from the Lesser Sundas immediately north of the Pilbara. For these species it indicates entry from a more north-westerly direction. Others, e.g. White-throated Needletail and Latham's Snipe, are regular migrants to eastern Australia and have strayed off their normal migration routes, whilst others, e.g. Spotted Redshank and Eastern Curlew, have probably 'overshot' their normal migratory destination. Cyclones often drive migrants well off course and far beyond normal range limits. They are also known to entrap birds in the eye and carry them not only across seas but far inland and this has led to a number of Asian species reaching the Pilbara and sometimes well inland (e.g. Streaked Shearwater from Nullagine). Noteworthy also are recent invasions by Australian species, e.g. Australian Kestrel, which have been recorded from Christmas Is. and the Cocos (Keeling) Is, would almost certainly have departed from north-west WA even if they did not originate from it. It may well be that the North Keeling Island endemic race of the Buff-banded Rail became established via this route. Increased shipping to the region will also increase the number of ship-assisted vagrants from Asia. Examples include a dead immature female Dusky Thrush, *Turdus naumanni*, found on a vessel from China on 27 Oct. 2012 and a recently dead female Daurion Redstart, *Phoenicurus aureoreus*, on a vessel from China on 2 Nov. 2012, both at the Barrow Is. offloading facility.

As discussed elsewhere in this paper, climatic conditions prevailing elsewhere in Australia can directly influence the appearance, numbers and even temporary status of many species recorded from the Pilbara region. There are regular migratory movements into and through the region for some south-western breeding species (e.g. Rainbow Bee-eater, Tree Martin). For many others it is essentially a refuge, an area where the local conditions are temporarily modified and provide an environment where they can survive while resources in their normal ranges are depleted. For example, when extreme drought conditions prevail over southern, central and eastern areas of Australia, waterbirds are under survival pressure (Kingsford *et al.* 1999; Roshier *et al.* 2002). When such occurrences are co-incident with extreme local cyclonic flooding in the Pilbara region, vast numbers seek refuge there, only to be displaced again as these transient conditions dry out (Halse *et al.* 2005). Obviously there are years when, despite

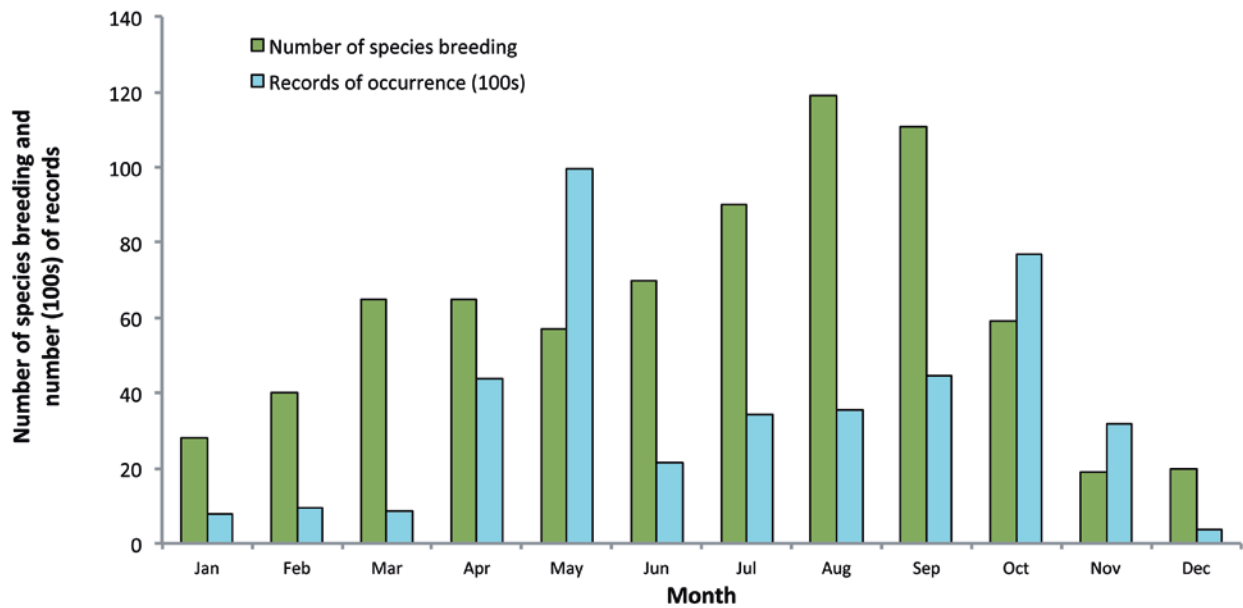


Figure 2 Breeding of land birds in the Pilbara. Data are the number of species recorded with eggs in a given month, and the number of dated records of all occurrences (which are a surrogate of observer effort).

such widespread drought conditions, there are no acceptable habitats for these birds in the Pilbara and refuge has to be sought elsewhere. Conversely, there are occasions when very attractive conditions occur regionally but coincide with good conditions across a species' traditional breeding/feeding areas, and in such years far fewer (in many cases none) of these birds appear.

A similar situation appears to apply to the blossom nomads. In seasons when local conditions have led to extensive flowering, e.g. by eucalypts, hakeas and grevilleas, numbers of honeyeaters can increase markedly and other species not normally seen in a locality appear. This is not always the case, however, and sometimes only local or resident birds are present. These two cases illustrate that many of the species visiting the Pilbara are well adapted to variable or extreme conditions prevailing within it, and although many have regular breeding/non-breeding ranges they are capable of adapting to adverse conditions within those areas.

In comparison, migrants to the Pilbara from the northern hemisphere have an entirely different regime that is highly programmed. Post-breeding birds fly from their various Arctic/cold temperate ranges to congregate at feeding grounds on the tidal mudflats of the Yellow Sea. Here they rapidly increase their body weight by accumulating the body fat deposits needed for their extensive transoceanic flights southwards. In some species these are direct non-stop along the East Asian/Australasian Flyway which over-crosses north-western Australia, mainly the sector between Broome and Port Hedland (e.g. Minton *et al.* 2011). The fact that in many or most cases juvenile birds

remain on the breeding grounds, to make their own way, but via the same routes, indicates just how programmed these birds have become (Higgins and Davies 1996; Hockey *et al.* 1998). A disruption or variation to this inherited pattern of migration may impair their capacity to complete the cycle successfully. Unfortunately, such a major disruption is occurring. The tidal flats over vast areas of the Yellow Sea staging grounds are being reclaimed and developed for industry with attendant waste and pollution (Van de Kam *et al.* 2010). Regular surveys carried out by AWSG have already indicated that in some species the number of birds now using the East Asian/Australasian Flyway has decreased substantially (e.g. approximately 30% in the case of the Great Knot and Curlew Sandpiper) (Minton *et al.* 2005; Bamford *et al.* 2008). In this context it is quite possible that the numbers given in our species accounts for these and similar species will not be seen again. Furthermore, the inability of many species to pioneer new routes to overcome the substantial loss of feeding habitat illustrates how threats to the avifauna of the Pilbara can arise from events occurring in areas far beyond the region. The whole Eighty Mile Beach area has been listed as a RAMSAR site in order to secure this important staging area for these birds on their return flight northwards.

Breeding

Based on the number of land birds known to have bred in each month (i.e. laid eggs), most breeding in the Pilbara occurs from July to September but there is also a minor peak in March–April (Figure 2; note that records of occurrence are a surrogate measure of effort). The autumn peak is presumably

linked to the occurrence of cyclones that result in January to March being the wettest months (Ambrose and Murphy 1994; McKenzie *et al.* 2009). More species are known to breed in August than any other month, with 86% of breeding land birds recorded as having bred in that month. The major peak is very similar in size and shape to that found for the Carnarvon Basin to the south, where there are about 90 species (78% of the breeding land birds) known to breed in August (Johnstone *et al.* 2000). However, the Carnarvon region lacks a noticeable peak in autumn. Interestingly, given the relatively low number of occurrence records from the December to March period (a reflection of reduced observer activity) the number of species breeding in this period may be under-estimated. Just south of the Pilbara, Carnaby (1954) found a bimodal distribution of nesting activity, with a clear peak in March–April and second peak in August–September, with more nests being found in August than in any other month. At Ulawarra, on the south-western margin of our study area, Robinson (1955) noted that many species have two breeding seasons each year, breeding in each of the peak periods noted above. A peak of breeding in summer would be consistent with Nix's (1976) predictions of maximum breeding activity for this part of Australia, based on the timing of maximum quarterly growth index values. We would encourage further investigation into the breeding biology of Pilbara birds.

Changes in status

Of the 203 breeding species we assessed, none is known to have become extinct in the region, except possibly the Chestnut Teal. A small number have declined, however, namely the Plumed Whistling Duck, Purple Swamphen, Bush Stone-curlew, Beach Stone-curlew, Fairy Tern, Pheasant Coucal and possibly the Night Parrot. In addition, some waders including the Eastern Curlew, Great Knot and Curlew Sandpiper, appear to have declined in abundance since the 1980s, matching declines noted elsewhere (Garnett *et al.* 2011).

Overall, about 20 species appear to be increasing in abundance for various reasons and these changes are discussed below.

1. Stubble Quail appears to have increased in abundance in the past 50 years; few records prior to 1966.
2. Brown Quail has increased in range and abundance since the introduction of Buffel Grass and a series of cyclones in 1990s.
3. Black Swan, formerly a scarce visitor, but since the 1970s it has become an increasingly frequent visitor, especially to sewage ponds.
4. Australian Shelduck reported more frequently since the 1970s.
5. Plumed Whistling Duck, apparently much more numerous and widespread before the degradation of the coastal plain and river valleys. Few records between 1922 and the 1990s but since that time an apparent increase in numbers after a series of cyclones flooded the coastal plain.
6. Pink-eared Duck, an apparent increase in abundance, with few records for the region before the establishment of sewage ponds.
7. Australian Grebe and Hoary-headed Grebe both appear to have increased since the 1970s with the establishment of many sewage ponds.
8. Black-necked Stork, formerly only a vagrant but increasing in the last 50 years and now a moderately common resident.
9. Black-breasted Buzzard, rare between 1900 and 1980 but now moderately common and increasing in abundance, probably due to decline in poisoning dingoes by pastoralists.
10. Black Kite, originally a scarce visitor from the Kimberley but with increase in development (especially increase in food supply, i.e. garbage, sewage and road kills) now more frequent, and breeding.
11. Wedge-tailed Eagle, appears to have increased since the 1960s, probably due to the increase in carrion. This is consistent with observations elsewhere in WA (Saunders and Curry 1990; Johnstone *et al.* 2000) and in other parts of arid Australia (e.g. Smith and Smith 1994).
12. Australian Kestrel has probably increased in abundance in the past 100 years.
13. Brolga appears to have increased in range and abundance in past 50 years.
14. Red-chested Button-quail appears to have increased in range and abundance since the introduction of Buffel Grass and a spate of cyclones in 1990s.
15. Masked Lapwing, formerly a rare visitor from the Kimberley (one record prior to 1999), now resident and expanding its range and abundance.
16. Lesser Crested Tern appears to be increasing in abundance and expanding southwards.
17. Roseate Tern, appears to be increasing in abundance.
18. White-shafted Little Tern appears to be increasing in abundance as a breeding bird on the Eighty Mile Beach and apparently spreading southwards, like several other tropical terns (see Wooller *et al.* 1991).
19. Crested Pigeon has benefited greatly from the pastoral industry, especially the provision of

water supplies for stock. A similar increase has been observed further south in the Carnarvon Basin (Johnstone *et al.* 2000).

20. Galah has benefited greatly since the 1930s with the expansion of pastoral industry, similar to the way it has done further south in the Carnarvon Basin (Johnstone *et al.* 2000).
21. House Crow, along with the huge increase in shipping to the Pilbara from Asia there has been a marked increase in the reporting rate of this species.
22. Torresian Crow and Little Crow both appear to have benefited from pastoralism.
23. Fairy Martin has benefited greatly from the provision of artificial water points and nest sites (e.g. culverts, bridges, tanks, buildings, rock piles) that have proliferated in the past 50 years.
24. Australian Reed Warbler has probably increased with the expansion of artificial water points and sewage ponds.
25. Zebra Finch is the most plentiful bird in the region and has no doubt benefited from both the pastoral and mining industries with the proliferation of watering points.
26. Pictorella Mannikin judging from recent records this species appears to be increasing in abundance and is possibly also expanding its range southwards from the Kimberley.

Impacts of nuclear tests on Montebello Islands

The status of several species on the Montebello Islands changed and some disappeared after atomic weapons were tested there in the 1950s, although Black Rats and Feral Cats were common and probably also contributed (A.A. Burbidge *et al.* 2000; Algar *et al.* 2002). Montague (1914) gave a detailed account of the fauna of these islands and in 1912 he collected two Collared Kingfishers and recorded the Spinifex-bird on Hermite Island. The islands were next visited in August 1950 by Sheard, who observed the Spinifex-bird and the White-winged Fairy-wren on Trimouille Island. This was the first and only record of this wren from these islands. Hill (1955) also recorded Collared Kingfishers on the Montebello Islands in 1952 and compiled data on the fauna following the testing. A bay on Trimouille Island was the site of the first British atomic weapon test on 3 October 1952. This was followed by a further two tests in 1956, the second of which was the largest device detonated in Australia. Following the blasts, neither Hill (1955) nor any other visitor has recorded the Collared Kingfisher, White-winged Fairy-wren and Spinifex-bird there, e.g. Serventy in 1958 and Burbidge in 1970 (A.A. Burbidge *et al.* 2000 and references therein). As a contribution towards reconstructing the bird fauna of the Montebello Islands, the Department of Environment and

Conservation translocated 27 White-winged Fairy-wrens to Hermite Island in 2010 and 10 in mid-2011, and 35 Spinifex-birds in 2010 and 12 in 2011. The Montebello Islands are now listed as an Important Bird Area (IBA) by Birdlife Australia (Dutson *et al.* 2009).

In conclusion, we would like to point out that this study has used a combination of both past and present survey data. This includes the broad-scale information compiled from the Storr-Johnstone Bird Data Bank of mainly historical records together with recent observations and contemporary quadrat based surveys, and this has produced a more definitive picture of the distribution, status and changes in the avifauna of the Pilbara than would otherwise have been possible.

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