Suntay Aquaculture

Suntay Aquaculture Centre

Terrestrial Fauna Survey

Report

May 2003

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Appendices

1. Introduction

GHD was commissioned by Suntay Aquaculture Pty Ltd to undertake a fauna survey for the Suntay Aquaculture Centre Project located on Portion 3192 Hundred of Milne Dundee district (Point Celyon). The study area is located approximately 40 km south west of Darwin and 20 km to the north east of the township of Dundee. It consists of a north south aligned peninsula, approximately 7 km long and surrounded to the north by tidal mangrove systems. The vegetation on the peninsula primarily consists of *Eucalyptus* dominated woodland / savannah.

The fauna assessment of this site has been conducted as a component of an Environmental Impact Assessment (EIS) for the proposed project. The terrestrial vertebrate fauna survey methodology and findings are presented in this report. Significant fauna and habitats are identified, and the potential impacts of the proposed development and mitigation measures are discussed. The report has been prepared in accordance with the guidelines provided by the Department of Infrastructure, Planning and Environment – Office of Environment and Heritage.

2. Survey Methods

The fauna survey methodology complies with the requirements of the EIS/PER guidelines developed by Northern Territory Department of Infrastructure, Planning and Environment – Office of Environment and Heritage and is consistent with the Northern Territory Parks and wildlife fauna survey standard methodology. Fourteen 50 x 50 metre quadrats were chosen to represent each of the ten vegetation groups and five land units identified within the Northern Territory DIPE Land Resources of the Lower Finniss Vegetation Groups and Land Unit maps. These quadrats were surveyed between the 15-23 November 2002 and 6-12 February 2003.

Each quadrat consisted of four cage traps placed in each corner, with 20 Elliot traps spaced evenly around the perimeter. These were baited with honey, oats and peanut butter and bait for cages were mixed with tuna. Within each quadrat (with the exception of site 10, whose substrate consisted of solid rock), four pitfall traps with 10 m drift fences were placed within different microhabitats. All traps were open for 3 nights, with cage and elliot traps checked and closed each morning and rebaited in the late afternoon.

Survey throughout each of the two mangrove sites consisted of three 25 m transects across the intertidal and the landward zones spaced at 15 metre intervals. These transects were slowly traversed and actively searched at varying times throughout the survey period.

Quadrat locations and their respective land units/ vegetation groups are given in Table 1. This information was obtained from the Northern Territory Government DIPE Land Resources of the Lower Finniss River Land Units and Vegetation Groups. Figure 1 shows the location of each fauna survey site within the study area.

2.1 Bird Counts

Each quadrat was censored for birds three times in the morning and three times in the afternoon with an additional two nocturnal visits. Bird counts involved walking randomly through the quadrat and all birds heard or observed utilising the quadrat were recorded. Birds flying overhead were not included and raptors were only included if hunting overhead.

2.2 Active Searches

Each quadrat was actively searched three times for reptiles, mammals, scats and signs. Each active search lasted for ten minutes and involved turning rocks and logs, raking through leaf litter, looking under bark, in crevices, etc. Three searches were conducted during the day (morning, midday and late afternoon) with an additional two searches at night using spotlights.

2.3 Incidental records

Other species seen in the general area that were not attributable to a quadrat were recorded separately on a list for the general area. All incidental records were assigned to broad habitat categories.

2.4 Bat Sampling

Using the Anabat system (Titley Electronics) ten minute recordings were undertaken in each quadrat during spotlighting. These recordings were then analysed for the presence of bats.

2.5 Taxonomy and Nomenclature

Common and scientific names used in this report follow Strahan (1995) for mammals, Christidis and Boles (1994) for birds, Cogger (2000) for reptiles and Tyler and Davies (1986) for frogs.

2.6 Limitations

The survey is limited by its extent and the time period over which the survey was conducted. Cryptic and rare species may not have been recorded due to the relatively short sampling period, and further species may be detected if trapping were conducted over a longer period, or throughout different times of the year. An early onset of monsoonal rain during November precluded a survey while water was scarce, therefore possibly underestimating the importance of wetter habitats (paper bark swamps and vine thickets), which may act as refugia for many animals.

2.7 Relevant Literature

Relevant literature includes the *Territory Parks and Wildlife Conservation Act 2001* (Parks & Wildlife Commission of the Northern Territory 2001) and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia 1999) as well as the China-Australia Migratory Bird Agreement (CAMBA) 1987 and the Japan-Australia Migratory Birds Agreement (JAMBA) 1974. Species that are covered by these treaties and acts that were either recorded on site or could potentially occur on the site were noted and potential impacts identified / management recommendations proposed, where necessary.

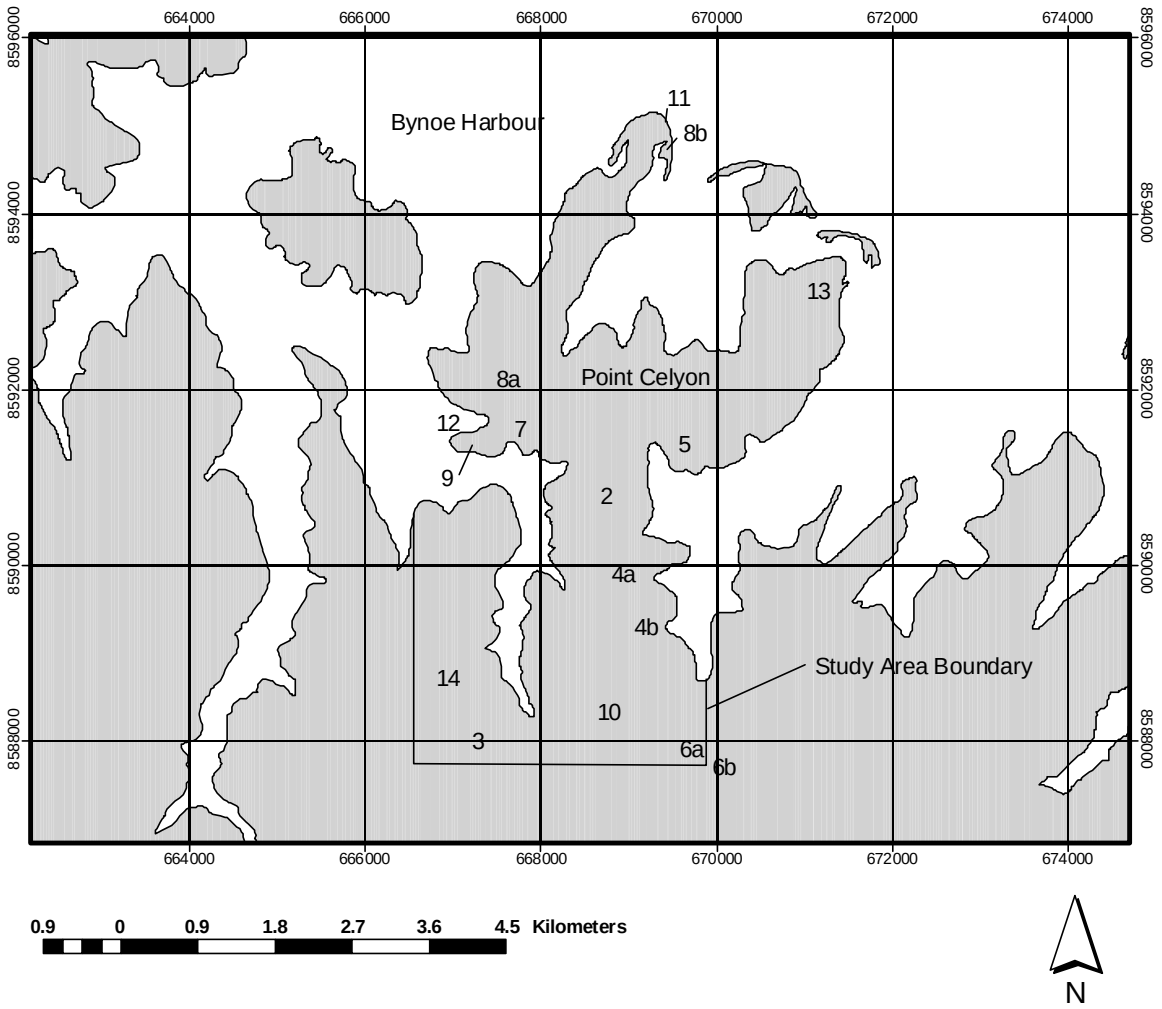

Figure 1. Point Celyon quadrat locations. Quadrats 11 and 12 refer to transects through mangrove forests. Map Grid GDA 94

Table 1 Location and descriptions of quadrats

Site	Co-ordinates (GDA 94) E	N	Site Description
2	668640	8592566	A stand of tall open forest dominated by *Eucalyptus tetrodonta* and *Eucalyptus miniata* . The substrate is laterite and is on a gentle easterly slope. The understory is dominated by *Livistona humilis* . The groundstory was dominated by grasses including *Sorghum spp.* and *Heteropogon triticeus.*
3	666819	8587617	Tall open forest dominated by Eucalyptus tetrodonta and Eucalyptus miniata. The substrate consists of sandy loam on flat ground. The understory is sparse and is dominated by Livistona humilis and Acacia auriculiformis. The groundstory was dominated by grasses including Sorghum spp. and Heteropogon triticeus.
4a	668721	8589887	A stand of open woodland growing on a dark grey/black loam soil. The area is on a slope with a westerly aspect, with a drainage line on the western border of the site and is relatively open and dominated by grasses. The dominant species of the canopy were *Acacia auriculiformis* , *Lophostemon lactifuus* and *Corymba polycarpa* . The midstory was dominated by *Pandanus spiralis* , while the groundstory was dominated by grasses including *Eriahne spp* and *Heteropogon triticeus* . There were also seedlings of *P. spiralis* , *L. lactifuus* .
4b	668654	8589090	A stand of tall open forest dominated by *Eucalyptus tetrodonta* and *Eucalyptus miniata* . The substrate is dark grey/black loam soil and is on a very gentle westerly slope. The understory was dense and dominated by *Livistona humilis* and *Pandanus spiralis* , with several rainforest species also present. The groundstory was dominated by grasses including *Sorghum spp.* , *Eriahne spp* . and *Heteropogon triticeus.* There were also seedlings of *P. spiralis* and *L. lactifuus* .
5	669440	8591420	A stand of tall open forest dominated by *Eucalyptus tetrodonta* and Eucalyptus miniata. The substrate is laterite and is on a gentle southerly slope. The understory is dominated by Livistona humilis. The groundstory was dominated by grasses including *Sorghum spp.* and *Heteropogon triticeus* .
6a	669528	8587581	A stand of tall open forest dominated by *Eucalyptus tetrodonta* and *Eucalyptus miniata* . The site is on the edge of a laterite pleateu and there are many boulders and rocks. The understory is dominated by *Cycad sp* . The groundstory was dominated by grasses including *Sorghum spp.* and *Heteropogon triticeus.*
6b	669618	8587585	A stand of tall open forest dominated by *Eucalyptus tetrodonta* and *Eucalyptus miniata.* The substrate is dark grey/black loam soil and is on a very gentle westerly slope. The understory was *Livistona humilis* and *Pandanus spiralis* , with several rainforest species, *Acacia auriculiformis* and *Grevillea pteridifolia* also present. The groundstory was dominated by grasses including *Eriachne spp* . and *Heteropogon triticeus* . There were also seedlings of *P. spiralis* and *L. lactifuus* .

Site	Co-ordinates (GDA 94) E	N	Site Description
7	667533	8591542	A stand of low open woodland growing on a loam soil. The area is on a slight slope with a westerly aspect. The dominant species of the canopy were *Lophostemon lactifuus* and *Melaleuca viridiflora* , the midstory was dominated by *Pandanus spiralis* and *Livistona humilis* . The groundstory was dominated by grasses including *Eriachne spp* , and seedlings of *L. lactifuus* and *M. viridiflora* , and *P. spiralis* .
8a	667372	8592150	A stand of monsoon rainforest melaleuca swamp on relatively flat, low lying ground adjacent to mangroves. The soil was a dark grey/black loam. The dominant species of the canopy were *Acacia auriculiformis* , *Lophostemon lactifuus* and *Melaleuca viridiflora* . The midstory was dominated by *Pandanus spiralis* , while the groundstory was sparse, there were some grasses including *Eriachne spp* and seedlings of *P. spiralis*
8b	669082	8594469	A stand of monsoon rainforest surrounded on three sides by mangroves. There is a very gentle southerly slope, draining onto a saltpan. The substrate is sand, with a substantial amount of leaf litter. The dominant species of the canopy were *Acacia auriculiformis* and *Erythrophleum chlorostachys* . The midstory was dominated by *Petalostigma pubescens* , and *Syzgium spp* ., while the groundstory contained the vines *Similax australis* and *Flagellaria indica* .
9	666816	8591370	A stand of *Callitris intratropica* open forest growing on sandy soil, with the underlying laterite exposed in some areas. The area is on a slight slope with a westerly aspect, draining into adjacent mangroves. There were few midstory plants and little ground cover.
10	668626	8588033	A stand of *Calytrix exstipulata* growing on a flat area of laterite with little topsoil present. There are some herbs present among areas of exposed rock.
11	669179	8595175	A mangrove community that included a saltpan surrounded by *Avicennia marina* and *Ceriops tagal* and a small tidal creek lined by a dense stand of *Rhizophora stylosa* .
13	670840	8593238	Monsoon rainforest on the eastern edge of a low peninsula, the remainder of which was dominated by open forest. The substrate is laterite and there was a well developed layer of leaf litter. The dominant species of the canopy were *Acacia auriculiformis* and *Erythrophleum chlorostachys* , the midstory was dominated by *Petalostigma pubescens* , *Syzgium spp,* and there were also *Cycad spp* . The groundstory contained the vines *Similax australis* and *Flagellaria indica* .
14	666109	8588358	A low open forest on relatively flat, low lying ground. The soil was a dark grey/black loam. The canopy was sparse with the dominant species being *Grevillea pteridifolia* , *Lophostemon lactifuus* , *Acacia auriculiformis* and *Melaleuca viridiflora* . The midstory was dominated by *Pandanus spiralis* , while the sparse groundstory consisted of predominantly grasses including *Eriachne spp* and seedlings of *P. spiralis* .

3. Results

3.1 Previous Surveys

The study area had not been previously surveyed prior to the current assessment, however a comprehensive study of Litchfield National Park (Griffith's et.al. 1997), provides some further insight into species that may be present in the area. This study outlined many species of conservation significance present in the park, and those that could possibly be present in the study area are discussed below.

The blind snake *Ramphotyphlops kimberleyensis* has few records in the Northern Territory and its habits are little known. As the range of this species extends from the north Kimberley coast to Litchfield National Park in the Northern Territory, it is possible this species is present on the site, although both records from Litchfield NP were in large piles of boulders and rock outcrops, a habitat that is poorly represented on the site.

Many bird species of conservation significance have been recorded in Litchfield National Park including Gouldian Finch, Bush-Hen, Spotless Crake and Hooded Parrot, however the only species that are likely to inhabit the study area are the Partridge Pigeon and Red Goshawk. Partridge Pigeons are listed as Vulnerable (Garnett 1992) and have noticeably declined in some regions, possibly due to feral predators, altered fire regimes, grazing and hunting. This species is possibly present on the study site. Red Goshawks appear at low density in open forests in the Top End and are listed as Vulnerable (Garnett 1992) due to their apparent range contraction from increased habitat modification for agriculture in eastern Australia. This species is also possibly present on the study site.

The biology of the Tropical Short-tailed Mouse *Leggadina lakedownensis* is little known in the Top End, but as it was recorded twice from the western side of Litchfield National Park, in *Melaleuca- Lophostemon* vegetation, it is possible the species occurs on the site.

The Northern Quoll is common and widespread in Litchfield National Park. This species was recorded approximately 20 km east of the study area (during the November 2002 survey) and is subsequently likely to occur on the site.

3.2 Study Area

A total of 7 mammal species (1 introduced), 65 bird species, 9 amphibian species and 22 reptile species (1 introduced) were recorded in quadrats during the two surveys. Table 2 shows the cumulative total of all fauna recorded in each quadrat during November 2003, and Table 3 provides those from the February 2003 survey. Table 4 lists all incidental sightings recorded throughout the study area.

3.3 Amphibians

Nine species of amphibians were recorded during the survey, three in November, and all nine species during February 2003. Amphibians were commonly associated with wetter habitats and more readily detected just before, during or immediately after rainfall.

Jabiru toadlet (*Uperolia arenicola*) and Bilingual frog (*Crina bilingua*) were the most common species. Site 8a was the only site containing standing water and had by far the highest diversity of frogs (8 species). Frog spawn of the Marbled Frog *Limnodynastes convexiusculus* was also recorded in this site during February. Although recorded relatively infrequently with the quadrats, large numbers of giant frogs (C*yclorana australis*) could frequently be heard in the vicinity of many sites during spotlighting.

3.4 Reptiles

A total of 22 reptile species were recorded within the survey area, with 17 identified within quadrats (Table 2 and 3) and an additional 5 species recorded incidentally (Table 4). The surveys revealed a taxonomically diverse reptile fauna with 9 skinks, 2 monitors, 2 snakes, 2 geckos, 3 dragons and one blind snake recorded. The Douglas Skink *Glaphyromophus douglasi*, Port Essington Ctenotus C*tenotus essingtoni* and the Red-sided Rainbow Skink *Carlia rufilatus* were the most abundant species. All species for which there were several records were recorded at numerous sites. Reptiles were recorded in all habitats with the highest diversity in open woodland sites. The majority of reptiles were recorded during active searches during the day although many of the larger species (monitors) were captured in either elliot, pitfall or cage traps.

3.5 Birds

Birds were the most diverse group of vertebrates recorded during the study with 61 species recorded within quadrats (Table 2 and 3), and an additional four species recorded incidentally in the study area (Table 4). A total of 46 species were recorded in November and 48 during the February survey.

The most abundant species were those that commonly inhabit the dry open woodlands that are widely distributed across northern Australia. However most species were recorded across a range of habitats, with similar species richness between sites.

The mangroves, and to a lesser extent the vine forest, were the only habitats with a specialised bird fauna. Seven species were recorded only in the mangroves while the Orange-footed Scrubfowl and Green-backed Gerygone were recorded only in vine forest.

Four nocturnal bird species, Tawny Frogmouth *Podargus strigoides*, Southern Boobook Owl *Ninox boobook*, Barking Owl *Ninox connivens* and Bush Stone Curlew *Burhinus reinwardt*, were recorded during spotlighting within the study area. An additional nocturnal bird, Spotted Nightjar *Eurostopodus guttatus*, was recorded roosting in vine thickets at site 8b. Five diurnal raptors were recorded within the site,

the two most commonly seen; Osprey *Pandion haliatus* and White-breasted Sea Eagle *Haliaeetus leucogaster* were associated with the mangrove / mudflat interchange.

The only bird species recorded on the site with listed conservation status was Emu *Dromaius novaehollandiae* Garnett and Crowley (2000), which was seen during both surveys in the dry open woodland.

3.6 Mammals

Mammals were the least diverse vertebrate group on the study area with eight species recorded (Table 2 and 3). They encompassed two species of macropod, 3 rodents, one dasyurid, one possum and one fruit bat.

Five species were recorded during both surveys, the brushtail possum *Trichosurus vulpecula* was recorded only in November and the Red-cheeked Dunnart *Sminthopsis virginiae* and Western Chestnut mouse *Pseudomys nanus* only in February. The Black Flying-fox P*teropus alecto* was recorded incidentally in the study area during February.

Few (particularly small) mammals were recorded during the survey and the sites where small mammals were captured relatively consistently (sites 6b and 4b), did not yield high abundances. The wetter habitats contained the most species, (site 4b had permanent water during both survey periods) and no mammals were recorded at five sites.

The following table describes results of the late wet season bat survey using the Anabat detector. No calibration tones could be found on the early wet season tape. Survey results can therefore only be presented for the late wet season survey (see below).

Refer to Appendix II for a full description of the bat survey.

Digitally recorded bat calls from the late wet season survey

	Site Number							
Species	**8a**	**9**	**5**	**2**	**4a**	**10**	**3**	**6b**
Taphozous kapalgensis	x			x			x	
Scotorepens greyii		x	x					
Chalanolobus nigrogreseus		x			x			x
Pipistrellus westralis					x		x	
Miniopteris schreibersii					x		x	
Nyctophilus walkeri						x		x
Nyctophilus sp.								x
* names in bold denote species with conservation significance								
* only sites that recorded bats are included in table								

3.7 Introduced Species

Several sightings were made of wild pig (*Sus scrofa*) in the study area and additional evidence included tracks, scats and rootings in all habitats, particularly along drainage lines and in monsoon vine forests. Pigs are likely to be the most numerous and significant introduced vertebrate species within the study area.

The feral house gecko (*Hemidactylus frenatus*) was also recorded in the study area.

4. Significant Terrestrial Fauna Species

The majority of species recorded within the study area are widespread in tropical Australia and no species are listed in the Environmental Protection and Conservation Act 1999. There are also no records of fauna of conservation interest in the area on the Biodiversity Assessment Unit (DIPE) database, although this probably reflects a lack of surveying in the area.

4.1 Amphibians

The frog species recorded within the study area are predominantly those that have a known distribution across the tropical and semi-arid regions of northern Australia. All species recorded are generally common throughout the Top End and most have been recorded in conservation reserves in the region (Griffiths *et. al.* 1997).

No species are listed in the Environmental Protection and Conservation Act 1999. There are also no records of fauna of conservation interest in the area on the Biodiversity Assessment Unit (DIPE) database, although this probably reflects a lack of surveying in the area.

4.2 Reptiles

Although there is a paucity of survey data from this general region, the majority of species that were recorded are more than likely common in the area and none are considered to have threatened status (TPWC Act 2001; EPBC Act 1999; Cogger *et al* 2000).

4.3 Birds

The Emu was the only bird species with listed conservation status, it is listed as “of least concern” by Garnett and Crowley (2000) and it is believed to be in decline in the Northern Territory (Storr 1977). The atlas of Australian birds (Emison *et. al.* 1987) show it is more common along the Northern Territory coast to the south of Darwin, than elsewhere in the Top-End.

Emu scats found on the study area contained a large proportion of Sand Palm, *Livistonia humilis,* seeds. These plants are very common on the southern-end of the study area, and in the broader (off-site) area. Although this project covers a small proportion of this habitat in the region, continued land clearing in the area could threaten this population.

4.4 Mammals

Very few mammals were recorded throughout the study, with recordings of most species occurring from one or two trapped individuals, none of which are considered to have threatened status (TPWC Act 2001; EPBC Act 1999; Strahan 1995).

Although not recorded within the study area, one mammal of significance, the Northern Quoll *Dasyurus hallucatus* was noted approximately 20 km to the East (during the November survey).

This species is listed as Lower Risk- Near Threatened (TPWC Act 2001) and its range is becoming increasingly restricted and disjunct (Braithwaite & Griffiths 1994). This reduction in range has been attributed directly to habitat disturbance, suggesting this species is intolerant of sub-optimal habitats that have been disturbed. The comparatively short length of the two surveys does not allow definite preclusion of the Northern Quoll from the study area.

4.5 Further Species

Two species covered by migratory international migratory bird agreements (CAMBA, JAMBA) and migratory provisions of the EPBC Act were noted and probably occur sporadically along the mangrove edges at different times of the year. These are White-breasted Sea Eagle *Haliaeetus leucogaster* (CAMBA) and Whimbrel *Numenius phaeopus*.

Two further species that are covered by migratory provisions of the EPBC Act are likely to occur within the mangroves in the area; Estuarine Crocodile *Crocodylus porosus*, Rufous Fantail *Rhipidura rufifrons*.

5. Significance of Habitats to Terrestrial Wildlife

5.1 Cypress Pine Woodland

Site 9 consists of Cypress Pine *Callitris intratropica* dominated habitat, very close to tidal influences adjacent to mangroves. Although no threatened species were found in this habitat during this study, stands of this size are uncommon in lowland areas of the Top-end, and therefore are worthy of retention.

5.2 Riparian Woodlands and Associated Wetlands

The wetter habitats, particularly those dominated by *Lophostemon lactifluus* contained high levels of diversity and may be important dry season refuges for many species. The majority of amphibian species were recorded in these habitats and they are probably important breeding sites. Almost all records of small mammal species; Dusky Rat *Rattus colletti*, Delicate Mouse *Pseudomys delicatulus*, Western Chestnut Mouse *Pseudomys nanus* and Red Cheeked Dunnart *Sminthopsis virginiae* were from either riparian or wetter habitats. These areas should be given the next priority for retention.

5.3 Monsoonal Vine Thickets

Point Celyon contains many scattered patches of monsoonal vine thicket, the largest of which is 57 ha. This patch is also the most isolated, being situated in the far north east of the eastern arm of the peninsula and accessible only by a heavily regenerated 4wd track. Although not highly diverse in its faunal assemblage, patches of this size are rare in the Top End due probably to existing burning practices. Because of it relative size and isolation, this patch is worthy of retention and protection from future fire events.

5.4 Eucalypt Dominated Vegetation Groups

Mixed eucalypt communities including *Eucalypt tetrodonta/ E. miniata* woodlands are the most common habitat within the study area and support a large number of locally and regionally common birds, reptiles and large mammals. These complexes provide potential habitat for the threatened northern quoll and are likely to attract large numbers of certain species (predominantly bats and birds) during canopy flowering events.

6. Potential and Anticipated Impacts

The habitats and associated fauna of the area are typical of that from the western Top-End coast but the impact of the development needs to be considered in the context of other habitat modification that has occurred or is planned in the surrounding area, i.e. although a single development may not greatly affect populations of fauna species, a series of developments will. With this in mind, vegetation clearance should be kept to a minimum and appropriate fire regimes should be developed and regulated, and feral animal and weed populations should be controlled.

6.1 Major Impacts

The primary impact from the proposed development will be the loss of habitat as a direct result of land clearance for pond and infrastructure creation. This habitat is primarily open *Eucalyptus tetrodonta/ E. Miniata* woodland in which a large proportion of species were recorded. None of these species are considered to be of conservation significance, and this is the most common habitat in the Top-End. Another major impact will be associated with the damming of small creeks which will cause inundation of nearby riparian vegetation and reduced / altered wet season flow downstream of these dams. This will directly impact upon the habitat quality, condition and availability of riparian habitat for fauna in these areas.

6.2 Fire

With amplified activity on Point Celyon particularly during the construction phases, potentials for fire activity are greatly increased. Many habitats throughout the site are fire sensitive, especially the Cypress Pine forest and monsoonal vine thickets.

6.3 Sedimentation

Sedimentation can cause significant impact upon aquatic environments such as streams and mangroves. During the construction phases there would be potential sedimentation impacts on frog species. The duration of the construction phases may result in the generation of sediment pulses into the local streams, albeit in response to significant rainfall events. The impact of increased suspended sediment is likely to be a significant stress upon these species.

6.4 Mangroves

The majority of the Point Celyon peninsula is surrounded by highly productive mangrove systems, which are susceptible to degradation from increased sediment loads and altered water regimes from the proposed developoment.

6.5 Weeds and Feral Animals

The spread of weeds during and after the construction phases is likely to contribute to the overall degradation of fauna habitat on the site, particularly adjacent to construction

sites. Increased feral pig populations may further compound this problem by moving problem species further a field. Feral pigs also cause considerable damage to native, particularly riparian, vegetation.

6.6 Water Tables

Changes to water tables would have negative consequences for fauna habitats, particularly paperbark swamps and monsoon vine forest. These are species rich habitats, and may also be important refuges for many species during the driest times of year. Loss of these habitats could result in a large reduction in vertebrate diversity on the site.

6.7 Further Species

White-bellied Sea Eagles and Whimbrels probably utilise the mangrove fringes of the study area and would not be effected to any great extent by the proposed development unless tidal regimes were altered or excess sediment / nutrient loads were ejected into the harbour.

6.8 Nightlighting

Although the effects of night lighting have been to shown to be hazardous to migratory birds in other places (Evans Ogden 1996), this is not considered to be a threat in northern Australia at present. Night lighting can also seriously affect the survivorship of marine turtle hatchlings, but as there are no sandy beaches present along the coast of Point Celyon (a requirement for them to nest), this is not considered to be an issue.

6.9 Risks and seriousness of impacts

Although the clearance of relatively large areas of intact savannah woodland is unavoidable for the development of this project, the seriousness of this impact is only at a local scale. In a regional context, savannah woodland is widespread and represented in many parks and reserves. However, it should not be overlooked that continued clearance in this region (Dundee) is planned, which could lead to the scarcity of many species in the future. With this in mind, vegetation retention should be of a high priority (see Managament Recommendations below).

The resultant impacts from this land clearance however, could be more severe. For instance altering water tables and potential erosion/ sedimentation/ weed introduction from construction works pose a greater threat to the biodiversity of the local area. Uncontrolled fires reaching the large vine forest patch in the north-east of the site, or the Callitris patch to the east are also of particular concern. Increasing nutrient loads into mangrove systems can have extensive "downstream" effects on food webs and this should also be avoided.

7. Management Recommendations

Although clearance of large tracts of *Eucalyptus tetrodonta/ E. Miniata* is unavoidable, increased weed invasion and degradation of retained vegetation and habitat due to lower area/perimeter ratios and physical and drainage disturbances can be minimised to a large extent by applying the appropriate protocols.

7.1 General Management Issues

Particular attention should be paid to developing ways of retaining native vegetation that are consistent with road design and traffic engineering requirements.

Recommendations:

- The installation of temporary fencing of adjacent native vegetation and large trees prior to any road works.
- Avoid the widespread dumping of soil and other materials from construction. This will aid in maintaining the ecological values of remnant native vegetation throughout the site.
- Select and clearly define an area (areas) within the construction area for future deposition of all rubbish and soil. This site (sites) should be located away from any area that supports native trees or other native vegetation.
- Do not place stockpiles of materials including grass clippings within any area that supports native trees or other native vegetation.

7.2 Fire

A fire management plan should be developed and implemented to include appropriate fire regimes that will minimize the impact of fire on the large stands of monsoonal vine forest and the Cypress Pine stand on the site. The management plan should take into account the necessity for early dry season fires that are of low intensity and on a small scale, to create a spatial diversity of habitat structures.

7.3 Sedimentation

Sediment control works will be able to control some but not all sediment movement because of difficult terrain, poor access and tight working areas. The extended length of time during which sediments would be generated is likely to cause relatively high impacts on the ecology of some stream systems and mangrove communities.

Recommendations:

- Sediment traps should be installed as close as possible to construction works to minimise erosion and sediment deposition into nearby waterways.

7.4 Mangroves

As mangrove systems are sensitive to increased sedimentation and nutrient levels, wide buffers (at least 100 m) of adjacent native woodland should be retained and incorporated into any future plans for the site and sediment traps should be installed and maintained throughout the construction and operational phases.

Creation of access points into nearby streams through mangroves should be kept to a minimum, with particular attention paid to future erosion of the surrounding area, which can be caused by loose soils particularly when under the influence of large tidal regimes. Any outflow of wastewater into mangroves or surrounding streams should be avoided. Such management practices lead to the slow but steady degradation of aquatic ecosystems via silt build up, increased nutrient load and potentially higher water volumes.

7.5 Weeds and Feral Pigs

Spread of introduced weed species can be facilitated by disturbances such as land clearance, and construction works (particularly by using machinery that are carrying weeds from other areas) and feral pigs. Minimising disturbance to native vegetation should aid in reducing the spread of weed species'. In combination, a management program for feral pigs should be developed and implemented to maintain their population at low numbers, at the very least rubbish dumping areas should be securely fenced to deter feral pigs from foraging and potentially spreading weeds. Monitoring of management actions, notably weed control, and changes in vegetation condition should be used to guide future management decisions. Establishment of permanent photo points is a simple method of monitoring such changes.

7.6 Water Body Creation

If coupled with considered replanting and revegetation efforts, creation of large bodies of water need not adversely affect all species within the area and could be used to create further habitat for many species. During the design and construction phase, consideration should be given to fauna habitat creation as detailed below;

Recommendations:

- Where possible, native emergent vegetation should be encouraged, providing breeding and refuge habitat for native frog species.
- Access points to waterbodies should be designed such that they create minimal impact on the surrounding vegetation, by sticking to an agreed access point or points and by carefully preparing the surface to prevent erosion and widening of the track during wetter months.
- Apart from cleared access points to ponds, the encouragement of regenerating native riparian vegetation around the remainder of the bank would help reduce erosion into the pond and provide further fauna habitat.

After the completion of construction Phase 1, revegetation efforts and success can be re-evaluated and appropriate measures taken / protocols assigned to ensure all available areas are revegetated in the preceding phases.

7.7 Water Tables

Alteration of existing water tables is not advised as many species and habitats within the study site will be adversely effected, particularly those that rely on water for breeding.

7.8 Fauna Reporting Protocols

The likelihood of encountering fauna of conservation significance during the construction or operation phases of the project are low to very low. As discussed, this is primarily due to the lack of suitable habitat within the study area to support the specialized resource requirements of these species. Any fauna of conservation significance that is likely to be encountered will probably be primarily transitory (eg birds).

Suntay Aquaculture will maintain a register of significant fauna that *may* from time to time, be encountered within the study area. Suntay Aquaculture staff will be notified of the importance of recording such fauna in the register. This register will be available to the Department of Lands, Planning and Environment (DLPE), however only if fauna are obviously resident (breeding or foraging) will they be reported to DLPE. Transitory species, such as sea-eagles, will be recorded on the register as sightings but not reported to DLPE unless these species take up residence.

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Appendix A

Fauna Species Lists

- Table 2 : Total abundance of all species recorded in each quadrat (Point Celyon 15-23 Nove 2002)
- Table 3 : Total abundance of all species recorded in each quadrat (Point Celyon 6-12 Feb 2003)
- Table 4 : Incidental records from (Point Celyon 15-23 Nov, 6-12 Feb 2003)

Table 2. Total abundance of all species recorded in each quadrat (Point Celyon 15-23 Nov 2002)

Species		Site Number															
		2	3	4a	4b	5	6a	6b	7	8a	8b	9	10	11*	12*	13	14	mangrove
Birds																		
Australian Magpie-lark	*Grallina cyanoleuca*												2					
Bar-shouldered Dove	*Geopelia humeralis*			1	1	1				13		1						
Black Butcherbird	*Cracticus quoyi*																	2
Black-faced Cuckoo-shrike	*Coracina novahollandiae*	1		1		1												
Blue-winged Kookaburra	*Dacelo leachii*			3	7	1	1	4	1	3		1	2					
Broad-billed Flycatcher	*Myiagra ruficollis*																	1
Brown Goshawk	*Accipiter fasciatus*			1		1										1		
Brown Honeyeater	*Lichmera indistincta*			2				2					1					
Brown Whistler	*Pachycephala simplex*																	1
Brush Cuckoo	*Cuculus variolosus*		1				2			1	2	1	1				1	
Bush Stone-curlew	*Burhinus magnirostris*												1					
Cicadabird	*Coracina tenuirostris*	1		3			1											
Common Koel	*Eudynamis scolopacea*	1		2	1		2	1			1					1		
Double Barred Finch	*Taeniopygia bichenovii*																3	
Dusky Honeyeater	*Myzomela obscura*								1									
Forest Kingfisher	*Todiramphus macleayii*		1	1		1	3			5								
Great Bowerbird	*Chlamydera nuchalis*					2							3			1	3	
Silver-backed Butcherbird	*Cracticus argenteus*	3										2	1				1	
Grey-crowned Babbler	*Pomatostomus temporalis*		1														4	1
Helmeted Friarbird	*Philemon buceroides*	3	3			1							2				1	1
Leaden Flycatcher	*Myiagra rubecula*	1					7	2		3		1						
Little Friarbird	*Philemon citreogularis*	4			2	3			1				2				1	5
Mangrove Gerygone	*Gerygone laevigaster*																	2
Mistletoebird	*Dicaeum hirundinaceum*	2		1		3		1					2				4	1
Northern Fantail	*Rhipidura rufiventris*				1					6			1					
Northern Rosella	*Platycercus venustus*																3	3
Orange-footed Scrubfowl	*Megapodius reinwardt*										1							
Peaceful Dove	*Geopelia striata*									11								3
Pied Butcherbird	*Cracticus nigrogularis*							1										2
Pied Imperial Pidgeon	*Ducula bicolor*																	1
Rainbow Bee-eater	*Trichoglossus haematodus*							2										
Red-collared Lorikeet	*Trichoglossus rubritorquis*	1	11	5	1	6	2										7	2
Red-headed Honeyeater	*Myzomela erythrocephala*																	2
Red-winged Parrot	*Aprosmictus erythropterus*	2		1						1						1		
Rufous Whistler	*Pachycephala rufiventris*	1	8		1		5	6		2			1				1	
Sacred Kingfisher	*Todiramphus sanctus*						1						1					
Spangled Drongo	*Dicrurus megarhynchus*			1		1												
Spotted Nightjar	*Eurostopodus argus*										1					2		
Striated Pardalote	*Pardalotus striatus*	1																
Sulphur-crested Cockatoo	*Cacatua galerita*						1	1		1						1	1	
Torresian Crow	*Corvus orru*																	1
Varied Triller	*Lalage leucomela*										1							
Weebill	*Smicrornis brevirostris*	3																
White-bellied Cuckoo-shrike	*Coracina papuensis*	5	7	3	1		2	4									2	
White-throated Honeyeater	*Melithreptus albogularis*	1					3	2				1						
Yelllow-throated Miner	*Lichenostomus flavicollis*					2												
Yellow Oriole	*Oriolus flavocinctus*	1		1	5		1	1	1	3	1		1			2		

Table 2 (cont)

Species		Site Number															
		2	3	4a	4b	5	6a	6b	7	8a	8b	9	10	11*	12*	13	14	mangrove
Frogs																		
	Uperolia arenicola		2	1	1	1											3	
	Cyclorana longipes			1	4		2	1		1								
Giant Frog	*Cyclorana australis*		1	2			1	5										
Reptiles																		
Sand Goanna	*Varanus gouldii*		1															
Spotted-tree Monitor	*Varanus scalaris*																1	
Arboreal snake eyed skink	*Cryptoblepharus plagiocephalus*				2			1		3			1			3		
Douglas' skink	*Glaphyromorphus douglasi*	1			1	1	11	2		1	4	1				7	1	
Darwin skink	*Glaphyromorphus darwiniensis*			1	2	1	3											
Spot tailed Monitor	*Varanus panoptes*			1				1								1		
Bynoes Gecko	*Heteronotia bynoei*	3				1	1	1	12			2						
Two spined rainbow skink	*Carlia amax*			1		3	8		1	1	1	1	2				1	
Slender rainbow skink	*Carlia gracilis*	1								6								
Red-sided rainbow skink	*Carlia rufilatus*				6	1	1	4	7	1	1		3				2	
Port Essington Ctenotus	*Ctenotus essingtoni*		2	1	5		4	3		1							1	
Alana's Menetia	*Menetia alanae*						1											
Two-lined Dragon	*Diporiphora bilineata*				1								1					
Mammals																		
Brush Tailed Possum	*Trichosurus vulpecula*									1								
Agile Wallaby	*Macropus agilis*							1										
Delicate Mouse	*Pseudomys delicatulus*			2				1										
Dusky Rat	*Rattus colletti*			2														
Feral Pig	*Sus scrofa*								1									

Numbers indicate total number of records

***** denotes species of conservation significance

Note different survey methods for mangrove sites 11 and 12 (see Survey Methods)

Table 3. Total abundance of all species recorded in each quadrat (Point Celyon 6-12 Feb 2003)

Species		Site Number															
		2	3	4a	4b	5	6a	6b	7	8a	8b	9	10	11*	12*	13	14	mangrove
Birds																		
Azure Kingfisher	*Ceyx azurea*																	1
Bar-shouldered Dove	*Geopelia humeralis*			3	6		5	3		6	7		2	1		2		
Black Butcherbird	*Cracticus quoyi*																	3
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*									2	1							
Blue-winged Kookaburra	*Dacelo leachii*	4	2		5					7	2					4	1	
Brown Whistler	*Pachycephala simplex*										1					1		
Brush Cuckoo	*Cacomantis variolosus*						1			1								
Channel Billed Cuckoo	*Scythrops novaehollandiae*										1							
Figbird	*Sphecotheres viridis*									1						2		
Forest Kingfisher	*Todiramphus macleayii*						1	1		1								
Great Bowerbird	*Chlamydera nuchalis*			1			1							1				
Green-backed Gerygone	*Gerygone chloronota*									1								
Silver-backed Butcherbird	*Cracticus argenteus*	1			1	2												
Grey-crowned Babbler	*Pomatostomus temporalis*	7																
Helmeted Friarbird	*Philemon buceroides*	1		1	2	2		2										
Leaden Flycatcher	*Myiagra rubecula*				1		1			1	1							
Lemon-bellied Flycatcher	*Microeca flavigaster*							1										
Little Friarbird	*Philemon citreogularis*	7		4		1	1	1		1	1							
Little Kingfisher	*Ceyx pusilla*																	1
Mangrove Gerygone	*Gerygone laevigaster*																	2
Masked Lapwing	*Vanellus miles*																	1
Mistletoebird	*Dicaeum hirundinaceum*	1		1			1	1					1				1	
Northern Fantail	*Rhipidura rufiventris*		2				2	1		1	3	1		1				
Orange-footed Scrubfowl	*Megapodius reinwardt*										1						2	
Osprey	*Pandion haliaetus*																	1
Pallid Cuckoo	*Cuculus pallidus*			3	1	1												
Peaceful Dove	*Geopelia striata*				1			1	1	4								
Pied Butcherbird	*Cracticus nigrogularis*																1	
Pied Imperial Pidgeon	*Ducula bicolor*			1		1					3							
Rainbow Bee-eater	*Merops ornatus*			1				2										
Red-collared Lorikeet	*Trichoglossus rubritorquis*	5	2	10	8	8	5	5	4	2	2						3	
Red-tailed Black Cockatoo	*Calyptorhynchus banksii*							2										
Red-winged Parrot	*Calyptorhynchus banksii*							1				1						
Rufous Whistler	*Pachycephala rufiventris*		5	1			4	5		2								
Southern Boobook	*Ninox novaeseelandiae*															1		
Spangled Drongo	*Dicrurus hottentottus*	1		2	1			1		2	1							
Striated Pardalote	*Pardalotus punctatus*	2		4			1	1									2	
Sulphur-crested Cockatoo	*Cacatua galerita*					1												
Tawny Frogmouth	*Podargus strigoides*																1	
Torresian Crow	*Corvus orru*										2							
Varied Triller	*Lalage leucomela*													1				
* White bellied sea eagle	*Haliaeetus leucogaster*																	1
White-throated Honeyeater	*Melithreptus albogularis*	6		3			3											
Yelllow-throated Miner	*Manorina flavigula*				1		1											
Yellow Oriole	*Oriolus flavocinctus*									3	5			1				

Table 3. (cont)

Species		Site Number															
		2	3	4a	4b	5	6a	6b	7	8a	8b	9	10	11*	12*	13	14	mangrove
Frogs																		
	Uperolia arenicola		2	11	1		1	3		4	1							
	Cyclorana longipes																	
Giant frog	*Cyclorana australis*									3								
Green tree frog	*Litoria caerulea*					2				5								
Northern Dwarf tree frog	*Litoria bicolor*									7								
Marbled frog	*Limnodynastes convexiusculus*									8								
Roth's treefrog	*Litoria rothii*									5						1		
Bilingual froglet	*Crinia bilingua*							4		10								
Tornier's frog	*Litoria tornieri*							1										
Reptiles																		
Sand Goanna	*Varanus gouldii*																	
Yellow Spotted Monitor	*Varanus panoptes*							1										
Spotted-tree Monitor	*Varanus scalaris*							1										
Arboreal snake eyed skink	*Cryptoblepharus plagiocephalus*					1		1										
Douglas' skink	*Glaphyromorphus douglasi*	2			6	2	2	2	4		4					5	2	
Darwin skink	*Glaphyromorphus darwiniensis*					1						1						
Bynoes Gecko	*Heteronotia bynoei*					1			1									
Two spined rainbow skink	*Carlia amax*	4	3			1				5	3		1					
Slender rainbow skink	*Carlia gracilis*																	
Red-sided rainbow skink	*Carlia rufilatus*				1	1	2	4	3	7		6					1	
Port Essington Ctenotus	*Ctenotus essingtoni*		5	2	5		4	2		1								
Alana's Menetia	*Menetia alanae*																	
Two-lined Dragon	*Diporiphora bilineata*		1															
Claw snouted blind snake	*Ramphotyphlops unguirostris*	1																
Northern blue tongued lizard	*Tiliqua scincoides*											1						
Mammals																		
Agile Wallaby	*Macropus agilis*				1			2										
Delicate Mouse	*Pseudomys delicatulus*			1				1										
Dusky Rat	*Rattus colletti*			3														
Feral Pig	*Sus scrofa*									1								
Antilopine Wallaroo	*Macropus antilopinus*																	
Red-cheecked Dunnart	*Sminthopsis virginiae*							1										
Western Chestnut Mouse	*Pseudomys nanus*			1														

Numbers indicate total number of records

***** denotes species of conservation significance

Note different survey methods for mangrove sites 11 and 12 (see Survey Methods)

Table 4. Incidental records from Point Celyon

Species		Habitat					
		Coastal	Riparian	Open Forest	Vine Thicket	Mangroves	Disturbed
Birds							
Australian White Ibis	*Threskiornis molucca*		N	F			
Azure Kingfisher	*Ceyx azurea*					F	
Bar-shouldered Dove	*Geopelia humeralis*		F	F	F	N,F	N,F
Barking Owl	*Ninnox connivens*			N			
Black Butcherbird	*Cracticus quoyi*					N	
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*			N			
Black-necked Stork	*Ephippiorhynchus asiaticus*	N,F				F	
Blue-winged Kookaburra	*Dacelo leachii*			N,F			
Blue-faced Honeyeater	*Entomyzon cyanotis*			N			
Brown Falcon	*Falco berigora*			N,F			
Brown Honeyeater	*Lichmera indistincta*					N	
Bush Stone Curlew	*Burhinus magnirostris*			N,F			
Collared Kingfisher	*Todiramphus chloris*					N,F	
Common Koel	*Eudynamis scolopacea*		N	N,F			
Dollarbird	*Eurystomus orientalis*			F			F
Emerald Dove	*Chalcophaps indica*				N		
* Emu	*Dromaius novaehollandiae*			N,F			
Great Bowerbird	*Chlamydera nuchalis*			N,F			
Great Egret	*Ardea alba*	N				N	
Silver-backed Butcherbird	*Cracticus argenteus*			N,F			
Grey-crowned Babbler	*Pomatostomus temporalis*			N,F			
Helmeted Friarbird	*Philemon buceroides*			F			
Little Friarbird	*Philemon citreogularis*			N,F			
Little-bronze Cuckoo	*Chrysococcyx minutillus*					F	
Mangrove Gerygone	*Gerygone laevigaster*	F				N,F	
Masked Woodswallow	*Artamus personatus*			N			N
Mistletoebird	*Dicaeum hirundinaceum*			F			
Northern Fantail	*Rhipidura rufiventris*		F	N		F	N
Northern Rosella	*Platycercus venustus*			N,F			N,F
Orange-footed Scrubfowl	*Megapodius reinwardt*			F	F		
Pacific Baza	*Aviceda subcristata*			N			
Peaceful Dove	*Geopelia striata*			N,F			N,F
Pied Butcherbird	*Cracticus nigrogularis*			F			
Pied Imperial Pigeon	*Ducula bicolor*			F	F		
Rainbow Beeater	*Merops ornatus*			N,F			N,F
Red-collared Lorikeet	*Trichoglossus rubritorquis*		N,F	N,F	N		
Red-backed Fairywren	*Malurus elegans*			N			
Red-tailed Black Cockatoo	*Calyptorhynchus banksii*			N,F			
Red-winged Parrot	*Aprosmictus erythropterus*			N,F	N		N,F
Sacred Kingfisher	*Todiramphus sanctus*			N			N
Southern Boobook	*Ninox novaeseelandiae*			N			
Spangled Drongo	*Dicrurus hottentottus*			N			
Spotted Nightjar	*Eurostopodus argus*			N	N		
Sulphur-crested Cockatoo	*Cacatua galerita*			N,F			N
Varied Lorikeet	*Psitteuteles versicolor*			F			
Weebil	*Smicrornis brevirostris*			N			
* Whimbrel	*Numenius phaeopus*	N					
White-bellied Cuckoo-shrike	*Coracina papuensis*			N,F			
White-breasted Woodswallow	*Artamus leucorhynchus*			N		F	N
Yellow Oriole	*Oriolus flavocinctus*			N,F	N		

Table 4. (cont)

Species		Habitat					
		Coastal	Riparian	Open Forest	Vine Thicket	Mangroves	Disturbed
Reptiles							
Frillneck Lizard	*Chlamydosaurus kingii*			N			
Sand Goanna	*Varanus gouldii*			N			
Yellow Spotted Goanna	*Varanus panoptes*			N			
Arboreal snake eyed skink	*Cryptoblepharus plagiocephalus*			N,F			
Northern Water Dragon	*Lophognathus temporalis*			N			
Two Lined Dragon	*Diporiphora bilineata*			N			
Spotted Tree Monitor	*Varanus scalaris*			N			
Green Tree Snake	*Dendrelaphis punctulatus*			N,F			
Feral House Gecko	*Hemidactylus frenatus*						N
Douglas' Skink	*Glaphyromorphus douglasi*			N			N
Western Brown Snake	*Pseudonaja nuchalis*			F			
Frogs							
Northern dwarf tree frog	*Litoria bicolor*			N			
Giant Frog	*Cyclorana australis*			N,F			N
Roth's treefrog	*Litoria rothii*			N,F			
Green tree frog	*Litoria caerulea*			N			
Mammals							
Black Flying Fox	*Pteropus alecto*			N			
Feral Pig	*Sus scrofa*			N			
Agile Wallaby	*Macropus agilis*			N			
Antilopine Wallaroo	*Macropus antilopinus*			N,F			

***** denotes species of conservation significance

Note: disturbed habitat refers to the northern most section of the site, where old building foundations and dumped rubbish was present.

Appendix B

Fauna Species Lists

Bat Call Analysis Summary

1.0 Introduction

As a component of the Environmental Impact Assessment for Suntay Aquaculture, bats were surveyed using an Anabat sonar detection and recording system. Sonar recordings (using the bat echo location calls) were made and the recordings cross-referenced against known keys (see below) for species identification. No measures of abundance were able to be undertaken using this methodology.

2.0 Survey Limitations and Assumptions

Identifications were based on the *Key to the bat calls of the Top End of the Northern Territory* (Milne 2002)[1]. There are a number of assumptions used to identify calls and several key limitations. The key limitations include:

- The non-inclusion of reference calls of the critically endangered species *Saccolaimus saccolaimus.* Consequently this species cannot be surveyed for using the Anabat methodology.
- Omissions of Northern Territory reference calls for *Mormopterus beccarii,* and *Hipposideros stenotis.* Reference calls for this species are derived from Queensland or were derived from frequencies reported in the scientific literature.
- Only two reference calls were collected from the region for *Taphozous kapalgensis, Mormopterus loriae* and *Nyctophilus geoffroyi*. Therefore, it is doubtful that the full variation of call parameters for each of these species is presented in the key.
- Although reference calls have been collected from across the Top End, reference calls for each species have not. Therefore, intraspecific geographic variation in echolocation calls, if it occurs, has not been fully described for all species in the key.

Several factors also need to be considered when interpreting the results obtained from the Anabat recorder. The distance an ultrasonic call will travel varies considerable depending on the type of call produced by different species of bats (Woodside and Taylor, 1985). Therefore, an Anabat unit will detect some species more frequently than others. For example, small Hipposiderid bats (e.g. *Hipposideros ater*) are rarely recorded by Anabat detectors but are more readily detected using harp traps. The environment in which bats are recorded can also impact on the results of Anabat

[1] Milne D.J. (2002). *Key to the bat calls of the Top End of the Northern Territory.* Parks and Wildlife Commission of the Northern Territory, Technical report no. 71, Darwin.

surveys. Bats will be detected more readily in open areas that are free of obstructions as opposed to densely vegetated closed habitats. Tall forest environments may result in some species of bats flying higher and further away from an Anabat detector, when compared with a low woodland environment. This will also reduce the likelihood of calls being recorded (Law et al.,1999; Duffy et al., 2000). For these reasons, Anabat recordings cannot be used to directly measure bat abundances, nor can it be assumed that all echolocating bats will be detected using an Anabat detector during a survey.

3.0 Results and Discussion

For the Anabat calls that were recorded to tape-recorder, no calibration tones could be found on the tape, therefore calls could not be calibrated and identification of these calls could not be made. Survey results therefore can only be presented for the Late Wet season survey (see below).

Table 5 Digitally recorded bat calls from the late wet season survey

	Site Number							
Species	**8a**	**9**	**5**	**2**	**4a**	**10**	**3**	**6b**
Taphozous kapalgensis	x			x			x	
Scotorepens greyii		x	x					
Chalanolobus nigrogreseus		x			x			x
Pipistrellus westralis					x		x	
Miniopteris schreibersii					x		x	
Nyctophilus walkeri						x		x
Nyctophilus sp.								x
* names in bold denote species with conservation significance								
* only sites that recorded bats are included in table								

One species of conservation significance was recorded within the study site. The Arnhem Sheathtail Bat *Taphozous kapalgensis* is regarded as Near Threatened by the Territory Parks and Wildlife Conservation Act (2000) and is listed as Data Deficient in the national Bat Action Plan (Duncan et. al. 1999).

All information below comes from Damian Milne, Parks and Wildlife (pers. comm.);

Taphozous kapalgensis has been physically captured and detected from most coastal environments and adjacent woodlands. The species probably roosts in trees and is known from no more than ten locations, three of which are within conservation reserves. Very little is known about this species ecology and therefore it is very difficult to predict whether individuals recorded during the survey (at three sites) are roosting on the site.

4.0 Recommendation

A further survey of bat calls in areas adjacent to the site would aid in determining how prevalent *Taphozous kapalgensis* (a listed threatened species) is in the area.

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