

# 1. Introduction

## 1.1 THE PROTECTED NATURAL AREAS PROGRAMME

The Protected Natural Areas Programme (PNAP) was established in 1982 to implement Section 3 (b) of the Reserves Act 1977:

*Ensuring, as far as possible, the survival of all indigenous species of flora and fauna, both rare and commonplace, in their natural communities and habitats, and the preservation of representative examples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character.*

The goal of the programme is:

*To identify and protect representative examples of the full range of indigenous biological and landscape features in New Zealand, and thus maintain the distinctive New Zealand character of the country (Technical Advisory Group 1986).*

The specific aim of the PNAP is to identify, by a process of field survey and evaluation, natural areas of ecological significance throughout New Zealand which are not well represented in existing protected natural areas, and to retain the greatest possible diversity of landform and vegetation patterns consistent with what was originally present. To achieve this, representative biological and landscape features that are common or extensive within an Ecological District (ED) are considered for protection, as well as those features which are special or unique.

As knowledge and information about the presence and distribution of biota such as invertebrates and bryophytes is limited, the protection of the full range of habitat types is important for maintaining the diversity of lesser known species.

This report differs from many PNAP reports in that:

- it only covers the part of the ED within in the Northland Conservancy;
- it is based mainly on a reconnaissance survey supplemented by existing published and unpublished information; and
- it includes descriptions of all natural areas within the study area.

The natural areas described have been evaluated and classified using two levels of significance, based on specified criteria (see Section 2), and are not confined to recommended areas for protection (RAPs), as defined in most PNAP reports outside of Northland.

This approach was adopted so that the survey report better meets the broader information requirements of the Department of Conservation arising from the Resource Management Act 1991 (RMA), the Convention on Biological Diversity (1992), and the more recent New Zealand Biodiversity Strategy (2000).

The Purpose and Principles of the RMA 1991 are set out in Part II of that Act and include:

- safe-guarding the life-supporting capacity of air, water, soil and ecosystems;
- the preservation of natural character of the coastal environment, wetlands and lakes and rivers and their margins;
- the protection of outstanding natural features and landscapes;
- the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna;
- intrinsic values of ecosystems;
- maintenance and enhancement of the quality of the environment.

Of particular relevance is Section 6 (c) of the RMA 1991, which lists as a ‘matter of national importance’:

*The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.*

The Convention on Biological Diversity (1992), under the auspices of the United Nations Environment Programme, has promoted the concepts of biodiversity and ecosystems. These concepts are reflected in this report by the number of sites, their size, and the emphasis on buffers and linkages in the identification and assessment of sites.

## 1.2 ECOLOGICAL REGIONS AND DISTRICTS

New Zealand’s physical environment is very diverse and this is reflected in the considerable diversity of indigenous plant and animal communities. In recognition of the biogeographic differences between various parts of New Zealand, a classification of Ecological Regions and Districts has been established (McEwen 1987).

An Ecological District is a local part of New Zealand where the topographical, geological, climatic, soil and biological features, including the broad cultural pattern, produce a characteristic landscape and range of biological communities. Ecological Districts are grouped together into a series of Ecological Regions on the basis of shared general ecological and geological characteristics. In some cases, a single very distinctive Ecological District is given the status of Ecological Region to emphasise its uniqueness (Technical Advisory Group 1986).

The New Zealand Biological Resources Centre coordinated the mapping of the country into more than 268 Districts in 1982. Ecological Regions and Districts in northern New Zealand have since been redefined to more accurately classify ecological variation within the Northland and Auckland areas (Brook 1996).

The PNAP uses the division of Ecological Districts as a framework throughout the country for determining ecological significance, including representativeness.

### 1.3 CONTENTS OF THIS REPORT

This report presents the findings of the reconnaissance phase of the PNAP survey of the Otamatea Ecological District which falls within Northland Conservancy boundaries (hitherto referred to as Otamatea ED Northland). The methods and terminology follow those defined and specified in the Hokianga Ecological District PNAP report (Conning *et al.* 2004). The Auckland Conservancy part of the Otamatea Ecological District has been previously surveyed and reported on, using different methods (Davis 2002). This report includes maps and brief descriptions of all of the indigenous natural areas within the Northland Conservancy part of the ED which were surveyed during the summer of 2005/06, together with an analysis of the main vegetation types and information on threatened species and other taxa of scientific and/or conservation interest. The assessment of representativeness, local rarity/uncommonness and relative extents of different habitat types is made *in reference to the Northland Conservancy part of the ED only*.

No soil sites of international, national or regional significance are known to occur within this part of the Ecological District (Arand *et al.* 1993). Important geological sites and landforms within the Northland Region, including internationally, nationally and regionally significant sites are derived from Kenny & Hayward (1996). See Appendix 8.4 for ranking criteria.

### 1.4 OTAMATEA ECOLOGICAL DISTRICT (NORTHLAND CONSERVANCY)

Otamatea ED Northland covers approximately 57,950 ha encompassing three convoluted arms of the Kaipara Harbour extending far inland (the 'saltwater rivers': Arapaoa, Otamatea, and Oruawharo) which are interwoven with three major peninsulas (Hukatere, Whakapirau-Batley, and Oneriri-Puketotara) and several smaller peninsulas and headlands of varying dimensions. The most characteristic feature of Otamatea ED Northland is the long, relatively sheltered coastline with numerous saltmarsh and mangrove areas flanked by extensive intertidal mudflats and sandflats. The Auckland Conservancy part of Otamatea ED covers approximately 46,842 ha, from the southern side of the Oruawharo River southeastwards.

Otamatea ED Northland adjoins four other Ecological Districts: Rodney to the east, Waipu to the northeast, Tokatoka to the north, and Kaipara to the west.

Results of this study show that, of the natural areas identified, 74% of the extent is estuarine, 23% is forest, 3.2% is shrubland, 0.05% is freshwater wetland and 0.01% is classed as 'other vegetation'. The total area of sites recorded in this report is 16,793 ha (including harbour and estuarine areas), or 4,445 ha (excluding harbour and estuarine areas).

Significant natural features of particular note are:

- Extensive shallow mudflats and sandflats on the margins of the ‘saltwater rivers’<sup>1</sup> (Arapaoa, Otamatea, and Oruawharo), which are both nationally and internationally important feeding and roosting sites for a migrant waders such as wrybills, Northern New Zealand dotterels, banded dotterels, eastern bar-tailed godwits, lesser knots, variable oystercatchers, pied stilts and black stilts. These rich estuarine areas are used year-round by resident sea birds such as white-faced herons, pied shags, black shags, little shags, little black shags, Caspian terns, white-fronted terns, black-backed gulls and red-billed gulls, some of which have colonies on trees, cliffs or ponds near the coast.
- Extensive mangroves and saltmarshes fringe the shores of the saltwater rivers and provide habitat for bird species such as banded rail and northern NI fernbird.
- The largest and best connected indigenous forest remnants are on the Hukatere peninsula (particularly on the west coast and at Pakaurangi in the east) and on the Puketotara Peninsula.
- Hukatere Scenic Reserve (30 ha) contains the last remaining example of mature kauri forest left in Otamatea ED Northland. All other remaining areas of this forest type are secondary (<120 years old), except for two other tiny sites with only one or a few mature kauri trees remaining.
- Many significant (albeit small) secondary coastal forest remnants occur along the margins of the Arapaoa, Otamatea and Oruawharo Rivers. These are rich in totara, kanuka, kowhai, puriri, kahikatea and kauri. Kowhai is a common component of forest on limestone and calcareous siltstone, which is characteristic on in the inner-harbour waterways. The more exposed western coasts of the Hukatere and Puketotara peninsulas, as well as some small offshore islands have significant pohutukawa forest and other rare coastal vegetation types.
- In the semi-coastal zone further inland, there are also many small but significant secondary forest and shrubland areas. These are rich in kanuka, totara, taraire, puriri, kahikatea and kauri. The 10 largest sites are between 75 and 428 ha.
- With the lack of natural freshwater wetlands, the importance of constructed wetlands (both ponds and lakes) cannot be underestimated for the Northland part of the ED. The open water habitat in these areas is crucial for indigenous water birds such as grey duck, paradise shelduck, grey teal, black shag, pied shag, little shag and Australasian shoveler, while reedland around the margins is important habitat for species such as spotless crane, marsh crane, Australasian bittern and banded rail. Three constructed lakes and several ponds have been described and assessed as natural areas in this report.
- The Northland part of the Ecological District is very geologically diverse and contains nine important geological sites, eight of which fall within areas of indigenous vegetation. Under pohutukawa forest on northern coast of Puketotara Peninsula (also known as ‘the Funnel’), there are exposed cliffs with internationally significant erionite deposits.

---

<sup>1</sup> These three major arms of the inner Kaipara Harbour are traditionally referred to as ‘saltwater rivers’ and carry river in their names, e.g. ‘Arapaoa River’, ‘Otamatea River’ and ‘Oruawharo River’. Some of their tidal tributaries are referred to either as rivers or creeks, e.g. ‘Wairau River’, ‘Kaiwaka River’ and ‘Kaira Creek’.

## 2. Methods

### 2.1 GENERAL APPROACH

Between 1994 and 1996, reconnaissance surveys using rapid semi-quantitative methods were carried out in 12 Ecological Districts in the northern sector of the Northland Conservancy, to obtain information on the composition, extent and ecological values of indigenous natural areas. A rapid survey method was selected by the Department of Conservation (DOC), Northland Conservancy, because of time constraints for the field survey and the extensive areas to be covered, and because it could be easily applied to all natural areas. These methods were also specified by DOC for the current study, in order to achieve consistency in information over several decades.

Natural areas were identified using recent aerial photography (orthophotography flown in 2002 for Northland Regional Council and Kaipara District Council) and the Sites of Special Biological Interest (SSBI) information system. Sites were identified irrespective of tenure. Consequently, natural areas which are administered by the Department of Conservation, as well as other protected areas, were also surveyed using the same methods. This provided a consistent approach to determine the representativeness of all natural areas.

Each site was mapped, allocated a generic number and described. Having evaluated the sites (see Section 2.4 below), they were grouped according to one of two levels of ecological significance. Scientific names of species for which common names have been used can be found in Appendix 8.5 (Plant species list), Appendix 8.6 (Common plant names) or Appendix 8.7 (Fauna species list).

Extensive use was made of information from biological databases and information systems such as the SSBI, the Bioweb Threatened Plants Database, the Herpetofauna Database, the NIWA Freshwater Fish Database, published information and Department of Conservation internal reports. Herbarium records from Auckland Institute and Museum (prefixed 'AK') and Te Papa, Wellington (prefixed 'WELT') were also consulted. Geographical and geological information was gained from existing published and unpublished maps.

Although most sites were not surveyed in detail, a large amount of information was collected, considerably expanding the ecological information base for the Ecological District. It is important to note that due to the tight timetable and budget constraints, it is possible that some natural areas may have been overlooked.

### 2.2 CONSULTATION WITH LANDOWNERS

Personal contact with all landowners was not possible because of the magnitude and geographic range of the surveys being undertaken. Therefore, all ratepayers were advised by mail by way of a letter (Appendix 8.2) informing them of the survey programme and the reason for it. The letter was signed by the Northland Conservator of DOC and provided contacts for further

information. A press release on the survey methods and a photograph of the survey team was issued and featured in the local newspapers (see Appendix 8.2). In a few instances, permission for access was sought from landowners in person and was always given.

Te Uri o Hau are the tangata whenua of Otamatea ED Northland. Consultation was undertaken with the Te Uri o Hau Settlement Trust Office.

### 2.3 DATA ACQUISITION AND ANALYSIS

Methods followed those prescribed by DOC, as described in Conning *et al.* (2004).

A rapid reconnaissance field survey was carried out to record and map the ecological and geomorphological characteristics, broad habitat type and canopy vegetation of each identified natural area. Most of this work was carried out using telescopes and binoculars from vantage points on public roads or farm tracks, or from a small boat or kayak on the Kaipara Harbour.

Seven sites were not surveyed in this manner due their isolation and/or lack of visibility from a point with permitted access. In these instances, sites were identified and described from aerial photographs (flown in 2002), using nearby sites on similar topography as a guide. Information on some of these sites, therefore, remains limited, and it is likely that some vegetation types/ecological units present were not identified.

Natural areas were mapped using four broad categories of habitat type: forest, shrubland, freshwater wetland, and estuary (see Appendix 8.8 for definitions of terms, and Table B for the vegetation classification system). Estuarine habitat was always placed in separate sites from terrestrial habitat (forest, shrubland, and freshwater wetland), even though they were contiguous in many places.

At each site, the composition and relative abundance of canopy plant species were recorded on the field survey sheet (see Appendix 8.1) in the following four categories: greater than 50% cover was described as 'abundant'; 20–50% cover as 'common'; 5–20% cover as 'frequent'; and less than 5% cover as 'occasional'.

Canopy composition based on percentage cover abundance is widely considered to be an appropriate method of describing forest stands. This technique and variations of it have been used to describe canopy composition both within New Zealand (see Atkinson 1962, 1985; Leathwick & Rogers 1996; Park & Walls 1978) and in other parts of the world (see Kershaw & Looney 1985, Mueller-Dombois & Ellenberg 1974). The specific technique for vegetation description at each site is based on the approach described in Myers *et al.* (1987).

This semi-quantitative method was selected by DOC because it could be implemented over large areas with a small number of field surveyors during a limited time period, and could be applied to all vegetation types irrespective of the height of the canopy. More detailed, and therefore more time-consuming and expensive methods, would not necessarily provide more useful information for assessing representativeness. The disadvantage of this survey approach is that it does not provide a great deal of information on the distribution of

uncommon or threatened canopy and understorey species, nor does it provide full information on the distribution of bird species or other fauna. Fauna observations were incidental only.

Species present in the 'abundant' and 'common' columns of the field survey forms were used to define the vegetation type of each ecological unit. 'Abundant' species appear first in the name, followed by 'common' species in their relative order of cover. The standard technique of identifying emergent features in the canopy (i.e. / ) was not employed in this project. Details of vegetation types and geological units within each site were entered into an Excel spreadsheet. Geological units were classified into 16 categories and vegetation types into 227 categories (see Table 2). Some sites had only one vegetation type on one geological unit, while others had multiples of each. Sorting of these ecological units gave information on their frequency and extent in the study area. This information was used to determine the representativeness of each ecological unit (see Section 5. Summary and Conclusions, Table 2 (p. 430) Ecological units recorded in Otamatea ED Northland and protected status).

Other relevant information, such as fauna observations, threats, and landowner information collected incidentally, was also recorded on the survey sheet for each site. Once the field reconnaissance or survey had been completed, sites were numbered and information from other databases and information systems was incorporated into the site descriptions. Completed field survey forms are held by the Department of Conservation, Northland Conservancy Office, Whangarei.

## 2.4 CRITERIA FOR ASSESSMENT OF HABITAT SIGNIFICANCE

Assessment criteria follow Conning *et al.* (2004).

The natural areas described in this report meet at least one of the following criteria:

- They are predominantly of indigenous character, by virtue of physical dominance or species composition in the canopy.
- They provide habitat for a threatened indigenous plant or animal species.
- They include an indigenous vegetation community or ecological unit, in any condition, that is nationally uncommon or much reduced from its former extent.

The conservation values of these areas were assessed using a two-level classification of habitat significance based on the PNAP ecological criteria of representativeness, rarity and special features, diversity and pattern, naturalness, habitat structure and characteristics important for the maintenance of ecosystems (buffer, linkage or corridor, size and shape) (see Table 3, p. 465).

The PNAP criterion of long-term viability has not been included in Table 3. Long-term viability was considered under the umbrella of representativeness, diversity and pattern, naturalness, size and shape. Table A outlines the links between PNAP criteria and the Level 1 and 2 criteria.



### 2.4.1 Level 1 sites

A Level 1 site contains significant vegetation and/or significant habitats of indigenous fauna and is defined by the presence of one or more of the following ecological characteristics:

1. Contains or is regularly used by critical, endangered, vulnerable or declining or naturally uncommon taxa (i.e. species and subspecies), or taxa of indeterminate threatened status nationally.
2. Contains or is regularly used by indigenous or endemic taxa that are threatened, rare, or of local occurrence in Northland or in the Ecological District.<sup>2</sup>
3. Contains the best representative examples in the Ecological District<sup>2</sup> of a particular ecological unit or combination of ecological units.
4. Has high diversity of taxa or habitat types for the Ecological District<sup>2</sup>.
5. Forms ecological buffers, linkages or corridors to other areas of significant vegetation or significant habitats of indigenous fauna.
6. Contains habitat types that are rare or threatened in the Ecological District<sup>2</sup> or regionally or nationally.
7. Supports good populations of taxa which are endemic to Northland or Northland-Auckland.
8. Is important for endemic and indigenous migratory taxa.
9. Covers a large geographic area relative to other similar habitat types within the Ecological District.<sup>2</sup>

### 2.4.2 Level 2 sites

A Level 2 site is a natural area that supports populations of indigenous flora and fauna not identified as meeting the criteria for Level 1. It is a site which:

- contains common indigenous species but which is not one of the best representative examples of its type;
- may be small and isolated from other habitats;
- may contain a high proportion of pest species;
- may be structurally modified e.g. forest understorey grazed;
- has not been surveyed sufficiently to determine whether it meets the criteria for Level 1 sites.

## 2.5 UPDATING OF DATA

Natural ecosystems are dynamic and forever changing, both physically and biologically. Some areas are more dynamic than others, e.g. wetlands, which are particularly susceptible to changes in groundwater hydrology, whilst others, e.g. forests, change more gradually. The status and composition of species also changes over time and this could result in changes in the conservation value of some habitats.

---

<sup>2</sup> For the purpose of this study this means the part of Otamatea ED within the Northland Conservancy (DOC). The remainder of the ED is in Auckland Conservancy (DOC) and has been surveyed and assessed separately (Davis 2002).



TABLE A: LINKS BETWEEN THE PNAP CRITERIA AND LEVELS 1 AND 2.

PNAP CRITERIA	LEVEL 1	LEVEL 2
Representativeness <sup>3</sup>	Contains the best representative examples in the Ecological District of a particular ecological unit or combination of ecological units. (3) Supports good populations of taxa which are endemic to Northland or Northland-Auckland. (7)	Not one of the best examples of its type in the Ecological District.
Rarity and special features	Contains or is regularly used by critical, endangered, vulnerable, or declining, or naturally uncommon taxa (i.e. species and subspecies), or taxa of indeterminate threatened status nationally (1). Contains or is regularly used by indigenous or endemic taxa that are threatened, rare, or of local occurrence in Northland or in the Ecological District (2). Contains habitat types that are rare or threatened in the Ecological District or regionally or nationally (6). Is important for endemic and indigenous migratory taxa (8).	Does not regularly contain, or there is no currently known threatened, rare, or species of local occurrence. Contains common habitat types. No currently known special features.
Diversity and pattern	Has a high diversity of taxa or habitat types for the Ecological District. (4).	May contain only one habitat type and/or have a low diversity of taxa relative to other areas of a similar type.
Naturalness	Exhibits a higher level of naturalness than other examples of its type.	Exhibits a lower level of naturalness than other examples of its type.
Buffering/corridors and linkages	Forms ecological buffers, linkages or corridors to other areas of significant vegetation or significant habitats of indigenous fauna.(5)	May be heavily impacted by external influences or may be fragmented and isolated from other natural areas.
Size and shape	Covers a large geographic area relative to other similar habitat types within the Ecological District. (9)	Is likely to be small relative to other similar examples of its type, or if large, is not the best example of its type and meets no other criteria for a Level 1 site.
Long-term ecological viability	If the long-term viability of the site is high or medium, it is likely to meet one or more of the other criteria above, or if low, may nevertheless be the best or only example of its type in the Ecological District.	May require a high degree of management to achieve viability or may never be viable under present circumstances or, if viable, may not meet any other criteria for a Level 1 site

<sup>3</sup> Best representative examples include sites with the highest level of naturalness, diversity, in the best condition, and with values other than ecological values such as cultural and amenity values (where known).

Human-induced changes and activities, both within or adjoining significant natural areas, can accelerate the processes of change. Fire, followed by the invasion of adventive weeds, can dramatically modify shrublands. Drainage of adjoining land can alter the water tables of wetlands, thereby lowering the quality of the habitat and facilitating the establishment of weeds. Ongoing piecemeal destruction or modification of habitats and sustained grazing of forest remnants will, in the long term, completely eliminate some habitats.

The natural areas identified in this survey will therefore require regular monitoring to note changes in both species and habitat composition and condition.

## 3. Ecological character

### 3.1 TOPOGRAPHY/GEOLOGY

Otamatea ED Northland is characterised by rolling to moderately dissected hill country up to 207 m elevation, divided into three large and a number of smaller peninsulas by arms of the Kaipara Harbour. Much of the eastern part of the district is underlain by a structurally complex jumble of allochthonous Mangakahia Complex and Motatau Complex sedimentary rock units (including tectonic blocks of Cretaceous sandstone, mudstone and siliceous mudstone; and Paleogene mudstone, glauconitic sandstone and micritic limestone; incorporated within melange). In the west are overlying sequences of Lower Miocene Waitemata Group sandstone and conglomerate, and Waitakere Group basaltic andesite lava flows, hyaloclastite, pumiceous tuff breccia, and associated volcanoclastic sediments (Brook 1996).

### 3.2 CLIMATE

#### 3.2.1 General

Northland's climate is influenced by its northerly location (latitudes 34°S to 36°S), the narrowness of the peninsula (no areas are more than 50 km from the sea), and its generally low topography (most areas are below 150 m asl).

Summers are warm and humid, and winters mild. Mean annual air temperatures vary from 14.0°C to 16.0°C. Air frosts are infrequent in Northland, but ground frosts (< -1°C at 2.5 cm above ground) can be common, especially inland. Annual sunshine hours vary little across Northland, with 2000 at low altitudes, decreasing to 1700 at higher altitude sites.

Rainfall peaks in winter, with the driest seasons being summer and early autumn. Mean annual rainfall ranges from 1200 mm to 2400 mm. The predominant winds are from the southwest, with inland areas being more sheltered than exposed coastal sites (mean annual wind speeds range from 10 to 30 km/hour). Gale force winds can occur at any time, but are most common in winter. The occurrence of fog and thunderstorms varies from 1 to 75 and 3 to 16 days per year, respectively (Moir *et al.* 1986).

#### 3.2.2 Climate of Otamatea Ecological District (Northland Conservancy)

Few specific climate data are available for the Otamatea Ecological District. However, mean annual rainfall in the ED parallels orography, increasing from approximately 1200 mm in western coastal areas to 1450 mm further east. Mean annual rainfall is 1239 mm at Claren Brae, an inner harbour climate station just outside the northwestern boundary of the ED. Monthly rainfall there is highest between May and August (range 119-146 mm) and lowest between November and March (range 74-90 mm).

Mean air temperatures in western areas tend to be lower than the Northland average, varying between 14.0°C and 15.5°C (Moir *et al.* 1986). However, at Pouto, situated at the north head of the Kaipara Harbour just outside the Otamatea ED to the west, mean annual air temperature between 1993 and 2004 was relatively high for the region, at 17.2°C. The mean annual rainfall for the same period was 1134.5 mm (Pearce *et al.* 2005).

### 3.3 VEGETATION

#### 3.3.1 Historical

A vegetation history specific to the inner shores of the Kaipara Harbour has never been written, and the best information available about the extent of natural vegetation and the changes wrought on it comes from pollen studies, Maori oral history, accounts of timber milling, and written observations made by early European travelers and inhabitants.

During several millennia prior to the human settlement of New Zealand, which occurred around 800 years before present (BP) (McGlone & Wilmshurst 1999), most of Otamatea Ecological District would have been clothed in a dense mantle of forest, from the ridge crests down to the shores of the Kaipara Harbour. In earlier times, however, the extent of forest had waxed and waned with the changes in the Earth's climate. During the most recent ice age (14,000-10,000 years BP), harsher climatic conditions forced the forests into sheltered pockets and valleys, with vast areas of fern and shrubland in between (Dodson *et al.* 1988). The beginning of the Holocene (10,000 years BP) saw a return to warm, humid and equable conditions, which allowed forest to expand from these refuges onto hillsides and down to the coast. The sea level stabilised around 6000 years BP, and the climatic conditions which we know today were similar to those that the first Polynesian explorers encountered.

Pollen and charcoal analyses from Northland show that fire and fire-tolerant heathland was abundant during the ice age, decreased during the most of the Holocene, and then dramatically increased after the arrival of humans (Dodson *et al.* 1988). During the Polynesian period (800-200 years BP), approximately 50% of the land in all of New Zealand was cleared by fire, but most of this was concentrated in the lowlands (McGlone 1983). Since most of Otamatea ED Northland lies below 100 m asl, it is possible that large portions of the ED were burnt at that time. There is no specific pollen history of this area, however.

Tangata whenua of the Otamatea area are Te Uri O Hau, a hapu of Ngati Whatua (OTS 2006). Their ancestral waka, Mahuhu-ki-te-Rangi, commanded by Rongomai, made landfall at either Pouto (McKinnon (ed.) 1997) or Taporapora (Byrne 2002), and after periods of Ngati Apa and Kawerau (a Waitakere-based iwi) influence, Ngati Whatua emerged as the dominant people of the Kaipara around the 18th century. Their defeat in 1825 by Ngapuhi musketry at the battle of Ika-a-Ranginui, near Kaiwaka, precipitated swift and widespread depopulation of the region. Restoration of the balance of power in the 1830s allowed Ngati Whatua to re-occupy their lands to the point where Te Uri O Hau were largely reinstalled in Otamatea by 1845 (Byrne 2002).

Increasing European interest in the Kaipara area was reflected in the accounts of individuals such as Joel Samuel Polack, Nathaniel Turner, Ernst Dieffenbach, and Henry Kemp. Collectively they provided a picture of the Kaipara that was particularly complimentary of its fine waterways, like the Otamatea River, and the kahikatea and kauri that so heavily lined its banks, and estimated a human population size of 40-70 Europeans and 700-800 Maori (Byrne 2002).

European settlers were attracted by the wealth of kauri timber and gum in the Kaipara and its exploitation became the focus of the second half of the 1800s. The main period of timber milling was from the 1880s to 1906, although the port of Kaipara was open from 1854 to 1947, and most trade was plied on the open water, using steamer boats. Four mills were set up by private individuals in the area of Otamatea ED Northland:

- Smith and Brothers at Matakohe on the Arapaoa River (1881-1906) cut approximately 70,000-75,000 board feet per week, but not all of this wood was from within the local area. Logs were floated down the Awaroa Creek near Dargaville and rafted to Matakohe where they were processed. Large steam vessels at Pahi were used to take the wood to market in Auckland or Sydney.
- William Chadwick at Whakapirau on the Arapaoa River (1881-1912) cut approximately 50,000-60,000 board feet per week. They sledged logs down to the tidal waters and rafted them to Whakapirau, suggesting that the timber may have come from nearby.
- Nicholsons and Sons at Topuni on the Oruawharo River (1870-1900) cut approximately 50,000-60,000 board feet per week. Kauri was abundant in the 'Oruawharo block'.
- Bradley and Mander at Raekau (opposite Port Albert) on the Oruawharo River (1888-1901) cut approximately 60,000-70,000 board feet per week. By 1901 most of the kauri in the district had been logged and the mill had become un-economic.

These establishments had about half the milling capacity of those in the kauri timber and commerce rich area around Dargaville on the Northern Wairoa River (Ryburn 1999).

Jane Mander, early New Zealand novelist and daughter of a sawmiller, spent parts of her childhood living in European logging settlements on the inner arms of the Kaipara Harbour. Her most famous novel, 'The Story of a New Zealand River', was set in late 1800s Otamatea River country, and evokes images of lush forest all around the waterways.

*From the mangrove banks to the sky a great variety of trees in fifty shades of evergreen covered every yard of space. There was a riotous spring colour in the forest, voluptuous gold and red in the clumps of yellow kowhai and crimson rata, and there were masses of greeny white clematis and bowers of pale tree ferns to rest the satiated eye. Stiff laurel-like puriris stood beside the drooping fringe of the lacy rimu; hard blackish kahikateas brooded over the oak like titoki with its lovely scarlet berry. (Mander 1920).*

Before 1890 some valuable timber was lost through burn-offs, which were commonly set alight after the kauri had been removed, destroying other native trees. Kauri gum-diggers picked over logged areas, and settlers continued to clear them and establish pasture and orchards. Kauri was the primary wood in

the logging industry, but after 1890, mills were opened to process other woods, in particular kahikatea or 'white pine'. Puriri, rimu, totara and matai were also considered valuable. Kahikatea was used for butter and fruit boxes, as were matai, taraire and tawa. A mill which cut local timbers only (kauri, matai and kahikatea) was established at Maungaturoto in 1912 and worked for only four years (Ryburn 1999). This suggests that by the early part of the twentieth century, most of the forest in Otamatea ED Northland had been decimated.

The first popular text on New Zealand's plant life (Laing & Blackwell 1906) featured hundreds of photographs and vivid descriptions of coastal forest plants from around Pahi. Ellen Blackwell (author) and her brother Frank Blackwell photographed and studied the flora around Frank's farm north of Aute Bay on the Pahi Peninsula (Scott 1987). Of the mangrove forests, Blackwell wrote:

*... at high tide, a mangrove swamp is often a pleasant place to punt in, for then the somewhat sickly odour of the mud is replaced by the fresh smell of the sea.*

She also noted weka, or 'mangrove-hens' in the mangroves. While it is a delightful read, this book does not provide many specific details on plant distribution in the local area.

Pine plantations at Tinopai and Topuni (still operating today) were established in the 1930s. Immediately previous to this, Tinopai was an apple orchard area, and Topuni supported a milling industry based on kauri (Ryburn 1999). During the 20<sup>th</sup> century, pastoral farming established itself as the main industry in the Otamatea area, and only recently has there been substantial growth in bach and lifestyle block development around the harbour fringes.

### **3.3.2 Broad pattern**

Otamatea ED Northland contains a wide variety of indigenous forest types, including some of the largest and best quality examples of mangrove forest in New Zealand. Indigenous shrublands cover only a small area. Freshwater wetlands are very limited in extent and most of them are constructed.

After diversity, the most obvious feature of the indigenous terrestrial vegetation in Otamatea ED Northland is its fragmented character. Compared with Waipu ED to the northeast or Rodney ED to the southeast, there are no extensive tracts of indigenous forest or shrubland encompassing the full range of topography present, i.e. from the highest peaks down to the coast, over gullies, ridges, hillslopes and plains. The large-scale vegetation patterns have been reduced to disconnected segments. Indeed, almost all remaining forest is secondary, having developed since widespread logging and burning in the late 1800s. Piecemeal land clearance over the last century has greatly reduced the extent of this secondary mantle, and re-initiated succession many times in different places on the landscape. A mosaic of remnant secondary forest (the majority) with regenerating secondary shrubland and occasional surviving mature, emergent trees is what can be observed today in Otamatea ED Northland.

Despite the large scale of fragmentation, distinct ecological patterns can be identified from the remaining natural areas:

Pohutukawa forest is most common on exposed western coasts of the Hukatere and Puketotara Peninsulas while totara-kowhai and totara-puriri forest are

characteristic types on the sheltered shorelines of the Arapaoa, Otamatea and Oruawharo Rivers. Dense stands of kauri rickers and kahikatea spars sometimes extend right down to the shores of the saltwater rivers, but are not common on the open, western coasts. Houpara and tawapou, on the other hand, are only common on west coast cliffs or steep coastal slopes where they are less threatened by herbivorous mammals. Throughout the coastal zone, kanuka forest and treeland are the main early successional vegetation types.

Taraire forest is more prevalent on hillslopes away from the coast, while most kowhai forest occurs close to the sea. Puriri tends to be spread throughout, but is generally more abundant near coast. On the few alluvial soils present in Otamatea ED Northland, tall kahikatea and totara are the characteristic trees, along with frequent titoki.

Totara is overwhelmingly abundant in almost all forest remnants, except on the very western margin of Hukatere. Kahikatea is the next most common podocarp, preferring gullies and wetter soils, followed by matai and rimu, which are sparse. Miro is extremely uncommon, recorded only once in this survey. Tanekaha graces the driest parts of the landscape. Kauri is a member of a different gymnosperm family, the Araucariaceae, and is most similar to tanekaha in its ability to compete on poor, dry soils.

It appears that most secondary vegetation successions start with kanuka and/or manuka, though manuka is much less common in this ED than kanuka. Over time, kanuka and manuka are succeeded by broadleaved species (for example taraire, puriri, karaka, kowhai, kohekohe), podocarps and kauri in different proportions according to the site (the exact composition at any place depends on many factors such as the topography of the site, soil properties, hydrology, and proximity of seed sources).

Grazing can interfere with this process by eliminating palatable and trampling-sensitive species (usually broadleaves). Most habitats within Otamatea ED Northland are unfenced, and as a result kanuka, totara, and totara-kanuka forest with little palatable understorey are by far the most common forest types. Grazing and trampling also reduce the natural density of trees in the forest, as well as the density of the understorey, creating 'treeland'. Coastal forests often contain more palatable broadleaved species in the canopy because they are on more difficult terrain which livestock find hard to access. These areas are still open to the depredations of possums and rats. This may explain the general lack of kohekohe in coastal forest canopies (one small site only).

As stated earlier, one of the special features of Otamatea ED Northland is its extensive mangrove forest, which covers a much larger area than terrestrial forest. Saltmarsh vegetation on the landward side of the mangroves (e.g. saltmarsh ribbonwood shrubland, sea rush rushland, oioi-sea rush rushland, and low salt meadow), covers a smaller area and is less intact due to weed infestation and occasional land reclamation.



### 3.3.3 Main vegetation types

#### **OVERVIEW**

All terrestrial vegetation in Otamatea ED Northland can be regarded as coastal or semi-coastal, as the furthest point from the sea within the ED is little more than 5 km inland and the highest point is only 207 m asl. In the vegetation classification system used for this study the term 'coastal' has only been applied to vegetation that directly abuts beaches, mudflats, mangroves or saltmarsh and the term 'semi-coastal' includes vegetation types that are near the coast but do not extend to the coast. This classification is outlined in Table B. Vegetation and habitat classes (used for mapping) have been divided into bioclimatic zones; and then further divided into broad vegetation classes based on composition. This study recorded 227 different vegetation types in Otamatea ED Northland, and these are listed in Table 2 (page 430). The following section describes the general patterns exhibited by these 227 types across the study area.

#### **COASTAL FOREST AND TREELAND**

##### **Coastal early successional forest and treeland**

All coastal early successional forests in Otamatea ED Northland are dominated by kanuka.

- **Kanuka forest** is typified by a stand at Gittos Point Forest and Shrubland (Q09/032) covering 18 ha of land bordering the Oruawharo River. Frequent associates include mapou, ti kouka, mamaku, ponga, kahikatea, totara, hangehange, mahoe, mamangi, mingimingi and putaputaweta. Kanuka-mamaku forest occurs in the south of Kohatutahi Forest and Wetland (Q08/178) only. Some coastal early successional forest remnants are quite weed infested, e.g. kanuka-tree privet forest in the Batley Road Coastal Forest Remnants (Q08/142).

##### **Coastal broadleaved forest and treeland**

Thirty-five types of coastal broadleaved forest were identified around the shores of Otamatea ED Northland. Most of these can be grouped into the following general types:

- **Pohutukawa forest and treeland** is most abundant on exposed coastlines, such as the west coasts of the Hukatere and Puketotara Peninsulas, which bear the brunt of prevailing southwesterly winds and currents coming through the Kaipara Harbour mouth. Scattered pohutukawa also occur in other coastal forest types as far inland as Matakohe and Whakapirau on the Arapaoa River and Gittos Point Forest and Shrubland (Q08/032) on the Oruawharo River, but this species appears not to grow naturally on the Otamatea River.<sup>4</sup> The most intact examples of pohutukawa forest (e.g. at Waitieke Creek Forest (Q08/092) and Pakaurangi Forest and Shrubland (Q08/185)) are associated with frequent or occasional kowhai, puriri, karaka, kanuka, kahikatea, harakeke, tawapou, houpara, mamangi, *Coprosma macrocarpa*, *C. rhamnoides*, ti kouka, tarata, mamaku, kiokio, mapou, mingimingi, rengarenga, kowharawhara, akepiro, turutu and *Gabnia lacera*. Houpara is only a common or frequent associate of

---

<sup>4</sup> Pohutukawa has been planted in and around Takahoa Creek Forest (Q08/163) as part of a subdivision which is on the eastern shore of the Otamatea River.



TABLE B: CLASSIFICATION OF VEGETATION AND RELATED MAP UNITS.

VEGETATION/ HABITAT CLASS (MAP UNIT)	BIOCLIMATIC ZONE	BROAD VEGETATION CLASS (NO. VEGETATION TYPES WITHIN)
Forest (F)	Coastal	Early successional forest and treeland (4) Broadleaved forest and treeland (36) Broadleaved-podocarp forest (27) Podocarp-dominant forest (6) Kauri-dominant forest (5)
	Semi-coastal	Early successional forest (3) Broadleaved forest (16) Broadleaved-podocarp forest (41) Podocarp-dominant forest (20) Kauri-dominant forest (14) Unknown type (1)
Shrubland (S)	Coastal	Coastal shrubland (15)
	Semi-coastal	Semi-coastal shrubland (11)
Freshwater wetland (W)	Semi-coastal	Open water (2) Freshwater reedland (9) Freshwater rushland and tussockland (3) Unknown type (1)
Estuarine wetlands (E)	Coastal	Mangrove shrubland and forest (1) Saltmarsh and salt meadow (9) Exotic estuarine grassland and rushland (3)
Other (O)	Coastal	Grassland on islands (1)

pohutukawa on steep parts of west coast of the Hukatere peninsula (e.g. Kumete Bluff Forest Remnants (Q08/047), Otaiwhata Bay Forest and Shrubland (Q08/049)), or on offshore islands (e.g. Motuouhi Island (Q09/014)). At Oneriri Pa Forest (Q09/027), Puketotara Peninsula, there is a good example of pohutukawa-kanuka forest, which appears to be present at recently disturbed sites. More degraded examples of pohutukawa-kanuka forest and treeland occur all around Puketotara Peninsula coast and along the Tinopai coast. Radiata pine and brush wattle sometimes share the canopy in disturbed/small narrow examples of pohutukawa forest.

- **Puriri forest and treeland** occurs frequently on both saltwater river and outer coasts. Various mixtures with kanuka, karaka, kowhai, taraire, pohutukawa and ti kouka occur, depending on local conditions. It appears that puriri-dominant treeland may sometimes be an artifact of land clearance in which puriri trees are preferentially protected (e.g. at Puriri Point Forest and Shrubland (Q08/183), Kohatutahi Forest and Wetland (Q08/178), Raepere Creek Coastal Forest (Q08/098)).
- **Taraire forest** is uncommon in the coastal zone. Taraire dominates part of the forest canopy at eight sites, associated mainly with puriri, and occasionally with karaka, kowhai and/or kanuka.

Each of the following coastal broadleaved forest types occurs at only one site in Otamatea ED Northland and is considered to be particularly distinctive:

- **Kowhai–*Coprosma areolata*–ti kouka forest** on basalt colluvium at Kohatutahi Forest and Wetland (Q08/178). In this case, both the geological unit and the vegetation type are unique and distinctive in the study area.
- **Houpara–kowhai forest** at Owhareao Point Remnants (Q08/179) and **houpara–kowhai–tawapou forest** at Bushy Point Forest Remnants (Q09/046); these are two steep, exposed headlands on the western Hukatere peninsula coast.
- **Karaka–kowhai–tree privet forest** at Lower Pahi River Scenic Reserve (Q08/103) contains locally uncommon associates of mangeao and tawa.
- **Karaka–tawapou–harakeke forest** with frequent ti kouka grows on the western side of Kaiwhitu Island (Q08/175). This island was thought to be rat-free during a 1993 survey, which may explain the abundance of tawapou in the canopy (SSBI Q08/H056).

#### **Coastal broadleaved–podocarp forest and treeland**

Twenty-seven types of coastal broadleaved–podocarp forest were identified along the coast of Otamatea ED Northland. Most of these can be grouped into the following general types:

- **Totara–kowhai forest** is the most common coastal podocarp–broadleaved forest type, and tends to occur on sheltered coasts around the inner-harbour waterways of the Arapaoa, Otamatea and Oruawharo Rivers, and appears to be associated with limestone and calcareous siltstone of the Motatau Complex. Good examples of this type occur in the Wairau River Coastal Forest Remnants (Q08/151) near Maungaturoto. This forest type often contains common or frequent emergent kahikatea, with occasional mamangi, ti kouka, tarata, kanuka and titoki. Kowhai is more abundant than totara in a few places (e.g. Raepere Creek Coastal Forest (Q08/098) and Smith’s Point (Q08/079)), and puriri and karaka also share the canopy in a few places (e.g. Takahoa Creek Forest (Q08/163), Whakapirau Creek Coastal Forest (Q08/127) and Pakaurangi Forest and Shrubland (Q08/185)). Kanuka is more prominent in this type in places that are more degraded or recently disturbed (e.g. Upper Raepere Creek Forest Remnants (Q08/160) and Donaldson’s Forest (Q08/157)).
- **Totara–puriri forest** is the next most widespread coastal broadleaved–podocarp forest type and is slightly more tolerant of exposure than totara–kowhai forest. A good representative example occurs at Te Kowhai Scenic Reserve (Q08/132), which is semi-sheltered from northwest winds blowing down the Arapaoa River. Kahikatea and kanuka are commonly associated with this type; only occasionally kowhai and taraire.

Each of the following coastal broadleaved–podocarp forest types occurs at only one site in Otamatea ED Northland and is considered to be particularly distinctive:

- **Totara–kohekohe–puriri forest** at Whakapirau North Forest (Q08/107). This is the only remaining patch of forest where kohekohe comprises over 20% of the canopy.
- **Puriri–taraire–kahikatea–kauri forest** at Te Ope Headland Forest (Q08/119).

- **Kahikatea–puriri–taraire–kanuka forest** at Kaira Creek Forest (Q09/029).
- **Karaka–kanuka–kahikatea forest** at Puketotara Forest Remnant 15 (Q09/045).
- **Totara–kahikatea–karaka forest** at Hanerau Stream Forest Remnants (Q08/218).

#### **Coastal podocarp-dominant forest and treeland**

Podocarp-dominant forest tends to be more common inland, but six types of coastal podocarp-dominant forest were identified during the present study. They are all mixtures of kahikatea and totara with differing amounts of kanuka. The most outstanding and representative examples are listed below:

- **Kanuka–kahikatea forest** at Whakapirau River Scenic Reserve (Q08/128) contains common mature emergent kahikatea over tall kanuka.
- **Kanuka–totara forest, totara forest and totara–kahikatea forest** are typified by the Wairau River Coastal Forest Remnants (Q08/151). The latter type is the most intact example of podocarp-dominant forest within the site. Diverse stands of coastal totara–kahikatea forest have frequent emergent matai and/or kauri, and also frequent kowhai, and may be associated with occasional titoki, karaka, kauri, ti kouka, puriri, lancewood and nikau. A single example of kahikatea–totara forest occurs at Karakanui Road Forest Remnants (Q08/187).
- **Totara–kanuka forest and treeland:** A good example occurs at the Pahi Coastal Strip (Q08/105), which contains the regionally threatened coastal shrub *Olearia solandri*. All forest types with abundant totara and kanuka, to the exclusion of other species, reflect high levels of disturbance and/or grazing. Totara–kanuka forest is more likely to contain hardy, unpalatable associates such as tarata, kauri, kowhai, kahikatea, ti kouka, mamaku and mamangi, rather than more palatable species like kohekohe, karaka, taraire, tawapou, houpara or mahoe. Their history of frequent disturbance has also made them more likely to contain weed infestations.

#### **Coastal kauri-dominant forest**

Five forest types with abundant or common kauri occur immediately adjacent to the coastline of Otamatea ED Northland. All of them are secondary forest containing kauri rickers. The following three are representative examples of their types:

- **Kauri–kanuka forest** occurs on gentle coastal terraces on the shores of the Otamatea River at Wahiwaka Creek Forest Remnants (Q08/146). The Topuni River Forest Remnant 1 (Q09/037) is a magnificently dense stand of this type, occurring on a steep coastal margin. At this location tanekaha and totara are frequent members of the canopy, with scattered rimu, rewarewa, kowhai and karaka. Kauri–kanuka–tanekaha forest is known only from James Road Forest (Q08/147).
- **Kauri–totara forest** is best represented at Raepare Creek Headland Forest (Q08/145) where it is associated with frequent taraire, rewarewa, karaka, puriri, and tall kahikatea spars.
- **Totara–kauri–kahikatea forest** occurs at two points on the southern shores of Point Curtis (Q08/156) and has abundant totara with equal amounts of emergent kauri rickers and kahikatea spars.

## **SEMI-COASTAL FOREST AND TREELAND**

### **Semi-coastal early successional forest and treeland**

There is one main type of semi-coastal early successional forest in Otamatea ED Northland. This is kanuka forest and treeland, which is also the most extensive vegetation type seen during the present survey.

- **Kanuka forest and treeland** is present in 38 semi-coastal remnants which together cover almost 700 ha throughout the Northland Conservancy part of Otamatea ED (that is c. 18% of the forest and treeland recorded). Kanuka associations range from very disturbed, monospecific treeland with few other tree species regenerating through them (e.g. at Te Ruruku Bay Forest Remnants (Q08/089) and Puketotara Forest Remnants 3 (Q09/006)) to extremely diverse, dense forest (e.g. Hukatere North Forest (Q08/087)) containing mixtures with emergent podocarps (kahikatea, totara, matai, rimu, tanekaha), emergent kauri rickers, and a multitude of broadleaved species (e.g. kowhai, ti kouka, rewarewa, tarata, nikau, puriri, mamangi, puka, five finger, karamu, akepiro and mahoe). It seems that kanuka forest is an early stage in the succession to almost all semi-coastal forest types in Otamatea ED Northland. Kanuka forest with manuka in equal proportions in the canopy is present at one site only (Kirikiri Creek Forest and Wetland (Q08/091)).

The following type occurs at only one site in Otamatea ED Northland and is considered to be particularly distinctive:

- **Mamaku–manuka forest** is a low forest type occurring at the top of Otuhianga Hill Forest (Q08/065) where it is frequently associated with mahoe and ti kouka.

### **Semi-coastal broadleaved forest**

Forest composed mainly of broadleaved canopy species is not particularly common in the semi-coastal zone. Sixteen types were identified in the current study, most of which can be grouped to these two general types:

- **Taraire and puriri forest associations** comprise the majority of broadleaved forests inland. Taraire is more likely to grow furthest from the coast in the northern and eastern parts of the ED, as represented by taraire-dominant forests on Barton's Hill Forest (Q08/137) and at Bickerstaffe Forest and Shrubland (Q08/153). Puriri becomes more abundant nearer the coast. Taraire often occurs mixtures with puriri, which together form an even, rounded canopy (sometimes with karaka, nikau or kowhai), only punctuated by occasional emergent kahikatea, pukatea, rewarewa, matai or kauri (e.g. Te Ope Stream Remnants (Q08/116)). Taraire and puriri forest associations are more likely to occur in gullies and on steep hillslopes than on ridges or in gentle valleys.
- **Kowhai forest** is unusual in the semi-coastal zone, but it does occur at two sites. Kowhai–puriri forest, with frequent mamaku and occasional ti kouka is present in a small gully at Hautakima South Forest (Q08/088). Kanuka–kowhai forest in the upper gullies of Waihungaru Stream Forest (Q08/083) with frequent ti kouka and occasional puriri.

Each of the following semi-coastal broadleaved forest types occurs at only one site in Otamatea ED Northland and is considered to be particularly distinctive:

- **Nikau forest** at the Waipikopiko Stream Headwaters (Q08/171).

- **Mamaku–nikau–pukatea forest** at Puketotara Forest Remnants 3 (Q09/006).

### **Semi-coastal broadleaved–podocarp forest**

This forest class comprises the largest number of vegetation types (41) identified during the site surveys in Otamatea (Northland) ED. There are multiple, complex associations within this class, however some general patterns have been identified as follows:

- **Taraire–podocarp forest** commonly comprises taraire in association with kahikatea, but also with totara. Kahikatea is the main associate of taraire on wetter, more fertile soils, while totara tends to accompany it on drier ground. A large block in a valley on the eastern side of the Huarau Ridge Forest Remnants (Q08/200) typifies taraire–kahikatea forest. A good example of taraire–totara forest is in the Paparoa Stream Headwaters (Q08/110). Note that both these representative examples are from northeastern areas of the ED where taraire is most common.
- **Kowhai–podocarp forest** is quite unusual in the semi-coastal zone, as kowhai is far more likely to occur at high abundance near the coast, however it does occur in places such as Puketotara Forest Remnant 16 (Q09/024) (kowhai–kanuka–kahikatea forest) which was once immediately adjacent to the coast, but has since become removed from the coastline over 500 m through mudflat reclamation.
- **Totara–kahikatea–broadleaved forest** is found in four places within the study area, and can occur in the riparian zone (e.g. totara–kahikatea–kowhai forest at Hames Road Forest Remnants (Q08/124)) or on steep hillslopes (e.g. totara–kahikatea–puriri forest at Raepere Creek Forest Remnants (Q08/094) and totara–puriri–kahikatea forest at Payne Road Forest Remnants (Q08/192)).
- **Totara–broadleaved forest** includes associations of totara with karaka, kowhai and puriri. The best examples of totara associated with karaka are present further inland at Waipikopiko Stream Headwaters (Q08/171) and in the North Maungaturoto Forest Remnants (Q08/069). Puriri and kowhai are associated with totara nearer the coastal zone, e.g. at Otuhianga Coastal Forest Remnants (Q08/194) which constitute another example of coastal forest isolated from its original formative influences through reclamation of estuarine mudflats.
- **Kahikatea–broadleaved forest** includes associations of abundant kahikatea with broadleaved species that prefer or can tolerate wet soils, e.g. pukatea, kowhai, titoki, puriri, ti kouka and taraire. The best example of kahikatea–pukatea gully forest is at Mohinui Forest Remnants 3 (Q08/190).

Each of the following semi-coastal broadleaved–podocarp forest types occurs at only one site in Otamatea ED Northland and is considered to be particularly distinctive:

- **Mature matai over secondary kahikatea–ti kouka forest** at Kowhai Road Matai–Kahikatea Remnant (Q08/064) is remarkable for its tall, emergent, mature matai.
- **Totara–titoki forest** on alluvium in the Paparoa Stream Riparian Forest (Q08/121); only one other forest remnant in the Northland Conservancy part of the ED has titoki a major part of the canopy, and this is small and more degraded.

- **Nikau–kahikatea forest** at Waipikopiko Stream Headwaters (Q08/171).
- **Puriri–nikau–totara forest** at Raepere Creek Forest (Q08/094).
- **Tanekaha–tarata–mamangi forest** at Oneriri Station Homestead Forest (Q09/022). Tanekaha is not usually the main canopy component. This type stands out visually, as all canopy species have bright yellow foliage in summer.
- **Tanekaha–rewarewa–kanuka forest** at Hautakima South Forest (Q08/088).

#### **Semi-coastal podocarp-dominant forest and treeland**

In terms of extent, semi-coastal podocarp-dominant forest covers the largest areas within Otamatea (Northland Conservancy). Twenty forest types were identified. Totara and kahikatea feature prominently in most, the former being better adapted to drier situations and the latter occurring mainly in small stream gullies or on alluvial soils of large streams. The main types present (from dry to wet) are as follows:

- **Totara forest and treeland** is usually very species poor in the canopy and bare underneath. Most examples of this type were formed through a long history of trampling and grazing by livestock, which allowed the prickly totara saplings to establish and eliminated more palatable species. A representative example occurs in the Pukehuia Forest Remnants (Q08/115).
- **Totara–kanuka forest and treeland** indicates a similar situation with stock disturbance to the above, but the prevalence of kanuka shows the disturbance to be more recent. A representative example of this forest type on moderate hillslopes covers most of Raepere Creek Forest (Q08/094), while a good example of this type in a gully is present at Puketotara Forest Remnant 10 (Q09/017), which supports frequent emergent kahikatea and a range of associated species at low abundance, e.g. kowhai, mahoe, kauri, mamangi, puriri, tarata, tanekaha, ti kouka, karaka, kohekohe, heketara, mapou and rangiora.
- **Totara–kahikatea forest and treeland** is a very common forest type in semi-coastal gullies and hillslopes of grazed pastoral land. Representative examples of this type on alluvium occur in widely scattered remnants on the upper Wairau River (Q08/173) and in the Waipikopiko Stream Headwaters (Q08/171). The best examples on hilly topography are at Brynderwyn Road Forest Remnants (Q08/067) and the Lower Pukeareinga Forest Remnants (Q08/061).
- **Kahikatea forest** thrives on alluvial soil, and since this is not characteristically plentiful in Otamatea ED Northland, there are few examples of it. A magnificent stand in a QEII Open Space Covenant occurs in the Pahi River Headwaters (Q08/170).

Each of the following semi-coastal podocarp-dominant forest types occurs at only one site in Otamatea ED Northland and is considered to be particularly distinctive:

- **Mature totara–kahikatea forest** in the Upper Paparoa Creek Scenic Reserve (Q08/100), which also has large emergent matai associated with it.
- **Rimu–kanuka forest** in the Sherwin QEII Open Space Covenant (Q08/100) and **kanuka–rimu forest** with frequent totara at Raepere Creek Headland Forest (Q08/145).
- **Tanekaha forest** and **kanuka–totara–tanekaha forest** on the banks of a small stream at the Payne Road Forest Remnants (Q08/192).



- **Tanekaha–totara forest** in the Totara Creek Forest Remnant (Q08/095).
- **Mamaku–totara forest** at Paparoa Stream Headwaters (Q08/110) and **totara-mamaku forest** at Eastern Boundary Forest (Q08/214).

#### **Semi-coastal kauri-dominant forest**

Fourteen types of semi-coastal kauri-dominant forest were identified in Otamatea ED Northland. These can be divided into young or 'ricker' kauri associations and mature kauri associations:

- **Kauri ricker forest** approximately 100–120 years old constitutes 10 of the 14 types. These stands would have regenerated following widespread logging of kauri in the late 1800s. Tall kanuka is a common associate. Totara, tanekaha, rimu or kahikatea are occasional associates. Kauri ricker stands tend to occur in the driest and least favourable parts of the landscape to growth, hence their association with kanuka and gymnosperms that can compete in poor situations. Ridge tops are the most common topographical sites. Some of the finest examples of semi-coastal kauri ricker forest are at Raepere Creek Forest (Q08/094) on the Hukatere peninsula and Timber Bay Forest (Q09/001) on the Puketotara Peninsula.
- **Mature kauri forest.** There are four examples of mature kauri forest in Otamatea ED Northland. There is only one sizeable (c. 30 ha) example: mature kauri-kahikatea forest at Hukatere Scenic Reserve (Q08/081) is associated with frequent taraire, puriri, nikau and mamangi. Young kauri and kahikatea are also present in this mixture, and may have established during the time when some limited logging was carried out (Wright & Beever 1990). The other three sites where mature or semi-mature kauri still occur are Oneriri Station Homestead Forest (Q09/022), Paparoa Mature Kauri Stand (Q08/122) in association with totara, and Collins Scenic Reserve (Q08/078) in association with rimu.

#### **COASTAL SHRUBLAND**

Indigenous shrubland is far less common than indigenous forest around the coastal margin of Otamatea ED Northland. Fifteen coastal shrubland types were identified during the current survey, covering an estimated extent of only 71 ha spread over 18 sites. Almost all of these types have kanuka, manuka and mapou as abundant or common components. Harakeke, ti kouka and hangehange are common in places. Coastal shrublands are often associated with small amounts of akepiro, kowharawhara, toetoe, rengarenga, karamu, *Coprosma macrocarpa*, mingimingi, *Gabnia lacera*, lancewood, mamangi, rangiora and young karaka. Weeds, in particular gorse, woolly nightshade and pampas, are present in many of the shrubland canopies; however these are likely to become shaded out over time. One of the best quality examples of coastal shrubland on a nearshore island is mapou-manuka-harakeke shrubland at Kaiwhitu Island (Q08/175) off the Hukatere peninsula. The most extensive example of coastal kanuka shrubland occurs at Te Ruruku Bay (Q08/089), and a range of coastal shrubland types occur within the Mangaiti Creek Forest Remnants (Q08/167).

Each of the following coastal shrubland types occurs at only one site in Otamatea ED Northland and is considered to be particularly distinctive:

- **Tutu shrubland** on the steep face of a limestone cliff at Otara Head Forest and Shrubland (Q08/063).



- **Ti kouka–kanuka shrubland** at the top of the limestone cliff at Otara Head Forest and Shrubland (Q08/063).
- **Ti kouka shrubland** on Puriri Point Forest and Shrubland (Q08/183).
- **Mahoe shrubland** on the shores of the upper Paparoa Creek (Q08/108).

#### **SEMI-COASTAL SHRUBLAND**

Eleven types of semi-coastal shrubland were identified, covering approximately 450 ha spread over 24 sites. Most semi-coastal shrublands contain dominant kanuka, manuka or a mixture of both. Mamaku is notably more common in shrublands away from the coast, while mapou and harakeke are less common. Ti kouka is ubiquitous both in coastal and semi-coastal environments. More than half of the total semi-coastal shrubland extent (c. 260 ha) comprises tall kanuka–radiata pine shrubland within the Pakaurangi Forest and Shrubland (Q08/185) on the eastern end of Hukatere peninsula. Approximately 52 ha of kanuka–mamaku shrubland is present at Nathan Road Forest and Shrubland (Q08/198), and c. 55 ha of manuka–kanuka–mahoe shrubland occurs at the Bickerstaffe Forest and Shrubland (Q08/153).

Each of the following semi-coastal shrubland types occurs at only one site in Otamatea ED Northland and is considered to be particularly distinctive:

- **Coprosma propinqua shrubland** at Oruawhoro Road Stream (Q08/209) is the only location where *Coprosma propinqua* is the dominant vegetation cover.
- **Harakeke–manuka shrubland** at Hillstone Road Forest Remnants 3 (Q08/208) is unusual for having abundant harakeke on an inland hillslope.
- **Putaputaweta shrubland** at Bayer Road Shrubland (Q08/211) is the only location where putaputaweta is the dominant vegetation cover.
- **Totara–mapou shrubland** at Oruawhoro School Forest (Q09/033).

#### **FRESHWATER WETLAND**

##### **Open water**

No natural lakes or ponds have been identified in the Northland Conservancy part of this ED, but the following constructed water bodies were identified as natural areas, primarily as bird habitat:

- **Constructed freshwater farm ponds** with occasional floating *Azolla pinnata* and indeterminate subaquatic vegetation were recorded at 19 sites. Hundreds of ponds are present within the study area, but they were only identified as natural areas if they were large, or contiguous with indigenous forest, or had indigenous marginal vegetation such as raupo or lake clubrush.
- **Constructed lakes**, formed through embankment of tidal inlets, are found at three sites, two on the east coast of the Otamatea River (Kaitara Constructed Lake (Q08/159) and Takahoa Government Purpose Wildlife Management Reserve (Q08/164)), and one on the north coast of the Whakaki River (Wainonororo Constructed Lake (Q09/039)).

##### **Freshwater reedland**

Reedlands comprise 20–100% cover of reeds, which are tall erect herbs emergent from shallow water, having branched leaves or stems that are either hollow or have very spongy pith (Johnson & Gerbeaux 2004, adapted from Atkinson 1985), and are important as wetland bird habitat.

- **Raupo reedland** is the most common reedland type in Otamatea ED Northland, and can occur either in constructed ponds, in small natural depressions or slow-flowing stream gullies. Various associations of raupo with bracken, lake clubrush, ti kouka and willow weed occur. The largest (3.6 ha) and most significant raupo reedland is at the southern end of Kaitara Constructed Lake (Q08/159).
- **Lake clubrush reedland** was recorded at only two sites (Ngamotu Farm Pond (Q09/031) and Takahoa Government Purpose Wildlife Management Reserve (Q08/164)) where it is extremely limited in extent. It may be naturally established, or it may have been planted at either or both of the sites, as both are constructed.
- **Baumea articulata reedland** is known only from the margins of Kaitara Constructed Lake (Q08/159).

These two reedland types were recorded at only one site each in Otamatea ED Northland, and are considered particularly distinctive:

- **Raupo–Baumea articulata–pink bindweed reedland** at Kohatutahi Forest and Wetland (Q08/178).
- **Raupo–Baumea articulata–marsh clubrush reedland** at Owhareao Point Remnants (Q08/179).

#### **Freshwater rushland and tussockland**

The rushland and tussockland types found in Otamatea ED Northland are small. Indigenous rushlands in the study area comprise mainly scattered *Juncus sarophorus* amongst exotic grasses. There was only one example of tussockland recorded (*Carex virgata*-pampas tussockland at Puketotara Forest Remnant 10 (Q09/017), and it covers a tiny area at the edge of a constructed pond.

#### **ESTUARINE WETLAND**

The upper intertidal zone of the calm, inner Kaipara Harbour waters is host to a vegetation sequence from mangrove forest in the deepest water, to mangrove shrubland in shallower water, to various types of indigenous saltmarsh or exotic estuarine grassland and rushland near the terrestrial margin. Extensive mudflats and sandflats are present throughout the lower intertidal zone, but eelgrass (*Zostera* spp.), which can occur on sandflats in other parts of the harbour, was not recorded during this survey.

#### **Mangrove shrubland and forest**

Otamatea ED Northland encompasses c. 1817 ha of the extensive mangrove forest and shrubland of the Kaipara Harbour. A large part of the 1817 ha is in the Arapaoa River (c. 997 ha), followed by the Otamatea River (c. 470 ha) and then the Oruawharo River (north coast only = c. 350 ha). The tallest mangrove forests are on the edges of channels, where the trees are in optimal conditions for growth, while shrub-sized mangroves tend to be restricted to the upper tidal areas, bordering saltmarsh habitats. Saltmarsh species often occur within mangrove shrublands creating a patchwork mosaic of habitat.

#### **Saltmarsh associations**

Only eight saltmarsh vegetation types were identified within Otamatea ED Northland, but field survey in estuarine areas was much less intensive than that

undertaken in terrestrial areas, so some types may not have been recorded. The final three of the following are herbfields, also known as 'salt meadow'.

- **Sea rush rushland** is the most extensive saltmarsh type.
- **Mangrove–sea rush shrubland** often occurs at the boundary of mangrove shrubland and sea rush rushland.
- **Oioi–sea rush rushland** occurs at freshwater outflows (e.g. at the mouths of small creeks) or above the pure sea rush rushlands.
- **Saltmarsh ribbonwood shrubland** occurs at the extreme upper tidal limit and is often associated with frequent harakeke, mapou, pohuehue and *Coprosma propinqua*. Other associates recorded in Otamatea ED Northland include ngaio, *C. propinqua* × *C. robusta*, tanekaha, totara, manuka, sharp rush, oioi, remuremu periwinkle, Japanese honeysuckle, gorse, woolly nightshade. The best example of this type is in the upper Paparoa Creek of the Arapaoa River (Q08/084). *Olearia solandri*, a regionally significant plant species, was recorded there.
- **Baumea articulata reedland** was recorded at one site (Judd Road saltmarsh, Otamatea River (Q08/062)) where it was strictly limited to brackish water area.
- **Glasswort–*Suaeda novae-zelandiae*–sharp rush herbfield**. At the southern side of Gittos Point Forest and Shrubland on the Oruawharo River North Coast (Q09/020) there are shellbanks holding tidepools which are populated with scattered glasswort, *Suaeda novae-zelandiae* (a regionally significant plant species) and the exotic sharp rush around their edges.
- **Sea primrose–arrow grass–saltwater paspalum herbfield** is present at the Judd Road saltmarsh, Otamatea River (Q08/062), and is the only known site for the regionally threatened arrow grass in Otamatea ED Northland.
- **Sea primrose–remuremu–saltwater paspalum-sharp rush herbfield** is found all around the shores of Otamatea ED Northland, but is never very extensive.

#### **Exotic estuarine grassland and rushland**

- **Saltwater paspalum grassland** is the most extensive exotic vegetation type within the estuarine areas of Otamatea ED Northland. Saltwater paspalum has the potential to smother large areas of upper intertidal mudflat, and is now a component of all indigenous salt meadow communities and may overwhelm them in time. The extent of this vegetation type was not estimated in this study. More work is needed to determine the effects of saltwater paspalum grassland on indigenous salt meadows, and on threatened or uncommon plants which inhabit them (e.g. arrow grass, *Leptinella tenella*).
- ***Spartina alterniflora* grassland** tends to establish on upper intertidal mudflats, and is a more aggressive invader than saltwater paspalum. According to Northland Regional Council maps, there were 22 known infestations of the grass in Otamatea ED Northland. However, since 2002, eight have been eradicated and the remaining 14 are at 1–3% of their former extent, having been vigorously controlled via helicopter spray operations (Peter Joynt, Northland Regional Council, pers. comm.).
- **Sharp rush rushland** was recorded as a monospecific stand at only one location (on an estuarine shellbank in the Whakapirau Creek), but this species is common and is present in most saltmarshes and salt meadows.

### **GRASSLAND ON ISLANDS**

As a result of the need to classify entire nearshore islands as natural areas (rather than just the parts covered by indigenous shrubland and forest), three areas of mainly exotic grassland were included in sites in this study, on Kaiwhitu Island (Q08/175), Motuouhi Island (Q09/014) and Pupuia Island (Q08/177). A species list for Pupuia Island was compiled in 1993 which identified the main exotic grasses (kikuyu, buffalo grass and saltwater paspalum at the lower edge) and recorded occasional ti kouka, harakeke, kowharawhara, gorse and *Austrostipa stipoides* (SSBI Q08/H072). These islands were not visited as part of this study and the current composition of the grasslands is not known; they could have some indigenous grass cover.

#### **3.3.4 Species of botanical interest**

There is very little recent information about specific botanical values in Otamatea ED Northland. Botanists appear to have largely overlooked the area, with an average of only three indigenous plant specimens per decade lodged at the Auckland Museum Herbarium (accession numbers for some of these are given with the prefix 'AK'). Famous early botanist, Thomas Kirk, spent time around Paparoa at the beginning of his New Zealand career (after emigrating from England in 1863) and collected several specimens there which are now lodged at the Auckland Museum Herbarium (of which he was the curator from 1868 to 1873) and the Te Papa Herbarium ('WELT'). Many of his Paparoa collections are now classified as extinct or threatened plants, e.g. *Trilepidea adamsii* (Extinct), *Ophioglossum petiolatum* (Nationally Endangered), and *Picris burbridgeae* (Nationally Endangered).

The most recent (and maybe only) Auckland Botanical Society visit to the area, in which the authors exclaimed 'one cannot but feel saddened by the decimation of the once extensive Kaipara kauri forest' (Wright & Beaver 1990), was made to Hukatere Scenic Reserve in 1990. A plant species list for Pukehau QEII covenant (Q08/182) was compiled by Maureen Young and Frank Hudson (members of the above Society) on a field visit in 1992 (SSBI Q08/H073). Several plants lists have been compiled by DOC personnel during the last two decades, in particular Tony McCluggage, Richard Parrish, Peter Anderson, Wendy Holland, Lisa Forester, and Karen Riddell. These lists provide recent information on threatened, regionally significant and locally uncommon plants.

Observations made during the present study suggest that several plant species which are relatively common in other parts of Northland and the rest of the North Island are locally uncommon in Otamatea ED Northland, e.g. tawa, mangeao, northern rata, miro, manatu, kaikomako, kanono, ti ngahere, swamp maire, and *Alseuosmia* spp. These are either species which would have been naturally uncommon prior to human arrival (due to a natural lack of suitable habitat), or species which have lost much of their population as a result of habitat destruction. It is sometimes difficult to tease out these two causes of rarity. Tawa, mangeao, kanono, manatu, kaikomako, and ti ngahere probably fit into the 'naturally uncommon' group, while northern rata, miro, swamp maire, and *Alseuosmia* spp. are probably all in the 'uncommon due to habitat destruction' group. Some of the latter have been recognised as 'regionally significant' by the Northland Conservancy (Wendy Holland, pers. comm.), and are discussed in the next section. It is remarkable that towai (*Weinmannia*

*silvicola*), one of the most common indigenous trees in the rest of Northland, was not recorded in this survey nor in any of the reference material consulted. With a maximum altitude of 207 m (Hautakima peak on Hukatere peninsula), and a strong coastal influence, it is possible that the climate of Otamatea ED Northland is not suitable for towai. However, it may have been present in the past, and could still be present, but remain unrecorded, given the rapid nature of the current survey.

A few species which are not listed as threatened or regionally significant have failed to appear in recent records. *Alseuosmia banksii* var. *banksii* was collected near Paparoa by Thomas Kirk (AK 11699), but has not been recorded in the Northland part of the ED since. *Alseuosmia quercifolia* is known from three sites only. All species of this genus are vulnerable to browsing animals such as possums and goats, which appear to be particularly prevalent in Otamatea ED Northland. Three indigenous grasses collected by Kirk in the late 1800s around Paparoa and Matakohe, coastal wind grass (*Lachnagrostis littoralis*), *Trisetum arduanum*, and *Poa pusilla*, have not been recorded since. In 1903 Donald Petrie collected a specimen of short-hair plume grass (*Dichelachne inaequiglumis*, WELT SP067113), but this species has also gone unrecorded for more than a century. This probably reflects a lack of field survey in the ensuing decades, rather than an absence, as these are all locally common grasses in the rest of Northland. A relatively common fern species in other parts of New Zealand, *Hypolepis distans*, has not been recorded since 1867 (another T. Kirk record from Paparoa).

### 3.3.5 Threatened plant species

The current threat status of species listed below follows de Lange *et al.* (2004). Appendix 8.3 gives the definitions of threat categories as set out in Molloy *et al.* (2002).

#### **CHRONICALLY THREATENED**

##### ***Mida Mida salicifolia* (Gradual Decline)**

Endemic

This small, shiny-leaved, hemiparasitic tree is known in Otamatea ED Northland from Hukatere Scenic Reserve (Q08/081) (Wright & Beever 1990), Whakapirau/Rocky Point Forest and Shrubland (Q08/135) (SSBI Q08/H067), and Paparoa Creek Marginal Strip No. 2 and Surrounds (Q08/102) (Julia Walker, pers. comm.). It is threatened by possum and goat browse.

#### **AT RISK**

##### ***Doodia mollis* (Sparse)**

Endemic

This narrow, hairy fern is known to be present in the ED from one 1992 record from Pukehau QEII Covenant (Q08/182) (SSBI Q08/H073). It tends to occur in rather local populations in coastal forest between Kaitaia and Thames, and almost always grows with *D. australis*, but occupies damper situations (Brownsey & Smith-Dodsworth 2000). It is probably present elsewhere in Otamatea ED Northland.

***Leptinella tenella* (Sparse)**

Endemic

This is a naturally uncommon herb of sporadic distribution. It was collected in 1997 (AK 233971) in a tidal muddy seepage in the upper Paparoa Creek area of the Arapaoa River (Q08/084) in part of a high value saltmarsh, and probably occurs elsewhere in the ED. It is probably becoming more uncommon through invasion of its habitat by saltwater paspalum.

***Kawaka Libocedrus plumosa* (Sparse)**

Endemic

Kawaka is a tall conifer with bark falling in narrow strips and compressed, feather-like leaves. It has a naturally scattered distribution throughout its range (from southern Waikato northwards and in Northwest Nelson). Within Otamatea ED Northland it is known from one site only: Paparoa Creek Marginal Strip No. 2 and Surrounds (Q08/102) (Julia Walker, pers. comm.).

**Large-leaved milk tree *Streblus banksii* (Sparse)**

Endemic

This is a small coastal tree up to 12 m tall, similar to small-leaved milk tree (*Streblus heterophyllus*), except leaves are larger. It is very sensitive to seed predation by rats, as well as possum browse, and now exists at only a handful of sites around the Northland coast, and on offshore islands. It was recorded during this survey in the Whakapirau Creek Conservation Area (Q08/220), which is the only known site for this species on the Kaipara Harbour.

### 3.3.6 Regionally significant plant species

The following species are included in a draft list of regionally significant species prepared by DOC Northland Conservancy (DOC, in prep.).

***Coprosma crassifolia***

Endemic

This *Coprosma* is a small, divaricating tree with thick, rounded leaves which are white on the undersides. Its northern distributional limit in New Zealand is southern Northland, where it normally occurs in close proximity to the coast. It was recorded at three sites in Otamatea ED Northland, once in the present survey, once by an independent surveyor in 2005 (Julia Walker, pers. comm.) and once in 1990 by the Auckland Botanical Society (Wright & Beever 1990).

**Gully tree fern *Cyathea cunninghamii***

Endemic

This is a very tall, narrow-trunked tree fern (when mature), similar to mamaku (*Cyathea medullaris*), but with thinner stipes and shorter fronds that curl upwards slightly at the ends. It is usually sporadic in its distribution. During this survey it was recorded at one site only, Waitieke Creek Forest (Q08/092), on the coastal margin.

**Painted woodrush *Luzula picta* var. *picta***

Endemic

This is a small, hairy, tufted, grass-like rush which grows on dry ground, often in forest margins or scrub. One record exists from Hukatere Scenic Reserve



(Wright & Beever 1990). It is often overlooked, so may be more common than this suggests.

**Northern rata × pohutukawa hybrid**      *Metrosideros robusta* ×  
*M. excelsa*

Endemic hybrid

In northern regions of New Zealand, where both northern rata and pohutukawa grow naturally in close proximity (though not usually in the same forest type), hybrids of these species are sometimes present in low numbers. There are at least two sites within Otamatea ED Northland where hybrids are known to occur, both approximately 1 km from the coast. One was noted during this survey and another was previously recorded in 1994 (SSBI Q08/H051).

***Olearia solandri***

Endemic

This is a coastal shrub of local distribution, found only in the Kaipara and Hokianga Harbour regions in Northland. There are records from three sites within Otamatea ED Northland, all of which are in or continuous with saltmarsh habitat. One record is from the upper Paparoa Creek saltmarsh of the Arapaoa River estuary (Q08/084) in 1997 (AK 233985), another is from Pahi Coastal Strip (Q08/105) in 1999 (SSBI Q08/H066), and the third record is from Smith's Point (Q08/079) near Matakohe in 2001 (SSBI Q08/H071).

**Kaikomako *Pennantia corymbosa***

Endemic

This is a small tree which begins life with a small-leaved, divaricating growth habit and matures into a larger-leaved, more open form. It appears to be naturally sparse in Northland. In the Northland part of this ED it has been recorded at Te Kowhai Scenic Reserve (Q08/132) in 1996 (SSBI Q08/H038) and Paparoa Stream Headwaters (Q08/110) in 1995 (SSBI Q08/H015).

**Tawapou *Pouteria costata***

Endemic

This is coastal, shiny-leaved tree (up to 20 m tall) which has large red-brown berries that are a favourite with rats. As a result of seed and seedling predation, these trees are becoming increasingly uncommon in Northland. It was found at four sites in Otamatea ED Northland during the present survey, all on the west coast of the Hukatere peninsula (or islands off it).

**Leafless lawyer *Rubus squarrosus***

Endemic

The leafless lawyer is a vine with yellow prickles and almost no leaves (it can photosynthesise using its stems). A few scattered populations of this species exist in Northland. In Otamatea ED Northland this species recorded only once at Takahoa Creek Forest (Q08/163) in 2001 (SSBI Q08/H070), where it is abundant in the canopy of secondary coastal broadleaved forest.

**Arrow grass *Triglochin striata***

Endemic

This is a small salt meadow monocotyledonous plant, which grows on mudflats in sparse swards like a tiny grass (although it is not a grass), and is often mixed



with other salt meadow herbs such as sea primrose and remuremu. It is becoming less common around the fringes of the Kaipara Harbour due to competition with invasive weeds, e.g. saltwater paspalum. At least two populations were noted in the present study in Otamatea ED Northland, one on the Arapaoa River (Q08/084) and one on the Otamatea River (Q08/062). It is probably more common than this suggests, but detailed surveys have not been undertaken.

### 3.3.7 **Threatened and regionally significant plant species not recorded recently in the Northland part of the Ecological District**

#### ***EXTINCT***

##### **Adams mistletoe *Trilepidea adamsii***

Endemic

Thomas Kirk recorded this North Island endemic, semi-parasitic mistletoe near Paparoa Bridge around 1867 (WELT SP031299). It is now thought to be extinct throughout its former range through a combination of habitat loss, over-collecting, loss of pollinators, loss of dispersers, and possum browse (NZPCN 2006). The last specimen was collected at Cambridge in 1954. Its known hosts were mamangi, other *Coprosma* species, mapou, and wharangi. It was probably restricted to coastal and lowland kauri forest margins and associated open, seral shrublands (NZPCN 2006), which are abundant in Otamatea ED Northland.

#### ***ACUTELY THREATENED***

##### **Hairy willowherb *Epilobium birtigerum* (Nationally Endangered)**

Endemic

A collection of this robust, woody herb was made in 1924 by Walter Oliver on Pakaurangi Point (WELT SP042470). It was also known from the Paparoa area (Thomas Kirk collected it in 1867, AK 11459), so it may have been quite widespread in the ED, however it has not been recorded since 1924.

##### **Stalked adder's tongue *Ophioglossum petiolatum* (Nationally Endangered)**

Endemic

This annual fern was last recorded in Paparoa by Thomas Kirk in 1867 (DOC Bioweb database). Its habitat is in herbfields on the edges of streams, lakes or ephemeral wetlands; occasionally it occurs in podocarp forest (NZPCN 2006).

##### ***Picris burbridgeae* (Nationally Endangered)**

Endemic

This species was collected by Thomas Kirk in the vicinity of Paparoa in 1867 (AK 11814), but has not been recorded since. It is an annual herb in the daisy family which colonises disturbed soil, but is presumably out-competed by introduced annuals and grasses which now occupy the same niche.

## **CHRONICALLY THREATENED**

### ***Tupeia antarctica* (Gradual Decline)**

Endemic

This is a shrubby hemiparasitic mistletoe with small yellow-green flowers and white to pink berries that has a range of host species. In 1867 specimens were collected by Thomas Kirk in the locality of Paparoa, parasitic on tarata (AK 11268) and another parasitic on kohuhu (WELT SP031346). Throughout its present-day range (North Island and South Island) this species is threatened by possum browse, and could be locally extinct in Otamatea ED Northland.

## **AT RISK**

### **Sand brome *Bromus arenarius* (Sparse)**

Thomas Kirk collected this indigenous coastal grass at 'Te Pahi' in 1867 (WELT SP076361), however it has not been recorded since. Its distribution is naturally sporadic, and it is often associated with seabird nesting grounds (NZPCN 2006).

### ***Calystegia marginata* (Sparse)**

Endemic

This disturbance-related species was recorded by Thomas Kirk at Paparoa in the late 1800s (WELT SP004696). It occurs primarily in coastal, lowland shrublands, rough pasture or bracken dominated sites, usually on coastal headlands, but also on road sides, along railway embankments and in rough pasture and lawns (NZPCN 2006). There is no reason to suspect it is no longer present in Otamatea ED Northland, it has probably just gone unnoticed (it is often confused with convolvulus or other *Calystegia* species).

## **REGIONALLY SIGNIFICANT**

### ***Green mistletoe Ileostylus micranthus***

Endemic

This is another 1867 record by Thomas Kirk from around Paparoa (AK 11264). No other records of this species exist from the Northland part of the ED. This is a yellow-green flowered, woody semi-parasite with yellow berries that has been recorded on over 300 host species throughout the country (NZPCN 2006). Like all mistletoes it is threatened by possum browse, and is becoming less common in Northland.

### ***Carmine rata Metrosideros carminea***

Endemic

Two early collections of this species are stored in the Auckland Museum Herbarium: one from Paparoa in 1867 by Thomas Kirk (AK 11444), and one from Gitto's Point (called 'Stephen's Bush') in 1935 by F. H. Browne. This species, along with all larger-leaved rata (*Metrosideros* spp.), are threatened by browsing mammals.

## 3.4 FAUNA

### 3.4.1 Overview of indigenous fauna

Information on indigenous fauna in this report has been compiled from the following sources:

- Sites of Significant Biological Interest (SSBI) files held at the Northland Conservancy office, Department of Conservation.
- The Northland Region Ornithological Society of New Zealand Newsletter 'Amokura' (Crockett (comp.) 1992–2004).
- The Bioweb Herpetofauna database (DOC 2006).
- Uncommon and rare landsnails in the Northland region of New Zealand, and an assessment of conservation management priorities (Brook 2002).
- The NZ Freshwater Fish Database (NIWA 2006).
- Incidental field observations during November/December 2005 and January 2006 (current study).
- Surveys and incidental observations of Dr Ray Pierce between 1987 and 2005.

A comprehensive discussion and checklist of fauna, particularly invertebrates, is beyond the scope of the present study. The descriptions for each site detail known threatened fauna, as well as providing some records of non-threatened species. There are very few records of reptiles and invertebrates, irrespective of their prevalence, and it is recognised that they are a significant facet of indigenous ecosystems which is often overlooked. Indigenous New Zealand insects are our largest fauna group, and are intimately associated with indigenous habitat, carrying out a wide range of roles in ecosystems. In addition to their consumption of live plant material, they are involved in pollination, breakdown of leaves, litter and logs, soil formation, general scavenging, parasitism and predation, as well as providing the main food for birds, lizards, and most freshwater fish (Watt 1975). It is generally acknowledged that, although there are many 'generalist' species of insects, the great majority have particular habitat requirements that restrict their populations in both space and time. With the present state of knowledge of these species, the protection of the maximum range of habitat types is considered the most important strategic approach in order to provide a minimum basis on which populations can be maintained.

The Kaipara Harbour is the largest enclosed harbour and estuarine system in New Zealand, with a total surface area of 947 km<sup>2</sup> (Cromarty & Scott 1996). It is predominantly shallow, with 409 km<sup>2</sup> of the total surface area exposed as mudflats at low tide (Heath 1975). Otamatea ED Northland has approximately 68 km<sup>2</sup> of mudflats and sandflats, or 17% of the total present within the Kaipara Harbour. Kaipara Harbour shallow intertidal areas are vital non-breeding sites for New Zealand-breeding waders such as pied oystercatcher, variable oystercatcher, pied stilt, black stilt, banded dotterel, northern NZ dotterel, and wrybill (Dowding & Moore 2006), some of which are threatened (see below). Even greater numbers of waders and other waterbirds are present in the Kaipara Harbour in summer, when transequatorial migrants, such as bar-tailed godwit, lesser knot and turnstone, flock to the harbour to feed. Year-round seabirds or waterbirds which are common in the Northland Conservancy part of the ED

include white-faced heron, black-backed gull, red-billed gull, and pied shag. Species which are occasionally seen include Australasian gannet, Arctic skua, reef heron, little egret, and white heron. The harbour waters are also feeding grounds for four threatened tern species, at least three of which (Caspian tern, white-fronted tern, and NZ fairy tern) occur in Otamatea ED Northland (see below).

Mangroves provide habitat for several avifauna species, including white-faced herons, all the shag species and banded rails. In the Kaipara as a whole, banded rails occur mainly where mangroves merge with saltmarsh or dense terrestrial vegetation (Ray Pierce pers. comm.), but there is only one recent record from Otamatea ED Northland (Wildland Consultants Ltd 2004).

Natural freshwater wetland habitat is extremely limited in Otamatea ED Northland and it appears that the most important sites for fauna are now constructed lakes and ponds. Common indigenous bird species associated with the numerous farm ponds and three larger constructed lakes include white-faced heron, pukeko, paradise shelduck and kingfisher. During the present survey, a tape of spotless crane and NI fernbird calls was played at all wetlands which could be reached. A fernbird was heard in one location (Tinopai Wetland Q08/216), but spotless crane was not detected.

Indigenous birds of forests, shrublands and grasslands which are common throughout include grey warbler, tui, welcome swallow, kingfisher, NZ pipit, fantail, Australasian harrier, paradise shelduck, pukeko, spur-winged plover, black-backed gull, morepork, shining cuckoo, and silvereye.

There are records of three lizard species from Otamatea ED Northland: copper skink, ornate skink, and Auckland green gecko (DOC 2006).

Only one threatened endemic landsnail (*Amborhytida dunniae*) occurs in Otamatea ED Northland. Kauri snail may occur, but information is severely lacking on its distribution within the study area. A similar situation exists for other invertebrates.

New Zealand fur seals, *Arctocephalus forsteri*, come up the harbour arms and tidal creeks of this part of the ED quite frequently. These are mainly juveniles (Ray Pierce, pers. comm.).

The New Zealand, conservation status of species is derived from Hitchmough (comp.) (2002) which uses the threat classification system of Molloy *et al.* (2002) (see Appendix 8.3). Species classed as 'regionally significant' are determined by DOC Northland Conservancy (DOC, in prep., Wendy Holland pers. comm.). Nomenclature follows Heather & Robertson (2000) for birds, Gill & Whitaker (1996) for reptiles, McDowall (1990) for fish, and Brook (2002) for snails, and King (2005) for mammals.

A checklist of fauna recorded in Otamatea ED Northland is presented in Appendix 8.7.

### **3.4.2 Threatened bird species**

Otamatea ED Northland has high numbers of threatened bird species: eight species are currently acutely threatened, six species are chronically threatened,

and a further eight species are at risk. The conservation status of northern NZ dotterel may be upgraded from Sparse to Nationally Vulnerable and that of grey duck may be upgraded from Serious Decline to Nationally Endangered (Ray Pierce, pers. comm.) increasing the acutely threatened species count to ten in the 2006 edition of the national list of threatened species. However, pied shag is likely to be removed from the threatened species list in future (Ray Pierce, pers. comm.).

### ***ACUTELY THREATENED***

#### **Black stilt *Himantopus novaeseelandiae* (Nationally Critical)**

Endemic

Four black stilt-pied stilt (*Himantopus himantopus leucocephalus*) hybrids were recorded at Batley-Tanoa in 2001 (Crockett (comp.) 1992–2004). The only breeding sites for black stilts are in the Upper Waitaki (Mackenzie) Basin in North Otago and South Canterbury, from whence only 10–15% of the population migrates to other places for the winter. Kaipara Harbour is the fifth most important wintering site in the country for this species (Dowding & Moore 2006).

#### **New Zealand fairy tern *Sterna nereis davisae* (Nationally Critical)**

Endemic subspecies

Virtually the entire population winters at the Kaipara Harbour and it is likely that some birds feed over the harbour waters of the ED and roost at shellbanks (Ray Pierce, pers. comm.).

#### **White heron *Egretta alba modesta* (Nationally Critical)**

Indigenous

Occasional visitor to the Bickerstaffe area, at least up to 1978 (Veitch 1979).

#### **Australasian bittern *Botaurus poiciloptilus* (Nationally Endangered)**

Indigenous

There is one anecdotal record from Frenchman's Bay Forest and Wetland (Q09/015) (Tony Walden, Oneriri Station, pers. comm.). The Kaipara Harbour is an important site for bittern in New Zealand. Harbour habitats frequented include tidal flats, mangroves, saltmarsh, tidal creeks and nearby freshwater wetlands (Ray Pierce pers. obs.). Focused field survey is needed to identify important sites for bittern in the Northland Conservancy part of this ED.

#### **North Island kaka *Nestor meridionalis septentrionalis* (Nationally Endangered)**

Endemic

A single recent record (July 2004) exists of a pair of kaka visiting the area around Paparoa (Richard Gillies, pers. comm.). These birds may have originated from islands in the Hauraki Gulf to the east, or from protected forest further south on the mainland.

**Reef heron *Egretta sacra sacra* (Nationally Endangered)<sup>5</sup>**

Indigenous

This species is now occasionally sighted around the Hukatere peninsula, Arapaoa River and Otamatea River on rocky shoreline (Crockett (comp.) 1992-2004; Bull *et al.* 1985). Titipu Island (Q08/176) was a breeding place of long standing until 1965 at least (Veitch 1979), however the presence of the breeding colony has not been confirmed for many years. No birds were present during a survey in 1993 (SSBI Q08/H057) which determined the island to be covered in exotic grassland with rat and possum remains, so the birds' continued presence seems unlikely.

**Caspian tern *Sterna caspia* (Nationally Vulnerable)**

Indigenous

The Kaipara Harbour supports the largest breeding colony of Caspian terns in New Zealand. The largest numbers recorded in Otamatea ED Northland are from the Arapaoa River, where up to 29 have been seen at one time in recent years (Crockett (comp.) 1992-2004).

**Wrybill *Anarhynchus frontalis* (Nationally Vulnerable)**

Endemic

In recent years 16-42 wrybills have been recorded in the Arapaoa River (Pahi - Whakapirau area) (Crockett 1992-2004). The Raepere Creek on the eastern shore of the Hukatere peninsula is the most important roosting site for this species in the Kaipara Harbour (Veitch 1979), and the harbour itself is the fourth most important autumn/winter site in the country, after Manukau Harbour, Firth of Thames and Lake Ellesmere (Dowding and Moore 2006).

**CHRONICALLY THREATENED**

**Grey duck *Anas superciliosa superciliosa* (Serious Decline)<sup>6</sup>**

Indigenous

This species was recorded at several ponds and constructed lakes within the part-ED, however many are hybrids (to an unknown extent) with the introduced mallard (*Anas platyrhynchos*). Introgressive hybridisation is one of the primary reasons for the serious decline of the species.

**North Island brown kiwi *Apteryx mantelli* (Serious Decline)**

Endemic

Kiwi were recorded in two Hukatere peninsula forest remnants by the former New Zealand Wildlife Service in the 1970s (Hukatere Scenic Reserve (Q08/081) and Raepere Creek Forest (Q08/094) where they were found in 'good numbers'), but a subsequent survey in 1992 found no kiwi (Miller and Pierce 1995). There are old anecdotal records of kiwi in forest remnants on Puketotara Peninsula (Tony Walden, Oneriri Station, pers. comm.), but kiwi are now

---

<sup>5</sup> Reef heron may be downgraded in conservation status to Nationally Vulnerable (Ray Pierce, pers. comm.).

<sup>6</sup> Grey duck may be upgraded in conservation status to Nationally Endangered (Ray Pierce, pers. comm.).

probably locally extinct in Otamatea ED Northland, largely due to habitat loss and particularly the uncontrolled predation by the full range of introduced mammalian predators known to threaten kiwi (dogs, cats, stoats, ferrets, rats, etc.). During the 1970s and early 1980s there was large-scale land clearance throughout Northland (encouraged by government-subsidised rural bank land clearance loans), which, combined with the release of ferrets into the wild after the 'fitch' farming industry failed, may have contributed to the dramatic decline of kiwi witnessed around that period (Peter Anderson, pers. comm.).

**Banded dotterel *Charadrius bicinctus bicinctus* (Gradual Decline)**

Endemic

The Kaipara Harbour is the fourth most important wintering site in the country for banded dotterels, most of which originate from breeding grounds in Marlborough and the southern and central North Island (Pierce 1999). Within Otamatea ED Northland, the area where most birds congregate is around the southern Otamatea River and Puketotara Peninsula (Crockett (comp.) 1992-2004), but birds visit and forage in grazed pasture at high tide in several areas.

**Kukupa *Hemiphaga novaeseelandiae* (Gradual Decline)**

Endemic

This species occurs sparsely in Otamatea ED Northland, generally in the larger indigenous forest blocks that are not heavily dominated by kanuka.

**Northern little blue penguin *Eudyptula minor iredalei* (Gradual Decline)**

Endemic subspecies

This species is present in the harbour waters and has attempted to breed at Tinopai and probably elsewhere in the Northland Conservancy part of the ED (Ray Pierce, pers. comm.).

**White-fronted tern *Sterna striata striata* (Gradual Decline)**

Endemic

White-fronted terns are the most frequently encountered tern over the estuarine waters of Otamatea ED Northland, but flocks >20 are very uncommon. A flock of 56 was recorded off Tinopai in 1999, but otherwise low numbers are usually seen.

**AT RISK**

**Banded rail *Gallirallus philippensis assimilis* (Sparse)**

Indigenous

This species was formerly widespread in Northland (Bull *et al.* 1985), but there are few recent records. One was recorded in saltmarsh around Puketi Point, Tinopai in 2002 (Q09/021) (Wildland Consultants 2004). Ideal habitat exists in many areas of the part-ED, but these birds are probably threatened by predation from introduced mammals.

**Black shag *Phalacrocorax carbo novaehollandiae* (Sparse)**

Indigenous

Over 100 birds have been recorded in the Ngamotu area in the past (Veitch 1979). Black shags were recorded in the present study at Brynderwyn Farm



Pond (Q08/066) and Kaitara Constructed Lake (Q08/159), which emphasizes the importance of human-made wetlands to waterbirds in this part of the ED. There are occasional coastal records from Puketotara and Tinopai (Crockett (comp.) 1992-2004).

**Little black shag *Phalacrocorax sulcirostris* (Sparse)<sup>7</sup>**

Indigenous

This species is seen occasionally around the coast of Hukatere peninsula (Crockett (comp.) 1992-2004).

**Marsh crake *Porzana pusilla affinis* (Sparse)**

Indigenous

This species was formerly present (Bull *et al.* 1985), but there are no recent data.

**North Island fernbird *Bowdleria punctata vealeae* (Sparse)**

Endemic

Fernbirds were heard in Tinopai Wetland (Q08/216) and around the saltmarsh fringe near Puketi Point, Tinopai (Q09/021) in 2002 (Wildland Consultants Ltd 2004), but there are no other recent reports from Otamatea ED Northland. Just outside the ED boundary, in a shrubby, raupo wetland within the Topuni Carter Holt Harvey pine plantation (grid ref Q08 403 550) there were reports of 'many fernbirds' in a 2002 survey (Wildland Consultants Ltd 2004).

**Northern New Zealand dotterel *Charadrius obscurus aquilonius* (Sparse)<sup>8</sup>**

Endemic

In recent years, 2-7 New Zealand dotterel have been seen in the Batley-Tanoa area in winter, and 1-2 individuals have remained resident over summer. Since 1992, this species has only been seen in two areas of Otamatea ED Northland, at Ngamotu (Whakaki River) and Batley-Tanoa (both on the lower Otamatea River). The highest number recorded was 35 in winter 1999. As a result of recent overall population decline in New Zealand in the three years since it was last evaluated, this species' threat status is likely to increase to 'Nationally Vulnerable' (Ray Pierce, pers. comm.).

**Pied shag *Phalacrocorax varius varius* (Sparse)<sup>9</sup>**

Indigenous

This species occurs sparsely on all of the coastlines of Otamatea ED Northland. Roosts of 5-10 birds are frequently encountered in trees overhanging the water.

**Spotless crake *Porzana tabuensis plumbea* (Sparse)**

Indigenous

This species was formerly present (Bull *et al.* 1985) but there are no recent data.

---

<sup>7</sup> Little black shag may change in conservation status to Range Restricted (Ray Pierce, pers. comm.).

<sup>8</sup> Northern New Zealand dotterel may be upgraded in conservation status to Nationally Vulnerable (Ray Pierce, pers. comm.).

<sup>9</sup> Pied shag may be downgraded in conservation status to 'not threatened' (Ray Pierce, pers. comm.).

## **NON-RESIDENT NATIVE**

### **Turnstone *Arenaria interpres* (Migrant)**

Indigenous

Turnstones appear to be very uncommon in Otamatea ED Northland. Two turnstones were recorded by the OSNZ in winter 1992 on the lower Otamatea River (Crockett (comp.) 1992-2004).

### **Lesser knot *Calidris canutus* (Migrant)**

Indigenous

Lesser knots are recorded sporadically in Otamatea ED Northland, but presumably return each year during the summer season to feed. Records at OSNZ survey points on the Otamatea and Arapaoa Rivers have ranged from 0-500 in the last 15 years (Crockett (comp.) 1992-2004).

### **Bar-tailed godwit *Limosa lapponica* (Migrant)**

Indigenous

Bar-tailed godwits are the most common transequatorial migrants arriving at Otamatea ED Northland each summer to feed on the mudflats and sandflats of the estuary. This species has been recorded every year for the past 15 years in flocks of up to 2220 (Crockett (comp.) 1992-2004).

### **Royal spoonbill *Platalea regia* (Coloniser)**

Indigenous

During the present survey a pair was seen at Takahoa Government Purpose Wildlife Management Reserve (Q08/164), and up to 20 have been seen in recent years (Ray Pierce, pers. comm.). 2-3 birds have been recorded on occasion at Tinopai, Ngamotu (Whakaki River) and Batley-Tanoa by members of the OSNZ (Crockett (comp.) 1992-2004).

### **Arctic skua *Stercorarius parasiticus* (Migrant)**

Indigenous

One Arctic skua was observed harassing white-fronted terns (their typical target for regurgitated food) over the Otamatea River Confluence (Q09/021) opposite Tinopai during the present survey.

### **3.4.3 Regionally significant bird species**

The following species are included in a draft list of regionally significant species prepared by the Northland Conservancy (DOC, in prep.).

#### **North Island tomtit *Petroica macrocephala toitoi***

Endemic

The tomtit (or 'pied tit') has not been recorded in Otamatea ED Northland since 1969 (Bull *et al.* 1985), and is probably locally extinct. It was recently noted in forest on Pukeareinga in neighbouring Rodney ED (Peter Anderson, pers. comm.). Whilst this species declined throughout the country after lowland forest clearance and the introduction of predatory mammals, it was able to adapt in many parts of the country and continued to live in forest remnants (Heather & Robertson 2000). Perhaps its absence in Otamatea ED Northland is due to the severe reduction in size of habitat remnants and the general lack of

pest control throughout the area. Tomtits are known to thrive in older pine plantations, but none were recorded in either of the two large pine plantations in the study area, at Topuni and Tinopai.

#### **Variable oystercatcher *Haematopus unicolor***

Endemic

The variable oystercatcher is very uncommon in Otamatea ED Northland compared with its close relative, the pied oystercatcher, which is the most abundant wader by far in the part-ED. From 1992 to 2004, at most 9 birds were seen at one time, but usually 1–4 were present at scattered locations around the Arapaoa River, Otamatea River and Whakaki River.

### **3.4.4 Threatened mammal species**

Neither of New Zealand's endemic bat genera is known to occur at present in Otamatea ED Northland. The nearest and most recent record of North Island long-tailed bat (*Chalinolobus tuberculata*, Nationally Vulnerable) is from Rodney ED in the southeastern Kaipara. The northern short-tailed bat (*Mystacina tuberculata aoupourica*, Nationally Endangered) is now only known from Omahuta, Warawara and Little Barrier Island. Both of these bats would have occurred in Otamatea ED Northland before predators (cats, stoats, rats) became abundant and major habitat loss was induced by humans (Molloy 1995).

### **3.4.5 Threatened landsnail species**

There are no confirmed records of threatened landsnails from Otamatea ED Northland, but suitable habitat is present for two species, and this is discussed further below.

#### ***CHRONICALLY THREATENED***

##### ***Amborhytida dunniae* (Gradual Decline)**

Endemic

This snail is endemic to Auckland and Northland with a sporadic distribution resulting from extensive habitat destruction. The main threats to the species are predation by mammalian predators and loss or degradation of habitat, especially through browsing and trampling by livestock or land clearance. One record of *Amborhytida dunniae* is known from Otamatea ED Northland, at Barton's Hill Forest (Q08/137) (Fred Brook pers. comm.).

##### ***Kauri snail Paryphanta busbyi* (Gradual Decline)**

Endemic

The kauri snail is endemic to Northland and north Auckland with a fragmented distribution resulting from extensive destruction of its habitat, which is primarily in indigenous forest. It is also known from plantations of radiata pine and rank exotic grassland adjoining forest and shrubland. Predation by pigs, rats, possums and possibly hedgehogs and continued loss of habitat are the main threats to the species (Brook 2002). There are no formal records for the species in Otamatea ED Northland, but there are anecdotal accounts of kauri snails in kauri forest on the Puketotara Peninsula (Tony Walden, Oneriri Station, pers. comm.).

### 3.4.6 Threatened lizard species

#### ***CHRONICALLY THREATENED***

##### **Auckland green gecko *Naultinus elegans* subsp. *elegans* (Gradual Decline)**

Endemic

This is an arboreal species, endemic to Auckland and Northland (north to approximately Hokianga). There are three old records (1965-1967) of this species from Hukatere, Matakohē and Batley (the latter two geckos were yellow). There are only anecdotal recent records of the species in Otamatea ED Northland (Ray Pierce, pers. comm.), but their preferred habitat (manuka/kanuka shrubland and forest) is abundant. Threats to this species include predation by cats, rats, stoats, possibly other introduced mammals, blackbirds and magpies, as well as habitat loss and degradation.

### 3.4.7 Regionally significant lizard species

##### **Ornate skink *Cyclodina ornata*<sup>10</sup>**

Endemic

This species is endemic to the North Island and offshore islands. There are four recent records of ornate skink from Paparoa and the Hukatere peninsula (near Hukatere, and at Perkins QEII covenant (Q08/182)) (DOC 2006). These records were from underneath wood in both farmland and indigenous forest. Ornate skinks are not limited to indigenous vegetation, and can thrive under tall exotic grasses such as kikuyu. They are, however, much less common than the other skink found in Otamatea ED Northland, the copper skink (*C. aenea*) (DOC 2006).

### 3.4.8 Threatened fish species

#### ***CHRONICALLY THREATENED***

##### **Long-finned eel *Anguilla dieffenbachii* (Gradual Decline)**

Indigenous

This species was recorded in the Topuni River in 1966, the Otamatea River in 1992 and the Wairau River in 1994 (NIWA 2006). Long-finned eels are found throughout New Zealand, but are threatened by over-harvesting (especially of large females) and habitat modification.

---

<sup>10</sup> Ornate skink may be upgraded in conservation status to Gradual Decline (Peter Anderson, pers. comm.).

### 3.4.9 Regionally significant fish species

#### **Banded kokopu *Galaxias fasciatus***

Endemic

Banded kokopu were recorded in a tributary of the Topuni River in 1993 (NIWA 2006). This species occurs throughout New Zealand, but current records show this species as being sparse in Otamatea ED Northland, which is probably due to a lack of riparian forest, which creates the shaded stream environment that this fish needs. However, the lack of records may simply be due to only limited surveys being undertaken.

#### **Giant bully *Gobiomorphus gobioides***

Endemic

Northland appears to be the stronghold for this species, which has an intermittent distribution throughout New Zealand (Conning *et al.* 2004). There is a 1994 record of giant bully from the Wairau River (NIWA 2006).

## 3.5 THREATS

There are various ongoing and potential threats to the natural areas of Otamatea ED Northland. Most of these are common to all of lowland New Zealand.

#### ***Invasive plants***

Saltmarshes, freshwater wetlands and shrublands are the worst affected habitat types in terms of weed infestation. Apart from wilding pines (radiata pine and maritime pine) and crack willow which are relatively common, and occasional tree privet, brush wattle or black wattle, invasive tree species infrequently attain the forest canopy in Otamatea ED Northland. The main weed threat in forests is in the understorey. Weeds are particularly prevalent in riparian forest remnants, where the constant flooding disturbance plus the enhanced light from the edges of the remnant induces good habitat for some of the worst smothering weeds, e.g. periwinkle, tradescantia, selaginella, nasturtium, cleavers and montbretia. Flooding also spreads weeds by moving around plant fragments and seeds.

#### ***Pest animals***

Several mammalian pest animals are present in Otamatea ED Northland (see Appendix 8.7). There is currently very little pest control to keep populations in check, in order to benefit indigenous biodiversity. Mustelids, rats and possums prey on indigenous birds, lizards and invertebrates. Possums also browse indigenous vegetation, causing canopy dieback and the loss of some species. In many areas, goats are responsible for the sparseness of the understorey. Pigs also browse and dig up vegetation, as well as prey on large invertebrates such as landsnails and earthworms.

#### ***Effects of agriculture on natural areas***

Grazing and trampling by livestock in natural areas limits regeneration of sensitive species, leads to soil compaction and reduces habitat quality for

indigenous animals. In addition, high volumes of urine and faeces from livestock adversely affect freshwater quality, causing eutrophication of waterways, which degrades habitat for indigenous fish and sensitive aquatic macroinvertebrate species (e.g. stoneflies, caddisflies, and mayflies).

### ***Effects of residential dwelling on natural areas***

The main threats from residential areas in contact with natural areas are weed invasion through 'garden escapes' (horticultural plants which naturalise), dumping of refuse and predation by domestic pets (e.g. dogs and cats) on indigenous fauna. It has been shown that not only feral animals, but domestic ones too, can be important factors in the decline of species such as the North Island brown kiwi, which has gone extinct in Otamatea ED Northland in the last twenty years (Pierce & Sporle 1998). As residential development increases around the coasts of the Northland Conservancy part of the ED, the effects of agriculture may lessen, but the types of threats listed here are likely to increase. There is also the possibility that new residents will favour mangrove clearance, leading to illegal clearance activities, as has happened around many heavily populated estuaries in the North Island.

### ***Ongoing effects of former land clearance***

Former land clearance has led to severe habitat fragmentation through Otamatea ED Northland. Smaller habitats have a greater ratio of edge to area, and are therefore more vulnerable to a wide range of threats; these processes are often referred to as 'edge effects'. Edge effects include: a) increased penetration by invasive weeds and pest animals, b) more light entering the understorey from the sides, which changes conditions for plant growth and hence vegetation composition, and c) increased wind in the understorey and consequent drying effects. Many forest remnants are so small and exposed that the edge effects render them ecologically dysfunctional; they are tree museums. They no longer contain palatable species and regeneration is limited by the combined impacts of grazing/trampling and infestation by pest animals and plants. In addition, the further away they are from other habitats and seed sources, the less likely it is that regeneration can occur.

### ***Present-day land clearance***

Since the 2002 aerial photography was flown, a 7.7 ha area of coastal totara-kahikatea forest on the shores of the Pahi River has been cleared, and in two or three other places, areas in the order of 10s of hectares of kanuka and/or manuka shrubland have been cleared. This is not a particularly rapid rate of clearance; however as only 9.75% of the terrestrial part of Otamatea ED Northland is covered with indigenous vegetation, any amount of further clearance could be considered ecologically unwise. For example, residential subdivision developments near or within natural areas can lead to small-scale clearances for house sites or gardens that may appear to be of little consequence when considered individually, but may collectively contribute to a loss or degradation of habitat that is unacceptable, given the already high degree of habitat fragmentation in Otamatea ED Northland.

### ***Poaching of kukupa***

Kukupa occur sparsely in Otamatea ED Northland and are chronically threatened at a national level. It is an offence to kill or harm kukupa, but there



are anecdotal reports of poachers active around the Puketotara Peninsula area (Tony Walden, pers. comm.).

***Legal protection versus conservation management action***

Though small areas of Otamatea ED Northland have some legal protection status under the Department of Conservation, the Kaipara District Council or the QEII National Trust, without active conservation measures, even these areas will continue to lose biodiversity. As a minimum, the following actions need to be undertaken to protect the immediate and long-term viability of the natural areas:

- Fencing to exclude livestock from forest and shrubland remnants. This includes fencing along the coastal strip (so that livestock do not have access to beaches and mudflats).
- Reducing the impact of invasive plants through targetted control programmes. The current *Spartina alterniflora* control programme lead by the Northland Regional Council is a positive example of a large-scale species-focused programme. Weed control can also be at a smaller scale and site-focused.
- Regular control of mammalian pests in particular goats, pigs, possums, rats and mustelids.

A lack of conservation management action, in the face of all the other pressures enumerated here, is probably the greatest threat to the future viability of the natural areas of Otamatea ED Northland. Priority areas for protection are described in Section 5.2 (page 427).