

Information Sheet on Ramsar Wetlands (RIS) – 2009-2012 version

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX.22 of the 9th Conference of the Contracting Parties (2005).

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Designation date

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Site Reference Number

2. Date this sheet was completed/updated:

June 2011

3. Country:

Australia

4. Name of the Ramsar site:

The precise name of the designated site in one of the three official languages (English, French or Spanish) of the Convention. Alternative names, including in local language(s), should be given in parentheses after the precise name.

The Dales

This site was formerly listed on the Ramsar list as “The Dales”, Christmas Island.

5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):

a) Designation of a new Ramsar site ☐; or

b) Updated information on an existing Ramsar site ☒

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area

The Ramsar site boundary and site area are unchanged: ☐

or

If the site boundary has changed:

i) the boundary has been delineated more accurately ☒; or

ii) the boundary has been extended ☐; or

iii) the boundary has been restricted** ☐

and/or

If the site area has changed:

i) the area has been measured more accurately ☒; or

ii) the area has been extended ☐; or

iii) the area has been reduced** ☐

**** Important note:** If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

There has been no major change to the ecological character of the Ramsar site since the previous Ramsar Information Sheet

Two criteria have had their justification modified. A large number of threatened terrestrial species were used as justification for meeting criterion 2 in the previous RIS. Only wetland dependent species are listed in this version of the RIS and include: Abbott's booby (*Papasula abbotti*) and Christmas Island frigatebird (*Fregata andrewsi*).

The justification for meeting criterion 8 has been changed since the previous version of the Ramsar Information Sheet. Re-examination of the evidence to support this criterion has revealed that the site meets this criterion on the basis of supplying a food resource for Whale Sharks (*Rhincodon typus*).

Although prior RISs indicated that The Dales had an area of 57 hectares, this appears to have been a calculation error and should be 580 hectares. This updated area reflects the original intent of the Ramsar site's nomination and matches the boundary originally given to The Dales.

7. Map of site:

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

- i) a hard copy (required for inclusion of site in the Ramsar List): ☐;
- ii) an electronic format (e.g. a JPEG or ArcView image) ☒;
- iii) a GIS file providing geo-referenced site boundary vectors and attribute tables ☐.

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The Dales Ramsar site is on the western side of Christmas Island.

The boundary commences on the western boundary of Christmas Island National Park, as proclaimed on 14th December 1989, at the point nearest to 105°32' 43.130"E, 10° 29' 47.416" S (marked as point A on the map at Figure 1). The boundary follows the National Park boundary in a generally northerly direction to the point on the Christmas Island National Park boundary nearest to 105° 33' 24.239" E, 10° 28' 10.746" S (point B). The boundary heads inland to Martin Point Lookout and follows the northern edge of the Martin Point Lookout walking track until it joins the Dales Rd. From the northern most point of the junction of the Martin Point Lookout track and the Dales Rd (point C) the boundary follows a direct line to the northern corner of the mining lease on the National Park boundary at the point nearest to 105° 34' 5.189"E, 10° 28' 13.503" S (point D). The boundary then follows the National Park boundary in a generally southerly direction around the mining lease until the boundary meets Winifred Rd at the point nearest to 105° 34' 24.011" E, 10° 28' 42.177" S (point E). The boundary follows the western edge of Winifred Rd in a generally southern direction until the road forks, and then heads in a generally westerly direction following the northern edge of Winifred Rd to the end of the road at the coast. From the end of the road, the boundary is a straight line extending seaward to the park boundary meeting the boundary at the starting point (point A).

8. Geographical coordinates (latitude/longitude, in degrees and minutes):

Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

Latitude: 10°29'S; Longitude: 105°34'E

9. General location:

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

The Dales Ramsar site is located in the Australian Territory of Christmas Island in the Indian Ocean. The site is approximately 2800 kilometres west of Darwin (Northern Territory) and 2,600 kilometres northwest of Perth (Western Australia); within the Christmas Island National Park. The site lies on the central western coast of Christmas Island and is approximately 15 kilometres from the nearest settlement at Drumsite, which is located on the east coast of the island. The western boundary of the Ramsar Site extends 50 metres seaward from the low water mark, and therefore incorporates part of the coastline (corresponds with the western boundary of the National Park).

10. Elevation: (in metres: average and/or maximum & minimum)

Minimum: 0 metres above sea level.

Maximum: 150 metres above sea level.

Average: 25 metres above sea level.

11. Area: (in hectares)

580 hectares

Although prior RISs indicated that The Dales had an area of 57 hectares, this appears to have been a calculation error. The update area reflects the original intent of the Ramsar site's nomination and matches the boundary originally given to The Dales.

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Ramsar Site includes a near-pristine system of seven watercourses, collectively known as "The Dales". The site is located within the Christmas Island National Park and includes permanent and intermittent streams and includes the majority of surface water on the island. The Dales are surrounded predominantly by semi-deciduous forest. On the seaward side at the edge of the shore terrace there is a line of coastal shrubland which merges with sea cliffs and rocky marine shores. The site extends seaward 50 metres and includes part of a narrow, shallow, sloping reef. Mixed amongst the terrestrial and marine environments are a range of karst features, highly representative of the environment of Christmas Island. The presence of surface and subterranean karst features makes the site particularly important, being the first Australian Ramsar site to include such ecosystems. The combination of this variety of habitats and the presence of permanent surface water provide the physical habitat template which supports a wide diversity of endemic and threatened species. The site plays host to the annual mass migration and spawning of red crabs (*Gecarvoioidea natalis*) as well as providing critical habitat for the blue crab (*Discoplax hirtipes*). In total 20 species of land crabs are found within the site, all migrating to the ocean to spawn.

13. Ramsar Criteria:

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1	•	2	•	3	•	4	•	5	•	6	•	7		8	•	9	
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14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 1: *A wetland should be considered internationally important if it contains a representative, rare or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.*

The Dales are located in the Christmas Island Province bioregion, which encompasses Christmas Island and 277 180 square kilometres of the surrounding Indian Ocean (Heap et al. 2005).

Christmas Island represents the only land mass within the Christmas Island Province bioregion and the wetlands associated with The Dales, particularly the karst system, are unique in a bioregional context. Further information regarding the karst system can be found below in part 16.

Criterion 2: *A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.*

There are two wetland dependent threatened species supported by the wetlands within The Dales Ramsar site:

Common name	Scientific name	IUCN	CITES	CMS	National Status
Abbott's booby	<i>Papasula abbotti</i>	Endangered	Appendix I	-	Endangered, Marine, Migratory
Christmas Island frigatebird	<i>Fregata andrewsi</i>	Critically Endangered	Appendix I	-	Vulnerable, Marine, Migratory

Several other threatened species which are not wetland dependent are also found within The Dales Ramsar site

Common name	Scientific name	IUCN	CITES	CMS	National Status
Mammals					
Christmas Island shrew	<i>Crocidura attenuate trichura</i>	Critically Endangered	-	-	Endangered
Plants					
Lister's palm/ arenga palm	<i>Arenga listeri</i>	Vulnerable	-	-	-
Birds					
Christmas Island imperial pigeon	<i>Ducula whartoni</i> (endemic)	Vulnerable			Vulnerable
Christmas Island emerald dove	<i>Chalcophaps indica natalis</i> (endemic)	-	-	-	Endangered
Christmas Island goshawk	<i>Accipiter fasciatus natalis</i> (endemic)	Endangered	-	-	Vulnerable
Christmas Island hawk-owl	<i>Ninox natalis</i> (endemic)	Vulnerable	Appendix I	-	Endangered
Christmas Island thrush	<i>Turdus poliocephalus erythropleurus</i> (endemic)	-	-	-	Endangered
Christmas Island white-eye	<i>Zosterops natalis</i> (endemic)	Vulnerable	-	-	Vulnerable

Criterion 3: *A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.*

Christmas Island is recognised for its high conservation values and is specifically identified as an area for biodiversity conservation under Part 9 of the EPBC Regulations 2000. All native species on the island, as detailed in Schedule 12 of the Act, are considered protected. Of particular note is the land crab diversity, with Christmas Island supporting the greatest diversity of land crabs on an oceanic island in the world. All

20 species of land crab found on the island (Green 2009) occur within the Ramsar site, with the site particularly important for the blue crab (*Discoplax hirtipes*). In addition The Dales support a 10 hectare mono-dominant stand of Tahitian chestnut (*Inocarpus fagifer*), and is unique in the bioregion (P. Green, Latrobe University pers. comm.). The Dales include most of the habitat types present within the bioregion within the boundary of the site including semi-deciduous forest, coastal shrubland, sea cliffs rocky marine shores and shallow coral reef. Mixed amongst the terrestrial and marine environments are a range of karst features, highly representative of the environment of Christmas Island.

The site supports a number of endemic species like the red crab (*Gecarvoidea natalis*), a damselfish (*Stegastes insularis*), the sage orchid (*Brachypeza archytas*), arenga palm (*Arenga listeri*) and the Christmas Island spleenwort (*Asplenium listeri*). There is a total of eighteen endemic species (see Appendix A) of vascular plants on Christmas Island which may be present on the Ramsar site, however a floristic survey specific to The Dales has not been undertaken.

Criterion 4: *A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.*

The Dales is significant habitat and a migratory route for the red crab (*Gecarvoidea natalis*), the blue crab (*Discoplax hirtipes*) and the robber crab (*Birgus latro*). Blue crabs in particular are reliant on the Ramsar site, as they require freshwater to maintain respiratory function. During the wet season there is sufficient surface water in forests to maintain gill functioning in blue crabs and they can range over large areas of Christmas Island. However, during the dry season they are restricted to permanent freshwater sources, such as that provided by The Dales (Hicks et al. 1984). Their burrows at The Dales intersect the water table, with the bottom part of the burrow underwater (Hicks et al. 1984). In addition the site provides important habitat for land crab spawning, with all 20 species which occur in the site, migrating to the ocean to spawn with their larval stages being marine. The freshwater streams provide critical habitat for the blue crabs as the larvae emerge from the ocean and return inland (Hicks et al. 1984). Within the Ramsar site all the Dales are important migration pathways, but especially Sydney's Dale and No. 1 Dale.

The majority of birds found on Christmas Island are seabirds that live predominantly out at sea, utilising the island for breeding. Abbott's booby only comes ashore to nest and breed. Christmas Island is the only extant breeding colony. The species nests in the canopy of the tall emergent rainforest trees in the western, central and northern portions of the island (Reville et al. 1990; DEH 2004). Within The Dales the nesting sites occur in the vicinity of the eastern and north eastern boundaries. The red-footed booby (*Sula sula*) and the brown booby (*Sula leucogaster plotus*) also nest within the Ramsar site.

Criterion 8: *A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks either within the wetland or elsewhere, depend.*

The mass spawning and development of the larvae of the red crab (*Gecarvoidea natalis*) corresponds to the arrival and aggregation of juvenile whale sharks (*Rhincodon typus*) off shore of Christmas Island. Meekan et al. (2009) published results confirming whale sharks are feeding on the immature stages of the red crab. The offshore waters are believed to provide an important habitat and feeding area for the whale shark.

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Christmas Island Province

b) biogeographic regionalisation scheme (include reference citation):

IMCRA v4 (Commonwealth of Australia 2006)

16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Christmas Island lies within the moist tropical climatic zone of the Indian Ocean. The general climatic pattern is warm to hot temperatures and high rainfall occurring year round. Annual average rainfall at Christmas Island is in the order of 2,000 millimetres per year. The site is located in an area subject to tropical cyclones. Thirteen tropical cyclones were recorded in the vicinity of Christmas Island between 1972 and 2005. On average this equates to a tropical cyclone every two and a half years.

Christmas Island is dominated by a karstic landscape and drainage system with significant karst features both on the surface and underground. Cave formations typically occur at the basalt and limestone and sea and freshwater interfaces (Humphreys and Eberhard 2001). Anchialine caves at the current and ancient shoreline levels, formed by erosion from sea wave action, can extend considerable distances inland. Anchialine karst caves begin at the coast where the groundwater meets the sea, but the formation of the cave goes upwards along the groundwater drainage line, thus often extending inland beyond the influence of the sea.

The Dales contain flowstone formations which are more typically found underground (SKM 2000). The islands water drainage system is karstic, with rainfall percolating into the limestone then forming underground aquifers and drainage lines along the basalt. Short spring fed surface streams occur on the margins of the island where limestone and basalt interface leading to surface expression of the groundwater. The Dales support three such springs.

Grimes (2001) describes The Dales as narrow ravines, some with springs, occurring at volcanic outcrops forming streams which become deep fissures closer to the coastline. Considered surface karst features themselves, the other karst features at The Dales include springs and tufa deposits (Grimes 2001). Tufa deposits occur at Hugh's waterfall below a spring and have large vertical tufa deposits (Grimes 2001). Tufa is the calcareous and siliceous rock deposits which come from springs and groundwater.

17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

Christmas Island is a seamount island, which rises above the 5 500 metre deep abyssal area of the Western Australian Basin (SKM 2000). The island has a basaltic volcanic core overlain with limestone of predominantly Tertiary origins (Woodroffe 1988). The island is characterised by a series of stepped terraces, which developed during uplift events. The most prominent of the limestone terraces, is the lowest one, called the "shore terrace". This feature surrounds the entire island, with the exception of a short break in the northeast at Flying Fish Cove. The Dales Ramsar site lies predominantly in the shore terrace, however the site also spans the plateau and rocky shores.

Although Christmas Island is completely surrounded by coral reef, the extent of this habitat is limited (Gray and Clarke 1995). At the seaward edge, reef is limited by a steep drop off some 20 to 100 metres from shore, where the underwater terraces descend steeply. At the landward edge, reef is limited by the exposed coastline and high impact of waves and consequently only extends to the intertidal zone in sheltered locations (Gray and Clarke 1995).

The soils of Christmas Island are derived from two sources; limestone (terra rossa soils) or basaltic extrusive rocks (krasnozem soils). Terra rossa soils occur mainly on exposed terraces, and are predominantly thin, red-grey soils that dry out rapidly. They may have high phosphate content and be over 30 metres deep. Krasnozem soils are red brown in colour and occur in areas of volcanic activity or in fault or fissure zones. There has been no systematic evaluation of the non mined/non phosphate reserve regions of the island, so other soil types may exist.

The hydrology of Christmas Island is driven strongly by the underlying geology. The high porosity of the surface soils and underlying limestone limits the formation of permanent surface water. Surface water run-off is confined to the wet season (December to March) in relatively short, spring fed streams (Grimes 2001). The dominant water resource on the island, and the source of water for The Dales Ramsar site, is groundwater.

Climate in the catchment is as described above in section 16.

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

Christmas Island has a karst drainage system with surface water restricted to a few springs, and intermittent systems which flow after significant rainfall events in the wet season, but last only for short periods of time (Grimes 2001). Springs are fed from recharge areas on the plateau (Puhlovich et al. 2003) with approximately half of incident rainfall passing through the soil zone to recharge the aquifers, with recharge occurring rapidly once soils are saturated. Recharge also occurs through dissolution features including dolines and sinkholes (Puhlovich et al. 2003).

Rain infiltrates the land surface and contributes to soil water storage, being taken up by plants or moving to recharge the groundwater. Water either flows along the interface or down fractures in the volcanic rock and contributes to basal and perched aquifers (SKM 2000). Higher permeability of the limestone on the margin of the island results in the water table being just above sea level (SKM 2000; Grimes 2001).

The Dales represent the main area of permanent surface water on Christmas Island and are expressions of groundwater discharge and seasonal rainfall.

19. Wetland Types

a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp • Ts • U • Va •
Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

In the RIS (2002) Ramsar wetland types Tp and Ts were listed as occurring at The Dales, however, in the 2010 Ecological Character Description these marsh and pool areas were not felt to be distinct from the permanent and intermittent streams and as such have been combined under type M and N.

b) dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

The extent of each wetland type is not known at this stage but the following is judged the order of likely dominance:

Zk(b), Zk(a), N, D, C, Y, Xf, M, E.

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The terrestrial vegetation, and other biota, of Christmas Island are derived from species colonisation and show little affinity with the Australian mainland. The isolation of the island and the randomness of the colonisation process have resulted in a unique flora and fauna (Expert Working Group 2009). The major types of rainforest on the island are dominated by plants which are pan-tropical species most likely from South East Asia (Expert Working Group 2009). The dominant vegetation types present on Christmas Island include plateau/primary rainforest, marginal rainforest, and scrub forest (also referred to as open forest and vine forest). Other minor community types include coastal fringe forest (also referred to as shore cliff and spray zone vegetation), and areas with surface water such as The Dales. Within the boundary of the site the following vegetation associations occur:

- Semi deciduous closed forest/ Marginal rainforest (438.2 hectares): characterised by a more open forest than the plateau rainforest, on thinner soils on the lower terraces, at elevations predominantly above 130 metres (Mitchell 1985).
- Evergreen tall closed forest/ Plateau rainforest (86.4 hectares): characterised by deeper soils with rainforest species reaching 30 – 45 metres tall with emergent trees reaching up to 50 metres. Usually restricted to elevations above 160 metres (Mitchell 1985). Included in this association is the distinctive vegetation community of ‘closed forest, freshwater seepage’. Hugh’s Dale supports a 10 hectare mono-dominant stand of Tahitian chestnut (*Inocarpus fagifer*).
- Coastal fringe shrubland and herbland/ coastal fringe forest (11.1 hectares): as the name suggests this vegetation type is a narrow strip along the coastline between the sea cliffs and edge of the marginal forest, dominated by low stature sclerophyllus species which have their stature affected by exposure to wind and sea spray (Mitchell 1985, Parks Australia 2008).

The Dales supports a number of unique ecological and geomorphic features including anchialine cave communities, surface karst including the unique stepped tufa deposits at Hugh’s waterfall, the stand of Tahitian chestnuts, supports a large number of endemic terrestrial species and a significant number of seabirds including Abbott’s booby (*Papasula abotti*), red-footed booby (*Sula sula*) and the brown booby (*Sula leucogaster plotus*), all of which breed at the site.

The Dales Ramsar site supports all 20 species of land crabs found on the island. In particular, large numbers of three species occur at the spring site:

- red crab (*Gecarcoidea natalis*) – which are the most abundant at the site and is endemic to Christmas Island;
- robber crab (*Birgus latro*) – which are considered common; and
- blue crab (*Discoplax hirtipes*) – which have been described as restricted to the freshwater wetland (and other freshwater areas on the Island). Although widespread, this species occurs in its blue form only on Christmas Island.

The site includes a rocky marine shore and coral reef. Although there is little direct information on these environments, observations and anecdotal evidence suggests that the marine environment and biota of the east coast of Christmas Island is similar to other marine areas that have been surveyed (Jean-Paul Hobbs, James Cook University, pers. comm.). The reef at Christmas Island is dominated by hard corals, with low cover of soft corals, encrusting algae and other biota. Six hundred and twenty-two species of fish from 80 families have been recorded in the waters of Christmas Island (Hobbs et al. 2010). The list includes species of Indo-Pacific, Pacific Ocean and Indian Ocean origins and Christmas Island is considered as an important “stepping-stone” in the dispersal of species between the Indian and Pacific Oceans (Hobbs et al. 2010).

Services provided by the site are largely ecological supporting services and include ecological connectivity, near natural wetland ecosystem, significant biodiversity values, two distinct food webs, special ecological and geomorphological features, supporting threatened wetland species and unique wetland species.

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

The Dales Ramsar site supports a diverse community of tree species and epiphytes. At Hugh's Dale, both above and below the waterfall, and in parts of Anderson Dale and Sydney's Dale are monodominant stands of Tahitian chestnut (*Inocarpus fagifer*) and the rare epiphytic ribbon fern (*Ophioglossum pendulum*). The endemic arenga palm (*Arenga listeri*) and endemic Ridley's orchid (*Brachypeza archytas*) are common in The Dales. The tropical almond (*Terminalia catappa*) grows to an unusual size on Christmas Island and several large specimens occur in The Dales. The main vegetation associations are described in section 20 above.

There are approximately 420 species of vascular plants on Christmas Island, however a floristic survey specific to The Dales has not been undertaken. Of the 420 species found on Christmas Island, 242 are indigenous and 177 are naturalised since human occupation (Claussen 2005). The island has eighteen endemic species (see Appendix A), including the lithophytic fern, *Asplenium listeri*, which is listed under the EPBC Act. Two ground ferns *Pneumatopteris truncate* and *Tectaria devexa* var *minor* are also EPBC Act listed.

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Christmas Island is renowned for its birdlife, with a large number of seabirds and migratory species utilising the habitats of the island for roosting and breeding, many of which occur in The Dales. Of particular note are the large breeding colonies of seabirds, including the last extant colony for Abbott's booby (*Papasula abotti*) which is listed as endangered under the EBPC Act. Another threatened wetland dependent listed species also occurs within the site, the Christmas Island frigatebird (*Fregata andrewsi*), which is listed as vulnerable. Data from the Bird Atlas (Birds Australia unpublished) puts the number of species on the island at 42, with 20 of these species occurring within The Dales Ramsar site. Other sources put the number of bird species on the island as much higher, as a large number of vagrant species (104 vagrants - Parks Australia 2008, 76 vagrants - Director of National Parks 2002) have been sighted on the island. See Appendix B for wetland species recorded in The Dales.

The Christmas Island fish community also consists of seven endemic species which are likely to occur within the site:

- mottled sole (*Aseraggodes crypticus*)
- Cocos angelfish (*Centropyge jocularis*)
- lemonpeel angelfish (*Centropyge flavissima*)
- Christmas eviota (*Eviota natalis*)
- Christmas dottyback (*Pseudochromis viridis*)
- Christmas blenny (*Præalticus natalis*)
- island Gregory (*Stegastes insularis*)

The Cocos angelfish (*Centropyge jocularis*) is locally abundant and endemic to both Christmas Island and Cocos (Keeling) Islands. The Island Gregory (*Stegastes insularis*) is also locally abundant in shallow waters (Gilligan et al. 2008) and can only be found at Christmas Island and in small pockets of the north east Pacific.

Christmas Island is also a globally significant area for whale sharks because juveniles aggregate at the Island in summer to feed on the larvae of red crabs (Hobbs et al. 2009). They have been observed along the east coast of the island within 50 metres of the shoreline (J-P Hobbs, James Cook University, pers. comm.) and so potentially could occur at times within the Ramsar Site.

A notable feature of Christmas Island is that it supports a broad band of caverns and associated crevicular habitat from above the surface of the ocean to a depth of over 100 metres (Humphreys et al. 2009) that support anchialine fauna. Anchialine systems are essentially interfaces between marine and inland waters, described by Humphreys and Danielopol (2006) as groundwater estuaries (see section 4.3.1). There is only one other anchialine system in Australia, the Cape Range/Barrow Island area (Humphreys and Eberhard 2001). Two distinct types of anchialine fauna have been identified, each with an often predictable species assemblage: the remipede and procaridid types (Humphreys and Danielopol 2006). The procaridid type is usually restricted to seamount islands such as Christmas Island and typically contains typically comprises procaridid, alpheid, hippolytid, and atyid shrimps (Humphreys and Danielopol 2006). Whilst the stygofauna is considered a significant component of the biodiversity values of the island it is not known if anchialine communities are present within The Dales Ramsar site, however as there is at least one sea cave within the site it is likely. This remains a knowledge gap for the site.

23. Social and cultural values:

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

Local people as well as tourists visit The Dales. It is, in fact, one of the most popular destinations for sightseeing and recreation on the island, with the waterfall at Hugh's Dale being the sites greatest attraction. The Dales are an area of high conservation and recreation significance. An increase in this type of activity may be expected in the future.

The resident population of the island has an ethnic composition of Chinese, European and Malay. The Christmas Island Rey Tseng Temple Association, a Chinese Buddhist sect, have declared the Hugh's Dale waterfall as a significant cultural site in relation to their worship and regularly conduct ceremonies and worship at the site.

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box ☐ and describe this importance under one or more of the following categories:

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:
- ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
- iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
- iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:

a) within the Ramsar site:

The Dales Ramsar site is entirely within a declared Commonwealth Reserve under the control of the Director of National Parks.

b) in the surrounding area:

The Dales are predominantly surrounded by National Park, although there is a mining area (Mining Lease 140) adjacent to the site boundary to the east and north-east. The main Christmas Island Immigration Detention Centre facility is approximately 0.5 kilometres from the northern boundary of the site.

25. Current land (including water) use:

a) within the Ramsar site:

National Park, conservation, research and recreation.

b) in the surroundings/catchment:

The surrounding areas are predominantly National Park with some areas of mining, transport (roads and airport), detention centre and domestic residences at the opposite side of the island.

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

a) within the Ramsar site:

The greatest known threat to the ecological character from within the Ramsar site comes from the invasive yellow crazy ant (*Anoplolepis gracilipes*). Yellow crazy ants are thought to have been introduced accidentally to Christmas Island between 1915 and 1934 (O'Dowd et al. 1999). On Listed as one of the top 100 worst invasive alien species in the world by the Global Invasive Species Database (2009), they have caused wide scale impacts to tropical ecosystems on Christmas Island. Yellow crazy ants forage over a large range of habitats, including forest floor and canopy and are scavengers feeding on a range of invertebrates, but may also be reliant on carbohydrates, which they obtain from plant nectar or honeydew-producing scale insects (particularly of the Homoptera genus). Christmas Island the relationship between yellow crazy ants and scale insects has resulted in the formation of multi-queen "super colonies" which result in high population densities (Abbott 2005). Yellow crazy ants were first found at The Dales in 1997 (P. Green, Latrobe University, pers. comm.) prior to listing and that this has resulted in impacts on the red crabs and forest structure dynamics in parts of the site. The blue crab appear to be less affected by the ants, perhaps due to the water within their burrows diluting the formic acid.

Increased population on the island has potential to increase recreational impacts on the site. Increases in visitor numbers may necessitate further low key facilities and infrastructure to maintain the area in a relatively pristine condition.

b) in the surrounding area:

There is little permanent surface water on Christmas Island, and water for consumptive uses is extracted from the unconfined aquifers. While, there is no information on the quantity of water extracted for consumptive purposes, recent increases in the population at Christmas Island (including the large influx of people associated with the immigration detention facility) may pose a serious threat to freshwater ecosystems. Although water is not extracted from The Dales directly, Grimes (2001) described the groundwater resources of the island as interconnected. This suggests that extraction from water on the plateau at Grants Well or Jane-up, could impact on the discharge volumes and rates at coastal springs on the shore terrace. A significant reduction in flow, or a loss of permanent water at The Dales Ramsar site has the potential to result in dramatic effects to the ecological character of the site. This situation could be exacerbated by climate change if rainfall were to decrease.

There are a variety of climate change predictions for Christmas Island (McInnes et al. 2008); those of direct relevance to The Dales Ramsar Site are related to rainfall, tropical storms and sea temperature. In general it is thought that the intensity (if not the frequency) of tropical storms could increase and sea surface temperatures will rise by up to 2.5 degrees Celsius by 2070 (McInnes et al. 2008). The predicted increases in sea temperature are likely to impact on the marine communities of Christmas Island (including those in the Ramsar Site) through increasing diseases such as White Syndrome and coral bleaching.

The nearby Christmas Island Immigration Detention Centre (IDC) may also be a direct or indirect threat regarding groundwater use, impacts of traffic on land crabs and the IDC providing habitat and therefore source populations for invasive species, such as cats and rats. However, these threats have not been fully assessed or quantified.

The South-East Asian wolf snake (*Lycodon aulicus capucinus*) was accidentally introduced to the island around 1987, and densities in the residential areas of the Island were relatively high until about 1993. Since then, anecdotal evidence suggests that their densities have declined but they now occur in primary rainforest and in the Central Plateau area. This increase in range may have contributed to the decline in numbers of some of the native reptiles and the pipistrelle bat in the national park. Further research is required to understand the potential impact of this species and possible control options.

The giant African snail (*Achatina fulica*) was probably introduced to Christmas Island during the Second World War (Sproul 1983). It feeds on a wide variety of plants and there is concern about the potential environmental damage it could cause. The presence of land crabs appears to restrict its distribution and abundance. The impact of yellow crazy ants on crab populations may provide potential for the snail to expand its range.

27. Conservation measures taken:

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

The site is within a National Park, managed for conservation and visitor access to the site is controlled by Parks Australia.

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ☐; Ib ☐; II ☒; III ☐; IV ☐; V ☐; VI ☐

c) Does an officially approved management plan exist; and is it being implemented?:

Christmas Island National Park Management Plan, Director of National Parks (2002).

d) Describe any other current management practices:

Current management activities include:

- Research and control programs to better understand the ecology of the yellow crazy ant
 - Island wide survey that monitors yellow crazy ant and red crab distribution and abundance as well as other biodiversity is ongoing.
 - Visitor management activities include maintaining interpretative signage, board walks and walking tracks to minimise recreational impacts.
-

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

The management plan is currently being updated and due for release in 2011.

29. Current scientific research and facilities:

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Scientific research is periodically carried out within the Ramsar Site boundaries, although no site specific recent studies have occurred within the site boundary.

30. Current communications, education, participation and awareness (CEPA) activities related to or benefiting the site:

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

The management plan for the Christmas Island National Park contains a number of key communication messages and a program for implementing community education.

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

The Dales, plays a role in the economic development of the island as an eco-tourism destination (Director of National Parks 2002). Recreational activities within The Dales include, walking, sightseeing, and the enjoyment of wildlife (Director of National Parks 2002). Since human settlement in 1888 members of the Malay and Chinese communities, in particular, have fished for food and they consider fishing to be part of their cultural lifestyle rather than a recreational pursuit (Director of National Parks 2002). Overall visitor numbers are low and so the pressure from recreation and tourism is considered low. There is, however, increasing use of the site due to recent population increases on the island and potential impacts from recreational activities needs to be monitored. Visitor facilities that have been provided at The Dales include interpretive signs and a short self-guided nature trail along boardwalks and walking tracks.

32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Commonwealth of Australia

33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Director of National Parks
GPO Box 787
Canberra, ACT 2601

34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

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Appendix A: Endemic Flora (vascular)

Species names from EWL Sciences and Tallegalla (2005), common names from Director of National Parks (2002).

Family	Species	Lifeform	Habitat	Common name
Malvaceae	<i>Abuliton listeri</i>	shrub	coast and shore terrace	lantern flower
Areaceae	<i>Arenga listeri</i>	palm	closed forests	arenga palm, Christmas Island palm
Aspleniaceae	<i>Asplenium listeri</i>	fern	exposed limestone outcrops	spleenwort
Acanthaceae	<i>Asystasia alba</i>	herb	terrace forest	
Orchidaceae	<i>Brachypeza archytas</i>	epiphytic orchid	terrace and plateau forests	
Rhamnaceae	<i>Colubrina pendunculata</i>	shrub/ small tree	terrace shrubland	
Urticaceae	<i>Dendrocnide peltata</i> var. <i>murrayana</i>	small tree	inland cliffs	stinging tree
	<i>Dicliptera maclearii</i>	herb	terrace vegetation	
	<i>Flickingeria nativitatis</i>	epiphytic orchid	plateau forests	
Tiliaceae	<i>Grewia insularis</i>	small tree	terrace forest	
Asclepidaceae	<i>Hoya aldrichii</i>	vine	closed forests	hoya vine
Poaceae	<i>Ischaemum nativitatis</i>	grass	seacliffs	Christmas Island duck beak
Pandanaceae	<i>Pandanus christmatensis</i>	shrub	shore and inland cliffs	pandanus, screw pine
	<i>Pandanus elatus</i>	shrub/small tree	forest understorey	pandanus, screw pine
Piperaceae	<i>Perperomia rossii</i>	epiphytic herb	plateau (?)	
	<i>Phreatia listeri</i>	epiphytic orchid	plateau forests	
Cucurbitaceae	<i>Zehneria alba</i>	vine	forest margins	
	<i>Zeuxine exilis</i>	epiphytic orchid	plateau forests	

Appendix B: Wetland birds recorded in The Dales Ramsar Site

Species list compiled from Birds Australia Bird Atlas (Birds Australia unpublished).

Scientific Name	Family Name	EPBC Listing
<i>Amaurornis phoenicurus</i>	White-breasted water-hen	
<i>Egretta novaehollandiae</i>	White-faced heron	
<i>Egretta sacra</i>	Eastern reef egret	Marine; Migratory (CAMBA)
<i>Fregata andrewsi</i>	Christmas Island frigatebird	Vulnerable; Marine; Migratory (CAMBA)
<i>Fregata ariel</i>	Lesser frigatebird	Marine; Migratory (CAMBA, JAMBA, ROKAMBA)
<i>Fregata minor</i>	Greater frigatebird	Marine; Migratory (CAMBA, JAMBA)
<i>Nycticorax caledonicus</i>	Nankeen night heron	Marine
<i>Papasula abbotti</i>	Abbott's booby	Endangered; Marine, Migratory (JAMBA)
<i>Phaethon lepturus fulvus</i>	White-tailed tropicbird	Marine
<i>Phaethon rubricauda</i>	Red-tailed tropicbird	Marine
<i>Sula sula</i>	Red-footed booby	Marine; Migratory (CAMBA, JAMBA)

Figure 1.

