KANUNNAH

The Research Journal of the
Tasmanian Museum and Art Gallery

VOLUME 4

Ka-nunnah – 'Thylacine'

The oldest fossils of thylacines are Late Oligocene to Middle Miocene in age (20–25 My B.P.) and are from the Riversleigh deposits in north-western Queensland (Vickers-Rich *et al*. 1991). It is speculated that competition with introduced dingoes in mainland Australia may have caused their extinction in mainland Australia during the last 5000 years. The most recent remains of thylacines in mainland Australia were dated at just over 3000 years old (Archer 1974).

The thylacine *(Thylacinus cynocephalus)* in Tasmania coexisted with Aboriginal people for millennia. The arrival of Europeans in Tasmania resulted, in just over a hundred years, in the extinction of thylacines from their last refuge. The demise of the thylacine resulted in the extinction of an entire lineage of marsupials from the planet.

To the Aboriginal people of Tasmania the thylacine was called many things due to its wide spread distribution in the State. Tribes from the areas of Mount Royal, Bruny Island, Recherche Bay, and the south of Tasmania referred to the Tiger as 'Ka-nunnah' or 'Laoonana', while tribes from Oyster Bay to Pittwater called it 'Langunta' and the North-west and Western Tribes called it 'Loarinnah' (Milligan 1859). Famous Tasmanian Aboriginal chief Mannalargenna from the East Coast of Tasmania called the thylacine 'Cab-berr-one-nen-er', while Truganinni and Worrady, (Bruny Island) called it 'Can-nen-ner'.

The thylacine is the state logo for Tasmania. The title of the journal 'Kanunnah' commemorates the Tasmanian Aboriginal word used by tribes from southern Tasmania for the thylacine.

Archer M (1974) New information about the Quaternary distribution of the thylacine (Marsupialia: Thylacinidae) in Australia. *Journal and Proceedings of the Royal Society of Western Australia* **57**: 43–50.

Milligan J (1859) Vocabulary of dialects of Aboriginal Tribes of Tasmania. *Papers and Proceedings of the Royal Society of Tasmania* **3(2)**: 239–282.

Vickers-Rich P, Monaghan JM, Baird RF, Rich TM (1991) *Vertebrate Palaeontology of Australasia* (Monash University Publications Committee: Melbourne).

Publication Date: 30 June 2011

KANUNNAH

The Research Journal of the
Tasmanian Museum and Art Gallery

The Tasmanian Museum and Art Gallery is a combined museum, art gallery and state herbarium. It has the broadest collection range of any single institution in Australia and these collections span the arts, sciences, history and technology. The Tasmanian Museum and Art Gallery's role is to collect, conserve and interpret material evidence on the State's natural history and cultural heritage.

Kanunnah is a peer-reviewed journal published by the Tasmanian Museum and Art Gallery in Hobart, Tasmania. Its aim is to disseminate research in all areas of study undertaken by the Tasmanian Museum and Art Gallery. These areas include the life sciences, culture, history and the arts. Papers on any of these research areas will be considered, but papers dealing with Tasmanian, southern Australian and sub-Antarctic issues will be particularly welcome.

Short communications and reviews are also welcome. Researchers based outside the institution are encouraged to submit manuscripts for publication to the journal, although they must be relevant to the Museum's primary areas of study.

Kanunnah will be published occasionally, depending upon budgetary considerations and available manuscripts.

Annual Subscriptions

*Within Australia**

Individuals $30
Institutions $50

Overseas

Individuals and institutions (surface mail) $70
**This subscription includes an amount for GST ($3.00/$5.00)*

Subscription details, with a cheque or money order made out to the Tasmanian Museum and Art Gallery, should be sent to:

Museum Shop
Tasmanian Museum and Art Gallery
GPO Box 1164
Hobart Tas 7001 Australia

www.tmag.tas.gov.au

Cover Image: Reproduction of the original painting of *Craspedia macrocephala*.
From *Curtis's Botanical Magazine* 62, Tab. 3415 (1835)

Kanunnah 4: 1–118, 30 June 2011

Editorial team: Marco F. Duretto, Peter J. Hughes, Andrew C. Rozefelds, Catherine J. Young and Cobus F. van Breda

Editorial assistance: Lyn Wilson, Forty Degrees South Pty Ltd

Layout and design: Forty Degrees South Pty Ltd

Printer: Print Applied Technology

ISSN 1832-536X

GPO Box 1164
Hobart Tas 7001 Australia

KANUNNAH

Volume 4 (2011)

CONTENTS

'A FUNNY OLD HOBBY': SIR WILLIAM CROWTHER'S COLLECTION OF ABORIGINAL REMAINS

Caroline Evans

Evans C. 2011. 'A Funny Old Hobby': Sir William Crowther's Collection of Aboriginal Remains. *Kanunnah* 4: 1–25. ISSN 1832-536X. William Edward Lodewyk Hamilton Crowther (1887–1981) was a Tasmanian medical doctor who collected historical documents and objects. He also collected the stone tools and remains of Tasmanian Aboriginal people, widely believed at the time to be extinct. Crowther created his collection through the exhumation of Aboriginal remains at Oyster Cove and by information supplied to him about finds. He may also have acquired them through exchange and during his searches for stone tools. An important motive for his collecting was social engagement with friends and colleagues in Tasmania and elsewhere. The collection also enabled Crowther to engage in contemporary anthropological debates.

Crowther belonged to a group of physical anthropologists who believed that the remains of Tasmanian Aborigines, thought to be especially primitive, could provide clues to the evolution of the human race. During his lifetime physical anthropology was challenged by the functionalists who were more interested in the mechanisms by which societies operated than their place on the evolutionary scale. Their research involved going into the field where many gained some understanding of the Aborigines. This did not happen to Crowther – as a doctor he was committed to physical anthropology and he believed, like many others, that in Tasmania fieldwork was impossible because there were no Aborigines. In later life, however, he wrote a paper about the final days of the Aborigines at Oyster Cove that gave him some empathy for their plight. The experience led him to express remorse about his part in the exhumation of their remains. Even so, he never doubted the scientific value of his collection and that it should be kept for future generations.

Caroline Evans, School of History and Classics,
Private Bag 81, Hobart, Tasmania 7001, Australia.
Email: Caroline.Evans@utas.edu.au

KEY WORDS: anthropology, physical anthropology, William Edward Hamilton Crowther, Tasmania, Indigenous, Tasmanian Aboriginal people, collecting, human remains, evolution, phrenology, eugenics, colonial

> Sir William emerges as a typical example of the decent European citizen of the nineteenth century who, justified by both Christian and scientific (evolutionary) beliefs, saw nothing wrong with both wiping out the dangerous blacks and then digging up their skeletons in the interest of research.
>
> —Bill Perkins[1]

Sir William Edward Lodewyk Hamilton Crowther, medical doctor, collected Tasmanian books, manuscripts, photographs, works of art and objects, as well as Aboriginal artefacts and remains. He had the second-largest collection of the latter in the world, with thousands of stone tools and twenty crania.[2] His historical curiosity mostly concerned areas in which his immediate ancestors had been involved – medicine, whaling, shipping, Antarctic and South Pacific exploration and the military.[3] As Tony Marshall shows in his article 'The Choosing of a Proper Hobby', Crowther's sociability led him to focus on the subject matter of stories told to him by his family, friends, and elderly patients, many of whom donated objects and manuscripts.[4] His collection of Aboriginal remains and in his other collecting activities Crowther's methods and motives are similar. All were 'working collections' and his curiosity about Tasmanian history and his geniality played significant roles. In addition, he based his interests on the stories told to him. As he said in 1975 to Graham Pike, an archaeologist and anthropologist: 'My work on the Tasmanians and their culture deals only with things that are historical to me viz. either came to myself by hearsay and by conversations with old patients and friends and whose family had related them also'.[5] Crowther's collection and study of Aboriginal remains differed from the rest of his other historical interests in that, although they were hobbies, they were informed by his scientific training. They led an apparently loving husband, warm friend and conscientious doctor, who enjoyed chats with his older patients, to become detached from his usual sympathies, so that he saw his collection not as the remains of human beings but as objects to be measured, categorised and assessed, with the results written up in coolly precise papers.[6] Towards the end of his life, he finally came to see the Aborigines with the same sympathy as he did other people and regretted some of his actions. Even then, the cultural milieu of the time seems to have prevented his fully comprehending the implications of what he had done.

Crowther believed that the interests of science justified the collection of Aboriginal remains. In *The Last Tasmanian*, a documentary film released in 1977, he admitted to the interviewer that 'you can do almost anything when you use science as an excuse'.[7] The omnipotence of science, formed by the belief that it benefited, and could not harm, human beings seems to have prevented Crowther, and many others like him, from maintaining the respect that was usually due to the dead. Medicine was a particular example of the benevolence of science because it aimed to cure disease. The right of doctors to make decisions

Fig. 1. Annie Benbow (1841–1917) *Tasmanian Aborigines at Oyster Cove Station*, c. 1900.
Crayon and watercolour. 34 x 52 cm. WL Crowther Library, Tasmanian Archives and Heritage Office. AUTAS001124870148

about living bodies through diagnosis and prescription after often only limited consultation with a patient gave them considerable power. If they had this right over living bodies, this was even more the case regarding those who had died. In *Human Remains*, Helen MacDonald argues that many doctors justified dissection by arguing that it helped the living. In order to cope emotionally, doctors objectified the bodies – people were, in her words, 'turned into things for surgeons'.[8]

That the remains were Aboriginal further justified their collection. There was a widely held belief among anthropologists that studying so-called primitive societies could bring benefits to mankind. According to Russell McGregor, they hoped to understand how progress was made through the study of humanity's social and biological development, using these societies as a starting point. Under the influence of progressivism, a passionate belief in the power of rationality and efficiency to improve the human condition, and also of the pseudo-science of eugenics, whose adherents sought to uplift only the white race, many believed that their findings could have a social benefit.[9]

This article is based on the letters, newspapers, memoirs, field notes and articles that Crowther deposited at the State Library of Tasmania in 1964, together with much of the rest of his collection. The papers offer an insight into his methods of and rationale for

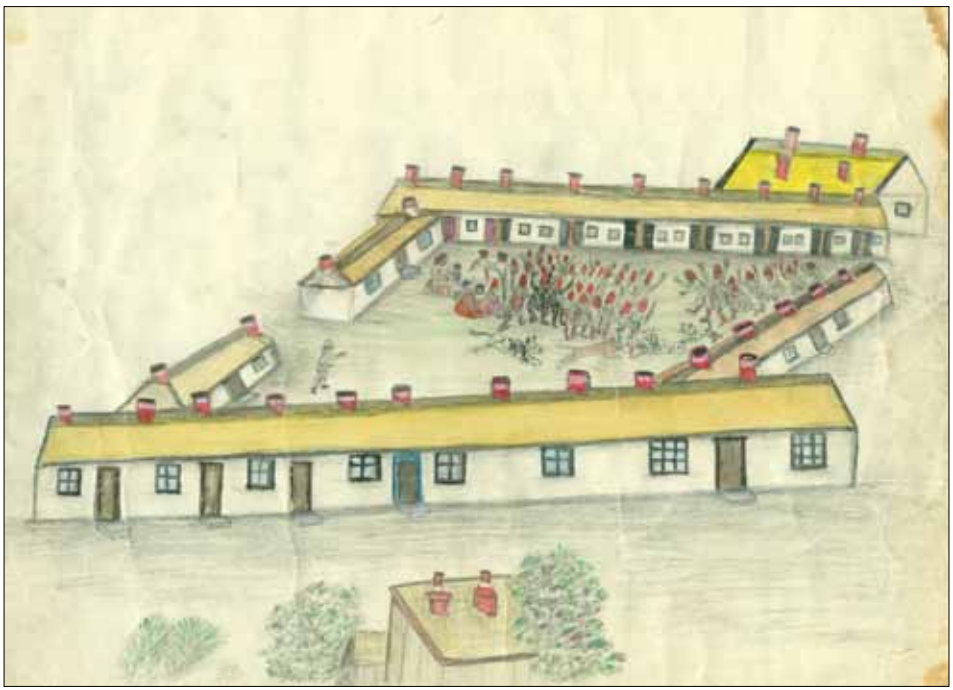

Fig. 2. Annie Benbow (1841–1917) *Aboriginal Station at Oyster Cove*, c. 1900.
Pencil and watercolour. 22 x 29 cm. WL Crowther Library, Tasmanian Archives and Heritage Office. AUTAS001131821381

collecting Aboriginal remains that can improve our understanding of the cultural milieu of that small group of European Australians who condoned and engaged in this activity. These were specific cultural attitudes, however, and we cannot assume that they shed any light on the ways in which Aborigines saw themselves or even how they were seen by the wider community. In the interests of historical integrity, I have included a detailed discussion of the activities and opinions of Crowther, his father and his colleagues, which might make painful reading for some people.

Crowther's Biography

WELH Crowther was a fourth generation Tasmanian and medical doctor. His grandfather, William Lodewyk, an honorary surgeon at the Hobart General Hospital, was also a successful businessman with interests in timber, whaling and guano. He was briefly the premier of Tasmania. Edward Lodewyk, Crowther's father, had a similar career as an honorary surgeon at the hospital and member for Queenborough in the House of Assembly for a number of years.[10] Crowther's maternal grandfather, John Hamilton, was a businessman and represented Glenorchy in the House of Assembly.[11] As Caroline

Fig. 3. Dr William and Mrs Crowther and Others at the Beach, 1920.
Black and white photographic print (postcard). 9 x 14 cm. WL Crowther Library, Tasmanian Archives and Heritage Office. AUTAS001131821373. Unknown photographer

Von Oppeln points out, Crowther's family history greatly influenced him:

> While family background makes a deep impression on the character of us all, in Crowther's case this was particularly marked. That influence began with baptism when he was named, almost in the manner of the nobility, after his grandfather, William Lodewyk Crowther and, presumably, his maternal grandfather … John Hamilton.[12]

Crowther was born in Hobart on 9 May 1887, an only son, although his father had five daughters from an earlier marriage. His mother was Emily Ida Hamilton.[13] Young Crowther grew up in Hobart Town where, he said, because of the natural environment, there was 'so much of extraordinary interest' and 'always so much to do'.[14] For holidays, he went to Manuka, the family property at Oyster Cove that included the old probation station where, after 1847, the Aborigines from Flinders Island lived, died and were buried. Crowther studied medicine at Melbourne University, graduating in 1910.[15] He became a house surgeon at Bolingbroke Hospital in Wandsworth, London, but when his mother became ill returned to Australia earlier than planned. Shortly after, he met and fell in love with Joyce 'Josie' Mitchell. They married in 1915. That same year, Crowther joined the Australian Army Medical Services as a captain. During

Fig. 4. Sir William Crowther in the WL Crowther Library, April 1979.
Black and white photograph. 18 x 23 cm. WL Crowther Library, Tasmanian Archives and Heritage Office. AUTAS001131821365. Photographer Frank Bolt

the war, he was the medical officer in charge of field hospitals at Gallipoli and in France, where, at one time, he commanded more than a thousand men. He attained the rank of lieutenant-colonel and received a Distinguished Service Order medal for his service. Returning to Hobart, he had a private practice specialising in obstetrics and was honorary consultant physician at the Royal Hobart and Queen Alexandra Hospitals. He served on numerous boards and wrote articles for the *Medical Journal of Australia*.[16]

Crowther was intellectually lively with a great many interests. He participated in medical politics, attended military camps and, during the 1950s, helped establish Narryna, the Van Diemen's Land Folk Museum in Battery Point. He belonged to the Field Naturalists Club and Royal Australian Ornithologists Union. His love of Tasmania's natural environment led him to become an environmentalist and opponent of the Lake Pedder hydro-electric scheme. Crowther was a member of the Council of the Tasmanian Museum and Art Gallery (TMAG) from 1919 to

1973 and a member of the Royal Society from 1912 until his death in 1981. He was awarded the Royal Society of Tasmania Medal in 1940 for his contribution to anthropology. In 1964, Crowther received a knighthood for his services to medicine and literature in Tasmania.[17]

Methods of Collecting

Crowther's most notorious method of collecting Aboriginal remains was through exhumation. During his medical studies at Melbourne University in the early 1900s, he attended Professor RJA Berry's lectures whose references to physical anthropology enthused the class.[18] Berry asked students from the country to look out for remains on the properties of their families and friends. He was especially interested in those of Tasmanian Aborigines, and in the dissecting room, made a point of asking Crowther about them. Enthusiastic and eager to help, Crowther told him about the small nineteenth-century collection of crania made by Dr JF Storey, assistant colonial surgeon at Waterloo Point (now Swansea), the much larger collections at TMAG and the Queen Victoria Museum and Art Gallery and the Aboriginal graves at Oyster Cove.

In January 1909, Dr W Robertson, Berry's demonstrator in anatomy, went to Tasmania. He purchased the Storey collection from its then owner, Tilney Cotton, for Sir Colin MacKenzie, an anatomist and specialist in orthopaedics, who was making diptographic tracings of Tasmanian crania. Using a diptograph, Robertson took tracings of the crania at the museums. At Oyster Cove, Robertson, Crowther and Wendell Inglis Clark, a friend with whom Crowther attended Melbourne University, exhumed the remains of twelve of the Aborigines. EL Crowther gave one cranium to Melbourne University's Anatomy Museum, and one to Clark, keeping the rest, first lending them to RJA Berry.[19]

Crowther also used his social contacts to collect remains. Marshall suggests that, as a widely respected doctor, people trusted him with information and objects.[20] Similarly, Crowther's reputation as an amateur anthropologist must have been well established enough for people to contact him with their discoveries. This could be why VL Horton wrote to him when he found a skull and seven teeth while riding on the north-west coast: 'the skull is in 4 parts which is [sic] easily put together … the parts are quite solid also the teeth. You could let me know if this is of any value'.[21] In April 1927, Alfred Morrisby told Crowther that an 'ancient' skull had been found in his orchard at Sandford. Three days later, on Good Friday, Crowther and Clark went to examine it. Where the skull had been they found broken bits of charred bone and by digging, unearthed more parts of the skeleton.[22] In 1921, Crowther did some excavating at Little Swanport after hearing of the discovery of remains there. The area had been well known for them since 1912, the first pieces having been discovered lying in some ashes. Crowther extracted a promise from the owner not to remove any bones he came across until someone had examined them.[23] Although he probably wanted to be among the first at the scene of any discoveries, he would also have been motivated by a concern that investigations were carried out scientifically.

The collecting of Aboriginal stone implements was not easily disentangled from that of human remains – the artefacts informed the same scientific debates, and the same reasons: friendship, collegiality, curiosity and a desire to belong to the scientific world underpinned Crowther's collecting. He may also have found Aboriginal remains while searching for implements although there is no evidence to confirm this.[24] Crowther began his collecting in the early 1920s after examining a skeleton at Eaglehawk Neck with the curator from TMAG, Clive Lord. He found it fascinating, and it seems to have provided the impetus for his investigations. Crowther continued his searches during the next fourteen years on holidays and at weekends, beginning at the north end of Opposum Bay and in ploughed fields and fallow paddocks at Rokeby, Carlton and South Arm. At first he did not find much but with experience learned where to look, usually on the coast near promontories with fresh water close by. Seaford, at the mouth of the Little Swanport River, was the best site. There the middens were so substantial they had been used for lime burning.[25] Tools sometimes appeared among the shells but they were more common on the north bank. Farmers often found them while ploughing fields. In other areas, erosion exposed artefacts. During his friendship with Robert Legge, a farmer on the east coast with a particular interest in stone tools, Crowther searched middens on the north-east and west coasts.[26] Some of these expeditions were specifically to look for Aboriginal artefacts but he also undertook searches when he was away for military camps, on Christmas holidays or during Field Naturalists Club outings.

Crowther kept field notes for expeditions made from 1925 to 1927 that provide some insight into the way he worked. The notes, written in a minute, cramped hand that is almost illegible, and sometimes accompanied by meticulous diagrams, show that he was systematic, methodical and thorough. He was persistent, too, repeatedly returning to the same sites to see if the wind had uncovered more artefacts, 'prowling', he wrote, in one area for a number of years.[27] Although the notes were principally concerned with Aboriginal relics, Crowther also recorded more general activities and other matters such as the sighting of a bird, or the plants and geology of an area. Crowther thoroughly embedded his collecting habits in his broader social and intellectual life.

In his field notes, Crowther recorded that, for Easter 1925, the Field Naturalists Club hired a steamer for five days to go to Schouten Island, taking with them Robert Pulleine who, like Crowther, was a physician interested in anthropology. They spent their time fishing at Coles and Wine Glass Bays, and studying the plants and geology of the area. Crowther thoroughly enjoyed the holiday:

> The island is ideal for a camp, the red granite formation is very interesting and most picturesque. The vegetation including the Oyster Bay Pine gave great pleasure to all. Several small plants of the pine was [sic] dug up and taken home with us. There were any number of fish in the sandy bay in which our ship was anchored, mostly large Cod and Flathead. Off the rocks were caught parrot and kelp fish.

Crowther, Clive Lord and Pulleine spent one day looking for implements on Schouten Island at a sand blow that Crowther had noticed from the boat. There they discovered many roughly made implements. Crowther found a better-made one that the Aborigines had brought from the Tasmanian mainland but he lost it. His notes offer no clue as to how he interpreted its significance.[28]

In February 1926 Crowther, his wife and a friend went to South Arm for the weekend to explore Aboriginal sites. First they stopped at the 'the neck' to search an old camp where three years previously a local farmer had discovered the skeleton of a woman near to a stone tool that Crowther described as 'finely worked'. He found well-made scrapers stained with charcoal, shells and the bones of a seal or sea leopard, as well as the nest of a red-capped dotterel. On Sunday, they explored a site on a friend's property. Crowther recorded that: 'It has almost certainly been picked over many times but I found several good specimens'.[29]

The following Christmas, the Crowthers stayed with friends at Spring Bay. There, during various outings, Crowther looked for Aboriginal implements, combining research with swimming, fishing, socialising and celebrating Christmas. There were interests other than the Aborigines. On one beach, the group found a young, exhausted crested penguin that the children returned to the water. At Lisdillon, near Swansea, Crowther tried unsuccessfully to obtain a photograph of an echidna 'in motion' crossing the road.[30]

At annual military camps near Mona Vale, an area well known to investigators since James Scott explored it in 1875, Crowther, and occasionally Clark, searched Grimes Lagoon and the Ross and Tunbridge areas. Here many small sand blows had exposed artefacts on a hard sub-surface of clay. Each year Crowther examined them, at first on foot after the day's work, and later using a horse or car to go further.[31] His field notes for March 1926 and 1927 show that at those camps he found a few good specimens, quantities of red ochre with tools for grinding it, and numerous tools in two small mounds, but no human remains. He later wrote that no one had found any in the midlands for some time, speculating that the good supply of wood meant that the Aborigines cremated the bodies.[32] One weekend in July 1926, Clark and Crowther went to the area again, staying at the hotel in Tunbridge for the night and spending the Sunday searching. This time Crowther found stone implements made of a yellow soft stone, blue chert rock crystal, quartzite and petrified wood while Clark made a preliminary survey of the campsites.[33]

Reasons for Collecting Aboriginal Remains

Crowther attributed his intellectual curiosity to the influence of his father, EL Crowther. He was 'a very wise and understanding father, who never wearied of answering questions and thus enlarging the minds of a somewhat large and exacting family'.[34] Crowther's father encouraged his collecting by giving him a piece of scrimshaw when he was eight years old and later a Baltic pine chest for 'curiosities' – it contained birds' nests, minerals found while prospecting and

a convict leg iron dug up at the General Hospital.[35]

EL Crowther also told stories about encounters he and his father, WL Crowther, had had with Aborigines in their youth. For WL Crowther, most of these took place in the 1820s, during the 'Black War', when he boarded at Claiborne Academy in Norfolk Plains, now Longford. He occasionally met Aborigines in the area and during the 193-kilometre walk to and from Hobart for holidays. Once he and a friend played a prank by rolling a stone onto encamped Aborigines, expecting them to run away. Instead they gave chase and the boys had to hide under a log. His son, EL Crowther, wrote that it was 'the most narrow of escapes' with '[h]is life saved by the utmost chance as the natives jumped on the log they were concealed under'. The incident made WL Crowther afraid of the Aborigines, a fear that deepened after he found the body of a man speared by them in a hut near Bagdad. After that, according to his son, he was 'against' them because of the man 'never having had the slightest chance to defend himself'.[36]

WL Crowther owned property at Oyster Cove close to his timber mills in the Kettering Tiers and near the old probation station where the Aborigines from Flinders Island spent their final days. Later the Crowther family acquired the probation station and the site where the Aborigines were buried.[37] EL Crowther spent much of his youth at Oyster Cove and occasionally saw them. The first time, he was asleep on the paddle steamer *Cobra* when his father woke him to see some Aborigines in a whaleboat collecting supplies. He thought them 'very ugly, rather like monkeys with their clay pipes in their mouths'.[38] Once when EL Crowther and his father were out shooting, the Aborigines gave them a ride on their whaleboat. EL Crowther also remembered seeing Aborigines sitting outside their home at Oyster Cove.[39]

In the 1890s, WELH Crowther stayed at Oyster Cove for the school holidays. There he spent rainy Sundays exploring the back of the house which he described as 'part surgery, part gun room' where, in addition to the guns, there was a large case containing an articulated skeleton and a number of skulls, some of which were Aboriginal.[40] Crowther became interested in Aborigines partly because of the crania kept in that room. As the skulls at the house suggest, the Crowther family had a tradition of collecting Aboriginal remains. In 1869, Crowther's grandfather, WL Crowther, caused a public scandal and protest after he clandestinely removed the skull of William Lanne while his body was in the hospital morgue. He planned to send it to Sir William Flowers in London for the Hunterian Museum, the repository of the Royal College of Surgeons.[41] WELH Crowther was never convinced that his grandfather carried out the act, suspecting his enemies of attempting to make 'political capital' out of it.[42] It is not clear what effect the episode had on his own interest in collecting human remains – Marshall speculates that it may have encouraged it while Von Oppeln believes that it was a source of deep shame.[43] Watching Ernest Westlake, an amateur geologist, collecting stone implements on the foreshore one summer further aroused Crowther's enthusiasm.[44] Westlake collected more than twelve thousand stone implements between

1908 and 1910. They are now in the Pitt Rivers Museum at Oxford University.[45]

Crowther knew the old probation station well. Every morning he fetched milk from a Mr Palmer who lived in the superintendent's quarters. Crowther and his sisters made friends with the older settlers, many of whom told them stories about the Aborigines. A Mrs Benbow, whose father, Sergeant Meredith of the 21st Foot, had been a guard at the station, told stories about the Aborigines, sang their songs, and using charcoal from the fire, drew pictures of them on her white hearth.[46] The tragedy resulting from the Aboriginal encounter with Europeans and the challenge of piecing together scraps of information about them seems to have aroused Crowther's historical interest.

A reason that collectors often give for their hobby is that it provides an opportunity to make friends with people of similar interests.[47] This seems to apply to Crowther; Marshall describes him as a 'markedly companionable collector' who 'maintained close contact in person and by correspondence with collecting friends'.[48] In Tasmania, Crowther worked closely with his friends, Robert Legge, Clive Lord and Dr Wendell Inglis Clark. Legge and Crowther corresponded and sometimes held absorbing face-to-face discussions about topics such as the use of stone implements.[49] Legge's letters are a mixture of friendship, anthropological discussion and intuition about the feel of places. The following extract concerns an expedition that he made to the Friendly Beaches:

> I must wait for a favourable opportunity, when I can have a good talk to you, to set forth my theories as to why the natives did not make this spot a favourite camping ground. Game certainly must have abounded, but water would have been scarce. In my walk round part of the shores of the lagoon, I was struck with the marked desolation of the locality, for bird life was almost entirely absent, and it being a calm afternoon, the place was as silent as a tomb, & gave one a certain feeling of chill, and a desire to quit it without delay.[50]

When Legge died in the mid-1940s, still fairly young, Crowther wrote: 'Robert's sudden and untimely death during shearing operations in about 1944 was a great sorrow and loss to me, as we had much in common.'[51] Collecting played a part in Crowther's relationship with his wife, who, he said in 1964, was 'a constant stimulus and help' for more than fifty years. In this supportive capacity, she often accompanied Crowther on expeditions to hunt for Aboriginal artefacts.[52] In later life, he remembered these outings fondly, writing: 'I recall such occasions as sharing a seven mile long trudge over a sandy road to Seaford on a hot summer's day, when working over the aboriginal [sic] camping ground of our east coast.'[53] Even so, her collecting enthusiasms differed from his. For instance, when Crowther donated his collection to the State Library of Tasmania, he acknowledged not only his wife's 'active interest and keen co-operation' but her patience as his collection of books grew, threatening to swamp her more modest one of Trollope, Galsworthy and the Brontës:

> As my own gatherings began to encroach more and more on the not unlimited accommodation of her home, she would

> greet yet another picture or parcel of books with a mild expletive, an inimitable shrug of her shoulders and a slow smile of understanding.[54]

In a moving article about the anthropologists, Ronald and Catherine Berndt, Kate Brittlebank shows how the sustaining force of a marriage could be a mutual interest in a collection.[55] However, in the case of the Crowthers, much of that sustenance apparently came from Joyce Crowther's support for her husband's interests.

Another reason for collecting was that it provided collegiality and access to a wider scientific world through letter writing and the exchange of gifts. Von Oppeln wrote: 'Crowther loved Tasmania, its history and pre-history, its people and geography and had no wish to live anywhere else. The collection was the visible sign of his love for his native land'.[56] Even so, he apparently enjoyed the stimulation of meeting people from elsewhere with similar interests, as his frequent visits to the mainland, and occasional ones to New Zealand, suggest.[57] MacDonald argues that, among other reasons, sending Aboriginal remains to the Royal College of Surgeons made his grandfather, WL Crowther, and others like him, feel that they belonged to a wider scientific community, 'that they were something more than forgotten men living in some outlandish place'.[58] If Crowther did not fear irrelevance, he still craved a wider intellectual circle than Tasmania's small population could provide.

Crowther's first and most important outside contact was with the members of the University of Melbourne's School of Anatomy. They had a tradition of working on the racial characteristics of Aboriginal crania since its establishment by Professor George Halford in the 1860s.[59] He wrote seven anthropological articles, including one about the crania of Victorian Aborigines.[60] In 1928, his family established an annual oration in his memory.[61] In 1933 Crowther gave one of the orations, entitling it 'The Passing of the Tasmanian Race', at the Institute of Anatomy, Canberra. At The University of Melbourne, Crowther also met Frederic Wood Jones, initially from the University of Adelaide, who replaced Berry on his retirement.[62] Wood Jones later became an honorary member of Tasmania's Royal Society and was its RM Johnson lecturer in 1925.[63] Another contact was J Wunderly, an orthodontist who referred to his own interest in crania as 'my funny old hobby'. Wunderly originally supported his work with a research scholarship, later continuing it as a private interest.[64] Wunderly visited Tasmania in 1932 and 1934 as part of a project to reclassify remains, which will be explained below. Another Victorian correspondent, AS Kenyon, an engineer, ethnologist and historian, had a large collection of stone implements, more than 1000 in 1907.[65] In the 1920s, he too visited Tasmania, in his case, to extend his searches.[66] In Victoria, he devoted much of his time to looking for osteological evidence of Tasmanian ancestry among the Aborigines there.[67]

Wood Jones probably introduced Crowther to anthropologists in South Australia. One of these was Professor Sir Burton Cleland, a pathologist with a specific interest in the blood groups of Aborigines and their use of plants for

food and medicine.[68] In 1939, the Royal Society of Tasmania invited Cleland to give the Clive Lord Memorial Lecture on 'Some Aspects of the Ecology of the Aboriginal Inhabitants of Southern and Central Australia and Tasmania'.[69] Another South Australian, Robert Henry Pulleine, a physician specialising in the diseases of the eyes, nose, ears and throat, had wide-ranging scientific interests, including anthropology. Like Crowther, he had a large collection of books, paintings and Aboriginal artefacts.[70] One of his specialities was Aboriginal camps in north-west Tasmania.[71] In 1925, Pulleine, who was a corresponding member, gave a lecture to the Royal Society of Tasmania.[72] A few years later, as president of the Australian Association for the Advancement of Science, he gave another address in Hobart.[73] Crowther's South Australian colleagues probably put him in touch with Joseph Birdsell of the Peabody Institute at Harvard University with whom he corresponded in the 1940s.[74] They met at a dinner in Hobart when Birdsell was a member of the Universities of Harvard and Adelaide anthropological expedition to Cape Barren Island in early 1939.[75] Crowther had an earlier contact with the Peabody Institute in 1910 when he tried to sell them a Tasmanian Aboriginal skeleton, presumably from Oyster Cove, and they refused because of lack of funds. He did not meet Birdsell this way, however.[76] Through his membership of the Australian and New Zealand Association for the Advancement of Science, Crowther cemented old relationships and formed new ones, including those with the anthropologists Bishop Herbert Williams of New Zealand, Wood Jones, Cleland, Pulleine, Kenyon, Sir Hubert Murray, the Australian administrator of Papua New Guinea and collector of Papuan artefacts, and George Horne, co-author of *Savage Life in Central Australia*.[77]

Crowther claimed Wood Jones, Horne and Cleland as his 'friends'.[78] Wood Jones appears to have enjoyed Crowther's company, writing in 1925: 'I was very glad to have a letter from you, for it had such happy associations connected with it'.[79] In a letter dated 1934 he concluded, apparently after a friendship had developed between the families: 'Your good wishes are heartily reciprocated by my wife (and this is not fiction, for I am writing at home) and myself'.[80] Before Cleland came to Tasmania to give the Clive Lord Memorial Lecture, Crowther sent him an invitation to stay at his house and Cleland replied, discussing in the same letter family news and the latest ideas regarding the racial origins of Aborigines.[81]

Crowther worked collaboratively with his colleagues sharing information and lending or exchanging artefacts and remains with them – sharing was a way of cementing relationships.[82] In the museum world, this was a time-honoured practice – the Tasmanian Museum and Art Gallery frequently exchanged items with other museums around the world.[83] Crowther had apparently lent some crania to Melbourne University's Anatomy Museum because, in 1933, he asked for them to be returned.[84] He sent a number of Tasmanian stone tools to the Public Library, Museum and Art Gallery of South Australia on the condition that he be sent something in exchange.[85] Wood Jones used some Tasmanian hair given to him by Crowther to entice an American scholar

visiting Melbourne to teach him about the latest anthropological advances:

> We have got Hrdlicka from America working here for a time at aboriginal [sic] skulls. I am seeing as much of him as possible in order to learn the latest Yankee notions and I have a key to his affections for I have promised him a tiny bit of the Tasmanian hair you gave me – the gift coming from you. I shant [sic] give it to him till he goes – and then only if he has been a good boy – so he has to behave.[86]

Wood Jones sent more samples of Tasmanian Aboriginal hair given to him by Crowther to an academic at Stanford University, 'the best man working on hair at the present'.[87] In 1938, AH Tebbutt, a Victorian doctor specialising in blood grouping, asked Crowther for samples of remains in order to determine Aboriginal blood groups. Tebbutt was one of the first scientists to show that few Aborigines had a B blood group suggesting that they did not have Asian ancestry.[88] Interest in studying the Tasmanian Aborigines was due to their isolation. Tebbutt wrote: 'Don't you think that the Tasmanians may have been the most isolated or longest isolated race in the world & therefore the purest remnant of a very ancient race? What are your views on this?'[89]

The Debates of the Late Nineteenth and Early Twentieth Centuries

Another reason for collecting Aboriginal remains was that it enabled Crowther to engage in the debates of his time. Essentially he belonged to a school of anthropology that believed that by studying the remains and tools of 'primitive' peoples, and a limited range of documents left by those who had contact with them, something could be learned about the development of human beings from an original to a highly evolved state, that of the Caucasians.[90] These ideas originated in Charles Darwin's *The Descent of Man, and Selection in Relation to Sex*, in which he argued that human beings had a common ancestor but had evolved in different ways according to environmental influences.

Later, the development of phrenology, the theory that the bumps on the head denoted psychological characteristics, encouraged a physical approach to the question of race.[91] The shape and capacity of skulls could, anthropologists thought, answer questions about how racial groups differed, the origins and migration patterns of the Tasmanians, and, finally, prove that Darwin's theory of evolution applied to humans. This latter involved the study of 'primitive' peoples as a benchmark for the original physical and cultural state of human beings – physique allegedly determined culture.[92]

Since the Tasmanian Aborigines were supposed to be especially 'primitive', their remains were considered especially valuable. The devastation of their society made them rare, which explains the enthusiasm for obtaining them.[93] Darwinist thought also gave rise to the idea that the Tasmanian Aborigines were extinct. It seemed inevitable since the supposedly superior Caucasians were bound to outlast any other race in the competition for survival.[94] According to Russell McGregor, this led to the 'doomed race theory' that Australian Aborigines would follow the Tasmanian Aborigines

and die out.[95] Since early anthropologists linked social and cultural development with that of the human body, those specialising in anatomy could also be experts on social and cultural attributes. Conversely, those with socio-cultural expertise could comment on the body.[96]

Anthropology began to change in the 1920s with the advent of functionalism, otherwise known as social anthropology, a worldwide movement. Two leaders of this school, Bronislow Malinowski and AR Radcliffe-Brown, carried out fieldwork in Australia. The latter was the first, in 1925, to hold the newly established and only Australian chair in anthropology at Sydney University. His successor, AP Elkin, was another leading proponent.[97] Functionalists believed that the purpose of anthropology was to explain the mechanisms by which societies functioned, not to allocate races a place on some evolutionary scale.[98] Rather than piecing together fragments from lost societies to draw some, to them, vague conclusions about the origins of human beings, functionalists went into the field to conduct their research. Meeting Aborigines and seeing their plight first hand gave their work a strong social justice component.[99]

The two approaches to anthropology co-existed and overlapped in part because functionalism did not involve a complete re-evaluation. McGregor emphasised that functionalists did not rethink racial theory or abandon the idea that societies developed sequentially. He wrote: 'Some societies were more primitive – those were the ones that anthropologists studied. Some societies were more advanced – those were the ones anthropologists came from.'[100] A significant number of functionalists continued to draw on anatomical data. For instance, Elkin believed that cranial capacity indicated intellectual ability.[101] Moreover, physical anthropologists also began to go into the field although, unlike the functionalists, they were interested in the physiology of living Aborigines, not their culture.[102]

In the early twentieth century, competition between Adelaide and Sydney Universities for Australia's chair in anthropology fostered the co-existence of the two streams. In 1923, the Pan-Pacific Science Congress passed a resolution for the chair's establishment. Sydney University, in which functionalism dominated, and the University of Adelaide, which remained 'old school', competed for the honour. Although the chair went to Sydney, in lobbying for it, Adelaide established a Board of Anthropological Research, made up mostly of members of the Medical School's Departments of Anatomy and Physiology. This consolidated their old school approach and helped maintain its influence in Australia.[103]

Crowther's contacts belonged almost entirely to the old school of anthropology. I found only one letter in his correspondence from AP Elkin, and none from other functionalists, although he corresponded with Olive Pink, a Tasmanian who was one of Elkin's students.[104] The major influence on Crowther was his professor, RJA Berry, who specialised in the osteology of the Aborigines of south-east Australia. Like others using the anatomical approach, Berry was concerned with evolutionary theory and therefore the origins of races. One of the principal mysteries was why the Tasmanian Aborigines had a different appearance and culture from the

mainlanders. Berry used hair type, skin colour, the characteristics of skeletons and multiple cranial measurements to show that they were related to both Papua New Guineans and mainland Aborigines. He concluded that all Aborigines originally came from the Pacific Islands but that in Tasmania they became isolated and so retained the characteristics of the earlier race, while the mainlanders mixed with late-comers. Berry was also keen to establish the place of Tasmanians on the evolutionary scale. For one publication he studied seventy-nine crania in an attempt to demonstrate that they had a Neanderthal body and therefore a Stone Age culture. On a joint project, Berry and Robertson compared crania from a range of different races to create a hierarchy of cranial capacity that was supposed to indicate a place on the evolutionary scale.[105]

Instead of measurements, Wood Jones used 'graphic reconstruction' arguing that it showed the differences between the skulls of Tasmanians and mainlanders more clearly than 'mere measurements'. In a letter to Crowther, he said: 'they are very unlike each other when you include features that you cant [sic] measure. The Tasmanian is a more high class skull with a bigger cranial and a better shaped [illegible] than the Australian.'[106] Wood Jones collaborated with J Wunderly on a 'detailed survey' of Aboriginal remains throughout Australian collections.[107] On one occasion, Crowther sent some remains to him for an opinion and, using his knowledge of skeletal mechanics, Wood Jones demonstrated that they almost conclusively belonged to one Aborigine.[108] Wood Jones rejected the functionalist approach, believing that the findings lacked depth and overwhelmed the physiological and psychological research that he considered most important. Unusually for the Adelaide physiologists, who mostly argued for absorption, Wood Jones's admiration of the physiques of nomadic Aborigines in central Australia led to a deep concern about the integrity of their race.[109]

Wunderly described his interest in Tasmanian skulls as 'the historical, the anatomical and the anthropological aspects'. One of his concerns was to systematise their classification. At the time, anatomists chose their own numbers and used their initials when marking skulls. Wunderly considered this 'unscientific', adopting instead a 'continuous' system, which at Crowther's suggestion, he called the Tasman series. He supplied Crowther with a list of old and new numbers, asking him to relabel the crania in his collection and to encourage the Tasmanian Museum and Art Gallery to do the same.[110] Wunderly's project was associated with another one intended to enable comparisons between the teeth and palates of Tasmanian and mainland Aborigines.[111] A further aim was to learn how to identify the sex of crania.[112]

This emphasis on anatomy was deeply flawed. Cove writes that later in the twentieth century anthropologists discontinued it because it became increasingly obvious that modern skulls were useless for gauging ancient populations; the brain was not the most important aspect of human evolution, and skull measurements did not indicate mentality.[113]

Wunderly had a curiosity about the origins of the Tasmanians that typified the old school of anthropology. In 1935, he told the *Mercury* that it was a 'great mystery', which had 'puzzled the scientific thought of the world for a century, and anthropologists have not yet met any definite knowledge of the matter'. Since insufficient documentary evidence had survived, the solution lay in investigating implements and remains, especially crania. Wunderly described the Tasmanians as members of 'the great group of Oceanic negroes subdivided into various types, who probably originated in a group of primitive people in eastern Asia'. He was unsure how they originally travelled to Tasmania although he thought that they had probably lived on the mainland for some time.[114]

Crowther's colleagues at the Universities of Adelaide and Harvard had different interests. JB Cleland's work on Aboriginal blood groups led him to believe that they were a kind of Caucasian. He was a vociferous advocate of programmes to breed out Aboriginality because he did not believe that there would be any 'throwbacks'.[115] In 1939, drawing on Cleland's work, Joseph Birdsell of Harvard University and Norman Tindale from Adelaide went to Cape Barren Island to study the Aboriginal population there as part of a project to investigate the effects of racial mixing. Tindale was an ethnographer while Birdsell, who corresponded with Crowther, was a physical anthropologist. He, too, was concerned with the origins of the Tasmanians: if they were African, racial mixing was less likely to succeed in breeding out the colour. To understand the effects of that mixing, Birdsell carried out head measurements and took samples of hair and blood.[116] The overall conclusions of the expedition were that if absorption could work for the Tasmanians it would also do so for mainlanders.[117]

Like many of his contacts on the mainland, Crowther based his research on stone tools, Aboriginal remains and scraps of documentary evidence from contemporary onlookers, including those left by his father, EL Crowther. He never studied Aboriginal culture and society as the functionalist anthropologists did. Nor did he embark upon the physiological study of living Aborigines like his friends in Adelaide. In Tasmania, fieldwork was impossible because he believed, like many others, that the Bass Strait Islanders were not true Aborigines. Crowther was only concerned with the osteology, technology and origins of the Tasmanian Aborigines – this still put him at the centre of an important national debate, which must have been gratifying. He accepted the supposed extinction of the Tasmanians as a sad but inevitable outcome of contact with the Europeans.

Crowther published eleven papers about the Tasmanian Aborigines, mostly in the Royal Society's *Papers and Proceedings*.[118] His starting point, in the early 1920s, was 'A Descriptive Catalogue of the Osteological Specimens Relating to the Tasmanian Aborigines Contained in the Tasmanian Museum', a list of remains with descriptions and identifications, if they were available.[119] During the 1920s and 1930s, he published other articles about remains, sometimes using them to draw conclusions about Aboriginal culture. In the 'Description of Two Tasmanian Crania', published in 1921,

he argued that the arrangement of the molars in a woman's skull showed that the Tasmanians were closer to anthropoid apes than other races. Regarding a skull found at Eaglehawk Neck he wrote: 'The points that the Tasmanian skull emphasised more thoroughly than any recent race were the prominent glabella, superciliary ridges and narrowing (post-orbital) of the frontal bone. It will be seen how these compare with the Neanderthal skull, the actual measurements of the two skulls being very similar'.[120] In 1928, another article described the skulls of two children, in order to show how Aboriginal facial features developed.[121]

Crowther also wrote about Aboriginal methods of disposing of their dead. In an article published in 1933, he described some remains discovered at Sandford, concluding that one method was the cremation of the strongly flexed body placed in the hollow of a tree.[122] The discovery in the 1930s of the bones of an Aboriginal youth in a cave at Mount Dromedary led to an article arguing that the Aborigines sometimes simply deposited remains in a safe place.[123]

Crowther accepted many of the culturally induced assessments of Aborigines made by Europeans. For instance, in his Halford Oration, he said that: 'They were fickle and unstable, and some unknown cause of offence would in a moment change their attitude from friendship to open hostility'.This statement does not take into account the Aboriginal struggle for their land or their very survival in the face of European usurpation.[124] Even in his attempts to be liberal, he could not escape the old school paradigm of an evolutionary scale. In an article about stone implements, published in 1923, he challenged the frequently made assumption that Tasmanian Aborigines were technologically backward by disputing the claim of the palaeontologist, Fritz Noetling, that the Aborigines did not use bone implements. Crowther believed that scraps of bone found by collectors at Little Swanport (Seaford) was used to scoop out meat from shellfish; although no Europeans had seen them doing it. This was not surprising since their presence would stop the Aborigines eating.[125] Similarly, in his Halford Oration, Crowther argued that Legge's collection of stone implements and work carried out by AL Meston on rock carvings on the north and west coasts showed the Tasmanians to be the cultural equals of mainland Aborigines.[126] Crowther's motives in defending the Tasmanians might have been self-interested. As MacDonald points out, the continual emphasis on their primitive state was a potential concern for European Tasmanians. If one race could deteriorate in isolation, so could another.[127]

In his Halford Oration, Crowther agreed with others of his school that the Tasmanian Aborigines could be classified as 'Macro-Negritos' from the Pacific Islands and therefore of different ethnic origins from the mainlanders. However, since he believed that they did not have the vessels or seagoing skills of the Polynesians, he disagreed with Pulleine who also considered them of 'Macro-Negrito' ethnicity, but argued that they made the journey by canoe from Melanesia in one crossing. Crowther thought that they had, instead, arrived from the mainland by a land bridge or moved slowly from one Bass Strait Island to the

next.[128] In a more detailed article published in the *Journal of Polynesian Society*, Crowther reaffirmed these views except that he now believed that the Aborigines did not use a land bridge that had disappeared after the Ice Age, because they had not been in Tasmania that long. Instead, he contended, they travelled slowly from Melanesia in a south-easterly direction, setting up permanent or semi-permanent camps as they went. The journey was slow because the bark and log canoes of the Aborigines were not strong enough to go further than twenty or thirty miles. Crowther discounted the arguments of Wood Jones and Pulleine that the Aborigines once possessed superior seafaring skills and canoe building technology that they had lost, although he conceded that this might have been the case.[129]

Aftermath – Remorse and the Return of the Remains to the Aboriginal Community

During the 1930s, because their fieldwork facilitated friendships with Aborigines, anthropologists of the functionalist school increasingly developed empathy for them as fellow human beings.[130] This did not happen to Crowther. Since, like many others, he believed that there were no Aborigines in Tasmania, he could not actually meet them. In addition, his medical and anatomical approach to anthropology prevented his forming any empathic understanding, although as his Halford Oration suggests, he was concerned about the plight of mainland Aborigines.[131] Even so, by the 1960s, he had begun to move in the direction of the functionalists, regretting his involvement in the exhumation of the Aboriginal skeletons at Oyster Cove. In 1963, when he donated his collection of remains to the Tasmanian Museum and Art Gallery, he said:

> I am by no means proud of the part I played and trust that ere long as an act of piety, to see these remains reunited with the whole racial group in the Memorial Room at the Tasmanian Museum as promised in the proposed additions to the building.[132]

Even so, Crowther's plan to house all the remains together at the Tasmanian Museum and Art Gallery as restitution suggests that he still saw them as objects of scientific research. He had not yet reached any fundamental understanding of Aboriginal feelings. This went against a growing public view that Aboriginal remains should be treated more respectfully. In 1953, the bishop of Tasmania, GF Cranswick, had led a deputation to the Premier to ask for the 'honourable interment' of the remains of Trukanini, reputedly the last Tasmanian Aboriginal woman, kept at the museum since their disinterment in 1878. The minutes record that the Council, possibly influenced by Crowther, 'considered that it was inadvisable that the skeleton should be lost to science'.[133]

Perhaps the most important milestone in Crowther's growing remorse was the research for his paper, 'The Final Phase of the Extinct Tasmanian Race', written in 1972 for a meeting of the Tasmanian fellows and members of the Royal Australasian College of Physicians. In it, he explored the reasons for the high death rate of Aborigines at Oyster Cove after they were transferred there from Flinders Island in 1847. This is the closest he came to having an experience like that

of the functionalist anthropologists. In writing the paper, he felt that he had come to know the Aborigines personally and further regretted exhuming their remains:

> Now in these last few months working at the data covering the last few months of the survivors of the Race, I have been able to picture them, name by name, their huts here and there, and their individual habits and peculiarities, with the males off for an occasional whaling voyage, and the women, apart from occasional excursions into the bush with their dogs, at the last doomed to sitting around in the Reserve waiting for the end. With this additional knowledge came a certain sympathy, affection and sadness that no one had been able to give them hope and health. So my complacency in regard to the recovery of their remains had given place to feelings of deep regret and dissatisfaction with myself.[134]

Later, in 'The Last Tasmanian', Crowther again expressed remorse regarding the exhumations.[135]

In 1964, Crowther formally donated his collection of Aboriginal remains to the Tasmanian Museum and Art Gallery where it had been housed for some time.[136] About fifteen years later, the Tasmanian Aboriginal Centre (TAC) began a campaign to have the collection returned to their community. In 1982, having initially offered 'Aboriginal representatives' joint custody with the Trustees of TMAG, which would retain the remains, the new Gray Liberal government reluctantly capitulated.[137] One reason was the 'social stigma' associated with the means by which Crowther acquired them.[138] In addition, as the Minister of Recreation, the Environment and Licensing Geoff Pearsall, said, 'social thinking had changed dramatically in the years since the Crowther collection had been put together and most enlightened Tasmanians would support the Government's decision'.[139]

There were nevertheless still some sticking points. In particular, the TAC wished to cremate the remains privately at Oyster Cove whereas the government preferred a ceremony at Cornelian Bay with government ministers and representatives of the museum present.[140] In a draft letter to the State Secretary of the TAC, Kerry Randriamahafa, the Attorney-General, Max Bingham, wrote: 'We would like this [the disposal] to be done in a co-operative and reasonable way, thereby symbolising a joint recognition of our Aboriginal inheritance and its significance to <u>all</u> Tasmanians.'[141]

Believing that modern technology and methods might produce new evidence about the origins of Tasmanian Aborigines, the Director of TMAG also wanted to have the remains measured and photographed before returning them.[142] Members of the Aboriginal community argued that these conditions showed disrespect to their ancestors. In a letter to the *Mercury* concerning the cremation, Cheryl Fulton of the Wayee Aboriginal Radio and Cultural Corporation, wrote: 'Have people forgotten that the issue is the disposal of Aboriginal remains, the remains of people who have relatives living today?'[143]

In 1984, the Hawke Labor government in Canberra introduced its Aboriginal and Islander Bill. This put added pressure on the state government because, according to Senator Susan Ryan, one of the bill's purposes was to prevent

Aboriginal remains from being used in a way that was an 'anathema' to the community.[144] The state government conceded. Julia Clark, a curator at the Tasmanian Museum and Art Gallery, oversaw the return of the collection. She recalls that, since not all could be clearly identified as Tasmanian Aboriginal, the museum returned the remains in two stages – firstly, the named remains from all the collections, and secondly, those from the Crowther collection that were obviously Tasmanian.[145] His habit of exchanging remains meant that some care had to be taken. A crowd of three hundred Aboriginal people cremated the collection during a private ceremony at Oyster Cove in May 1985. Afterwards, the representative of the Tasmanian Council of Aboriginal Organisations, Alma Stackhouse, told the *Mercury*: 'We put the spirits of our ancestors to rest yesterday – the first time we have been able to do so for many years.'[146]

Conclusion

The public outcry about WL Crowther's mutilation of William Lanne's body in 1869 shows that many members of the wider Tasmanian public had always felt uneasy about the disturbance of Aboriginal remains. Nevertheless, the justification that research using the remains might improve the lot of human beings, allowed their collection to continue. This encouraged Sir William Crowther to pursue his hobby but there were also other reasons. It gave him a chance to engage in current debates, form friendships and indulge in an absorbing pastime. Despite his considerable sympathies, he did not think there was anything wrong with his practice of collecting. Moreover, he never rethought his belief that Tasmanian Aborigines occupied a lowly place on the evolutionary scale or that they had died out. Although he expressed guilt and remorse in his old age about the exhumations at Oyster Cove, he saw no reason why the Tasmanian Museum and Art Gallery should not keep Aboriginal remains, suggesting that he did not fully understand how his collection affected the Aboriginal community. Perhaps it was just too difficult for him to completely repudiate such an integral part of his life. Crowther remained a man of his era, a period that had a unique faith in the power of science to do good and so did not question its authority.

Endnotes

1 Bill Perkins, '"The Last Tasmanian" Tom Haydon's New Documentary Reviewed by Bill Perkins after Three Pre-view Screenings', p. 21, in spine labelled WELH Crowther, vol. 1, C12535, WL Crowther Library, Tasmanian Archives and Heritage Office (hereafter TAHO), State Library of Tasmania (hereafter SLT).

2 John J Cove, *What the Bones Say: Tasmanian Aborigines, Science and Domination*, Carleton University Press, Ottawa, 1995, p. 62.

3 Caroline Von Oppeln, 'Sir William Crowther: a Biographical Sketch', pp. 218–219, in G Winter (ed.), *Tasmanian Insights*, State Library of Tasmania, 1992; Kathy Evans, 'Guide to the Crowther Family Papers', WL Crowther Library, State Library of Tasmania Heritage Collections', unpublished manuscript, p. 15, TAHO, SLT.

4 Tony Marshall, 'The Choosing of a Proper Hobby', *Australian Library Journal*, vol. 56, nos 3–4, November 2007, p. 5.

5 Letter from Graham Pike to WELH Crowther, 9 April 1975; Letter from WELH Crowther to Graham Pike, 27 May 1975, Box 13, Crowther Library Correspondence Files, 1970s–1985, WL Crowther Library, TAHO, SLT.
6 WELH Crowther, 'My Collections: Sir William Crowther: Three Interviews with Ken Gilmore', TL.CD027.82MYC, TAHO, SLT.
7 Perkins, p. 21.
8 Helen MacDonald, *Human Remains: Episodes in Human Dissection*, Melbourne University Press, Melbourne, 2005, pp. 8–9.
9 Russell McGregor, *Imagined Destinies: Aboriginal Australians and the Doomed Race Theory, 1880–1939*, Melbourne University Press, Melbourne, 1997, pp. 34–36; 44; For a discussion of progressivism see: Michael Roe, *Nine Australian Progressives: Vitalism and Bourgeois Social Thought 1890–1960*, University of Queensland Press, Brisbane, 1984, pp. 9–20.
10 WELH Crowther, 'Crowther, Edward Lodewyk (1843–1931)', *Australian Dictionary of Biography Online*, www.adb.online.anu.edu.au/adbonline.htm
11 Scott and Barbara Bennett, *Biographical Register of the Tasmanian Parliament*, Australian National University Press, Canberra, 1980, p. 77.
12 Von Oppeln, p. 212.
13 Von Oppeln, p. 212.
14 WELH Crowther, 'My Collections'.
15 Evans, p. 14; Marshall, p. 1; Von Oppeln, pp. 213–214.
16 Evans, pp. 14–15; Von Oppeln, pp. 214–216.
17 Evans, pp. 14–16; Minutes of the Council of the Tasmanian Museum, 4 August 1919, RSA/A/7, University of Tasmania Archives (hereafter UTAS).
18 WELH Crowther, *The Halford Oration: 1803–1876 The Passing of the Tasmanian Race*, 1933, in spine labelled WELH Crowther DSO, vol. 3, C 12537, WL Crowther Library, TAHO, SLT; WELH Crowther, 'On the Formation and Disposal of a Collection', Royal Society of Tasmania: *Papers and Proceedings*, 1949, issued separately on 15 September 1950, p. 83, Crowther Publications, Box 11, WL Crowther Library, TAHO, SLT.
19 WELH Crowther, *The Halford Oration*, p. 4; WELH Crowther, 'On the Formation and Disposal of a Collection'; WELH Crowther, 'The Final Phase of the Extinct Tasmanian Race, 1847–1876 Being an Epilogue to the Sixth Halford Oration, Canberra, ACT, 23 November 1933', given 7 October 1972, Records of the Queen Victoria Museum, no. 49, Crowther Publications, Box 11, TAHO, SLT; WELH Crowther, 'Tasmanian and Australian Aborigines, lecture given on 13 February, 1963 in *Centenary of the Opening of the Tasmanian Museum and Art Gallery Building*, p. 13, Crowther Publications, Box 12, WL Crowther Library, TAHO, SLT; undated letter from WELH Crowther to Clifford Craig, c. 1942–1979, NS 1697/1/26, TAHO, SLT; Monica MacCallum, 'Mackenzie, Sir William Colin (1877–1938)', www.adb.online.anu.edu.au/adbonline.htm See also Von Oppeln, p. 221.
20 Marshall, 'The Choosing of a Proper Hobby', p. 3.
21 Letter from VL Horton to WELH Crowther, 12 July 1934 in file marked Horton, VL Correspondence, Box 4, WL Crowther Library, TAHO, SLT.
22 Field Notes, C5918, WL Crowther Library, TAHO, SLT.
23 *Mercury*, 10 May 1921 clipping in spine labelled WELH Crowther DSO vol. 1, C12535, WL Crowther Library, TAHO, SLT.
24 Sometimes searches for tools uncovered remains. For instance, Mrs Legge found the skull of a young Aboriginal girl during an expedition with her husband to look for artefacts on the west coast of Tasmania. WELH Crowther, 'On Two Tasmanian Crania (Immature)', Royal Society of Tasmania: *Papers and Proceedings*, read 12 November 1928, pp. 123–127, Crowther Publications, Box 12, WL Crowther Library, TAHO, SLT.
25 WELH Crowther, 'On the Formation and Disposal of a Collection', p. 84.
26 WELH Crowther, 'On the Formation and Disposal of a Collection', p. 84.
27 Field Notes, C5918.
28 Field Notes, C5918.
29 Crowther used the term 'the neck'. Field Notes, C5918, WL Crowther Library, TAHO, SLT.
30 Field Notes, C5918.
31 WELH Crowther, 'On the Formation and Disposal of a Collection', p. 84.
32 WELH Crowther, 'On the Formation and Disposal of a Collection', p. 89; Field Notes, C5918.
33 Field Notes, C5918.
34 'The Address by WELH Crowther', *Proceedings at the Handing Over of the Crowther Collection of Australiana*, 8 April 1964, Hobart, State Library of Tasmania, 1967, unpaginated.
35 WELH Crowther, 'My Collections'; Von Oppeln, p. 212.
36 WELH Crowther, 'Crowther, Edward Lodewyk (1843–1931)', *Australian Dictionary of Biography Online*; WELH Crowther, *The Final Phase of the Extinct Tasmanian Race*, p. 2; Notes by EL Crowther, in spine labelled EL Crowther, MD, vol. 5, C12594, WL Crowther Library, TAHO, SLT; 'Aborigines', p. 23, in spine labelled EL Crowther, MD, vol. 5, C12534, WL Crowther Library, TAHO, SLT. See also Von Oppeln, p. 220.
37 WELH Crowther, 'Crowther, Edward Lodewyk (1843–1931)', *Australian Dictionary of Biography Online*; WELH Crowther and AA Abbie, 'Tasmanian and Australian Aborigines: Second Lecture', *Centenary of the Opening of*

the Tasmanian Museum and Art Gallery Building, 13 February 1963, p. 12, Box 12, WL Crowther Library, TAHO, SLT; Sir William Crowther, 'Extinct Tasmanians', *Centaur*, AMSA Convention Hobart, 1972, p. 41, Box 12, WL Crowther Library, TAHO, SLT.

38 WELH Crowther, *The Halford Oration*, p. 1.

39 Notes by EL Crowther, C12632, WL Crowther Library, TAHO, SLT.

40 'The Address by WELH Crowther', *Proceedings at the Handing Over of the Crowther Collection of Australiana*.

41 For accounts of the mutilation of William Lanne's body see: Stefan Petrow, 'Aboriginal Skulls in the Nineteenth Century', Tasmanian Historical Research Association: *Papers and Proceedings*, vol. 44, no. 3, September 1997, p. 218; Stefan Petrow, 'The Last Man: The Mutilation of William Lanne in 1869 and Its Aftermath', in David Walker and Michael Bennett (eds), *Intellect and Emotion: Perspectives on Australian History: Essays in Honour of Michael Roe*, Centre for Australian Studies, Deakin University and Centre for Tasmanian Historical Studies, University of Tasmania, 1998, pp. 18–39; MacDonald, pp. 137–138, 146–158.

42 WELH Crowther, *The Halford Oration*, pp. 12–13.

43 Marshall, p. 5.

44 WELH Crowther, 'On the Formation and Disposal of a Collection', p. 83.

45 Cove, p. 62.

46 WELH Crowther, 'Tasmanian and Australian Aborigines', p. 13; WELH Crowther, *The Final Phase of the Extinct Tasmanian Race 1847–1876*.

47 Ruth Formanek, 'Why They Collect: Collectors Reveal Their Motivations', Susan M Pearce (ed.), *Interpreting Objects and Collections*, Routledge, London and New York, 1994, pp. 329, 332.

48 Marshall, p. 5.

49 Letter from RW Legge to WELH Crowther, 23 July 1926, C12540, WL Crowther Library, TAHO, SLT.

50 Letter from RW Legge to WELH Crowther, 27 June 1926, C12540, WL Crowther Library, TAHO, SLT.

51 Typewritten manuscript in envelope marked 'Collectors Progress in Hobart', unpaginated and p. 2, WL Crowther Library, TAHO, SLT.

52 'The Address by WELH Crowther', *Proceedings at the Handing Over of the Crowther Collection of Australiana*.

53 Typewritten manuscript in envelope marked 'Collectors Progress in Hobart', WL Crowther Library, TAHO, SLT, p. 25.

54 'The Address by WELH Crowther', *Proceedings at the Handing Over of the Crowther Collection of Australiana*.

55 Kate Brittlebank, '"Two People – One Life": Collecting and the Marriage of Ronald M and Catherine H Berndt', *Australian Historical Studies*, vol. 39, no. 1, 2008, pp. 3–18.

56 Von Oppeln, p. 216.

57 Marshall, p. 2; Evans, p. 14.

58 MacDonald, p. 110.

59 WELH Crowther, *The Halford Oration*, p. 4.

60 WELH Crowther, *The Halford Oration*, pp. 1–2.

61 KF Russell, 'Halford, George Britton (1824–1910)', *Australian Dictionary of Biography Online*, www.adb.online.anu.edu.au/adbonline.htm

62 Letter from WELH Crowther to Graham Pike, 27 May 1975.

63 Minutes of the Council of the Tasmanian Museum, 29 May 1925; 16 February 1925, RSA/A/7, UTAS.

64 Letter from J Wunderly to WELH Crowther, 30 September 1933, in spine labelled WELH Crowther DSO, vol. 3, C 12537; *Mercury*, 1 June 1935, p. 7, newspaper clipping in spine labelled WELH Crowther DSO, vol. 1, C12535, WL Crowther Library, TAHO, SLT.

65 Ronald McNicoll, 'Kenyon, Alfred Stephen (1867–1943)', *Australian Dictionary of Biography Online*, www.adb.online.anu.edu.au/adbonline.htm

66 WELH Crowther, 'Formation and Disposal of a Collection', p. 84.

67 Tom Griffiths, *Hunters and Collectors: The Antiquarian Imagination in Australia*, Cambridge University Press, 1996, p. 72.

68 Letter from WELH Crowther to Graham Pike, 27 May 1975; RV Southcott, 'Cleland, Sir John Burton (1878–1971)', *Australian Dictionary of Biography Online*, www.adb.online.anu.edu.au/adbonline.htm

69 Letter from JB Cleland to WELH Crowther, 18 April 1939, in file labelled Cleland, JB in Crowther Files, Box 2, WL Crowther Library, TAHO, SLT; Minutes of the Council of the Tasmanian Museum, 1 May 1939, RSA/A/8, UTAS.

70 Neville Hicks and Helen McIntosh, 'Pulleine, Robert Henry (1869–1935)', *Australian Dictionary of Biography Online*, www.adb.online.anu.edu.au/adbonline.htm

71 *Mercury*, 16 April 1925, p. 3, clipping in C5918, WL Crowther Library, TAHO, SLT.

72 Minutes of the Council of the Tasmanian Museum, 29 May, 1925, RSA/A/7, UTAS.

73 Warwick Anderson, *The Cultivation of Whiteness: Science, Health and Racial Destiny in Australia*, Melbourne University Press, 2002, p. 138.

74 Letter from Joseph Birdsell to WELH Crowther, 29 January 1941, in file labelled Birdsell, Joseph B, in Crowther Files, Box 1, WL Crowther Library, TAHO, SLT.

75 Jacqueline D'Arcy, '"The Same But Different": Aborigines, Eugenics, and the Harvard-Adelaide Universities' Anthropological Expedition to Cape Barren Island Reserve, January 1939', *Tasmanian Historical Studies*, vol. 12, 2007, p. 83.

76 Letter from the Honorary Curator in Charge of the Peabody Museum of Archaeology and Ethnology (signature illegible) to WELH Crowther, 23 March 1910 in box labelled 'WELH Crowther Correspondence and a Few C19 Items', WL Crowther Library, TAHO, SLT.
77 WELH Crowther, 'Formation and Disposal of a Collection', p. 84; Sylvia Schaffarcyzk, 'Australia's Official Papuan Collection: Sir Hubert Murray and the How and Why of a Colonial Collection', presented at the Collecting for a Nation Symposium, National Museum of Australia, 21 March 2006, www.nma.gov.au, accessed on 23 October 2008; G Horne and G Aiston, *Savage Life in Central Australia*, Macmillan and Co., London, 1924.
78 Letter from WELH Crowther to Graham Pike, 27 May 1975.
79 Letter from F Wood Jones to WELH Crowther, 24 June 1925 in file labelled Wood Jones Correspondence with Sir William Crowther in Box 8 Crowther Files, WL Crowther Library, TAHO, SLT.
80 Letter from F Wood Jones to WELH Crowther, 17 August 1934 in file labelled Wood Jones Correspondence with Sir William Crowther in Box 8 Crowther Files, WL Crowther Library, TAHO, SLT.
81 Letter from John B Cleland to WELH Crowther, 10 September 1939 in file labelled Cleland, JB Correspondence to Sir William Crowther, Box 2, WL Crowther Library, TAHO, SLT.
82 According Marcel Mauss, there is a political economy of gift-giving – it binds relationships, creates obligations, and promotes social interaction, imbuing it with civility. MacDonald, p. 109.
83 Minutes of the Council of the Tasmanian Museum, 28 January 1918; 15 March 1920; 2 August 1920, RSA/A/7 UTAS.
84 J Wunderly to WELH Crowther, 6 October 1933; 22 December 1933, in spine labelled WELH Crowther DSO, vol. 3, C 12537.
85 Letter from F Wood Jones to WELH Crowther, 10 July 1926, C12540, WL Crowther Library, TAHO, SLT; Letter from HW Marshall to WELH Crowther, 9 July 1926, C12540, WL Crowther Library, TAHO, SLT; Letter HW Marshall to WELH Crowther, 22 May 1926, C12540, WL Crowther Library, TAHO, SLT.
86 Letter from F Wood Jones to WELH Crowther, 24 June 1925 in file labelled Wood Jones Correspondence with Sir William Crowther in Box 8 Crowther Files, WL Crowther Library, TAHO, SLT.
87 Letter from F Wood Jones to WELH Crowther, 3 June 1928, in spine labelled WELH Crowther DSO, vol. 3, C 12537, WL Crowther Library, TAHO, SLT.
88 Anderson, pp. 210–211.
89 Letter from AH Tebbutt to WELH Crowther, 22 November 1938 in file marked Tebbutt AH Correspondence to Sir William Crowther, Box 7, WL Crowther Library, TAHO, SLT; David Piers Thomas, *Reading Doctors' Writing: Race, Politics and Power in Indigenous Health Research, 1870–1969*, Australian Institute of Aboriginal and Torres Strait Islanders, Canberra, 2004, pp. 57–58.
90 McGregor, p. 103.
91 Griffiths, pp. 38, 44.
92 Stefan Petrow, 'Aboriginal Skulls in the Nineteenth Century', pp. 37–38. See also: Griffiths, p. 63; Geoffrey Blainey, *Triumph of the Nomads: A History of Ancient Australia*, Macmillan, 1982, Ch. 3.
93 MacDonald, p. 108.
94 McGregor, pp. 47–49.
95 McGregor, p. ix.
96 McGregor, pp. 37–38.
97 McGregor, p. 102; Henry Reynolds, *This Whispering in Our Hearts*, Allen and Unwin, Sydney, 1998, pp. 230–233.
98 McGregor, pp. 102–103.
99 McGregor, p. 103; Reynolds, pp. 233–234.
100 McGregor, p. 103.
101 McGregor, p. 197.
102 Anderson, pp. 206–207.
103 McGregor, p. 105.
104 Letter from WP Elkin to WELH Crowther, 14 June 1939 in file labelled Elkin, WP Correspondence to Sir William Crowther, Box 3, WL Crowther Library, TAHO, SLT. File labelled Pink, Olive Correspondence to Sir William Crowther, Box 6, WL Crowther Library, TAHO, SLT.
105 Cove, pp. 63–69.
106 Letter from F Wood Jones to WELH Crowther, 3 June 1928.
107 Letter from J Wunderly to WELH Crowther, 3 July 1933, in spine labelled WELH Crowther DSO vol. 3, C12537, WL Crowther Library, TAHO, SLT.
108 F Wood Jones to WELH Crowther, 19 September 1933, in spine labelled WELH Crowther DSO, vol. 3, C 12537, WL Crowther Library, TAHO, SLT.
109 Anderson, pp. 206–208.
110 Letters from J Wunderly to WELH Crowther, 3 July 1933; 5 September 1933; 16 September 1933, all in spine labelled WELH Crowther, vol. 3, C12537, WL Crowther Library, TAHO, SLT.
111 WELH Crowther, *The Halford Oration*, p. 5.
112 Letter from J Wunderly to WELH Crowther, 3 July 1933.
113 Cove, p. 69.
114 *Mercury*, 1 June 1935, p. 7, newspaper clipping in spine labelled WELH Crowther DSO, vol. 1, C12535, WL Crowther Library, TAHO, SLT. Extracts from *Oceania*, vol. vi, no. 1, September 1935, in spine labelled WELH Crowther DSO, vol. 3, C 12537, WL Crowther Library, TAHO, SLT.
115 McGregor, p. 158; Anderson, p. 210–211.
116 McGregor, p. 159; D'Arcy, pp. 74–75, 78–79.

117 McGregor, p. 290; Anderson, p. 238.
118 Von Oppeln, p. 221.
119 Crowther & Lord, 'A Descriptive Catalogue of the Osteological Specimens Relating to the Tasmanian Aborigines Contained in the Tasmanian Museum', Royal Society of Tasmania: *Papers and Proceedings*, vols 55–57, 1920–1922, p. 137.
120 WL Crowther & Clive Lord, 'Description of Two Tasmanian Crania, Royal Society of Tasmania: *Papers and Proceedings*, 1921, pp. 169–172.
121 WELH Crowther, 'On Two Tasmanian Crania (Immature)', pp. 123–127.
122 WELH Crowther, 'Notes on the Habits of the Extinct Tasmanian Race No. 3', Royal Society of Tasmania: *Papers and Proceedings*, 24 May 1933, pp. 1–4.
123 WELH Crowther, 'Notes on the Habits of the Extinct Tasmanian Race No. 4: On the Discovery of Tasmanian Aboriginal Remains at Mt Dromedary, Tasmania', Royal Society of Tasmania: *Papers and Proceedings*, 24 May 1939, pp. 209–211.
124 WELH Crowther, *The Halford Oration*, p. 7.
125 WELH Crowther, 'The Uses and Manufacture of Implements by the Tasmanian Aborigines', Pan Pacific Congress, Melbourne and Sydney, 1923, pp. 264–266.
126 WELH Crowther, *The Halford Oration*, p. 13.
127 MacDonald, p. 113.
128 WELH Crowther, *The Passing of the Tasmanian Race, 1803–1876*, p. 4; David Horton, *Recovering the Tracks: The Story of Australian Archaeology*, Aboriginal Studies Press, 1991, p. 95.
129 WELH Crowther, 'Method of Migration of the Extinct Tasmanian Race', *Journal of the Polynesian Society*, vol. 46, no. 4, pp. 225–231 in Contributions to Scientific Societies, WELH Crowther, C12539, WL Crowther Library, TAHO, SLT; Horton, p. 95.
130 Reynolds, pp. 230–236; McGregor, pp. 192–195.
131 WELH Crowther, *The Halford Oration*, pp. 14–15.
132 WELH Crowther, 'Tasmanian and Australian Aborigines', p. 14.
133 Minutes of the Council of the Tasmanian Museum, 10 September 1953, RSA/A/9, UTAS; Lyndall Ryan, 'The Struggle for Trukanini, Tasmanian Historical Research Association: *Papers and Proceedings*, vol. 44, no. 3, September 1997, p. 159; Louis V Daniels, 'Cranswick, Geoffrey Francis (1894–1978)', *Australian Dictionary of Biography Online*, www.adb.online.anu.edu.au/adbonline.htm
134 WELH Crowther, 'The Final Phase of the Extinct Tasmanian Race, 1847–1876', p. 29.
135 Perkins, p. 21.
136 WELH Crowther, 'Tasmanian and Australian Aborigines', p. 10.
137 'Briefing Notes Prepared by the Premier's Office for a Meeting of the Parliamentary Liberal party on Thursday 8 September', 1982, AA561/1/2, TAHO, SLT. For a comprehensive account of the return of the Crowther Collection to the Aboriginal community see: Lyndall Ryan, *The Aboriginal Tasmanians*, Second Edition, Allen and Unwin, Sydney, 1995, pp. 268–272.
138 'Briefing Notes for the Premiers' Meeting', 3 December 1982, AA561/1/2, TAHO, SLT.
139 *Mercury*, 1 December 1982, p. 7, newspaper clipping, AA561/1/2. The Tasmanian Parliamentary Library provided the title of Pearsall's ministry by phone on 4 December 2008.
140 'Information Paper for Cabinet, Skeletal Remains, Cabinet Submission No. 455' from the Attorney-General, Max Bingham, 15 November 1983; *Mercury*, 24 January 1984, p. 1, newspaper clipping, AA561/1/2, TAHO, SLT.
141 'All' is underlined as in the text. Undated draft Letter from Max Bingham to Kerry Randriamahafa, AA561/1/2, TAHO, SLT.
142 'Information Paper for Cabinet, Skeletal Remains, Cabinet Submission No. 455' from the Attorney-General, Max Bingham, 15 November 1983; Briefing Notes prepared by the Premier's Office for a meeting of the Parliamentary Liberal Party, 8 September 1982, AA 561/1/2; Undated Briefing Note: 'Crowther Collection Summary', AA 561/1/2, TAHO, SLT.
143 *Mercury*, 25 May 1984, p. 8, newspaper clipping in AA561/1/2, TAHO, SLT.
144 AGD 1/1/1304/60/1/1 Part 1, TAHO, SLT.
145 Julia Clark, Telephone conversation, 30 May 2009.
146 *Mercury*, 6 May 1985, p. 1.

AN UNSIGNED AND UNDATED PORTRAIT: UNRAVELLING THE MYSTERY OF *FOUR CHILDREN OF JOSEPH TICE GELLIBRAND*

Danielle Wood and Erica Burgess

Wood D.E., Burgess E.C. 2011. An Unsigned and Undated Portrait: Unravelling the Mystery of *Four Children of Joseph Tice Gellibrand*. *Kannunah* 4: 26–47. ISSN 1832-536X. In 2004 a painting depicting four children of Joseph Tice Gellibrand (1792–1837), Tasmania's first Attorney-General, was donated to the Tasmanian Museum and Art Gallery. Unsigned and undated, the painting is known as the *Four Children of Joseph Tice Gellibrand* and is conjectured to be the work of English-born itinerant artist Augustus Earle (1793–1838). Earle is known to have visited Van Diemen's Land in 1825, when Joseph Tice Gellibrand and his wife Anne had only three of their eventual nine children. This paper explores the possibility that the painting was created during Earle's little-known second visit to the colony in 1828, by which time five of the Gellibrand children had been born. The paper documents the attempt to definitively attribute *Four Children of Joseph Tice Gellibrand* to Earle, and to ascertain the identity of the four children depicted. The investigation detailed in the paper include a conservation examination of the painting, an exploration of archival sources relating to Earle's visits to Van Diemen's Land and the biographies of the Gellibrand children.

Danielle Wood, School of English, Journalism and European Languages,
University of Tasmania,
Private Bag 82, Hobart, Tasmania 7001, Australia.
Email: Danielle.Wood@utas.edu.au

Erica Burgess, Tasmanian Museum and Art Gallery,
GPO Box 1164, Hobart, Tasmania 7001, Australia.
Email: Erica.Burgess@tmag.tas.gov.au

KEY WORDS: Augustus Earle, Van Diemen's Land, colonial portraiture, Georgian children's costuming, attribution, Joseph Tice Gellibrand (father), Anne Gellibrand, Thomas Lloyd Gellibrand, Eliza Tice Gellibrand, Joseph Tice Gellibrand (son), William St Paul Gellibrand, George Henry Blake Gellibrand, Tasmanian Museum and Art Gallery

Fig. 1. Artist unknown (possibly Augustus Earle) *Four Children of Joseph Tice Gellibrand*, c. 1828. Oil on canvas, 63.5 x 75.3 cm, Tasmanian Musuem and Art Gallery: AG 7956

Introduction

In 2004, an unsigned and undated oil painting depicting four children in Georgian dress was gifted to the Tasmanian Museum and Art Gallery (TMAG) (Fig. 1). The children are four of the eventual nine sons and daughters of Joseph Tice Gellibrand (1792–1837) (Fig. 2) and Anne Isabella Kirby (1797–1863) (Fig. 3). Joseph Tice Gellibrand was an English-born lawyer who immigrated to Van Diemen's Land with his family, arriving in 1824 to take up the position of Attorney-General. Of Joseph and Anne's nine children, two were born in England, one at sea, and the others in Hobart.

Gellibrand's tenure as attorney-general was short, owing to major disagreements and legal skirmishes with Lieutenant-Governor George Arthur. Following a much-disputed dismissal from his position as attorney-general, Gellibrand remained in Van Diemen's Land and turned to other pursuits: practising law, acquiring land,

Fig. 2. Photograph of portrait of Joseph Tice Gellibrand, date unknown, reproduced from the Gellibrand family photograph album.
Tasmanian Archive and Heritage Office: NS 187/42/1/1

Fig. 3. Photograph of portrait of Anne Isabella Kirby, date unknown, reproduced from the Gellibrand family photograph album.
Tasmanian Archive and Heritage Office: NS 187/42/1/1

becoming involved in the press and joining the Port Philip Association. In February 1837, during an exploratory journey in the Port Philip hinterland, Gellibrand and a companion disappeared, never to be found. Accounts of Gellibrand portray him as 'an intelligent and able lawyer'[1] with high ideals and a zest for reform, but a naïve approach to colonial politics and an imprudently close association with the press.

The portrait of Joseph and Anne's children, which has become known as *Four Children of Joseph Tice Gellibrand*, has excellent provenance, having remained within the Gellibrand family since its creation. It passed to Joseph Tice Gellibrand's eldest son, Thomas Lloyd Gellibrand (born 1820). Following his death in 1874, his widow – Isabella – took their children (and presumably the painting) to England.[2] In due course, the painting was inherited by the farmer and distinguished soldier Major-General Sir John Gellibrand (1872–1945), grandfather of a contemporary John Gellibrand (of New South Wales), the donor of the painting. It seems likely that Sir John Gellibrand had the painting in his possession when he returned to Australia in 1912.[3] (He lived in Tasmania and Victoria until his death.) The donor recalls seeing the painting in his grandfather's house in the early 1940s. After Sir John's death, the painting was held by Sir John's daughter, Cynthia, until she passed it on to the donor, her nephew.

Despite this provenance, many aspects of the painting remain problematic. Can we be certain of the identity of the painter? When exactly was it painted? And can we be sure which four of the nine Gellibrand children are depicted? Following the donation of the painting to the TMAG in 2004, the first attribution was to colonial painter Benjamin Duterrau (1767–1851), an attribution that was accepted by the Gellibrand family. In a family photograph album held by the Tasmanian Archive and Heritage Office (compiled by Lady Elizabeth Gellibrand, wife of Major General Sir John, and grandmother of the donor), a photographic reproduction of the painting was labelled as being 'by Dutereau [*sic*]'.[4]

For a number of reasons, this seemed to be a reasonable attribution. In early Australian colonial times, draftsmen and watercolourists were sent to assist in setting up the colony and depict their new home, sending much of their work back to England to be worked up into engravings for publication. The more prestigious medium of painting in oil was much slower to become established. The early draftsmen and watercolourists to some extent fulfilled the desire for portraits in oil, even though they were not trained in this medium. The first professional oil painters did not arrive in the colonies until the late 1820s, and they were few and far between. In Van Diemen's Land, the earliest painters were Augustus Earle, who visited briefly in the mid-1820s; John Glover, who arrived in 1830; and Duterrau, who arrived in 1832. Earle and Duterrau are best known for their portraiture, while Glover is known for his landscapes.

There are often problems with attributions of art works in the early period of British settlement – between 1788 and the 1830s – because they were frequently unsigned. Convict artists were not usually allowed to sign their work, and professional – free – artists did not always sign theirs. There are also problems in distinguishing works painted in Australia

from those painted in England. Although attribution can be challenging, there are only a limited number of possibilities. Professional artists were uncommon in the period and their activities in the colonies were generally quite well documented. The Gellibrand family's attribution of this painting to Duterrau was probably made because there was no record of any other likely candidates in Van Diemen's Land working in oils at the approximate time they believed the portrait was painted.[5]

Former TMAG curator David Hansen doubted the attribution to Duterrau on stylistic grounds, regarding Augustus Earle as a more likely contender. In 1832 Duterrau arrived in Van Diemen's Land, but biographical and compositional aspects of *Four Children of Joseph Tice Gellibrand* (detailed below) suggest that it was painted prior to this date, probably in the late 1820s.

But can an attribution to Earle be confirmed? In order to answer this question, we have undertaken two primary lines of enquiry. The first (by painting conservator Erica Burgess) involved a detailed examination of the painting – a process that took place as part of a restoration treatment. The second (by writer Danielle Wood) involved an investigation of records of Earle's activities in the colonies and of archival material relating to the Gellibrand family, specifically that held by the Tasmanian Archive and Heritage Office and the State Library of Tasmania. In our attempt to confirm the origins of the portrait, we also ventured beyond these primary lines of enquiry to consider other details, including the history of children's costuming and Earle's painting style.

Composition, Costume and Style

The children of the portrait are figured against a backdrop of muted and indistinct foliage. The plants in the background might be potted; there is a sense, although only a sense, that the scene is set in a conservatory.[6] The eldest child is clearly a boy, but the sex of the three clustered children is not defined, either by costume or hairstyle. These younger three are connected not only by proximity, but also by the matching coral necklaces they wear above the low-cut necklines of their bodices. (The necklaces, and the coral rattle held by the baby, were common children's accessories, believed to ward off illness and death.) The portrait is composed as a series of triangles. One triangle is formed by the three children to the left, another by the striding body of the oldest boy to the right. Between the two features is an inverted triangle of backdrop, signalling a conventional polarisation, in family portraits of the era, between 'the breeched leaders (and potential leaders) and their subordinates in petticoats'.[7]

The oldest boy wears a blue, lace-trimmed bodice over the pair of beige pants that signal his greater maturity. Cunnington and Buck put the age of breeching at about four years,[8] and Calvert notes that boys of the approximate period were likely to spend 'three or four years of infancy in frocks'.[9] The youngest two children, whose costumes can be clearly seen, are wearing white frocks in the style common to both boy and girl children of the era. The costume of the second-eldest child cannot be clearly seen, although the muted blue of the bodice provides a subtle link to the costume of the eldest boy. In a detailed exploration of the costuming of

Fig. 4. Detail from *Four Children of Joseph Tice Gellibrand*.
Note the finger twining in the necklace of the middle child and the eye colour of the children.

children in American colonial portraiture, Calvert notes that in the first half of the nineteenth century, 'both boys and girls were put into knee-length dresses and long white trousers, and both sexes cropped their hair short or wore long curls'.[10] The express purpose of this styling, writes Calvert, 'was to blur sexual distinctions and preserve the innocence of children as long as possible'.[11] She further notes, however, that costume details such as the placement of buttons and the shaping of collars did offer clues to the sex of the children. In the nineteenth century, for example, the positioning of rosettes on the hoods of children's cloaks could indicate the gender of the wearer. *The Workwoman's Guide* of 1838 notes that 'a rosette of satin ribbon is worn on the left side if a boy, and in front, if a girl'.[12] In *Four Children of Joseph Tice Gellibrand*, the rosette on the baby's bonnet is positioned on the left, which possibly indicates that the baby is a boy.

The appeal of the painting, in our view, lies in its subject matter (it is not often that we see group portraits of children in early nineteenth century oil paintings) and in its playful approach to the representation of childhood. The palette demonstrates sensitivity to the nature of the young faces; the fabrics and other details – such as the coral necklaces – contribute to the warmth of the portrait. Individual components of the painting are finely executed, but they do not come together to present a refined work of great technical accomplishment. Though the children's faces are captivating, their hands and arms are relatively shapeless, and the ways in which the figures intersect – especially the manner in which the second-youngest child holds the arm of the baby – are awkward and unconvincing. The way the baby appears to levitate, floating some centimetres above the floor, strongly suggesting that this painting was composed from a series of sketches. It seems likely from the angled way the baby is sitting that he has been sketched while on someone's lap, rather than actually sitting on the floor.

But beyond even the composite nature of this painting, there are anomalies. At the neck of the second-eldest child, there is a finger twining in the necklace (Fig. 4). To whom does the finger belong? And in the dark space between the cluster of three and the eldest boy is a blue-shoed foot like the one poking out from the white dress of the second-youngest child. Yet again, it is not at all clear to which child it is supposed to belong. Perhaps these anomalies are the result of a painting being composed in haste. Or perhaps they are the result of the painter having changed his mind about the composition during the execution of the portrait. Or, they might point to the difficulty of grouping or arranging the poses of children sketched separately.

A detailed comparison of the technique of the painter of *Four Children of Joseph Tice Gellibrand* and that evident in other works known to be by Earle is beyond our expertise and the scope of this paper. However, in the course of our investigations, we have each examined various oil paintings held in Australian public institutions that are attributed to Earle; there are approximately 18 of these. We note some similarities between the Gellibrand painting and the following works attributed to Earle: *Doctor Robert Townson* (between 1825 and 1827) (Fig. 5), *Ann Piper and her children* (c. 1826) (Fig. 6), both held by the State Library of New

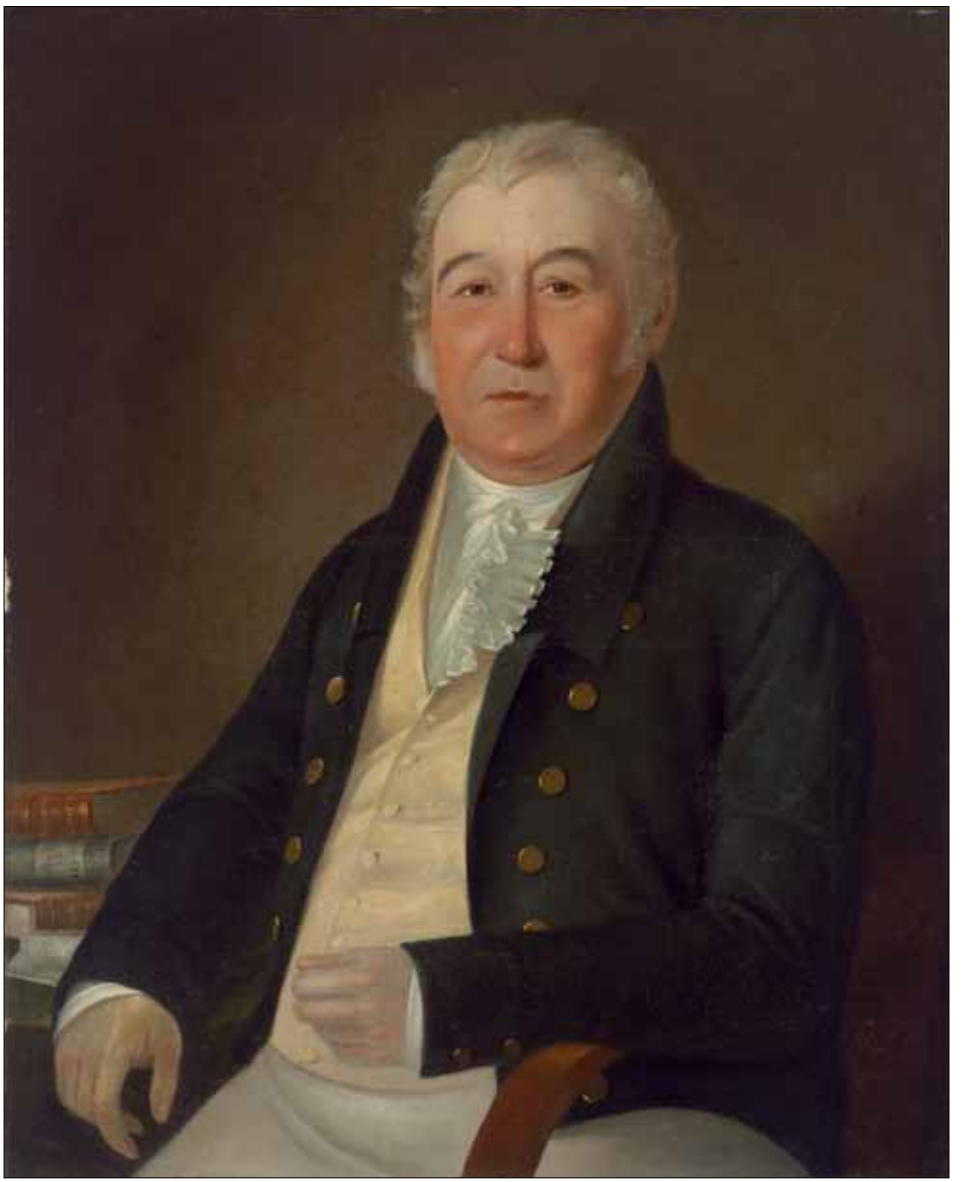

Fig. 5. Augustus Earle *Doctor Robert Townson*, 1825–1827.
Oil on canvas, 90.0 x 75.0 cm, Mitchell, State Library of New South Wales: ML 241

Fig. 6. Augustus Earle *Ann Piper and her children*, c. 1826.
Oil on canvas, 195.1 x 121.7 cm, Mitchell Library, State Library of New South Wales: ML 672

Fig. 7. Attributed to Augustus Earle
Portrait of Mrs George William Evans (Lucy Parris Lempriere) c. 1825.
Oil on paperboard on wood panel, 37.3 x 27.4 cm, Queen Victoria Museum and Art Gallery: QVM 1988:FP:3

South Wales and the *Portrait of Mrs George William Evans (Lucy Parris Lempriere)* (c. 1825) (Fig. 7), held by the Queen Victoria Museum and Art Gallery. In each of these portraits there is a tendency towards the top lighting of subjects, giving the impression of rather high, glowing foreheads. There is a similarity between the rendering of the coral necklaces in the Gellibrand portrait and the gold chain of Mrs Evans. Additionally, all four paintings are connected by a particular method of painting lace edgings. There is a marked similarity between the lace edging of the baby's bonnet in the Gellibrand painting, the neck ruff of the oldest boy in the Piper painting, the lace cravat of Doctor Townson and the bonnet of Mrs Evans. And finally, there is an atmospheric similarity that connects the works mentioned here – a sense of gentle humour and whimsy.

The Conservation Treatment of *Four Children of Joseph Tice Gellibrand*

When this painting became part of the collection at the Tasmanian Museum and Art Gallery, a process of restoration began. The restoration process is one that necessarily concerns itself with both the future and the past of an artwork. Findings made during a conservation treatment can provide clues about the material composition of a painting, and in turn this may shed light as to its origins. Some artists would inscribe and or sign the reverse of their paintings – for example, John Glover.[13] Sometimes, too, the stamps of colourmen (suppliers of artists' materials) can be found on the reverse of canvases, and these can assist in dating.

The first step was a detailed examination, which showed that the painting had areas of unstable paint (some of which had already been lost) and a discoloured varnish layer. No inscriptions, such as the artist's signature or date, were found on the front or back of the painting. It had been previously restored, and the restoration had included lining the original canvas (a new piece of canvas is adhered to the reverse of the original – see Fig. 8). During removal of the lining canvas, the reverse of the original painting canvas was exposed.

Unfortunately there were no inscriptions, but there was a duty stamp and a stamp from London colourman Thomas Brown (Fig. 9). Brown was a supplier of artists' materials and was at 163 High Holborn from 1805/06–1853 and supplied commercially prepared canvases from 1807.[14] It is sometimes possible to date the stamp by matching the stamp's format, exact wording and address to known historical facts about colourmen and their businesses. This stamp, however, is only partially legible, and we cannot determine an exact date.[15]

As well as examining the painting with the naked eye, we viewed it under magnification, and with infrared and ultra-violet light sources. These applications help us identify materials and see through layers, sometimes revealing hidden inscriptions, underdrawing, and/or changes in the image or composition made during the painting process. Restorations may also be revealed. In this painting we found nothing.

It was, perhaps, not surprising to find a lack of inscriptions, but one might expect to find some preparatory drawing considering the detail and complexity of

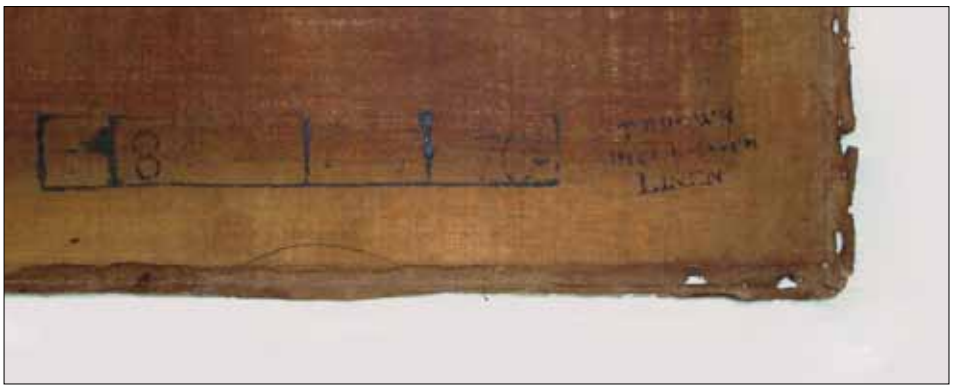

Fig. 8. Photograph of *Four Children of Joseph Tice Gellibrand*, showing the colourman's and duty stamps on the reverse of the painting canvas

the composition. Further investigation with more sophisticated equipment and other applications may well reveal additional detail. If this painting were by Earle, then there are factors that might lead us to expect the presence of underdrawing. One is that Earle was known to make preliminary drawings and watercolours before working some images into oil. The other is that one of Earle's paintings, *A bivouac of travellers in Australia in a cabbage-tree forest, day break*, c. 1838, oil on canvas, National Library of Australia, Rex Nan Kivell Collection, when examined with infra-red light, revealed detailed underdrawing.[16] Unfortunately, this is the only comparison available to us. Infra-red is of limited use, too, because of the complexities related to the infra-red radiation that can penetrate only certain colours. Hence, the presence of underdrawing may not necessarily be revealed. This may well be the case with the Gellibrand painting.

The next step in the examination was to take paint samples from several areas of the work. The samples are tiny, about half a pinhead in size, and were taken from areas of existing damage. The samples were then set in cross-section in resin so they could be examined and analysed. These cross-sections show us the make-up of the priming, paint and varnish layers used by the artist in the construction of the painting. The results could then be compared to existing information about paintings of a similar period. They can also be interpreted in conjunction with data from historical sources such as artists' manuals, colourmen's publications and artist's notes and diaries.

Microscopic examination and analysis revealed that the canvas was most probably prepared with two layers of priming. In most of the cross-section samples, the bottom priming layer (closest to the canvas) is thicker and more granular than the one above. Inorganic analysis with a scanning electron microprobe[17] identified a comparatively higher percentage of chalk to lead in the bottom layer and a higher percentage of lead in the top layer. This is

Fig. 9. Photograph of *Four Children of Joseph Tice Gellibrand*, showing the removal of the lining canvas and revealing the reverse of the painting canvas

consistent with the following description of Brown's primings which 'were smooth, thin and had two layers, neither of which was sized; the upper layer was richer in lead white'.[18] Commonly, the absorbent priming recipes from this time would include chalk, animal glue, lead white in linseed oil and often silicates. From the 1820s, we see the more common use of lead white and oil primings replacing the less flexible and absorbent chalk primings. This, in part, would explain the unstable paint and ground layers that are more vulnerable to movement and changes in humidity than the more flexible moisture-resistant oil primings.

Analysis of the pigments – paint colours – used was also made with a scanning electron microscope. As expected, the white is lead white, for example, in the baby's dress. In the sample taken from this area we can see particles of bright red (as in the coral attached to the rattle the child is holding) and these were analysed as vermilion. The greens in the upper right were probably made from a combination of yellows and blues (iron oxides and ultramarine blue) and the browns are burnt umber and bone black. As we could only take samples from areas of existing damage, there were a limited number of colours that we could sample. The palette used for this painting is, once again, characteristic of the 1820s, when all these pigments were readily available.

The restoration treatment of *Four Children of Joseph Tice Gellibrand* revealed no details that would enable a definitive attribution to Augustus Earle. Neither, however, did it reveal any details that would rule out such an attribution.

Augustus Earle and His Whereabouts in the 1820s

In 1793 Augustus Earle was born in England into an artistic family. He was an itinerant artist who spent his youth travelling, living by his wits, and recording his adventures in both images and text. The humour and playfulness that communicate themselves through his visual images also echo through the lively pages of his written narratives[19] – and he was a man with many a good story to tell. For example, the way he came to Van Diemen's Land for the first time was by quite a spectacular accident. He left Rio de Janeiro in 1824, bound for India aboard the *Duke of Gloucester*, having been promised an introduction to India's Governor-General Amherst. The ship, beset by foul weather, put in to the remote island of Tristan da Cunha in the South Atlantic. Here, Earle went ashore for a few days to sketch some views, taking his dog with him. The ship, however, set sail without him, abandoning him on the island with its tiny population of six adults and a number of children, for

the next eight months. Eventually, he was rescued by the *Admiral Cockburn*, en route to Van Diemen's Land.[20]

Earle arrived in Hobart Town in January 1825, and remained until May of that year, when he moved to New South Wales. Perhaps, during this interval, he became acquainted with Attorney-General Joseph Tice Gellibrand. Gellibrand and Earle were contemporaries – they were born a year apart, and their deaths were a year apart. They were both from relatively affluent (but not exalted) English families, and both clearly had a taste for travel and adventure. They might have had much in common, and taken pleasure in each other's company. We have not, however, uncovered any evidence of a connection between the two. Although it is conceivable that Gellibrand and Earle met in 1825, the portrait known as *Four Children of Joseph Tice Gellibrand* cannot have been painted at this time, since the Gellibrands in 1825 had only three children: five-year-old Thomas, three-year-old Eliza and one-year-old William. Their fourth child, Joseph, was not born until May 1826.

For three years in New South Wales Earle plied his trade, 'quickly establish[ing] himself as the colony's leading artist'.[21] Radford and Hylton regard him as 'by far the most interesting artist working in New South Wales in the 1820s'.[22] In October 1827, he departed for New Zealand, and he recorded his impressions of the destination in both words and pictures before returning to Sydney in May, 1828. Earle left Sydney again in October of the same year, aboard the ship *Rainbow*, which would eventually take him through the Pacific to the Caroline Islands, Guam, Manila and Singapore. After leaving Sydney, however, the *Rainbow* made a stop in Van Diemen's Land. The *Hobart Town Courier* noted the ship's arrival in Hobart on 10 October,[23] and on 1 November, the same publication reported:

> Mr Earle the artist, who has lately made such acquisitions to his collections of rural views in New Holland, New Zealand, &c., proceeds by the Rainbow to England, where a considerable number of his drawings is already engraved and where he will publish the whole on his arrival.[24]

The *Hobart Town Courier* also records the *Rainbow*'s departure on 11 November.[25] Between 10 October and 11 November, Earle was in Hobart Town. By now, the Gellibrand family had grown: Joseph and Anne were by this time parents to five children ranging in age from one year to eight years. It is conceivable that during this visit to Van Diemen's Land, Augustus Earle was commissioned to paint a portrait of the Gellibrand children. But if there were five children in the family at this time, why were only four in the portrait? At this juncture we turned to archival sources relating to the Gellibrand family in order to try to identify the children in the portrait.

The Gellibrand Children

Following their marriage in November 1819, Joseph Tice Gellibrand and Anne Isabella Kirby produced nine children. They were (with their birth dates):

Thomas Lloyd Gellibrand
22 September 1820
Eliza Tice Gellibrand
26 February 1822
William St Paul Gellibrand
18 December 1823

Joseph Tice Gellibrand
1 May 1826
George Henry Blake Gellibrand
16 November 1827
Anne Isabella Lloyd Gellibrand
16 September 1829
Walter Angus Bethune Gellibrand
17 October 1832
Sophia Louisa Gellibrand
14 April 1834
Mary Selina Gellibrand
19 May 1837[26]

Thomas Lloyd and Eliza Tice were born in England, prior to the family's emigration to Van Diemen's Land. William St Paul was born at sea aboard the vessel *Hibernia*, which brought the family to the colony, and his middle name is a reference to a rocky outcrop (part of the Saint Peter and Saint Paul Archipelago), in the equatorial Atlantic, which was the nearest landmark at the time of his birth. The other Gellibrand children were born in Hobart. The youngest, Mary Selina, would never meet her father; Anne was pregnant with her youngest at the time of her husband's disappearance in February 1837 in Victoria.

The Gellibrand children and their offspring were to make their mark on the developing colonial society, whether farming the land, becoming wives and mothers, serving in parliament, entering the church or contributing to benevolent organisations. As a young man of seventeen, Thomas Lloyd took part in the search for his missing father. He went on to farm at family properties at South Arm and near Ouse, and to be elected in 1856 to the House of Assembly. In 1860, at the age of forty, he married the considerably younger Isabella Brown, daughter of Hobart merchant Thomas Brown. He died fourteen years later after fathering seven children. Their sixth child, John, would become Major-General Sir John Gellibrand, the solider and farmer who inspired the Legacy movement by founding the Remembrance Club in Hobart in 1922.

Eliza Tice, nicknamed 'Tida' by her family, was married twice. With her first husband, George Pogson, she had six children, and with her second husband, William Dixon, she had three. William St Paul, who remained unmarried, became a wealthy farmer with holdings in both Van Diemen's Land and New Zealand, while Joseph Tice, known as 'Tice' to avoid confusion with his father, became a church minister. Tice retired at the age of forty-eight and moved to New Zealand, where his family was devastated by tragedy. His wife (a first cousin) was drowned near Tauranga while sailing home from the wedding of their beloved adopted daughter.

The Gellibrands' fifth child, George Henry Blake, fathered ten children and farmed at South Arm. Annie Isabella relocated to New Zealand with her husband Major Augustus Dean Pitt, while Walter Angus Bethune farmed at Ouse, served in the Legislative Council, and became known for his expertise in constitutional law. Sophia Louisa, known as 'Louie', cut a dash in Melbourne society after marrying the lawyer James Smith and caused a legal ruckus over her separation from him. Mary Selina remained unmarried and gave years of service to the Tasmanian Association for the Prevention of Cruelty to Animals.[27]

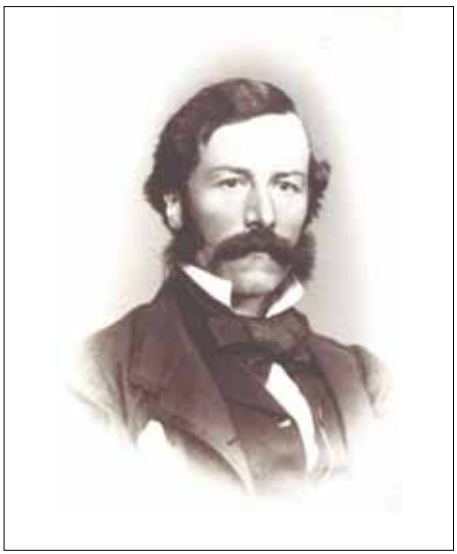

Fig. 10. Thomas Lloyd Gellibrand, date unknown.
Photograph, 14.0 x 9.8 cm, Allport Library and Museum of Fine Arts, Tasmanian Archive and Heritage Office: AUT AS001125647396
Photographer J.W. Beattie

At the time Augustus Earle visited Van Diemen's Land for the second time in late 1828, Joseph Tice and Anne Gellibrand had five children aged between eight years (Thomas Lloyd – the oldest) and eleven months (George Henry Blake – the youngest). At this time, the family was living at Derwent Park, to the north of Hobart. A reconstructed version of the homestead remains on the rise of the hillside between the industrial precinct of Prince of Wales Bay and the Nyrstar zinc smelter. At the age of thirty-six, Joseph Tice Gellibrand was a prosperous and well-connected man; he would certainly have been in a position to afford to commission a portrait of his young family.

On the date of Earle's return to Van Diemen's Land, the ages of the Gellibrand children were as follows:

Thomas	Eight years
Eliza	Six years and seven months
William	Four years and nine months
Joseph	Two years and five months
George	Almost twelve months

In Lady Gellibrand's photograph album, a photographic representation of the painting is captioned: 'Group of Gellibrand Children. Painted by Dutereau [sic]. Standing Thomas Lloyd. The dark boy in the middle is Wm St Paul Gellibrand. The girl on the left, bending forward, is Aunt Tida [Eliza] & the sitting child is Uncle George Gellibrand.'[28] The attribution to Duterrau, as discussed above, is unlikely. The caption identifies the sitters as Thomas, Eliza, William and George, positing that the fourth child, Joseph, is the one who has been omitted.

The caption is almost certainly correct in identifying the standing boy as the eldest son, Thomas Lloyd. The features of the dark-eyed boy of the portrait have a similarity to those of the adult Thomas Lloyd Gellibrand, as he appears in an undated photographic portrait held by the Allport Museum and Library (Fig. 10). But more compellingly, the composition of the portrait itself encourages the viewer to interpret this child as the eldest son and heir. The composition and the choice of props (the gun for Thomas, the rattle for the baby) make it clear that this portrait speaks to us by way of a series of 'conventionalised visual idioms'.[29] Artists convey 'an individual's position in his or her world through the idioms of costume, prop and pose',[30] and in *Four Children*

of Joseph Tice Gellibrand, the son and heir, Thomas Lloyd, strides towards his future, leaving behind the domestic knot formed by his younger and subordinate siblings. In confirming the eldest child's identity as Thomas Lloyd Gellibrand, it is also worth remembering that it was the Thomas Lloyd branch of the family that inherited the portrait. Identifying the three remaining children in the portrait is much more problematic, especially as it is difficult to tell their sex.

The first scenario we considered was that *Four Children of Joseph Tice Gellibrand* depicts the first four Gellibrand children (Thomas, Eliza, William and Joseph) and that it is one-year-old George who is missing. The problem with this conjecture is the probable age of the youngest child in the portrait. We acknowledge that matching the children in the portrait to the historical children on the basis of age is a most inexact science. Judging the probable age of children by their appearance is highly subjective in any case, even without taking into consideration the possible distortions of artistic representation. However, if Earle in 1828 painted the four eldest children (Thomas, Eliza, William and Joseph) then Joseph would have been nearly two-and-a-half years old. It is difficult to reconcile the bonneted, rattle-holding baby with the reality of an active, talkative two-and-a-half-year-old. Even as we acknowledge the difficulties of pinpointing the age of a child in a colonial portrait, it appears that the youngest child in the portrait is more likely to be about one year old, which was George Gellibrand's age at the time of Earle's 1828 visit. Perhaps then, if the family album caption were correct, the baby in the portrait is George, not Joseph.

The second scenario we considered was that *Four Children of Joseph Tice Gellibrand* is actually a portrait of 'four sons of Joseph Tice Gellibrand' and that the only daughter, Eliza, is the one omitted. Perhaps Joseph Tice Gellibrand wished for a portrait of masculinity, a proud representation of the male children who would follow in his footsteps and become the future leaders of the colony. Perhaps he even commissioned a separate portrait of his daughter. Looking only at the ages of the children, this scenario is compelling. The boy with the gun could be Thomas at age eight; the child at the back of the trio dressed in a blue bodice could be William at the age of five years and nine months; the pale-eyed child holding the baby could be Joseph at the age of two years and five months; and the baby could be George at twelve months. A problem remains, however: that of the children's colouring.

The painter of *Four Children of Joseph Tice Gellibrand* has taken pains to distinguish the colouring of the second-youngest child from that of the other siblings. This child is painted with pale hair, pale eyelashes and blue eyes, while the eldest boy, the blue-clad child at the rear, and the baby, are all depicted with very dark eyes. It is not a matter of subtle gradation of colour; the difference is marked. The painter has very clearly represented one child with blue eyes and three children with dark brown eyes. A family photograph album held by the Tasmanian Archive and Heritage Office, compiled by Cynthia Gellibrand, contains later photographs of most of the Gellibrand siblings. From these images we can see that the adult Thomas had dark eyes, as did Eliza (Fig. 11) and Joseph (Fig. 12). George, Sophia and Annie had

Fig. 11. Photograph of Eliza Tice Gellibrand, date unknown, reproduced from the Gellibrand family photograph album.
Tasmanian Archive and Heritage Office: NS187/42/1/1

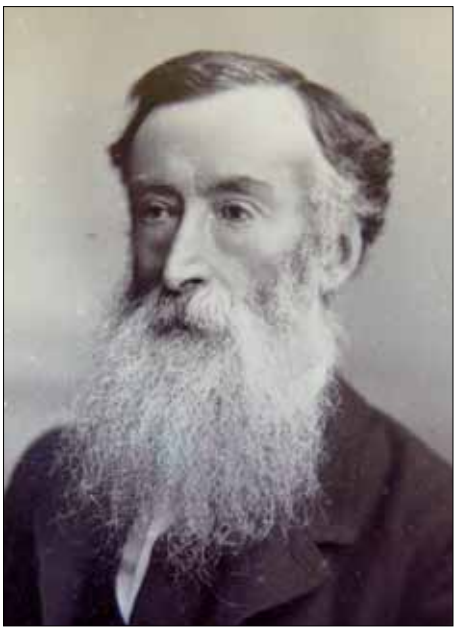

Fig. 12. Photograph of Joseph Tice Gellibrand Jr, date unknown, reproduced from the Gellibrand family photograph album.
Tasmanian Archive and Heritage Office: NS187/42/1/1

pale eyes. Images of Mary Selina make it difficult to tell her eye colour. A notebook accompanying the album (which was compiled by Cynthia Gellibrand in 1982) notes: 'We have no photograph of Wm St Paul Gellibrand. John Bethune [husband of Eliza's daughter Annie] told me that he always refused to be photographed.'[31] Gellibrand family descendant and family historian Jane d'Arcy writes in her 'Short History of the Gellibrand Family': '[William] was to become the tallest member of the family, with light brown hair and blue eyes. One eye may have had a cast and this could be the reason why he would never be photographed.'[32] Cynthia's photograph album also contains photographic reproductions of portraits of Joseph Tice Gellibrand and Anne Isabella Kirby, showing that the two have notably different colouring: Joseph had fair hair and blue eyes, and Anne very dark hair and eyes (see Figs 2 and 3).

Identifying the children by colouring may not be a reliable method since the colour of children's hair and eyes often change as they grow. But if we are to admit the evidence of eye colour, then we can return to our first scenario: the children in the portrait are dark-eyed Thomas at the right of the picture, dark-eyed Eliza at the rear, pale-eyed William at the far

left, and dark-eyed Joseph as the bonneted baby. But given our reluctance to accept the baby of the portrait as two-and-a-half-years-old Joseph, we are left without a perfect match between the history of the actual Gellibrand children, the depiction of the Gellibrand children in the painting, and the presence of Augustus Earle in Van Diemen's Land.

The best match between the ages of the children in the painting and the ages of the biographical children occurs in 1827, when Thomas was about seven, Eliza between five and six, William between three and four, and Joseph about one. This date, however, pre-dates Earle's second visit to Van Diemen's Land by about one year. For the first three quarters of 1827, Earle was in New South Wales, and in October of that year he departed for New Zealand, where he remained until May 1828. Both his journey to New Zealand and his return journey appear to have been direct; no other unexpected sojourns in Van Diemen's Land have been discovered.

It was also in 1827 that Joseph Tice Gellibrand made his first journey to New South Wales.[33] The *Colonial Times and Tasmanian Advertiser* records his departure on Thursday, 23 August. In September of that year, he was admitted as a barrister in the Supreme Court of New South Wales. A transcript shows that it was not a straight-forward affair: during admission proceedings, another barrister took the opportunity to raise a dispute between Gellibrand and a Captain Ostler, who claimed not to have been paid by Gellibrand for a quantity of wine. Gellibrand denied the charge vehemently, and was admitted. The transcript describes Gellibrand as 'at present residing in Sydney'.[34]

We have found no evidence that Gellibrand took his family with him to Sydney in 1827. Family historian Jane D'Arcy writes that on his visits to New South Wales, he 'always brought back gifts for his family, either oranges, books, saddles for his wife and eldest daughter, whom he called Bessy, and on one occasion this young lady received a coral negligee'.[35] Is it possible that in 1827, Joseph Tice Gellibrand did take his family with him, at least for a short time? Or, did he go to New South Wales armed with sketches of his children, which he presented to Earle – at the time the artistic toast of the colony – who then worked up a portrait of the Gellibrand children? Was one of the gifts that Gellibrand gave to his family, upon his return from a trip to Sydney, a portrait of his four eldest children?

Conclusion

The idea that Augustus Earle painted *Four Children of Joseph Tice Gellibrand* during his second, little-known, journey to Van Diemen's Land in October 1828 is a seductive one. Likewise, the similarity between the small details of the Gellibrand portrait and the small details of other known oils by Earle make attributing the painting to him a tantalising possibility. Unfortunately, the attribution cannot be categorically made. The date of Earle's 1828 visit to Van Diemen's Land does not perfectly match the biographies of the historical Gellibrand children. Weighing the evidence of biography, costuming, colouring and composition, it seems most likely that the four children depicted are the Gellibrands' first four children – Thomas, Eliza, William and Joseph – and the best match between the depicted

children and the historical children comes in the year 1827, a year before Earle's return to Van Diemen's Land. Thus, the portrait known as *Four Children of Joseph Tice Gellibrand* must for now remain on the list of Australian colonial artworks whose origins are unclear. As Radford and Hylton note 'attribution of … fascinating early-colonial works … remains speculative' because 'many early colonial images are unsigned, the documentary evidence is scant and our knowledge of Australia's first artists is still inadequate'.[36]

Earle may have painted the portrait in 1828 in Van Diemen's Land, depicting a grouping other than that of the four eldest children. Or, perhaps he painted it in Sydney in 1827, working from sketches sent from Van Diemen's Land – sketches that might even have been delivered by Joseph Tice Gellibrand during his visit to New South Wales that year. It is possible that the portrait was painted in England, by another artist entirely, working from sketches sent from Van Diemen's Land, or that it was painted in Australia by another itinerant artist whose presence in the colony has, for some reason, escaped the attention of historians. Earle may have painted the work at two separate times, or the painting might have been done partly by Earle, and partly by another artist. Or there may be yet another solution to the mystery of *Four Children of Joseph Tice Gellibrand*, which we have failed to uncover. We are hopeful that another piece of the puzzle is yet to come to light. But whatever its precise story, *Four Children of Joseph Tice Gellibrand* seems on the balance of evidence to have been painted in about 1827 or 1828, making it the oldest oil painting of a Tasmanian subject in the Tasmanian Museum and Art Gallery collection. And as such, it is a very significant donation indeed.

Acknowledgements

Our thanks to the Allport Library and Museum of Fine Arts (Tasmanian Archive and Heritage Office) for permission to reproduce a photograph of Thomas Lloyd Gellibrand; to the Mitchell Library (State Library of New South Wales) for permission to reproduce *Ann Piper and her children* and *Doctor Robert Townson*; to the Queen Victoria Museum and Art Gallery for permission to reproduce *Portrait of Mrs George William Evans (Lucy Parris Lempriere)*; and to Ms Helen Gellibrand for permission to reproduce photographs from the Gellibrand family album held by the Tasmanian Archive and Heritage Office. We would also like to thank David Hansen, who initiated work on this mystery, John Gellibrand for his generous assistance, and Christa Johannes for drawing our attention to the importance of costuming.

Endnotes

1 PC James, 'Gellibrand, Joseph Tice (1792?–1837)', *Australian Dictionary of Biography*, Melbourne, 1966, pp. 437–438.
2 Correspondence with the donor, 5 May 2007, email, TMAG Conservation Department file.
3 Correspondence with the donor, 17 May 2007, email, TMAG Conservation Department file.
4 Gellibrand family photograph album, Tasmanian Archive and Heritage Office, NS187/42/1/1.
5 For a more detailed discussion of the establishment of oil painting in early colonial times, see Erica Burgess and Paula Dredge, (1998), 'Supplying Artists' Materials to Australia 1788–1850', A Roy & P Smith (eds), *Painting Techniques: History, Materials and Studio Practice*, London, 1998, pp. 199–204.
6 The oil painting *Derwent Park House*, attributed to Benjamin Duterrau, c. 1840, held by the TMAG, depicts the Gellibrand family home with a conservatory within its grounds.
7 Karin Calvert, 'Children in American Family Portraiture, 1670 to 1810', *The William and Mary Quarterly*, vol. 39, no. 1, (1982), p. 94.
8 Phyllis Cunnington & Anne Buck, *Children's Costume to the end of the Nineteenth Century*, London, 1965, p. 172.
9 Calvert, 'Children in American Family Portraiture', p. 108.
10 Calvert, 'Children in American Family Portraiture', p. 105.
11 Calvert, 'Children in American Family Portraiture', p. 105.
12 Cunnington & Buck, *Children's Costume*, p. 150.
13 TMAG Conservation Department reports and notes. John Glover would sometimes title, date and sign his paintings on the reverse of the canvas or stretcher.
14 *British artists' suppliers, 1650–1950*, entry for Thomas Brown, online directories, document accessed 8 March 2010, http://www.npg.org.uk/research/programmes/directory-of-suppliers/b.php).
15 Correspondence with Jacob Simon, Chief Curator, National Portrait Gallery, London, 30 June 2007, email, TMAG Conservation Department file.
16 Allen Byrne, Kim Brunoro & Sheridan Roberts, 'An examination of Augustus Earle's *A bivouac of travellers in Australia in a cabbage-tree forest, day break*, using infrared reflectography', *The Melbourne Journal of Technical Studies in Art – Underdrawing*, vol. II, 2005, pp. 9–17.
17 Samples were analysed with a FEI Quanta 600 scanning electron microscope at the Central Science Laboratory, University of Tasmania, Hobart (with thanks to Dr Karsten Goemann).
18 Joyce Townsend, 'The materials and techniques of J.M.W. Turner: primings and supports', *Studies in Conservation*, vol. 39, no. 3, (1994) pp. 145–153.
19 Augustus Earle, *A Narrative of a Nine Months' Residence in New Zealand in 1827; Together With a Journal of a Residence in Tristan d'Acunha* [sic], *an Island Situated Between South America and the Cape of Good Hope*, London, 1832.
20 Jocelyn Hackforth-Jones, *Augustus Earle, travel artist: paintings and drawings in the Rex Nan Kivell collection, National Library of Australia*, Canberra, 1980, pp. 1–7; Jocelyn Hackforth-Jones and Joan Kerr, 'Earle, Augustus (1793–1838)', in Joan Kerr (ed.), *The Dictionary of Australian Artists: Painters, Sketchers, Photographers and Engravers to 1870*, Sydney, 1984, pp. 234–237.
21 Hackforth-Jones & Kerr, 'Earle, Augustus (1793–1838)', p. 234.
22 Ron Radford and Jane Hylton, *Australian Colonial Art: 1800–1900*, Adelaide, 1995, p. 38.
23 *Hobart Town Courier*, 18 October 1828.
24 *Hobart Town Courier*, 1 November 1828.
25 *Hobart Town Courier*, 15 November 1828.
26 List of Gellibrand family birth dates, insert in Gellibrand family Bible, Tasmanian Archive and Heritage Office, NS187/3/1/6; also Gellibrand family tree, www.gellibrand.com/fam00111 (1 March 2010).
27 Jane D'Arcy, 'A Short History of the Gellibrand Family', unpublished document, supplied to TMAG, Canberra, 1997, pp. 14–119.
28 Gellibrand family photograph album, compiled by Lady Elizabeth Gellibrand, Tasmanian Archive and Heritage Office, NS768/79.
29 Calvert, 'Children in American Family Portraiture', p. 91.
30 Calvert, 'Children in American Family Portraiture', p. 92.
31 Notebook accompanying Gellibrand family album compiled by Cynthia Gellibrand, Tasmanian Archive and Heritage Office, NS187/42/1/1.
32 D'Arcy, 'A Short History of the Gellibrand Family', p. 15.
33 D'Arcy, 'A Short History of the Gellibrand Family', p. 9.
34 Court transcript, 'In Re Gellibrand', Supreme Court of New South Wales, www.law.mq.edu.au/scnsw/Cases1827-28/html/in_re_gellibrand__1827.htm (1 March 2010).
35 D'Arcy, 'A Short History of the Gellibrand Family', p. 9.
36 Radford & Hylton, *Australian Colonial Art*, p. 28.

MARINE TURTLE OCCURRENCES IN TASMANIAN WATERS: 1846–2010

Belinda Bauer

Bauer B. 2011. Marine turtle occurrences in Tasmanian waters: 1846–2010. *Kanunnah* 4: 48–58. ISSN 1832-536X. Museum records and observational sightings indicate that five species of marine turtles occur in Tasmanian waters. Leatherback turtles, *Dermochelys coriacea* (Vandelli, 1761), are regular visitors to Tasmania. Loggerheads, *Caretta caretta* (Linnaeus, 1758), are the next most commonly found species. Hawksbill, *Eretmochelys imbricata* (Linnaeus, 1766), and green turtles, *Chelonia mydas* (Linnaeus, 1758), are vagrants. This study provides the first records of the olive ridley turtle, *Lepidochelys olivacea* (Eschscholtz, 1829), from Tasmania.

Belinda Bauer, Tasmanian Museum and Art Gallery,
GPO Box 1164, Hobart, Tasmania 7001, Australia.
Email: Belinda.Bauer@tmag.tas.gov.au

KEY WORDS: Marine turtles, Tasmania, *Lepidochelys olivacea*, *Dermochelys coriacea*, *Caretta caretta*, *Chelonia mydas*, *Eretmochelys imbricata*, geographical distribution

There are seven extant species of marine turtles and six of these occur in Australian waters. Although marine turtles are mostly found in subtropical areas of Australia, they have been recorded in cooler temperate waters as far south as Tasmania. Knowledge of their abundance and distribution in Tasmania, however, is very limited. This study provides a summary of turtle frequency through collation and critical assessment of all current and historical data on marine turtle occurrences in Tasmania. This study also suggests that the use of frequency data may be useful in understanding the impacts of climate change.

Materials and Methods

The records used for this project were obtained from opportunistic sightings, anecdotal evidence, reports of entanglements and registered museum specimens. Tasmanian specimen records were sourced from material lodged with the Tasmanian Museum and Art Gallery (TMAG), Queen Victoria Museum and Art Gallery (QVMAG) and the Museum of Victoria (MV). Although a few turtles have been recorded from Victoria's southern Bass Strait coast, these were not included in this study. Observation and entanglement records were gathered

from a variety of sources, notably: early accounts from the minutes of the Royal Society of Tasmania (Anon. 1851; Anon. 1890); Scott and Mollison (1956); Green (1971); Bone (1998) as summarised by Bryant and Jackson (1999); and the Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE) online *Natural Values Atlas* (2009). A number of other reliable recent sightings reported to DPIPWE officers and the author in 2010 are also included.

Species identities were only accepted from sources considered reliable, such as museum specimens and observation records by experienced marine observers. This distinction was necessary because although distinguishing between leathery-shelled (Dermochelyidae) and hard-shelled (Cheloniidae) turtles is relatively simple, identifying species within Cheloniidae can be difficult, particularly in juvenile animals or when the animal is swimming some distance away. Dermochelyidae is represented by one species (leatherback turtles) and is recognised by a distinctive elongated shell that has a series of longitudinal ridges (Wyneken 2001). The shell is made up of a mosaic of polygonal dermal bones that are embedded in a ridged leathery skin. Cheloniidae, or hard-shelled sea turtles, have six living species and can be distinguished from leathery-shelled turtles by the presence of scales on the head and carapace (Wyneken 2001). Within Cheloniidae the number of head scales, the number and arrangement of inframarginal scutes and the number of flipper claws are used to identify different species (Wyneken 2001).

When identification appeared unreliable and could not be confirmed, the specimen was listed as unidentified. The turtle sightings published by Scott and Mollison (1956) are a notable example. They correctly identified TMAG C35 from Adventure Bay (Bruny Island) as a loggerhead turtle, but then mistakenly attributed all verbal reports of hard-shelled chelonians to this species (Limpus and Roper 1977). Although it can be accepted that these records are Cheloniidae they have been omitted from the loggerhead turtle count.

Species distributions were mapped using the Geographic Information System desktop mapping application MapInfo (MapInfo Professional 9.0, 2007). Where a specimen or observation did not have recorded co-ordinates, the locality description was used to pinpoint a spot on a 1:25000 map sheet.

Morphometric data were not recorded for the majority of records. The arrangement of scutes on the epidermal shell confirms the identity of two recently collected specimens as olive ridley turtles, and measurements and observational notes were taken of these specimens. Carapace measurements were taken along the curve of the length and curve of the width of the carapace to give an indication of the animal's age. Determination of sex in marine turtles through the examination of external features (body size, tail length and weight) is not considered conclusive (Limpus and Reed 1985). The usual methods for sex determination (necropsy, laparoscopy or ultrasonography) were not available to the author, so the sex of the olive ridley turtles could not be confirmed.

RESULTS

Early records of turtles in Tasmania

The earliest written account of turtles in Tasmania was recorded at the November 1850 meeting of the Royal Society of Tasmania (Anonymous 1851). In the minutes of the meeting, Joseph Milligan (p. 299) is recorded as presenting a carapace of a hawksbill turtle collected on Flinders Island in 1846, which was later lodged in 1851 at the then Royal Society of Tasmania Museum. In the same report Milligan (p. 299) also notes earlier accounts of (unidentified) marine turtles by Europeans off Schouten Island (UTM 55G 605074 E 5314684 N) and describes how the local Aboriginal people knew of turtles 'being cast ashore' around Swanport (UTM 55G 582515 E 5314989 N). In 1889 the minutes of the Trustees of the TMAG acknowledge receipt of a leatherback turtle (TMAG C34) collected at Fortescue Bay on the Tasman Peninsula (Anonymous 1890). In the early 1890s, two specimens of green turtle (QVMAG 1967.3.22) were collected from the Tamar River. These specimens, lodged at the QVMAG in Launceston, are recorded as being used to make soup for a mayoral banquet in Launceston. They have large holes in the carapace that appear to have been made by a harpoon (Smith 2006; T. Gordon pers. comm. 2008). Lord and Scott's (1924) census on Tasmanian vertebrate species list leatherback turtles as the only marine reptile occurring in Tasmanian waters. The first extensive overview of marine turtles in Tasmanian waters was not, however, conducted until 1956 by Scott and Mollison. They similarly noted the presence of leatherback turtles and provide the first verified account of loggerhead turtles in Tasmania (TMAG C35). Scott and Mollison listed a number of reports of hard-shelled chelonians around Tasmania, which they also attributed to loggerhead turtles, but this determination cannot be confirmed. In 1971 Green published further Tasmanian turtle records, including a large green turtle caught and released in the waters off Burnie, which he erroneously thought was the first confirmed specimen of this species from Tasmania.

Frequency of marine turtles in Tasmania

A total of 106 records of marine turtles were sourced for this study (Table 1), with leatherback turtles the most frequently reported species (78 records). The next most frequently reported were loggerhead turtles (8) and hawksbill turtles (5 records). Olive ridley turtles have been recorded twice: these are the first specimen-based records from Tasmanian waters and are described in detail below.

New records of olive ridley turtles

Both animals are olive-grey dorsally and lighter, whitish-yellow in colour ventrally. Scutes are not imbricate and both have six or more pairs of aligned vertebratal and six or more normally aligned lateral scutes. There are four inframarginal scutes, each containing one Rathke's pore, characteristic of the genus. Both also have a distinctive, almost round-shaped, carapace that is slightly greater in width than length. The arrangement of scutes and morphometric data for each specimen is given below.

Table 1. Total numbers of marine turtles in Tasmanian waters from museum specimen records and reliable observations.

Species	Specimens	Observations	Total
Leatherback turtle *Dermochelys coriacea*	9	69	78
Loggerhead turtle *Caretta caretta*	6	2	8
Hawksbill turtle *Eretmochelys imbricata*	4	1	5
Olive ridley turtle *Lepidochelys olivacea*	2	0	2
Green turtle *Chelonia mydas*	3	1	4
Unidentified *Cheloniidae*	2	7	9

TMAG C1115: Adult (probably female)

(Figs 1A, B)

CARAPACE (ALONG CURVE): 720 mm length; 728 mm width

DORSAL: 1 nuchal; 6 vertebratal; 6/6 costal; 10/10 marginal

VENTRAL: 4/4 infra-marginal

LOCALITY: Phoques Bay; King Island (UTM 55G 234599 E; 5604999 N)

COLLECTED: Nigel Burgess, August 2003

SEX: Most likely female due to short tail relative to carapace size and location of vent

REMARKS: The carapace size indicates this is an adult animal. Injury to the animal suggests it was entangled in rock lobster buoy lines before being washed ashore.

TMAG C1234: Sub-adult (probably female)

(Figs 1C, D)

CARAPACE (ALONG CURVE): 511 mm length; 561 mm width

DORSAL: 1 nuchal; 6 vertebratal; 6/7 costal; 11/11 marginal

VENTRAL: 4/4 infra-marginal

LOCALITY: 3 km south of Stanley (UTM 55G 351999 E; 5481199 N)

COLLECTED: July 2004

SEX: Most likely female due to short tail relative to carapace size

REMARKS: These measurements suggest the animal is a sub-adult. The minimum carapace length recorded for nesting (sexually mature) olive ridley turtles is 585 mm (Pritchard 1969). No discernible evidence of injury or disease.

Geographical distribution in Tasmanian waters

All records collated for the study were mapped to give an indication of turtle distribution in Tasmanian waters (Fig. 2). Bass Strait and the Bass Strait islands show the greatest frequency of turtles. Nearly half of all records, (49%, n = 52) were recorded in this area (west Bass Strait and King Island = 33 compared with east Bass Strait and Flinders Island = 19); just over 20 per cent (21.7%, n = 23) were recorded on Tasmania's east coast (Maria Island to north of Eddystone Point); the remaining records were fairly evenly split between the west coast (Macquarie

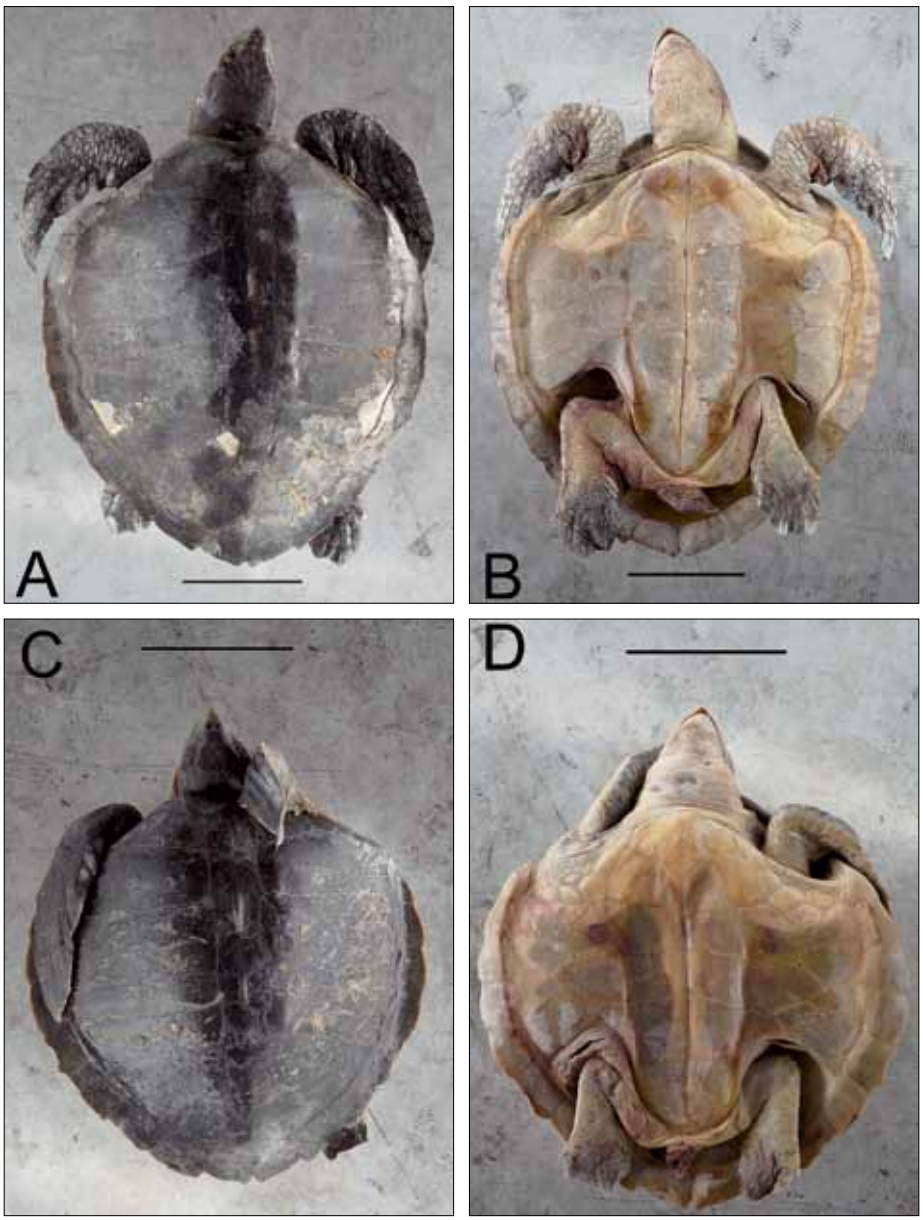

Fig. 1. Olive ridley turtles (*Lepidochelys olivacea*) specimens:
A–B. Adult, probably female (TMAG C1115) collected August 2003 King Island, Tasmania
A. Dorsal aspect, B. Ventral aspect.
C–D. Sub-adult, probably female (TMAG C1234) collected July 2004 Stanley, Tasmania
C. Dorsal aspect, D. Ventral aspect.
Scale bar = 20 cm

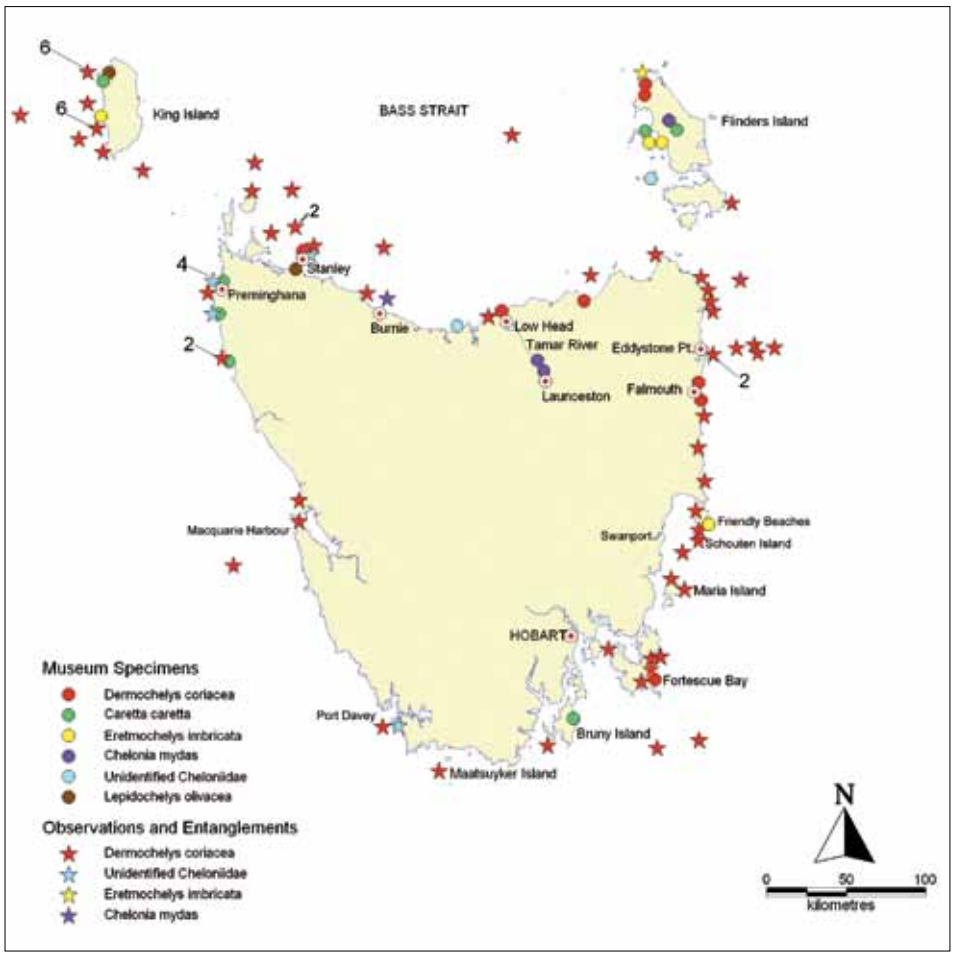

Fig. 2. Distribution of marine turtle records based on museum specimens, observations and entanglements around Tasmania 1851–2010. Numbers indicate multiple records in same location.

Harbour to Preminghana) (13.2%, n = 14) and southern Tasmania (Fortescue Bay to Port Davey) (12.2%, n = 13). Leatherback turtles have the widest Tasmanian distribution, being recorded around King and Flinders Islands in Bass Strait, along both east and west coasts and as far south as Maatsuyker Island. Loggerhead turtles are also widely distributed, being recorded in Bass Strait, on the west coast and as far south as Bruny Island. Olive ridley turtles were only found in the western half of Bass Strait, at King Island and Stanley. The remaining specimens and observations (all Cheloniidae) are restricted to the northern coast of Tasmania and the Bass Strait

Islands, with the exception of one record of a hawksbill turtle recovered in 2009 from Friendly Beaches on the east coast.

Temporal distribution

The collated data generally did not include a discreet date but instead listed a year or range of years when the observation or collection had occurred. With the limited data available it was decided to present the records in approximate 50-year intervals. From 1846 to 1900 there were five verified reports of marine turtles; between 1900 and 1950 there were ten verified accounts and from 1950 to present day there have been more than 80 reports of marine turtles. There are only three early accounts of hard-shelled species (2 green turtles and 1 hawksbill turtle) all recorded pre-1900; cheloniid turtles become far more frequently sighted in the last 50 years with 21 accounts. Leatherback turtle accounts, in comparison, have a far more even spread throughout the previous 150 years. The data suggest that turtle sightings have increased in Tasmania markedly, particularly in the last 50 years. Due to the small number of records, judgements about seasonality of any of the species in Tasmanian waters were unable to be made.

Mortality

Of the 106 records, 24 were reported as entanglements or died as a result of entanglement. Two of these animals were shot or killed to facilitate disentanglement. Lobster pot lines were the most commonly reported source of entanglement, but shark lines (1), fishing net (1) and tuna fishing branch lines (3) were also listed as causes. One animal was caught on a hand fishing line and released (green turtle at Burnie, 1959) and two were recorded as being harpooned and eaten (green turtles, Tamar River, 1890s QVMAG 1967.3.22). At least seventeen animals were found washed up on the beach but their cause of death was not recorded. One of these animals (hawksbill turtle, Flinders Island, 1969) is recorded as having a large shark bite wound that had completely healed and was not thought to be the cause of death. The remaining records were observations of live animals.

Discussion

The records collated in this report do not reflect actual abundance or patterns of abundance of turtles in Tasmanian waters. It is also difficult to assess from the available data just how frequent these visits are or if there has been any change in visitation that can be linked to large-scale changes in sea temperature and climate. As marine turtles are infrequent visitors to the southern latitudes, with habitat distribution that extends well beyond Tasmanian waters, it has been of low priority for wildlife agencies to monitor marine turtles in Tasmania (Driessen and Hocking 2008).

Leatherback turtles inhabit or regularly visit temperate waters in the Atlantic, Pacific and Indian Ocean basins following jellyfish and medusae as primary prey items (Hughes *et al.* 1998; James *et al.* 2006; Benson *et al.* 2007). It is their physiological ability to regulate their core body temperature that allows them to spend extended periods of time in cooler waters (Spotila and Standora 1985; James *et al.* 2006). In the Northern Hemisphere, leatherback turtles have been observed to migrate annually from West Africa and the

Caribbean to cooler waters of the North Atlantic to feed (Shoop and Kenney 1992; James *et al*. 2006). Gill (1997) proposed the increases in leatherback turtle numbers in summer around New Zealand may also represent deliberate feeding excursions into cooler southern waters. The number of sightings in Tasmania supports Gill's proposition that leatherback turtles are feeding in the southern latitudes and may suggest Tasmania is also part of this foraging distribution. Indeed, a recent update to Bensen *et al*. (2007) satellite-tracking work at the 2009 Sea Turtle Symposium, Brisbane, shows leatherback turtles were tracked from their nesting areas in Papua New Guinea to Victoria and Tasmania.

Loggerhead turtles were the second most frequent and widely dispersed species around Tasmania. Populations of loggerhead turtles have been recorded as journeying into temperate waters when they are seasonally habitable to feed (Hawkes *et al*. 2009) but, with the very low numbers of records, it is very difficult to say if this is occurring regularly in Tasmania.

The olive ridley turtles are most likely vagrants outside their normal range. The animal collected from King Island showed evidence of entanglement in rock lobster buoy lines suggesting the animal was alive in the waters around King Island (Burgess pers. comm. 2009). The cause of death for the Stanley animal was not determined. The carcass was in good condition and described as fresh when it was collected; it is not known, however, if this animal was washed into Tasmanian waters post mortem. Prior to this, the most southerly record of olive ridley turtles in Australia was from the southern coast of Victoria, the first in 1977 in Port Phillip Bay (Limpus and Roper 1977). This species has also been sighted, albeit rarely, in New Zealand (Gill 1997) and South Africa (Hughes 1972).

It is currently accepted that other cheloniid turtles generally occur as vagrants in Tasmanian waters as a result of ocean currents (Bryant and Jackson 1999). The major surface currents that have a seasonal impact on sea temperatures around Tasmania (and probably turtle numbers) are the Leeuwin Current (LC) and East Australia Current (EAC). The Leeuwin Current from West Australia brings warm water down the west coast and is felt mostly in the southern winter (Ridgway and Godfrey 1997). The East Australia Current flows north to south from Queensland along Australia's eastern seaboard and extends into Tasmanian waters as a tongue of warmer water down the east coast and into Bass Strait (Ridgway and Godfrey 1997), particularly in summer. Turtles use these currents as a means of dispersing as hatchlings and juveniles to benthic foraging grounds and they are also used by migratory and foraging adults (Hamann *et al*. 2007). The influence of the EAC has also been linked to the occurrence of hard-shelled turtle vagrants in New Zealand waters during summer (Gill 1997).

Ocean temperatures in south-eastern Australia have increased almost four times the global average over the last 100 years (Ridgway 2007) and projections suggest that this trend will continue with sea temperatures steadily increasing. This indicates that oceans in the south-east region of Australia, including around Tasmania, will be particularly sensitive to effects of broad-scale climate change (Battaglene *et al*. 2008). There is evidence

that climate change is already altering the marine ecology around Tasmania. The arrival and abundance of the long-spine urchin *Centrostephanus rodgersii* in Tasmania has been linked to seasonal changes in the EAC (Johnson *et al*. 2005). For marine turtles, which naturally respond to short-term changes in sea temperature, long-term warming projections will have a strong impact throughout their life history from the early nesting and hatchling stages through to adult distribution and foraging (Hughes 2000; Hamann *et al*. 2007; Fuentes *et al*. 2009).

In the Tasmanian context, warmer waters may result in an increase in turtle numbers, both hard-shelled and leathery-shelled families, due to the creation of appropriate habitat for a range of prey items and seagrass pastures. Globally, other research has suggested that adult foraging ranges may shift as a result of rising sea temperatures into temperate and boreal waters (James *et al*. 2006; Hamann et al. 2007; Hawkes *et al*. 2009). Robinson et al. (2005) also attribute the sharp increase of all species of marine turtle sightings in the United Kingdom (particularly over the last 40 years) as due to an expansion of habitat corresponding with recorded increases in sea temperature. Marine turtles are an ancient faunal group that have survived a number of climatic changes and temperate fluctuations for hundreds of millions of years, (Hamann *et al*. 2007; Hawkes et al. 2009). It is the rapidity of projected climate change, declining population numbers and the additional anthropogenic impacts that make it difficult to assess whether turtles will be able to adapt to the expected changes (Fuentes *et al*. 2009).

Anthropogenic factors such as entanglement and interactions with fishing industries appear to be the major threat to turtles in Tasmania. More than half (24 out of 40) of the confirmed turtle deaths in this report were a result of entanglements associated with the rock lobster fishery. Bryant and Jackson (1999) note that this makes up the majority of sea turtle mortality in Tasmania. The remaining records do not identify cause of death. It is suspected that some of these additional deaths may also be due to entanglements or interaction with fisheries (Environment Australia 2003). Bryant and Jackson (1999) also suggest that ingestion of marine debris poses a threat to turtles in Tasmania. The lack of mortality information, however, means that for most cases it is not possible to quantify the threat. The present study shows an increase in turtle observations over the last century and a half, particularly in the last 50 years. There has also been a large increase in marine observers and boat activity in the last 50 years that may account for some of the increase in records. Threat mitigation may be worth considering in the future, particularly regarding rock lobster fisheries.

All of the turtle species found in Tasmania are listed species under the Australian *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Leatherback turtles, loggerhead turtles and olive ridley turtles are listed as endangered and green turtles and hawksbill turtles are listed as vulnerable under the EPBC Act (Environment Australia 2003). Under Tasmanian legislation (*Threatened Species Protection Act*

1995) leatherback, green and hawksbill turtles are listed as vulnerable and the loggerhead turtle is listed as endangered. The olive ridley turtle should also be considered for listing under the Tasmanian *Threatened Species Protection Act 1995*.

The impact of climate change, rising sea temperatures and anthropogenic threats are likely to pose an increasing threat to sea turtle numbers (Robinson *et al*. 2005; Fuentes et al. 2009; Hawkes *et al*. 2009); however, the severity and repercussions of this are complex and still largely unknown. Although not an exhaustive survey this study draws together historical baseline data and provides evidence of an increase in turtle numbers around Tasmania, particularly in the last half century. This frequency data may add to the current body of research into the effects of climate change on Australian marine reptiles.

Conclusion

Five species of marine turtles occur in Tasmania, representing both extant families. All are listed threatened species under the Australian *Environment Protection and Biodiversity Conservation Act 1999*. Leatherback turtles occur most regularly, and are believed to be making deliberate feeding excursions into Tasmanian waters. It is speculated that this may also be the case for some loggerhead turtles. This, however, is still far from being proven. Green turtles and hawksbill turtles have been recorded to occur irregularly as vagrants outside their normal range. This work identifies the addition of olive ridley turtles to the list of vagrant species around Tasmania. Global warming of oceans may increase the frequency and range of some turtle species in Tasmania, although the impact of climate change on marine turtles is still not fully understood.

Acknowledgements

Thanks to Kathryn Medlock, Andrew Rozefelds, Catherine Young and anonymous referees for providing advice that has improved the text. Thanks to Tammy Gordon and Judy Rainbird (Queen Victoria Museum and Art Gallery) for providing specimen records and access to collections. Thanks to David Pemberton, Rosemary Gales, Nigel Burgess and staff at the Department of Primary Industries, Parks, Water and Environment for observation records and collecting specimens lodged at TMAG.

References

Anonymous (1851) Royal Society of Tasmania, Report of meeting 13 November 1850. *Papers and Proceedings of the Royal Society of Tasmania*. **1**, 298–299.

Anonymous (1890) Tasmanian Museum and Art Gallery, Minutes of meeting 2 May 1889, unpublished.

Battaglene S, Carter C, Hobday AJ, Lyne V, Nowak B (2008) *Scoping study into adaptation of the Tasmanian salmonid aquaculture industry to potential impacts of climate change*. (National Agriculture and Climate Change Action Plan: Implementation Programme Report TAFI, UTAS and CSIRO: Hobart)

Benson SR, Kisokau KM, Ambio L, Rei V, Dutton PH, Parker D (2007) Beach use, inter-nesting movement, and migration of leatherback turtles, *Dermochelys coriacea*, nesting on the north coast of Papua New Guinea. *Chelonian Conservation and Biology* **6(1)**, 7–14.

Bone C (1998) *Preliminary investigation into leatherback turtle,* Dermochelys coriacea *(L.) distribution, abundance and interactions with fisheries in Tasmanian waters*. (Tasmanian Parks and Wildlife Service: Hobart)

Bryant S, Jackson J (1999) *Tasmania's Threatened Fauna Handbook: what, where and how to protect Tasmania's threatened animals*. (Threatened Species Unit, Parks and Wildlife Service: Hobart)

Driessen MM, Hocking GJ (2008) *Review of Wildlife Monitoring Priorities*. Nature Conservation Report 08/02. (Department of Primary Industries and Water: Tasmania)

Environment Australia with Marine Turtle Recovery Team (2003) *Recovery Plan for Marine Turtles in Australia* (Environment Australia: Canberra) Available from: http://www.environment.gov.aucoasts/publications/turtle-recovery/pubs/marine-turtles.pdf (date accessed 12 May 2009)

Environment Protection and Biodiversity Conservation Act 1999. Available from: http://www.comlaw.gov.au/ComLaw/Legislation/ActCompilation1.nsf/framelodgmentattachments/6F311AC25FBF3601CA2577660018FD26 (date accessed 9 June 2009)

Fuentes MMPB, Hamann M, Lukoschek V (2009) Marine Reptiles. In ES Poloczanska, AJ Hobday, AJ Richardson (eds) *A Marine Climate Change Impacts and Adaptation Report Card for Australia 2009*. (NCCARF: Griffith University, Southport)

Gill J (1997) Records of turtles and sea snakes in New Zealand, 1837–1996. *New Zealand Journal of Marine and Freshwater Research* **31**, 477–486.

Green RH (1971) Sea Turtles round Tasmania. *Records of the Queen Victoria Museum and Art Gallery* [Launceston] **38**, 3–4.

Hawkes LA, Broderick AC, Godfrey MH, Godley BJ (2009) Climate change and marine turtles. *Endangered Species Research* **7**, 137–154.

Hamann M, Limpus C, Read M (2007) Vulnerability of marine reptiles to climate change in the Great Barrier Reef. In *Climate change and the Great Barrier Reef* (Eds J Johnson, P Marshall). (Great Barrier Reef Marine Parliamentary Authority and The Australian Greenhouse Office)

Hughes G (1972) The Olive Ridley Sea-turtle (*Lepidocheyls olivacea*) in South-east Africa. *Biological Conservation* **4**, 128–134.

Hughes GR, Luschi P, Mencacci R, Papi F (1998) The 7000 km oceanic journey of a leatherback turtle tracked by satellite. *Journal of Experimental Marine Biology and Ecology* **229**, 209–217.

Hughes L (2000) Biological consequences of global warming: is the signal already apparent? *Trends in Ecology and Evolution* **15**, 56–61.

James MC, Davenport J, Hays GC (2006) Expanded thermal niche for a diving vertebrate: a leatherback turtle diving into near-freezing water. *Journal of Experimental Marine Biology and Ecology* **335**, 221–226.

Johnson C, Ling S, Ross J, Shepherd S, Miller K (2005) *Establishment of the long-spined sea urchin (Centrostephanus rodgersii) in Tasmania: First assessment of potential threats to fisheries*. (FRDC Final Report, Project No. 2001/044. University of Tasmania, Tasmanian Aquaculture and Fisheries Institute, School of Zoology)

Limpus CJ, Reed PC (1985) The Green Turtle, *Chelonia mydas*, in Queensland: A preliminary description of the population structure in a coral reef feeding ground. In G Grigg, R Shine, H Ehmann (eds) *Biology of Australasian Frogs and Reptiles*. pp. 47–52. (Royal Zoological Society of NSW: Sydney)

Limpus CJ, Roper PA (1977) On the Victorian coast – a Pacific Ridley Sea-Turtle *Lepidochelys olivaceae* (Eschscholtz). *Victorian Naturalist* **94**, 54–56.

Lord CE, Scott HH (1924) *A synopsis of the vertebrate animals of Tasmania*. (Oldham, Beddome and Meredith: Hobart)

Mapinfo Professional, Version 9.0 (2007) (Pitney Bowes Business Insight: New York)

'Natural Values Atlas', 2009. (Department of Primary Industries, Water and Environment, State of Tasmania: Hobart): http://www.dpiw.tas.gov.au/inter.nsf/WebPages/LJEM-6TV6TV?open

Pritchard P (1969) Sea turtles of the Guianas. *Bulletin of the Florida State Museum* **13(2)**, 85–105.

Ridgway KR (2007) Long-term trend and decadal variability of the southward penetration of the East Australian Current. *Geophysical Research Letters* **34**, L13613, doi:10.1029/2007GL030393.

Ridgway KR, Godfrey JS (1997) Seasonal cycle of the East Australian Current. *Journal of Geophysical Research* **102**, 22921–22936.

Robinson RA, Learmouth JA, Hutson AM, Macleod CD, Sparks TH, Leech DI, Pierce GJ, Rehfisch MM, Crick HQP (2005) 'Climate Change and Migratory Species'. BTO Research Report 414, pp. 85–88 (British Trust for Ornithology: Norfolk, UK)

Scott EOG, Mollison BC (1956) The Indo-Pacific red-brown logger-head turtle *Caretta caretta gigas* and the leathery turtle *Dermochelys coriacea* (Linne) in Tasmanian waters. *Papers and Proceedings of the Royal Society of Tasmania* **90**, 59–63.

Shoop CR, Kenney RD (1992) Seasonal distributions and abundances of loggerheads and leatherback sea turtles in waters of the northeastern United States. *Herpetological Monographs* **6**, 43–67.

Smith B (2006) Turtle shell. In *Treasures of the Queen Victoria Museum and Art Gallery*, pp. 98–99. (Foot and Playsted: Launceston)

Spotila JR, Standora EA (1985) Environmental constraints on the thermal energetics of sea turtles. *Copeia* **1985**, 694–702.

Threatened Species Protection Act 1995. Available from: http://www.austlii.edu.au/au/legis/tas/consol_act/tspa1995305/ (date accessed 9 June 2009)

Wyneken J (2001) 'The Anatomy of Sea Turtles.' US Department of Commerce NOAA Technical Memorandum NMFS-SEFSC-470, 1–172. Available from: http://courses.science.fau.edu/~jwyneken/sta/ (date accessed 5 May 2009)

SOWERBAEA JUNCEA ANDREWS (LAXMANNIACEAE), PURPLE RUSHLILY: DISTRIBUTION, HABITAT CHARACTERISTICS AND CONSERVATION MANAGEMENT IN TASMANIA

Mark Wapstra

Wapstra M. 2011. *Sowerbaea juncea* Andrews (Laxmanniaceae), purple rushlily: distribution, habitat characteristics and conservation management in Tasmania. *Kanunnah* 4: 59–71. ISSN 1832-536-X. The ecology of *Sowerbaea juncea* Andrews (Laxmanniaceae) in Tasmania is elucidated with particular emphasis on its distribution and habitat requirements. The species has a restricted distribution in near-coastal areas of north-eastern Tasmania in heathland and heathy woodlands. It occurs mainly on private property and is subject to continuing threatening processes, such as land clearing (mainly for pasture development), inappropriate fire regimens (long periods without fire may be detrimental) and agricultural practices (such as stock grazing, fertilising and remnant/pasture edge effects). A reassessment of the conservation status of *S. juncea* has resulted in the species being uplisted from 'Rare' (Schedule 5) to 'Vulnerable' (Schedule 4) under the Tasmanian *Threatened Species Protection Act 1995*.

Mark Wapstra, Environmental Consulting Options Tasmania,
28 Suncrest Avenue, Lenah Valley, Tasmania 7008, Australia.
Email: mark@ecotas.com.au

KEY WORDS: *Sowerbaea juncea*, Laxmanniaceae, conservation management, Tasmania, Australia, threatened species

Introduction

Sowerbaea Sm. (Laxmanniaceae; formerly Liliaceae) is endemic to Australia, with five species currently recognised (Henderson 1987), occurring in the Northern Territory and all States except South Australia. The genus was described by Smith (1798) and a detailed account of the genus and its species is given by Henderson (1987). *Sowerbaea juncea* Andrews, the type species of the genus, occurs in Victoria, New South Wales, Queensland and Tasmania (Henderson 1987; Curtis and Morris 1994). It is poorly known in Tasmania and has been reported on only a few occasions over several decades. At the time of undertaking the assessments reported herein, *S. juncea* was listed as 'Rare' on the Tasmanian *Threatened Species Protection Act 1995* (Anon. 1995). New information reported here regarding the distribution and ecology of the species in Tasmania

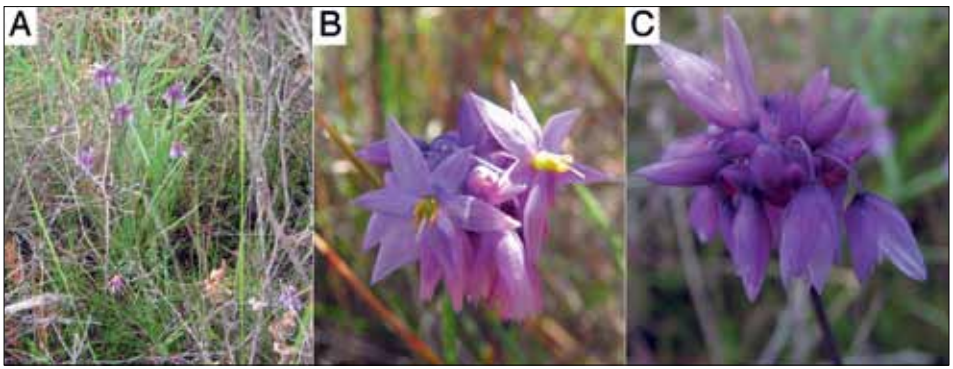

Fig. 1. *Sowerbaea juncea*: A. growth habit, B. inflorescence at full anthesis, and C. inflorescence at partial anthesis showing dense cluster of flowers.
Images: Mark Wapstra

has allowed a reassessment of the formal conservation status and management requirements of the species.

Identification

When in flower, *Sowerbaea juncea* is very difficult to confuse with any other Tasmanian plant. Its distinctive tuft of green leaves (up to 25 cm long) and its clustered head of up to 30 nodding purple flowers is instantly recognisable (Fig. 1), and gave rise to the name 'purple rushlily'. The perianth segments are 6–10 mm long and individual flowers are about 1.2–2 cm across, although the dense cluster of flowers is usually between 2–3 cm across. When flowers are absent it is virtually impossible to detect the species because the tuft of leaves is usually hidden amongst the dense grass and sedge sward typical of its usual habitat. The flowering season extends from October to early February. Sometimes old flowerheads, pale papery-dry clusters, are found later in the flowering season.

MATERIALS AND METHODS

Site data

All specimens of *Sowerbaea juncea* held at the Tasmanian Herbarium (HO) were examined to obtain collection information such as locality, habit, habitat and phenology. The *Natural Values Atlas* database (see References) was consulted to obtain details of all previously recorded sites for *S. juncea* in Tasmania. Additional information on particular collections or records was sought from the specimen collector or site recorder wherever possible. Site data are presented in this paper at a relatively high scale. Although precise grid references or latitude/longitude information are not included, some of the maps and the table of population information effectively display where *S. juncea* can be found. In Tasmania, data on threatened flora are readily available to the public and its presentation in a forum such as this paper is unlikely to increase the threat level to the species (e.g. from deliberate collection). It is suggested that

the publication of accurate information on *S. juncea* is more likely to result in the discovery of additional populations by interested botanists and field naturalists.

Field survey

This paper presents the distribution of *S. juncea* in Tasmania based on botanical field surveys conducted on an *ad hoc* basis by the author and colleagues between 2003 and 2009. The surveys did not form part of a stratified random sampling program targeting *S. juncea*, or intend to fully delineate the extent of occurrence within Tasmania. Site 'selection' was based on opportunity, accessibility from public roads to sites with previously reported collections of the species, or sites with potentially suitable habitat (based on descriptions of habitat on herbarium collections and the author's own experience), or access to potential sites conducted as part of commercial ecological assessments of proposed developments on private property and/or Crown land. The majority of the previously recorded sites were assessed to determine the continued presence of *S. juncea*, and if it were present, to ascertain the extent of its occurrence. Some sites on private land could not be accessed as owners' permission could not be obtained.

Wherever *S. juncea* was encountered, its location was precisely determined using a handheld eTrex™ GPS unit. The local extent of the species at any particular site was determined as precisely as possible, subject to practical limitations. The abundance of individuals at each site was determined by counting flowering clumps of plants as a surrogate for an absolute density. Counting non-flowering plants (i.e. the tuft of reed-like leaves) and/or identifying the number of individuals within a flowering clump are fraught with practical difficulties. The broad site features at each location were described in the field or from topographic maps (e.g. tenure, vegetation type, vegetation composition, land use history including indications of fire events and grazing regimens, geology, topography and elevation). Vegetation types occupied by *S. juncea* were classified under TASVEG nomenclature (Harris and Kitchener 2005).

Site data were provided to the *Natural Values Atlas*. All plant material was collected under scientific collecting permits issued by the Department of Primary Industries, Parks, Water and Environment. Specimens were collected from several of the sites and lodged at the Tasmanian Herbarium (HO).

RESULTS

Collection history

Sowerbaea juncea was first recorded from Tasmania in 1964 by Tom Burns (HO113525; Fig. 2). The area of original collection has long been developed as agricultural grazing land with patches of the original heathland and heathy woodland remaining amidst a sea of pasture. Several similar remnants elsewhere in the range of *S. juncea* support the species but searches in the vicinity of the site indicated in the hand-drawn map shown with the original collection (Fig. 2) were unsuccessful.

Following the initial discovery in 1964, a sporadic collecting history ensued, with

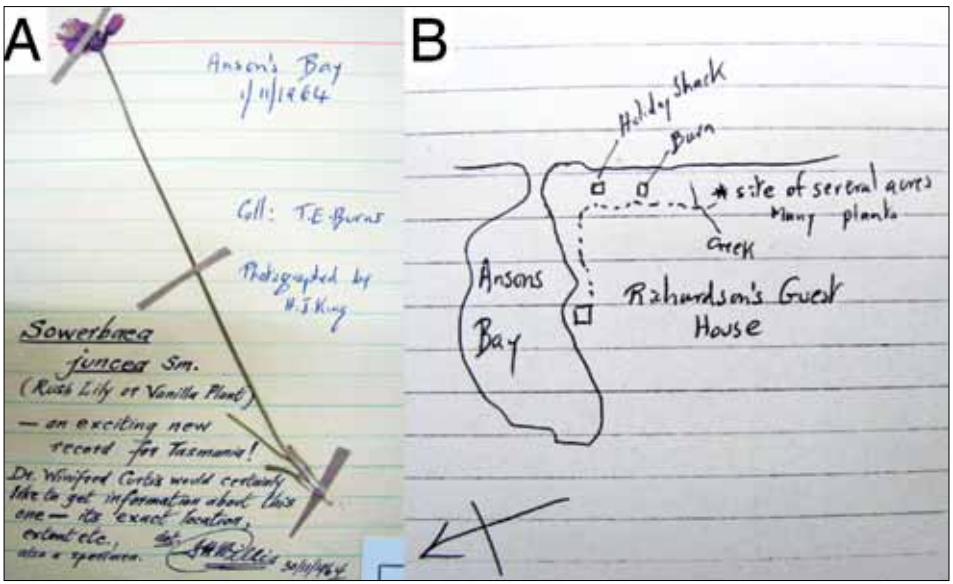

Fig. 2. A. First Tasmanian collection of *Sowerbaea juncea* (HO113525). B. Tom Burns' hand-drawn map of site, which accompanied the specimen.

collections in 1965, 1971, 1979, 1980 and 1983. In 2003, a collection was made by the author, which was followed by additional surveys by the author and colleagues between 2005 and 2009, which resulted in numerous additional sites being discovered.

Distribution

In Tasmania, *S. juncea* is restricted to the near-coastal parts of the east and north-east coast between The Gardens and Eddystone Point. It occurs from close to the coast (as at Eddystone Point and Ansons Bay) and to about 7 km inland west of The Gardens and about 12 km inland along Eddystone Road (Figs 3, 4).

The extent of occurrence, defined by a minimum convex polygon, was calculated on two datasets. Using all available data (which included some sites recorded prior to the author's surveys and where the species has not been confirmed as still being extant), the extent of occurrence is estimated as approximately 162 km^2, with a maximum linear extent of 23 km (23 km in a north-south direction and 13 km in an east-west direction). Using only sites where *S. juncea* was confirmed from recent surveys by the author (see Table 1), the extent of occurrence is reduced to 90 km^2, but the maximum linear extent remains at about 23 km (22 km in a north-south direction and 6 km in an east-west direction). Within this extent of occurrence, *S. juncea* has a significantly smaller area of occupancy, probably in the order of less than 20 ha (see population information below).

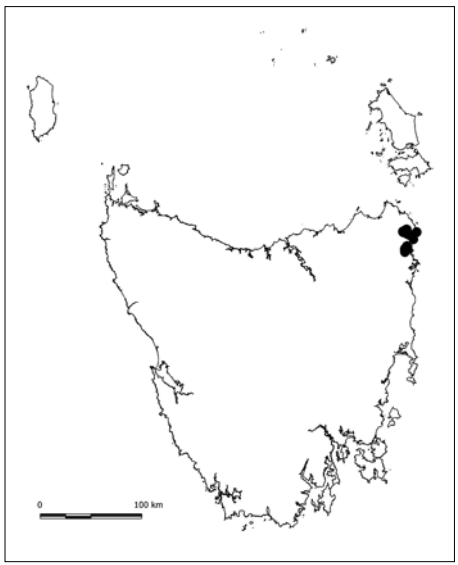

Fig. 3. Tasmanian distribution of *Sowerbaea juncea*.

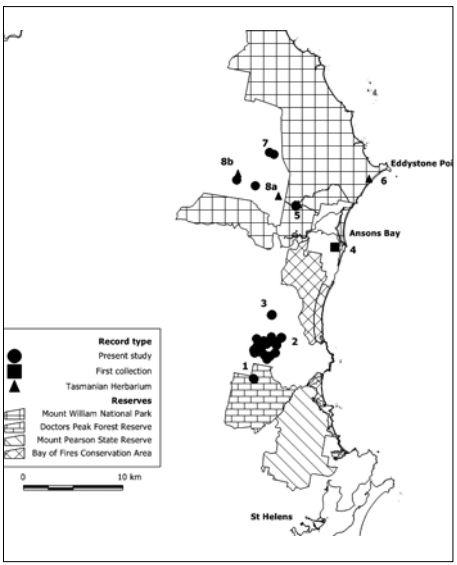

Fig. 4. Known distribution of *Sowerbaea juncea* in north-eastern Tasmania showing all records (herbarium collections, database records and recent surveys by author). Numbers cross-reference to Table 1.

Habitat characteristics

Sowerbaea juncea occurs mainly in near-coastal lowland sites from near sea level to about 120 m above sea level. The species is most commonly associated with sandy to peaty, moderately to poorly drained soils derived from Devonian granites and granodiorites, Ordovician-Devonian turbidite sequences (Mathinna Group) and Quaternary sediments. *Sowerbaea juncea* occurs in a range of heathy to sedgy vegetation types: 'coastal heathland' (SCH), 'wet heathland' (SHW), '*Eucalyptus amygdalina* coastal forest and woodland' (DAC) and '*Eucalyptus ovata* heathy woodland' (DOW).

Most sites supporting *S. juncea* are associated with low-lying relatively poorly drained heathland and sedgy heathland patches (Figs 5A–C) between forested low rises. The species frequently occurs on the fringes of these often dense heathland swathes but can also be sporadic in the heart of the heathland. Open heathy/sedgy woodland (usually dominated by *E. amygdalina* but also occasionally *E. ovata*) also supports several populations. In such habitats, *S. juncea* is often most prevalent in the patches of light canopy with open understorey, often created by a combination of low intensity fires and cattle grazing (Figs 5C–F). Many sites recorded in recent years occur on the fringes of remnant patches of light eucalypt woodland and intensively

Table 1. Subpopulations of *Sowerbaea juncea* in Tasmania.

SITE No.	LOCATION	TENURE	YEARS OBSERVED
1	Last River (upper catchment)	Doctors Peak Forest Reserve (State forest)	1970s, 1980s, 1990s (J. Simmons, R. Skabo pers. comm., no collection) 2009 (pers. obs., no collection)
2	Last River-Joe Peppers Creek-Thomas Creek-Teagardens Creek catchments	Private property (28 patches) and State forest (informal reserve – 1 site)	2003 (HO539171) 2005 (B. French pers. comm., no collection) 2006 (HO544476, HO544556) 2010 (pers. obs., no collection)
3	Sampsons Creek	Private property	2006 (pers. obs., no collection)
4	Ansons Bay, behind Policemans Point (catchment of Yacca Creek)	Private property	1964 (HO113525)
5	Icena Creek catchment (junction of Eddystone Road and North Ansons Road)	Mount William National Park	HO70401 (1983) 2002, 2006, 2007 (pers. obs., no collection) 2005 (B. French, pers. comm., no collection)
6	2 km SW of Eddystone Point	Mount William National Park	1983 (HO69486)
7	Headwaters of Telegraph Creek	Private property	2007 (B. French, pers. comm., no collection)
8a	Eddystone Road	Private property	1965 (HO534588) 1971 (HO31225, HO114238)
8b	Tonys Creek on Eddystone Road (west side)	Private property	2007 (HO547570)
9?	Sugarloaf Park Estate	Private property	1979 (HO534587)

EXTENT AND ABUNDANCE	COMMENTS
1970s–1990s: not recorded; Jan 2009: 8 flowerheads in c. 5 x 5 m; Dec 2009: c. 40 flowerheads over c. 1 ha	Southern most record for the species; long unburnt wet heathland dissected by gravel 'forestry' road; used to be present on both sides of road but now absent from eastern side, presumably due to dense growth of shrubs; extensive potential habitat elsewhere in reserve requires targeted surveys.
c. 1 to >100 flowerheads in each patch, patches varying in size from 1 x 1 m to c. 1 ha	Approximately 29 sites for *S. juncea*, mainly associated with forest/ woodland remnants adjacent to pasture but also in larger areas of wet heathland; habitat patches vary from <1 ha to c. 5 ha, the latter supporting '100s' in 2005 (B. French, pers. comm.).
3 patches within 1 ha, total 4 flowerheads	Recently burnt (c. 2004/2005) heathy/scrubby *Eucalyptus ovata* woodland dominated by burnt sticks of *Leptospermum scoparium* and a densely regenerating sward of grasses and sedges.
'several acres, many plants' (annotation on HO113525)	Site of first collection of *S. juncea* in Tasmania (Fig. 5). The approximate area of collection was searched as part of the present study. The site was probably from heathy woodland but such habitat in vicinity of mapped site is now largely converted to pasture and forest remnants in area are heavily grazed and appeared to not support *S. juncea*.
Reported as 'common' in 1983 (F. Duncan, pers. comm.) but only scattered plants found in 2002 (pers. obs.), 1 plant in 2006 and 2007 (pers. obs.); although in 2005 about 50 were reported on the heathy woodland fringes (B. French, pers. comm.); extent 1–3 ha	Poorly-drained heathy/sedgy wet heathland that is now long unburnt; species is more prevalent in the heathy woodland between the road and the heathland, even growing in the gravel road verge in some years.
'rare' (from annotation on HO69486)	'Rare. On peaty soils, burned in 1981 and pond banks (seepage slope) with *Lepidosperma/Leptocarpus brownii* (tussocks)/*Leptospermum lanigerum/Haloragis micranthus/Centella cordifolia/Selaginella uliginosa/Lomandra longifolia/Xyris* sp./ *Cryptostylis subulata*' (from HO69486); limited searching during 2006 in vicinity of record was unsuccessful (R. Schahinger pers. comm.).
Localised (B. French, pers. comm.)	Occurs in wet soak in heathy *Eucalyptus amygdalina* woodland adjacent to pasture (now surrounded by hardwood plantation), and on fenceline on pasture/forest margin.
Historically apparently quite common at different sites over c. 10 km of road verge (J. Simmons pers. comm.)	First collected by John and Marion Simmons in 1965 (HO534588), when it was imprecisely located between areas known as 'Big Boggy' and 'Little Boggy', on both sides of Eddystone Road in the poorly-drained road verges (note that both Little Boggy Creek and Big Boggy Creek 'touch' Eddystone Road so probably represent the sites of observation); other collections attributed to 'North-east Tasmania' (HO114238) and 'Road from Gladstone to Eddystone Point' (HO31225) represent the same 1971 collection and are likely to have been collected from a similar area as the 1965 collection.
c. 10 in two 3 x 3 m patches	Fringes of heathy *Eucalyptus amygdalina* woodland remnant amongst pasture now planted as eucalypt plantation (all similar remnants were also retained but have not been surveyed); only about 1–2 km southeast of subpopulation 8a and probably all part of the one larger population).
Unknown	The location of Sugarloaf Park Estate is not known to the author or staff of the Tasmanian Herbarium but it is assumed to refer to one of the larger grazing properties between Gladstone and Ansons Bay along Eddystone Road, and it is possible that the collection merely represents part of subpopulation 8.

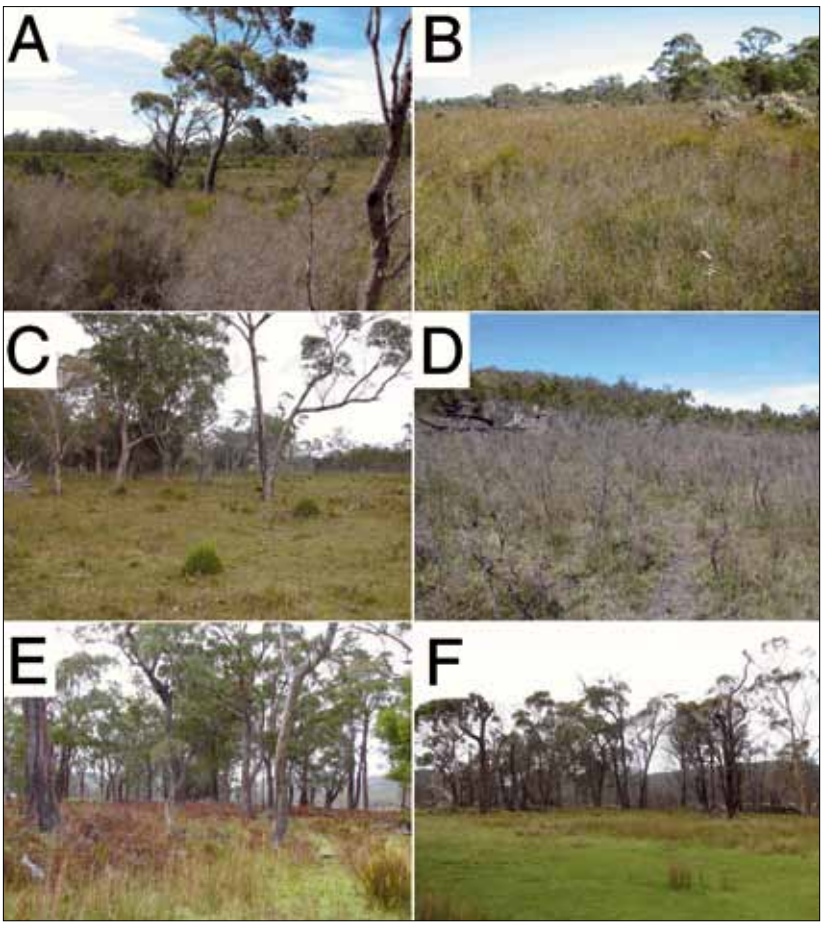

Fig. 5. Examples of habitats occupied by *Sowerbaea juncea*.

managed pasture, sometimes growing in patches dominated by pasture grass species such as *Holcus lanatus* (Figs 5E–F, 6).

Population information

Defining a subpopulation of *Sowerbaea juncea* is relatively difficult because of the fragmented nature of the habitat it occupies. *Sowerbaea juncea* usually occurs as discrete patches (localised clumps of individuals) separated from each other by various distances of only metres through to tens or even hundreds of metres, all of which are treated as a single subpopulation because opportunities for genetic exchange remain. Locations widely separated by at least two kilometres of unsuitable habitat (e.g. dense forest) can be reasonably regarded as separate

Fig. 6. Aerial photography of private property and State forest between Ansons Bay Road and The Gardens (Last River catchment) showing mosaic of intensively managed pasture, remnant riparian strips, patches of woodland/forest amongst pasture and extensive native vegetation. The black circles represent individual patches of *Sowerbaea juncea*, as recorded as part of the present study.

The LIST (Land Information System Tasmania)

subpopulations. However, separating individual sites that occur within several forest remnants amongst a broad expanse of pasture into distinct subpopulations is more difficult (Figs 4, 6). A pragmatic approach to defining the limits of subpopulations has been taken, based on a combination of degree of fragmentation, land tenure and distribution of vegetation types. On this basis, not more than nine subpopulations are described (Table 1). The total number of mature individuals is difficult to estimate because of scant demographic information associated with many records but is probably between 500 and 1000 in any particular year, depending on seasonal conditions and disturbance events.

DISCUSSION

Distribution and habitat

Sowerbaea juncea has a patchy distribution probably reflecting both the historical and contemporary occurrence of potentially suitable habitat. The species occurs in wet heathland/sedgeland and the ecotone between such habitat and heathy/sedgy woodland. Within the range of *S. juncea*, such habitat is discontinuous and associated with the drainage features of the topography (e.g., see Fig. 6). Within its range, however, *S. juncea* does not appear to occupy all potentially suitable sites.

It is likely that significant areas of potential habitat for *S. juncea* have been cleared for development of agricultural land, largely by the British Tobacco Company after the mid-1960s, and later by various (mainly) private landowners through the 1980s and up to the present day. It is difficult to determine if *S. juncea* once had a wider distribution beyond its presently mapped extent. However, given the distinctiveness of the species and its apparent ability to persist in small native remnants amongst pasture, it seems unlikely that the species is significantly more widespread than presently understood.

Range infillings are likely with additional targeted surveys because between Binalong Bay and Mount William National Park there are numerous heathy/sedgy areas of low-lying vegetation between lightly wooded rises that are superficially suitable for *S. juncea*. Even targeted surveys can fail to detect the species. For example, prior to this project, *S. juncea* was not formally documented from the Doctors Peak Forest Reserve, yet the species has

been known for at least a decade in this reserve from a marsh along a well-formed road between The Gardens and Ansons Bay Road (and its continued presence was confirmed in January 2009). Previous surveys of the reserve (North *et al.* 1998), which were largely aimed at determining the broad vegetation types within the reserve rather than targeting key species, did not report *S. juncea* from any sites. The cited survey dates and the accompanying species list and survey sites indicates that the marsh supporting *S. juncea* was targeted at an appropriate time of year, which suggests that the species was overlooked, and/or non-emergent at the time of survey, and most likely sporadic in its occurrence.

The absence of *S. juncea* in other parts of near-coastal north-eastern Tasmania, including the Furneaux Group, is a little difficult to explain because there are large areas of superficially suitable habitat, and the species occurs along much of the eastern Australian coastline. The southern limit of the species is also somewhat unexpected because some parts of the east coast of Tasmania (e.g. heathy vegetation types of the Freycinet Peninsula) are also superficially suitable. However, much of the near-coastal parts of the east coast between Binalong Bay (approximate known southern limit of *S. juncea*) and the Freycinet Peninsula are dolerite-based hills and may be unsuitable.

Reservation status and management implications

Sowerbaea juncea is poorly reserved in Tasmania. Mount William National Park supports one significant extant population at the junction of Eddystone Road and North Ansons Road, and two populations of unknown status are represented by database records from near Eddystone Point (Table 1). A small population occurs within the Doctors Peak Forest Reserve between Ansons Bay Road and The Gardens.

One population occurs in State forest in an area coded as 'informal reserve' on Forestry Tasmania's Management Decision Classification system (Orr & Gerrand 1998), and now forms part of the statewide reserve system through the Community Forest Agreement.

The remaining populations occur on several different parcels of private land, none of which are managed under conservation covenants. Several sites are on private land near Eddystone Road on the fringes of heathy forest remnants that until recently were nestled within expanses of grazing land. However, since about 2005, much of this pasture has been redeveloped as hardwood plantation, with the vast majority of forest/woodland remnants being retained. *Sowerbaea juncea* appears to persist on the forest/pasture margin (even in the presence of intensive grazing). However, the long-term viability of populations adjacent to hardwood plantations is unknown. These plantations were established after broad-scale herbicide spraying of the pasture and will grow into dense stands of trees that are likely to shade out adjacent forest patches and/or alter the local water table.

In my opinion, the level of formal reservation of a species does not necessarily correlate well with its conservation status: a poor state of formal reservation for some species may be

perceived as a potential source of risk to a species, and conversely, a well-reserved status can suggest a higher level of security. However, in the case of *S. juncea*, the reserved populations may be at greater risk of extinction than the populations on private property. Although gazetted reserves are subject to a code of practice, viz. the *Tasmanian Reserve Management Code of Practice* (Parks and Wildlife Service, 2003), this does not necessarily imply that any management actually occurs, or if it does, that the management is appropriate for the maintenance of particular species.

Based on the characteristics of the sites presently supporting the species *S. juncea* appears to benefit from periodic and relatively frequent disturbance. For example, the Eddystone Road-North Ansons Road junction population fluctuates in abundance between years. At this site, low numbers occur in the now densely shrubby/sedgy heathland and higher numbers occur on the fringes of the dense heathland in more open heathy woodland (Fig. 5A). Similarly, *S. juncea* has been known from the upper reaches of the Last River catchment for several decades. When first reported, it was present on both sides of a gravelled road in open marshy habitat. Currently it occurs only in relatively low numbers on one side of the road in the more open marsh (Fig. 5B), while the marsh on the other side of the road is now very dense and overgrown. In contrast, some populations that occur in remnants of native vegetation on private land amongst pasture are locally dense. In such situations, *S. juncea* occurs most frequently in the disturbed fringes of the woodland or heathland remnants (Fig. 5C), in sites subject to relatively frequent fuel reduction burning (Fig. 5D) and stock activity such as sheltering and grazing (Figs 5E–F).

It should be noted that this commentary is based on personal observations and not long-term demographic monitoring. Variations in the number of flowering plants observed at a site may not be an appropriate index of abundance due to the likely effect of seasonal conditions on the flowering response of a perennial species, different methods of counting individuals by observers in different years and the effect of within-season timing of observation (e.g. which part of the contemporary flowering season the observation is made).

An increase in the formal reservation status of *S. juncea* is a good long-term conservation management objective. However, there are limited opportunities to secure additional sites within some form of reserve (e.g. conservation covenant) from land not currently managed for intensive agriculture. Reserved sites need to be subject to appropriate management if *S. juncea* is to persist. Given that the majority of populations occur on private property, the greatest opportunities for further reservation may come from innovative agreements with landowners willing to manage a threatened species in harmony with primary production. I argue that finding a balance between conservation and production is both practicable and cost-effective because it is unlikely to require complex changes to land management practices. Fencing remnants and excluding the disturbance factors that create ideal habitat for *S. juncea* may not be warranted, and may even in some

circumstances be detrimental. Excluding stock from remnants during the flowering season, or perhaps rotating the ones used in any particular year, and avoiding feeding stock silage and hay within them to prevent such sites becoming infested with competitive pasture grasses are presented as relatively straightforward management techniques.

Outside the formal reserve system, surveys of potential habitat during the peak flowering period of *S. juncea* prior to forestry activities and land clearing are warranted to ensure that populations are detected and appropriately managed. Buffer zones, for example, to ensure maintenance of canopy and understorey characteristics could be considered.

Conservation status

At the time of undertaking the assessments reported herein, *S. juncea* was listed as 'Rare' (Schedule 5) on the Tasmanian *Threatened Species Protection Act 1995* (Anon. 1995). The distribution and population data presented allowed a reassessment of the conservation status of the species to be made against the criteria of this Act. In the opinion of the author, *S. juncea* meets criterion B for 'Endangered' (Schedule 3). Specifically, its extent of occurrence is c. 162 km^2 (an area much smaller than the 5000 km^2 threshold of the criterion); the area of occupancy is in the order of tens of hectares at most (also much smaller than the 500 km^2 threshold); and the species has a fragmented distribution with evidence of a continued decline in extent of occurrence, area of occupancy and quality of habitat. A formal nomination of the species for uplisting, based largely on the information presented in this paper, resulted in its status being changed from 'Rare' to 'Vulnerable' in March 2011 (TSS 2011), meeting criterion C (fewer than 10,000 mature individuals), specifically, C2a (a continuing decline in numbers inferred and fewer than 1,000 mature individuals in any subpopulation).

Demonstrating a continued decline in extent of occurrence, area of occupancy and quality of habitat of the species is a key part of a species meeting the criteria for 'Endangered'. Further monitoring of a subset of subpopulations is recommended to determine the degree of fluctuation in the area of occupancy, the number of mature individuals and response to land use practices. Response to fire, grazing and adjacent forest plantation establishment is of particular relevance. Additional surveys of potentially suitable habitat would also be prudent, both within the presently known range (with the intention of discovering range infillings) and its fringes (with the intention of increasing the extent of occurrence).

Acknowledgements

I am grateful to my field assistants Rebecca Dillon and Brian French for helping with private property surveys during which we recorded much of the information presented in this paper. Staff of the Tasmanian Herbarium kindly allowed access to the collection and assisted with interpreting annotations on herbarium sheets. Bernard Walker provided the orthorectified aerial imagery. Tim Leaman (ex-Forestry Tasmania) provided information on the tenure status of the site on State forest. I thank Fred Duncan, Brian French, Richard Schahinger, John and Marion Simmons and Roy Skabo for providing additional information on some populations. Lorilee Yeates and two anonymous referees provided useful comments on earlier versions of the manuscript.

References

Anonymous (1995) *Threatened Species Protection Act 1995, No. 83*. (Government Printer: Tasmania)

Curtis WM, Morris DI (1994) *The Student's Flora of Tasmania Part 4B Angiospermae: Alismataceae to Burmanniaceae*. (St. David's Park Publishing: Hobart)

Harris S, Kitchener A (2005) *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*. (Department of Primary Industries, Water and Environment: Hobart)

Henderson RJF (1987) *Sowerbaea* (Liliaceae). *Flora of Australia* **45**, 264–268, 494.

Natural Values Atlas (NVA). Tasmanian Department of Primary Industries, Parks, Water and Environment; www.naturalvaluesatlas.tas.gov.au (accessed 25 February 2009).

North A, Johnson K, Ziegler K, Duncan F, Hopkins K, Ziegeler D, Watts S (1998) *Flora of Recommended Areas for Protection and Forest Reserves in Tasmania Volume 1 Furneaux IBRA Region Ben Lomond IBRA Region*. (Forest Practices Board, Forestry Tasmania, Parks and Wildlife Service: Tasmania)

Orr S, Gerrand AM (1998) Management Decision Classification: a system for zoning land managed by Forestry Tasmania. *Tasforests* **10**, 1–14.

Parks and Wildlife Service, Forestry Tasmania and Department of Primary Industries, Water and Environment (2003) *Tasmanian Reserve Management Code of Practice*. (Department of Tourism, Parks, Heritage and the Arts: Hobart)

Smith JE (1798) The characters of twenty new genera of plants. *Transactions of the Linnean Society of London* **4**, 213–223.

Threatened Species Section (2011) *Listing Statement for* Sowerbaea juncea *(purple rushlily)*. Department of Primary Industries, Parks, Water and Environment, Tasmania. The LIST (Land Information System Tasmania) http://www.thelist.tas.gov.au/

INTRODUCED MOSSES IN THE FLORA OF TASMANIA. I. *SCLEROPODIUM* AND *PSEUDOSCLEROPODIUM* (BRYOPSIDA: BRACHYTHECIACEAE

Rodney D. Seppelt, Lynette H. Cave and Benjamin E. Carter

Seppelt R.D., Cave L.H., Carter B.E. 2011. Introduced mosses in the Flora of Tasmania. I. *Scleropodium* and *Pseudoscleropodium* (Bryopsida: Brachytheciaceae). *Kanunnah* 4: 72–81. ISSN1832-536X. *Scleropodium touretii* (Brid.) L.F.Koch (syn: *S. australe* Hedenäs) and *Pseudoscleropodium purum* (Hedw.) M.Fleisch. appear to have been introduced to Tasmania in recent decades and perhaps, in the absence of earlier collections, since the 1950s. The earliest Tasmanian collections of these species date from 1980 with *S. touretii* being rediscovered in 2009. Published molecular studies indicate the origin of the Tasmanian *S. touretii* being Europe and not North America. Both species are described and illustrated, the distribution of collections in Tasmania mapped, and the alleged superficial similarity of *S. touretii* to *P. purum* discussed.

Rodney D. Seppelt, Australian Antarctic Division,
Channel Highway, Kingston, Tasmania 7050, Australia.
Email: Rod.Seppelt@aad.gov.au

Lynette Cave, Tasmanian Herbarium, Tasmanian Museum and Art Gallery,
Private Bag 4, Hobart, Tasmania 7001, Australia.
Email: Lynette.Cave@tmag.tas.gov.au

Benjamin E. Carter, University Herbarium and Department of Integrative Biology,
University of California, Berkeley, U.S.A.

KEY WORDS: Brachytheciaceae; *Scleropodium*; *Pseudoscleropodium*; introduced species, Tasmania

Introduction

Although there is much awareness of vascular plants as invasive species amongst the native flora, little attention has been given to the presence of anthropogenically introduced and potentially invasive bryophytes (mosses, liverworts). Because of their generally small size and difficulties in identification, these plants are often not taken into account in vegetation surveys. It is thus not easy to determine if new records of taxa may represent overlooked occurrences or possible introductions. Species that have

been introduced to the state, however, may potentially assume the role of environmental weeds. One such example is the moss *Rhytidiadelphus squarrosus* (Hedw.) Warnst. (Hylocomiaceae), which was first recorded in Tasmania from collections on the west coast in 1974 but has since been found to be widespread in many parts of the west of the state, in lawns, along roadsides, on golf courses and in wilderness areas accessible to vehicular or foot traffic (pers. obs.). Mosses reproduce easily by fragmentation and thus the opportunities for anthropogenic dispersal are great. In this paper we discuss two introduced species in the genera *Scleropodium* and *Pseudoscleropodium*.

Scleropodium Bruch & Schimp., *Bryologia Europaea* 6: 27 (fasc. 55–56. Mon. 1.) (1853)

TYPE: *Scleropodium illecebrum* Schimp., *Bryologia Europaea* 6: 29 (1853)

Plants medium-sized with irregular ± close branching, the branches spreading or ascending with both branches and stems curved when dry; stems lacking paraphyllia; pseudoparaphyllia small, broadly triangular; axillary hairs 3–4 celled; leaves concave, erect, triangular-ovate to broadly ovate or ovate-cordate, not or scarcely plicate, the apices gradually or abruptly narrowed, acute or obtuse, sub-apiculate; margins plane, entire to serrulate above; costa single, occasionally with a lateral branch, reaching ½–⅔(–¾) leaf length; mid-lamina cells narrowly rhomboid to linear-vermicular, the ends square to tapered, thin-walled, aporose; cells near insertion shorter, broader, juxtacostal cells not to weakly porose; alar cells quadrate to rectangular; basal corners of leaves shortly and narrowly decurrent. Dioicous. Perichaetial leaves with a reflexed acumen. Seta rough, rarely almost smooth. Capsule inclined to horizontal. Annulus separating by fragments. Operculum conic. Peristome xerocastique (opening when dry), perfect (double) with an outer row of 16 exostome teeth and a well-developed inner endostome of 16 keeled segments alternating with one or more thin cilia. Spores small. Calyptra naked.

The description of the genus *Scleropodium* is derived largely from Hedenäs (1996, 2002) and Ignatov and Huttunen (2002). *Scleropodium* is a small genus of perhaps nine species and is currently under revision by the junior author. The centre of distribution appears to be western North America where all six of the well-recognised taxa are found [*S. californicum* (Lesq.) Kindb., *S. cespitans* (Müll.Hal.) L.F.Koch, *S. colpophyllum* (Sull.) Grout, *S. julaceum* E.Lawton, *S. obtusifolium* (Mitt.) Kindb., and *S. touretii* (Brid.) L.F.Koch]. *Scleropodium* is a Northern Hemisphere genus with the exception of an outlying endemic taxon described as *S. australe* (Hedenäs 1996), in the Southern Hemisphere. Recent morphological and molecular genetic studies indicate that the genus is indeed confined to the Northern Hemisphere and that the Tasmanian species represents an introduced taxon, *S. touretii*, with molecular affinities to Europe (Carter 2010).

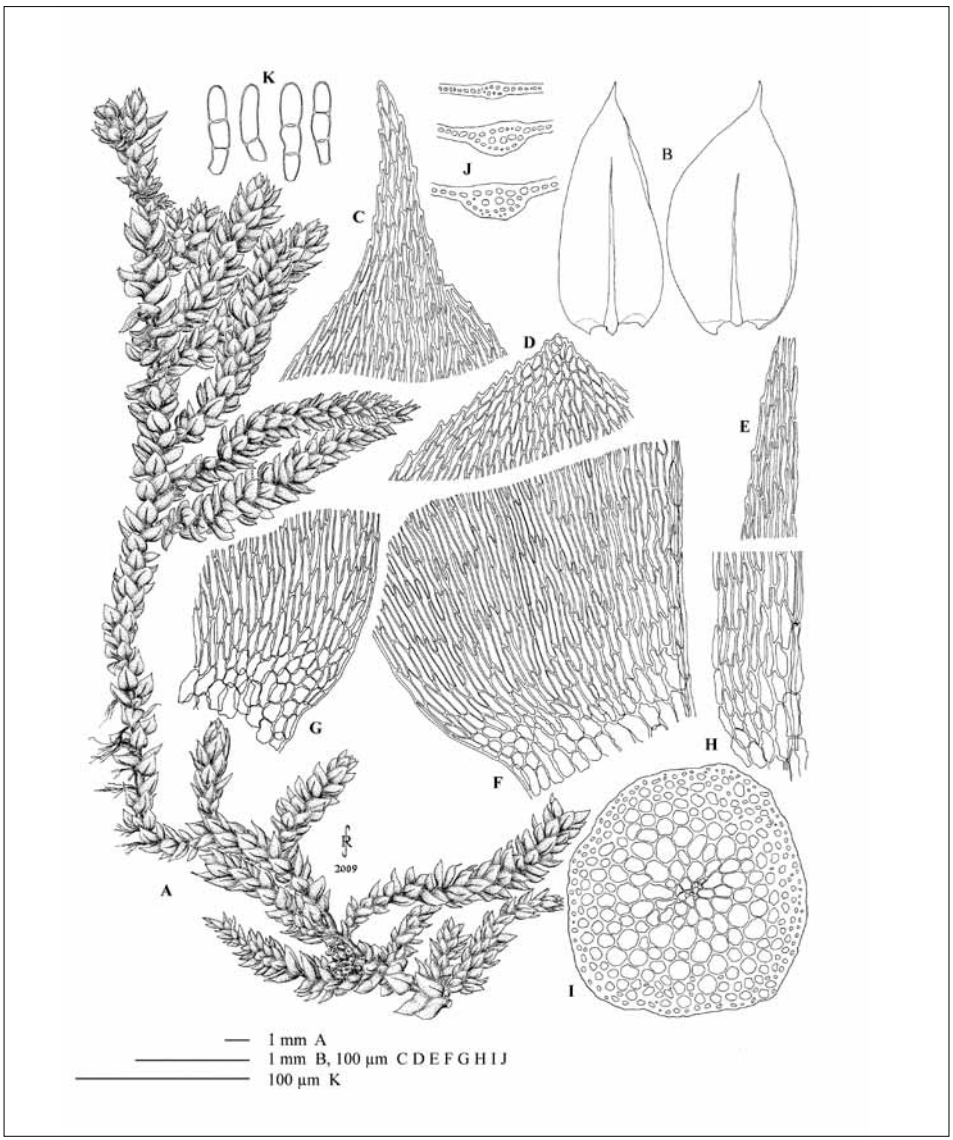

Fig. 1. *Scleropodium touretii*. [Drawn moist] **A.** Vegetative shoot. **B.** Leaves. **C–D.** Variation in shape of leaf apex. **E.** Cells of mid leaf margin. **F–G.** Cells of leaf basal angles showing weakly differentiated alar groups. **H.** Juxtacostal cells of leaf base. **I.** Stem section. **J.** Costal sections. **K.** Axillary hairs.

Drawn from Seppelt 27568

Scleropodium touretii (Brid.) L.F.Koch, *Revue Bryologique et Lichénologique* 18: 177 (1949)

BASIONYM: *Hypnum touretii* Brid., *Muscologia Recentiorum Supplementum* 2: 185 (1812)

TYPE: 'In Gallia prope Lugdunum La Tourette detextit; inde Déjean circa Viennam Delphinatus leit et communicavit.'

SYNONYM: *Scleropodium australe* Hedenäs, *Nova Hedwigia* 62: 457. f. 1: A, F–I (1996) (see Carter 2010).

TYPE: Road and creek behind Cascade Brewery, 42°54'S, 147°17'E, *A.V.Ratkowsky H372*, 05.ii.1980; HOLOYPE: CBG 8206591; ISOTYPES: AD, CBG, HO, L.

Plants (Fig. 1A) forming loose mats on soil and litter, green to yellowish-green. Stems to 6 cm or more in length, prostrate, intertwined, in section (Fig. 1I) with a narrow central strand surrounded by medullary cells with walls becoming thicker and somewhat porose towards the outside, outer cortical region of 2–3 rows of smaller, thicker-walled cells; rhizoids dark brown, in small groups on underside of lower parts of the stems, arising from below stem leaves. Branching irregular, the branches relatively short, crowded to scattered, arising mostly at an acute angle to the main stem, diverging from the stems at rather less than 90°, the tips of the branches and stems somewhat curved when dry. Axillary hairs (Fig. 1K) few in leaf axils, 2–3 cells in length, the basal cells not coloured. Stem and branch leaves (Fig. 1B) similar in size and shape, up to 2.6 mm long, 1.0–1.3 mm wide, erect to loosely spreading when dry, more divergent when moist, imbricate, concave, broadly ovate to triangular-ovate, the base somewhat cordate, the apex gradually or more abruptly narrowing to an acuminate or obtuse, subapiculate apex (Figs 1C, 1D); margins plane, smooth to denticulate, at least in the upper third. Costa single, sometimes with a lateral branch, reaching ½–¾ or slightly more the leaf length, 70–150 µm wide at the base, above narrow and gradually tapered towards the tip; in section (Fig. 1J) consisting of a few (2–3(–4)) layers of undifferentiated cells. Median lamina cells 50–85 x 4.5–7.0 µm, narrow, linear to linear-vermicular, the ends tapered or somewhat square, the walls thin to slightly incrassate, without pores, smooth (Fig. 1F). Alar cells (Figs 1F, 1G) well differentiated, quadrate to short-rectangular, occasionally longer, slightly inflated, the walls thin to slightly incrassate; juxtacostal cells (Figs 1F, 1H) not or weakly porose.

? Dioicous. Sporophytes not yet known in Tasmanian material.

REPRESENTATIVE SPECIMENS EXAMINED:
Road and creek behind Cascade Brewery, *A.V.Ratkowsky H372*, 05.ii.1980 (HO67822 – *S. australe* isotype); Old Farm Road behind Cascade Brewery, *R.D.Seppelt 27568*, 12.iii.2009 (ADT, HO551006).

No sporophytes have been located in the Australian material and only female plants have been seen (Hedenäs 1996, 2002).

In the Tasmanian material we have examined, branch and stem leaves are similar in shape and size (Fig. 1B), concave

Fig. 2. Distribution of *Scleropodium touretii* in Tasmania, based on Herbarium voucher records.

and the margins may be slightly recurved, at least in part. The costa is rather variable in length but reaches from just above mid leaf to about 90% of the leaf length. Costal width, near its base, is variable. Hedenäs (1996, 2002) gives a range for costal width of 80.0–111.5µm while in the leaves examined in the present collection, the width is 70.0–150.0µm. The leaf apex tapers, often quite abruptly, to a short point (Fig. 1C) or sometimes the apiculus is more or less absent (Fig. 1D). The leaf apex is seldom reflexed outwards, wet or dry. Leaf margins are mostly weakly denticulate (Fig. 1E) in the upper part but more strongly denticulate near the apex (Figs 1C, 1D). Most lamina cells are narrow elongate (Fig. 1F) with slender, straight to weakly vermicular, walls and the cells ends tapered to rather blunt. Hedenäs (1996, 2000) gives a size range of 35.5–94.5 x 4.0–6.5µm. Alar cells (Figs 1F, 1G) are distinct from lower lamina cells, thin-walled, quadrate to shortly rectangular, and the juxtacostal cells (Figs 1F, 1H) are not to only weakly porose. Axillary hairs (Fig. 1K) are few in number, found in the axils of distal leaves of shoot apices and consist of 2–3(–4) undifferentiated cells. Axillary cell and juxtacostal cell differences are useful features distinguishing this species from *Pseudoscleropodium purum*.

The exact type locality of *S. australe* is not certain. The type collection indicates 'Road and creek behind Cascade Brewery'. There are a number of roads or tracks behind the Brewery: the lower section of Marlyn Road, a disused fire trail that runs west along Hobart Rivulet, and Old Farm Road, an established and frequently used service road that runs north then west along Guy Fawkes Rivulet. Surrounding Marlyn Road and running along the Hobart Rivulet, the vegetation is a relatively open sclerophyll forest with *Eucalyptus obliqua*, *E. viminalis* and *Acacia dealbata*, as the dominant tree species. Along the Rivulet are numerous introduced weed species including species of *Salix*, *Rubus* and *Crataegus*, as well as a variety of grasses and herbs. A thorough search along Marlyn Road and the slopes either side revealed abundant *Pseudoscleropodium purum* and other mosses, in particular *Breutelia pendula* (Sm.) Mitt., *Kindbergia (Eurhynchium) praelonga* (Hedw.) Ochyra, and *Dicranoloma* spp., but no *Scleropodium*. A further search along Old Farm Road revealed abundant *Pseudoscleropodium* and other mosses, but no *Scleropodium*.

In a sheltered, moist, shaded site on the north side of Guy Fawkes Rivulet,

beneath a canopy of *Eucalyptus viminalis*, *Acacia dealbata* and *Crataegus*, we located a patch of *Scleropodium touretii* on soil and litter near a walking trail. Associated mosses were *Kindbergia praelonga*, *Wijkia extenuata* (Brid.) Crum, *Hypnum cupressiforme* Hedw., and scattered *Pseudoscleropodium purum*.

The specimen (*Seppelt 27568*) does not have particularly strongly curved branches, wet or dry, a feature that is stated to be characteristic of the genus *Scleropodium* (Hedenäs 1996, 2002; Ignatov & Huttunen 2002). Although curved branches are common in *Scleropodium*, and certainly in *S. touretii*, this feature is not an unequivocal characteristic for the genus. At least *S. californicum* and *S. julaceum* in North America have straight branches. However, a number of microscopic characters clearly link the specimen to the genus: the short axillary hairs, the juxtacostal cells that are almost non-porose and the distinct alar cells. Further, a useful distinguishing feature in *Scleropodium* is the presence of enlarged lamina cells over the base of the costa (Norris and Shevock 2004).

Distribution of collections within Tasmania is shown in Figure 2.

Pseudoscleropodium (Limpr.) M.Fleisch., *Die Musci der Flora von Buitenzorg* 4: 1542 (1923)

BASIONYM: *Scleropodium* sect. *Pseudoscleropodium* Limpr., *Laubm. Deutschl.* 3: 142 (1896).

TYPE: *Pseudoscleropodium purum* (Hedw.) M.Fleisch.

Plants robust, in loose, ± glossy brownish- to yellowish-green to whitish-green mats. Stems prostrate to ascending, pinnate to irregularly pinnately branched, appearing somewhat plumose, julaceous; branches well developed, ± straight when dry, somewhat curved when moist, tumid, blunt to attenuate; pseudoparaphyllia foliose; branch and stem leaves scarcely differentiated but stem leaves slightly larger and broader; branch leaves crowded, ± imbricate, broadly ovate to broadly oblong-ovate, apiculate, very concave, somewhat plicate towards the base, margins plane to broadly incurved above, plane to narrowly recurved below, serrate to serrulate above, entire to serrulate below; costa single, thin, occasionally forked, reaching ½–⅔ leaf; lamina cells ± straight to somewhat flexuose, smooth, weakly porose throughout; alar cells differentiated at extreme angles, quadrate to short rectangular, not reaching the costa. Dioicous. Perichaetial leaves homomallous, elongate, lanceolate, acuminate, concave, margins plane, serrulate above, costa short and single or absent, lamina cells linear, somewhat porose above. Seta smooth, long, reddish, flexuose. Capsules inclined, asymmetric, cylindric. Annulus persistent, of 1–3 rows of cells. Operculum high-conic, acute. Peristome double; exostome teeth reddish-brown, broadly lanceolate, abruptly tapered above with a well-defined shoulder, outer surface densely cross-striolate, inner surface trabeculate; endostome smooth, with a very high basal membrane giving rise to broad, keeled segments, gaping below, perforate above; cilia 1–3, well-developed, nodose to appendiculate. Spores 12–15 µm, papillose.

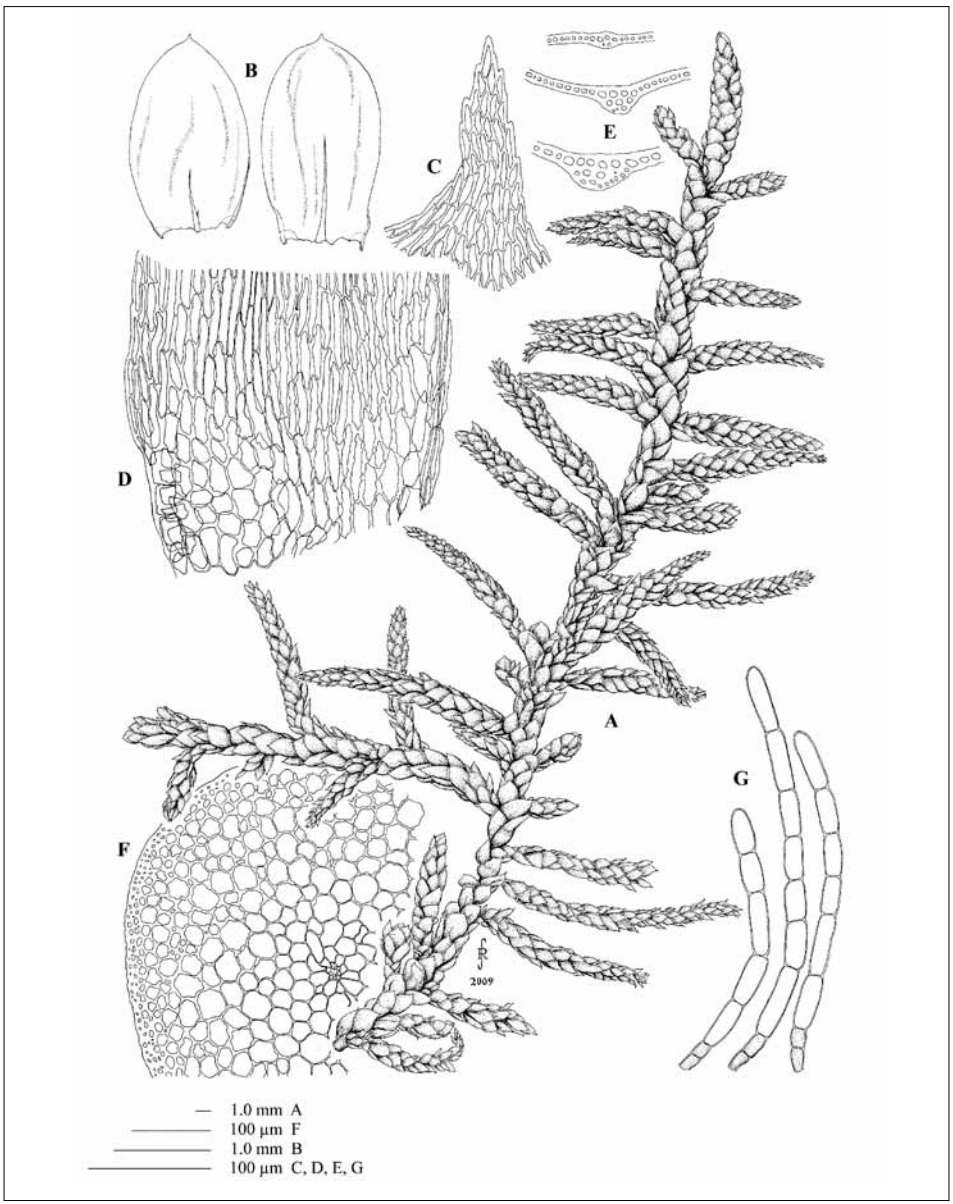

Fig. 3. *Pseudoscleropodium purum*. [Drawn moist] **A.** Vegetative shoot. **B.** Leaves. **C.** Cells of leaf apex. **D.** Cells of leaf basal angle showing weakly differentiated alar group and porose juxtacostal cells. **E.** Costal sections. **F.** Stem section. **G.** Axillary hairs.

Drawn from Seppelt 27566

No sporophytes have been located in the Australian material. The above description is based largely on Buck (1980), Hedenäs (2002) and Smith (2004).

Pseudoscleropodium is a monotypic genus and the description above also refers to the sole species, *P. purum*. The species is known from widely scattered regions of the world (Allen and Crosby 1987) and the distribution pattern one which was described by Schofield (1980) as 'anthropogenic'.

Pseudoscleropodium purum (Hedw.) M.Fleisch., ex Broth., in *Die Natürlichen Pflanzenfamilien*, ed. 2, 11: 395 (1925)

BASIONYM: *Hypnum purum* Hedw., *Sp. Musc. Frond.* 253, pl. 66, f. 3–6. 1801.

SYNONYM: *Scleropodium purum* (Hedw.) Limpr., *Laubm. Deutschl.* 3: 147 (1896).

REPRESENTATIVE SPECIMENS EXAMINED: Strickland Avenue, South Hobart, *A.V.Ratkowsky*, 14.v.1980 (HO302779); Corinna Road, 2 km SW of Waratah, *H.Streimann 59709*, 12.v.1997 (HO443526); Marriotts Falls, near Tyenna River, *J.Jarman*, 29.xii.2000 (HO511124); Lyell Highway, SE of Butlers Gorge Road, *J.Jarman*, 21.v.2000 (HO505254); Wynyard, Inglis River, *L.H.Cave 277*, 01.viii.2003 (HO523010); Zeehan, *L.H.Cave* 286, 17.iv.2004 (HO525983); Premaydena Cemetery, Tasman Peninsula, *L.H.Cave 470*, 14.iii.2005 (HO531597); South Hobart, Old Farm Road-Marlyn Road, *R.D.Seppelt 27566*, 12.iii.2009 (HO551081); Bruny Island, Adventure Bay, *R.D.Seppelt 28663*, 14.ii.2010 (HO554549); Gowrie Park, Rufus St., *L.H.Cave 1225*, 17.iii.2010 (HO555108); Gordon Dam Road, 5 Road, *R.D.Seppelt 26695*, 07.xii.2007 (HO557249).

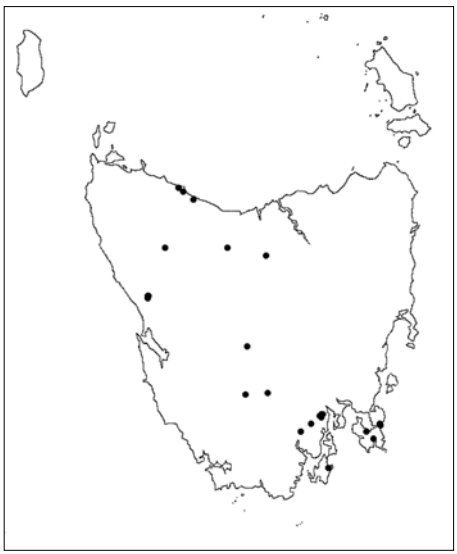

Fig. 4. Distribution of *Pseudoscleropodium purum* in Tasmania, based on Herbarium voucher records.

The distribution of collections in Tasmania is shown in Figure 4.

Comparison of *Scleropodium touretii* with *Pseudoscleropodium purum*

Hedenäs (2002) stated: '*Scleropodium australe* is superficially similar to *Pseudoscleropodium purum*, with which it was earlier confused.' However, we consider that these two mosses are unlikely to be confused.

Pseudoscleropodium purum (Fig. 3) differs in a number of macroscopic and microscopic features. The plants (Fig. 3A) are

considerably more robust, measuring to 10 cm or more in length, and the branches longer (to 2 cm in length) and more regularly pinnate, spreading at an angle of about 90° to the main shoots. Branch and stem leaves (Fig. 3B) are more broadly ovate to somewhat lingulate with rounded apices, plicate, more strongly concave, and the leaf apex usually strongly reflexed outwards. The leaf apex (Fig. 3C) is broadly apiculate, as in *Scleropodium*. The costa (Fig. 3B) is shorter than in *Scleropodium*, reaching barely to halfway up the leaf. The costa sometimes has a lateral branch and may even be very short and almost absent. The costal section (Fig. 3E) is similar in both species. Lamina cells (Figs 3C, 3D) are elongate, as in *Scleropodium*, but the walls of many, if not most, cells are porose. The alar cells (Fig. 3D) are distinct, quadrate to short rectangular, mostly thin-walled, and are fewer in number than in *Scleropodium*. The leaf basal margin is recurved and weakly decurrent. Juxtacostal cells (Fig. 3D) are clearly porose. The stem (Fig. 3F), in section, is similar in structure to that of *Scleropodium*. Axillary hairs (Fig. 3G) are more numerous in the shoot upper leaf axils and considerably longer, 7–9 cells in length with the basal two cells yellowish-brown.

The most obvious distinguishing features between these two species are: the more robust plants, more regularly pinnate branching, wide-spreading and straight to slightly curved (not strongly curved) and longer branches, more strongly concave leaves with recurved and outwardly reflexed apices, the less tapered leaf apices, and the more numerous and longer (more cells) axillary hairs with differentiated basal cells found in *Pseudoscleropodium purum*.

We have found some plants of *Pseudoscleropodium* with the terminal shoot and nearby branches having their apices distinctly curved, leading to potential confusion with *Scleropodium*. However, these plants are considerably more robust, the branches longer, and the leaf apices reflexed, as in typical *Pseudoscleropodium* plants.

Habitat preference of the two species also seems to differ. From the collections we have made, *Pseudoscleropodium* appears to be more tolerant of higher light and less humid habitat conditions, being abundant along the edge of both Old Farm Road and Marlyn Road and on roadside embankments. *Scleropodium touretii* appears to be a more shade tolerant species occurring in habitats of higher humidity. However, although not abundant, scattered stems of *Pseudoscleropodium* were found in the same habitat as the *Scleropodium*.

Allen and Crosby (1987) noted that 'The reputation of *P. purum* as a moss capable of establishing itself as a non-native, weedy element of moss floras throughout the world has reached legendary proportions' and although presently found scattered throughout the world (Allen and Crosby 1987, Fig. 1) it was 'unquestionably indigenous only to Europe'. Lewinsky and Bartlett (1982) considered it to be an aggressively spreading introduction to New Zealand although present indications are that implications of the spread may be overstated (Allan Fife, pers. comm.). We are not yet in a position to assess the impact on the native flora of its introduction to Tasmania.

References

Allen BH, Crosby MR (1987) *Pseudoscleropodium purum* re-established in South America. *Journal of Bryology* **14**, 523–525.

Buck WR (1980) A generic revision of the Entodontaceae. *Journal of the Hattori Botanical Laboratory* **48**, 71–159.

Carter BE (2010) The taxonomic status of the Tasmanian endemic moss, *Scleropodium australe* (Brachytheciaceae). *The Bryologist* **113(4)**, 775–780.

Hedenäs L (1996) Taxonomic and nomenclatural notes on Australian Brachytheciaceae. *Nova Hedwigia* **62**, 451–465.

Hedenäs L (2002) An overview of the family Brachytheciaceae (Bryophyta) in Australia. *Journal of the Hattori Botanical Laboratory* **92**, 51–90.

Ignatov MS, Huttunen S (2002) Brachytheciaceae (Bryophyta) – a family of sibling genera. *Arctoa* **11**, 245–296.

Lewinsky J, Bartlett J (1982) *Pseudoscleropodium purum* (Hedw.) Fleisch., in New Zealand. *Lindbergia* **8**, 177–180.

Norris DH, Shevock JR (2004) Contributions toward a bryoflora of California. II. A key to the mosses. *Madroño* **51**, 133–269.

Schofield WB (1980) Phytogeography of the mosses of North America (north of Mexico). In *The Mosses of North America*. (Eds RJ Taylor, AE Leviton) pp. 131–170. (Pacific Division – American Association for the Advancement of Science: San Francisco)

Smith AJE (2004) *The Moss Flora of Britain and Ireland*. 2nd Edition. (Cambridge University Press: Cambridge)

INTRODUCED MOSSES IN THE FLORA OF TASMANIA. II. *KINDBERGIA PRAELONGA* (BRYOPSIDA: BRACHYTHECIACEAE)

Rodney D. Seppelt and Lynette H. Cave

Seppelt R.D., Cave L.H. 2011. Introduced mosses in the Flora of Tasmania. II. *Kindbergia praelonga* (Bryopsida: Brachytheciaceae). *Kanunnah* 4: 82–88. ISSN 1832-536X. The first Tasmanian collection of *Kindbergia praelonga* (Hedw.) Ochyra (Brachytheciaceae), a native of the Northern Hemisphere and probably centred in Europe, was made in 1951. It is currently found in many parts of the State. It appears to be an opportunistic coloniser of disturbed habitats. The species is illustrated and the distribution of collections within the State mapped. Fruiting plants are reported for the first time from Tasmania, and possibly Australia.

Rodney D. Seppelt, Australian Antarctic Division,
Channel Highway, Kingston, Tasmania 7050, Australia.
Email: Rod.Seppelt@aad.gov.au

Lynette H. Cave, Tasmanian Herbarium, Tasmanian Museum and Art Gallery,
Private Bag 4, Hobart, Tasmania 7001, Australia.
Email: Lynette.Cave@tmag.tas.gov.au

KEY WORDS: Brachytheciaceae, *Kindbergia*, introduced species, Tasmania

Introduction

The Brachytheciaceae Schimp. is a family of some 43 genera and more than 700 species (Goffinet *et al*. 2008), but careful revisionary studies are needed to reappraise the family and its generic limits. According to Hedenäs (2002) there are seven genera with 22 species represented in the Australian moss flora, most being found in the eastern and south-eastern part of the continent and Tasmania. Many of the taxonomic features useful in the identification of the species and genera relate to the sporophyte, which is often not available, and some of the useful gametophyte characters are often difficult to assess.

The genus *Kindbergia* Ochyra (Ochyra 1982) replaced the name *Stokesiella* (Kindb.) H.Rob. that is an illegitimate homonym for a group of species previously placed within either *Eurhynchium* Bruch & Schimp. or *Oxyrrhynchium* (Schimp.) Warnst. Hedenäs (1996), in a preliminary note for the *Flora of Australia*, Vol. 51, Mosses I, refers to the genus *Eurhynchium*. Although *Kindbergia* has not received overall acceptance as a generic name we have chosen to accept the common usage of the name adopted by major Northern

Hemisphere moss floras (e.g., Smith 2004; Ignatov 2009), the familial classification of the mosses as given by Goffinet *et al.* (2008) and the TROPICOS database maintained at the Missouri Botanical Gardens. The distinction of *Kindbergia* from *Eurhynchium* is also supported by molecular phylogenetic analysis (Huttunen & Ignatov 2004).

Kindbergia Ochyra, *Lindbergia* 8: 53 (1982)

TYPE: *Hypnum praelongum* Hedw., *Sp. Musc. Frond.* 258 (1801)

Plants slender to medium-sized, forming light- to dark-green patches, mats or wefts. Stems procumbent, irregularly pinnate to bipinnate, the branches subcomplanate, ± curved. Paraphyllia, when present, short, of only a few cells. Stem leaves distant to crowded, patent to spreading or squarrose when moist, broadly cordate-triangular, usually rapidly narrowed to a long acumen, the base long-decurrent, margins plane, denticulate; costa reaching ½–¾ leaf; basal cells narrow-rhomboid, alar cells rectangular, cells above becoming narrower, upper cells linear. Branch leaves patent to spreading, markedly different from stem leaves, ovate to lanceolate, acute to acuminate. Seta smooth or papillose. Capsules inclined to horizontal, ellipsoid to subcylindrical, ± curved; operculum with a long curved rostrum.

Kindbergia praelonga (Hedw.) Ochyra, *Lindbergia* 8: 54. (1982)

BASIONYM: *Hypnum praelongum* Hedw., *Sp. Musc. Frond.* 258 (1801)

SYNONYM: *Eurhynchium praelongum* (Hedw.) Schimp., *Bryol. Eur.* 5: 224 (fasc. 57–61. Monogr. 8) (1854)

Plants straggling to forming dense wefts. Stems procumbent, in section with a narrow central strand of small, thin-walled cells, a medullary layer of larger thin-walled cells, surrounded by a cortical region of smaller, thicker-walled cells (Figs 1M, 2J). Branches irregularly pinnate, lateral branches vary considerably in length. Stem leaves (Fig. 1B) broadly cordate-triangular, narrowed to a long squarrose acumen, the base long-decurrent, margins plane, denticulate, differ in shape and size from the branch leaves (Figs 1C, 2C). Leaf apices are narrow with denticulate margins (Figs 1D, 2D). Both stem leaves and branch leaves have plane margins denticulate from the apex to the base (Figs 1E, 1F, 2E, 2F). Mid lamina cells are narrow linear-elongate (Fig. 1G). Alar cells of the stem leaves (Figs 1E, 2F) are elongate-hexagonal to rhomboid or rectangular, forming a ± well-defined group. Branch leaves (Figs 1C, 2C) differ in shape to stem leaves, are triangular- to ovate-lanceolate, with poorly defined alar cells and denticulate margins (Figs 1F, 2F). The costa reaches about ½–⅔ leaf length in both stem and branch leaves (Figs 1B, 1C, 2C), and in section lacks any differentiation (Figs 1H–J, 2H, 2I). Paraphyllia, when present, are short and consist of few cells (Figs 1K, 1L). Axillary hairs (Fig. 2K) are short, with 1–2 short, weakly coloured

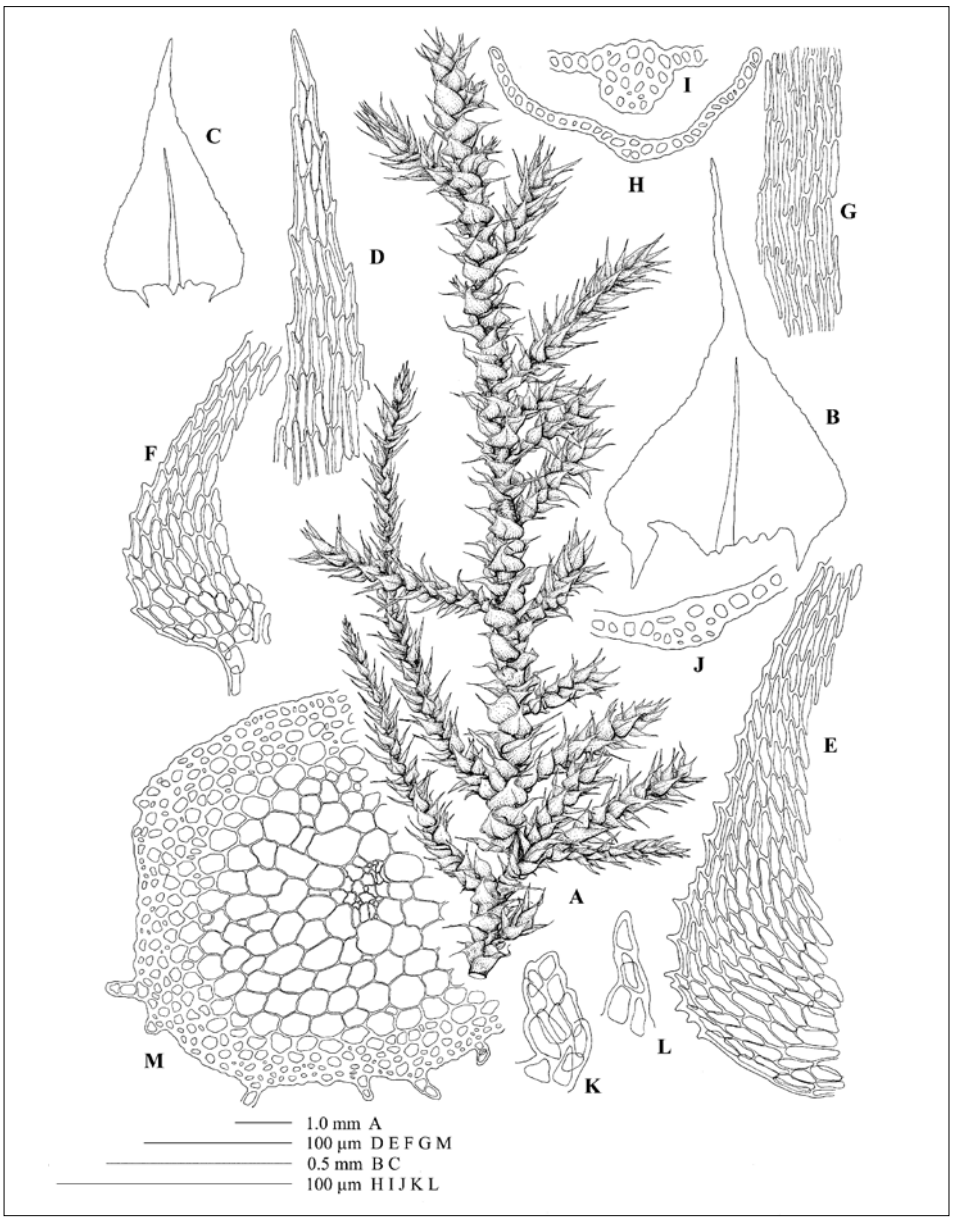

Fig. 1. *Kindbergia praelonga* (drawn moist). **A.** Segment of vegetative shoot. **B.** Stem leaf. **C.** Branch leaf. **D.** Cells of leaf apex. **E.** Cells of basal angle of stem leaf. **F.** Cells of basal angle of branch leaf. **G.** Leaf mid lamina cells. **H–J.** Costal sections. **K–L.** Pseudoparaphyllia. **M.** Stem section.
Drawn from HO 79099

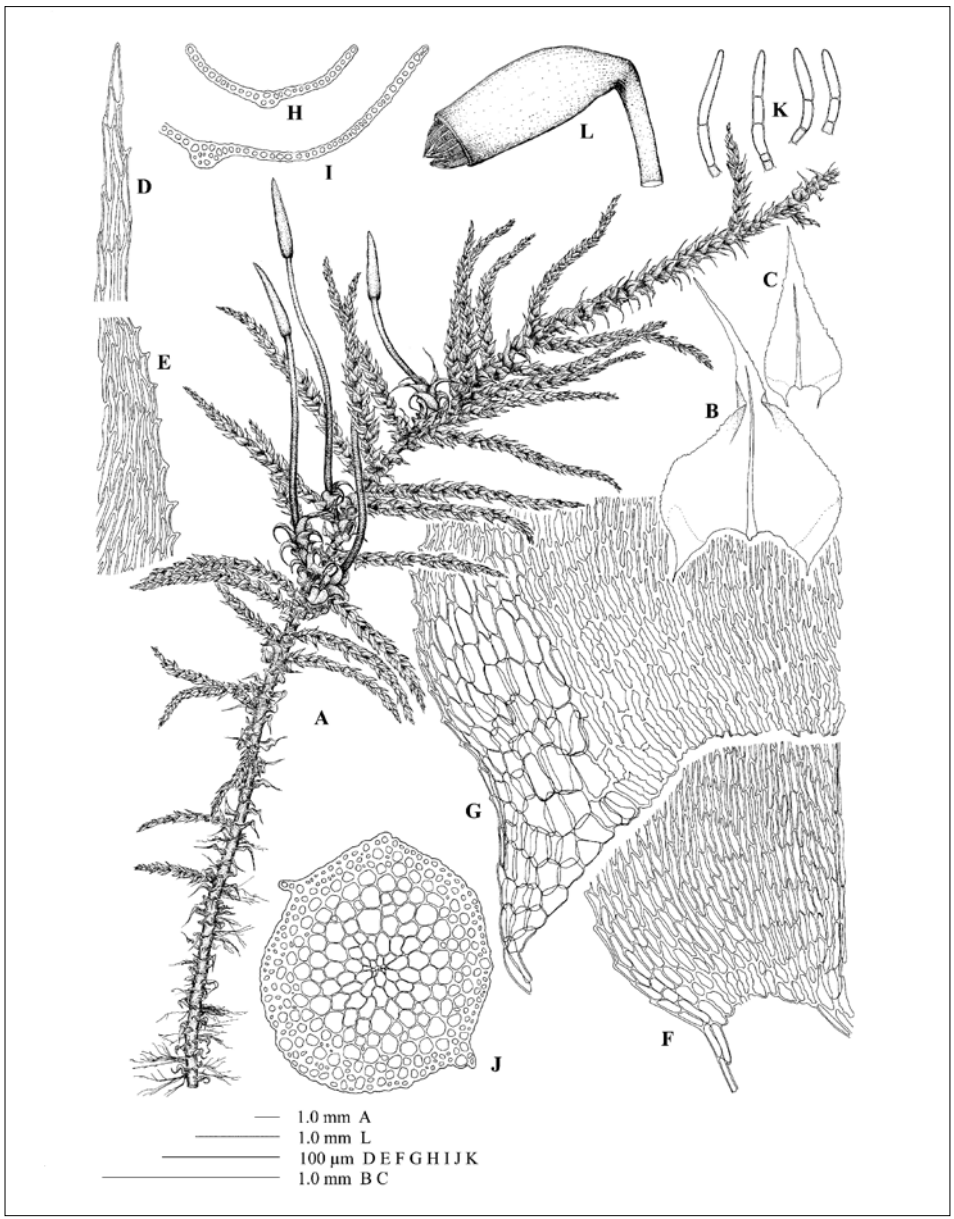

Fig. 2. *Kindbergia praelonga* (drawn moist). **A.** Fertile shoot with young sporophytes. **B.** Perichaetial leaf. **C.** Branch leaf. **D.** Cells of leaf apex. **E.** Cells of mid leaf lamina margin. **F.** Cells of basal angle of branch leaf showing poorly defined alar group. **G.** Cells of basal angle of perichaetial leaf showing well differentiated alar group and porose cells of leaf base. **H–I.** Costal sections. **J.** Stem section. **K.** Axillary hairs. **L.** Mature capsule with peristome.

Drawn from Seppelt 27495

cells and 2–3 longer colourless cells. Perichaetial leaves (Fig. 2B) are easily distinguished from stem leaves because they are larger, with a longer and somewhat sheathing base tapering abruptly to a longer tapering, reflexed acumen. The alar cells of perichaetial leaves (Fig. 2G) are more clearly differentiated than in stem or branch leaves, are thin walled, and form a distinct group. Basal laminal cells of the perichaetial leaves (Fig. 2G) are also clearly porose. The seta is red-brown and smooth in our specimen, although Ignatov (2009) states that the seta is usually strongly roughened and Smith (2004) that the seta is papillose. The capsule (Fig. 2L) is ellipsoid to subcylindrical, only weakly curved, and held horizontal to weakly pendent. The peristome is double, the exostome teeth reddish-brown, cross-striolate on their outer surface and tapered towards the tip. The endostome segments are pale and perforate.

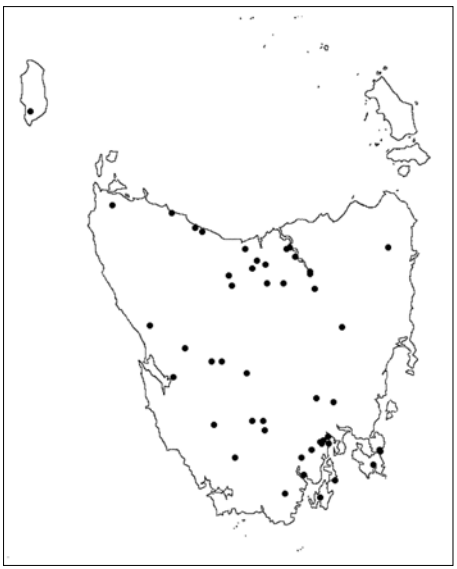

Fig. 3. Distribution of *Kindbergia praelonga* in Tasmania, based on Herbarium voucher records.

SPECIMENS EXAMINED:

Lymington, *R.N.Farquhar,* xi.1951 (HO-551324); Mt King William, near road, *J.Somerville*, 11.xi.1959 (HO82628); Neika-Fern Tree, *A.V.Ratkowsky H680,* 20.xii.1978 (HO302628); Mt Wellington, Lower Pipeline track, *A.V.Ratkowsky H682,* 17.ix.1979 (HO67547); Adamsons Falls, *A.V.Ratkowsky H683*, 01.iii.1980 (HO67546); Junee Cave State Reserve, *A.Moscal 23641,* 20.v.1992 (HO553966); King Solomons Cave State Reserve, *A.Moscal 24380*, 26.i.1993 (HO133987); Bruny Island, Cape Queen Elizabeth, *A.Moscal 25163*, 29.iv.1993 (HO553967); King Island, near Kentford Forest State Reserve, *A.Moscal 27844*, 09.xi.1995 (HO553960); Strathgordon, *R.D.Seppelt 20151*, 23.xi.1996 (HO553970); Scotts Peak Dam, *J.Jarman & L.H.Cave*, 10.v.2000 (HO505325); Lake Barrington, *A.Moscal 31188*, 23.iii.2001 (HO553961); Perth Bridge, *L.H.Cave 288*, 02.viii.2004 (HO527038); Storm Bay, Eaglehawk Neck Lookout, *L.H.Cave 474*, 23.vii.2005 (HO532079); Zeehan, Spray Mine site, *L.H.Cave 629*, 07.x.2006 (HO542852); Lyell Highway at Franklin River, *L.H.Cave 638*, 07.x.2006 (HO542857); Blacksmiths Gully, Lower Longley, *J.Jarman s.n.*, 07.v.2010 (HO556015)(c.fr.); Old Farm Road, South Hobart, *R.D.Seppelt 27495*, 06.iii.2009 (HO553973)(c.fr.); South Hobart, *R.D.Seppelt 27496*, 6.iii.2009 (HO551089)(c.fr.); South Hobart, Old Farm Road and Guy Fawkes Rivulet, *R.D.Seppelt 27744*, 10.iv.2009 (HO553975) (c.fr.).

DISTRIBUTION IN TASMANIA:
The distribution of the species in Tasmania, based on known localities and herbarium specimens, is given in Fig. 3. The species is not found on Macquarie Island (see Selkirk *et al*. 1990) and previous records were based on misidentifications.

Discussion

Kindbergia praelonga is widespread in the Northern Hemisphere, being known from temperate Europe northwards to Fennoscandia, the Faeroes, Iceland, Turkey, the Caucasus, Northern Asia, the Himalayan region, China, Japan, in Africa from Tunisia and Morocco, and in North America (Menzel and Schultze-Motel 1987; Smith 2004). In the Southern Hemisphere the species is considered to be introduced in New Zealand (Sainsbury 1955), in southern Australia and Tasmania (Scott and Stone 1976), where it is believed to have at least in part been introduced. In East Africa it is recorded from Tanzania (Bizot and Pocs 1974). In the neotropical regions of the Americas it is reported from disjunct localities and usually higher elevation localities in Peru, Ecuador, Colombia (Robinson 1962; Mitten 1969; Mägdefrau 1983; Menzel and Schultze-Motel 1987), Costa Rica (Bowers 1970, 1974), Guatemala (Bartram 1949), Mexico (Crum 1951), and from the Falkland (Malvinas) Islands, where it is also believed to have been introduced (Matteri and Ochyra 1989).

Typical of other members of the family Brachytheciaceae, *K. praelonga* shows considerable morphological plasticity throughout its range, particularly in the robustness of the plants, branching pattern and leaf shape. Scott and Stone (1976) considered the species to be rare or overlooked, inhabiting moist or damp habitats such as lawns and grasslands. They considered that it might have been introduced, at least in part, to Australia. However, the lack of early historical collections lends credence to the possibility of the species being relatively recently introduced. The earliest herbarium record appears to be from Tasmania, dating from 1951. The first 'undoubted record' from the state of Victoria was made in 1956, according to specimens in the National Herbarium of Victoria (MEL).

Kindbergia praelonga is unlikely to be confused with any other Australian moss except perhaps slender forms of *Thuidium*. However, the stems of *Thuidium* are densely clothed with paraphyllia and the leaf lamina cells are papillose.

Although fruiting specimens seem to be commonly reported in the Northern Hemisphere (Smith 2004), sporophytes have not apparently been found in Australian populations before now. The species is dioicous and thus the finding of fruiting material in two geographically separated Tasmanian populations from Old Farm Road, South Hobart (*Seppelt 27496, 27744*), and from Lower Longley (*J.Jarman*) is significant. No male reproductive structures have so far been seen in the Tasmanian collections.

The present distribution of *K. praelonga* would imply that either the species is an efficient invasive colonist or it has been present in Tasmania for some time but not collected. The ready ability of the moss to propagate by fragmentation through the agency of, for example, lawn or grass mowing, cannot be questioned. The abundant presence of the introduced

Rhytidiadelphus squarrosus (Hedw.) Warnst. (Hylocomiaceae) along roadsides and ditches and on golf courses in the north-western sector of the State (P. Dalton, pers. comm.) attests to the efficacy of fragmentation as a mechanism of vegetative dispersal. Such introduced and potentially aggressively invasive moss taxa have received little attention by land management or conservation authorities and may pose a threat to native bryophyte species.

References

Bartram EB (1949) Mosses of Guatemala. *Fieldiana, Botany* **25**, 1–442.

Bizot M, Pócs T (1974) East African Bryophytes. I. A checklist of bryophytes of East Africa. *Acta Academiae Paedogogicae Agriensis*. Nova Series **12**, 383–449.

Bowers FD (1970) High elevation mosses of Costa Rica. *Journal of the Hattori Botanical Laboratory* **33**, 7–35.

Bowers FD (1974) The mosses reported from Costa Rica. *The Bryologist* **77**, 150–171.

Crum H (1951) The Appalachian-Ozarkian element in the moss flora of Mexico with a checklist of all known Mexican mosses. *University of Michigan Doctoral Dissertation Series*, Publ. 3486. Ann Arbor, Michigan.

Goffinet B, Buck WR, Shaw AJ (2008) Morphology, anatomy, and classification of the Bryophyta. In B Goffinet, AJ Shaw (eds) *Bryophyte Biology*, pp. 55–138. (Cambridge University Press, Cambridge)

Hedenäs L (1996) Taxonomic and nomenclatural notes on Australian Brachytheciaceae (Musci). *Nova Hedwigia* **62(3–4)**, 451–465.

Hedenäs L (2002) An overview of the family Brachytheciaceae (Bryophyta) in Australia. *Journal of the Hattori Botanical Laboratory* **92**, 51–90.

Huttunen S, Ignatov MS (2004) Phylogeny of the Brachytheciaceae (Bryophyta) based on morphology and sequence level data. *Cladistics* **20(2)**, 151–183.

Ignatov MS (2009) Brachytheciaceae – Kindbergia. *Flora of North America, Mosses II* on-line version: http://www.mobot.org/plantscience/bfna/V2/BracKindbergia.htm (accessed 29 Jul. 2010)

Mägdefrau K (1983) The bryophyte vegetation of the forests and paramos of Venezuela and Colombia. *Nova Hedwigia* **38**, 1–63.

Matteri CM, Ochyra R (1989) Notes on two southern South American species of Brachytheciaceae (Musci). *Journal of the Hattori Botanical Laboratory* **66**, 321–330.

Menzel M, Schultze-Motel W (1987) Studies on Peruvian bryophytes. III. Phytogeographic analysis of the distribution patterns of Musci. *Memoirs of the New York Botanical Garden* **45**, 371–387.

Mitten W (1869) Musci Austro-Americani. Enumeratio muscorum omnium Austro-Americanorum auctori hucusque cognitorum. *Journal of the Linnean Society, Botany* **12**, 1–659.

Ochyra R (1982) *Kindbergia* (Brachytheciaceae, Musci), a new name for *Stokesiella* (Kindb.) Robins., hom. illeg. *Lindbergia* **8**, 53–54.

Robinson H (1962) Generic revisions of North American Brachytheciaceae. *The Bryologist* **65(2)**, 73–146.

Sainsbury GOK (1955) A handbook of the New Zealand mosses. *Bulletin of the Royal Society of New Zealand* **5**, 1–490.

Scott GAM and Stone IG (1976) *The Mosses of Southern Australia*. (Academic Press, London).

Selkirk PM, Seppelt RD, Selkirk DR (1990) *Subantarctic Macquarie Island; Environment and Biology*. (Cambridge University Press, Cambridge).

Smith AJE (2004) *The Moss Flora of Britain and Ireland*, 2nd Edition. (Cambridge University Press, Cambridge).

TROPICOS.org Missouri Botanical Garden http://www.tropicos.org (accessed 29 July 2010).

THE APPLICATION OF BERNARD BOIVIN'S TASMANIAN NAMES IN *WESTRINGIA* (LAMIACEAE)

Marco F. Duretto

Duretto M.F. 2011. The application of Bernard Boivin's Tasmanian names in *Westringia* (Lamiaceae). *Kanunnah* 4: 89–92. ISSN1832-536X. The Tasmanian species of *Westringia* (Lamiaceae) described by Bernard Boivin are assessed. The synonymy of *W. quaterna* B.Boivin and *W. angustifolia* R.Br. is confirmed and *W. raleighii* B.Boivin is treated as a synonym of *W. brevifolia* Benth. Issues surrounding the location of the personal herbarium of Bernard Boivin are discussed.

Marco F. Duretto, Tasmanian Herbarium, Tasmanian Museum and Art Gallery, Private Bag 4, Hobart, Tasmania 7000, Australia.
Present address: The Royal Botanic Gardens and Domain Trust, Mrs Macquaries Rd, Sydney, NSW 2000 Australia
Email: Marco.Duretto@rbgsyd.nsw.gov.au

KEY WORDS: *Westringia*, *Westringia angustifolia*, *Westringia brevifolia*, *Westringia quaterna*, *Westringia raleighii*, Lamiaceae, Bernard Boivin, Tasmania

Introduction

Joseph Robert Bernard Boivin (1949) reviewed *Westringia* Sm. (Lamiaceae) and described seven species and one variety as new, namely *W. amabilis* B.Boivin, *W. blakeana* B.Boivin, *W. longepedunculata* B.Boivin, *W. lucida* B.Boivin, *W. quaterna* B.Boivin, *W. raleighii* B.Boivin, *W. sericea* B.Boivin and *W. violacea* F.Muell. var. *bacchii* B.Boivin. Of these names, four, *W. amabilis*, *W. blakeana*, *W. lucida* and *W. sericea*, are currently accepted (Conn 1992, 1999; Bean and Forster 2007; Walsh and Stajsic 2007).

Westringia quaterna and *W. longepedunculata* have been placed in synonymy under *W. angustifolia* R.Br. (see Curtis 1967) and *W. cheelii* Maiden & Betche (see Stanley 1986), respectively. Curtis (1967) reduced *W. raleighii* to varietal status, as *W. brevifolia* Benth. var. *raleighii* (B.Boivin) W.M.Curtis. Willis (1967) transferred *W. violacea* var. *bacchii* B.Boivin to *W. glabra* R.Br. var. *bacchii* (B.Boivin) J.H.Willis. Subsequently, this variety has been placed in synonymy under *W. glabra* (Conn 1999; followed by Walsh and Stajsic 2007). The status of the two Tasmanian taxa, *W. quaterna* and *W. brevifolia* var. *raleighii*, is investigated here.

The Personal Collection of Joseph Robert Bernard Boivin (B.Boivin)

In his review of *Westringia* Boivin (1949) indicated that type material of *W. quaterna* and *W. brevifolia* var. *raleighii* was held in his personal herbarium (cited as 'B') with fragments lodged at both BRI (cited as 'Q') and MEL (cited as 'V'). (Herbarium acronyms follow Holgrem *et al*. (1999)). Locating the collections of his personal herbarium has been problematic. Significant holdings of B.Boivin's collections are held at DAO (Agriculture and Agri-Food Canada) (see Thiers 2008+). Type material of the Tasmanian taxa was not located at DAO (G. Mitrow, DAO, pers. comm.). Correspondence at DAO indicated that Boivin's collection may be at the Hunt Institute for Botanical Documentation (Carnegie Mellon University, Pittsburgh, USA), BM, K or MEL. The Hunt Institute does not hold a herbarium. However, it does hold significant archival material, however, and correspondence by B.Boivin indicating that specimens may be held at QFS (J.J. White, pers. comm.). Unfortunately, types could not be located at QFS (S. Payette, pers. comm.). Some of B.Boivin's types of *Westringia* are held at K and BM (J. Wege, pers. comm.) but these were not of the above Tasmanian taxa.

Based on discussions with Boivin in 1984, it can be concluded that his personal herbarium of species of *Westringia* is not extant (B.J. Conn, pers. comm.). Since the names of both species are based on collections by Raleigh A. Black, the origin of the material that was once held in Boivin's personal herbarium is unclear because Boivin was perhaps unaware of the history of these collections (B.J. Conn, pers. comm.). The 'fragments' at both BRI and MEL have been examined and are here regarded as effectively isotypes that are adequate to circumscribe these taxa.

Westringia quaterna and *W. raleighii*

While working on the *Flora of Tasmania Online* (Duretto 2009+) it became apparent that the application of the B.Boivin's taxonomic concepts of the Tasmanian taxa, *W. quaterna* and *W. raleighii* (= *W. brevifolia* var. *raleighii*), was unclear. This is especially important for the latter taxon as it is listed as 'Rare' under the Tasmanian *Threatened Species Protection Act 1995* (Anon. 1995).

Boivin (1949) distinguished *W. quaterna* from *W. angustifolia* by *W. quaterna* having leaves in whorls of four; he erroneously indicated that the latter had leaves in whorls of three when it in fact has leaves in whorls of two to four. Examination of the isotypes of *W. quaterna* confirm that it is conspecific with *W. angustifolia* as already concluded by Curtis (1967).

Westringia brevifolia var. *raleighii* was distinguished from the typical variety by having larger leaves and calyces though the dimensions usually given are not mutually exclusive (see Boivin 1949; Curtis 1967). The type of *W. raleighii* is a horticultural specimen grown in Sandy Bay (Hobart) and it is not known from where this material was sourced. The name has more recently been applied to large-leafed plants that occur in the south-west of the island of Tasmania and on Flinders Island (e.g., Anon. 2003). Based on the examination of specimens at the Tasmanian Herbarium

it was concluded that the variation in the length of the leaf and calyx within *W. brevifolia* is continuous, even in the south-west and on Flinders Island. The recognition of *W. brevifolia* var. *raleighii* is unjustified and is here regarded as a synonym of *W. brevifolia*.

TAXONOMY

Westringia angustifolia R.Br., *Prodr. Fl. Nov. Holland*. 501 (1810)

TYPE CITATION: '(D), v.v.' [Tasmania, R. Brown, 1804 (see Stearne 1960)].

Westringia quaterna B.Boivin, *Proc. Roy. Soc. Queensland* 60: 106 (1949). Type citation: 'TASMANIA; Raleigh A. Black 777–004 (5) A, Neika Stn., Jan. 1, 1946 (B [Boivin], TYPE; Q [BRI], V [MEL], fragments).' Type: Neika Station, Tasmania, *R.A.Black 777.004(5)A*, 19.Jan.1946 (holo: not located; iso: BRI-AQ340159, MEL622059, *R.A.Black 777.009* (1) MEL2299820 – see notes below; probable iso: *R.A.Black 777.006 (1) A*, BRI-AQ161510 – see notes below).

NOTES ON THE TYPE MATERIAL OF *W. QUATERNA*:

Ex herbarium Raleigh A. Black 777.009(1) [19.Jan.1946, from Neika, slope of Mount Wellington (MEL2299820)] was previously referred to as 'ex Herbarium Raleigh A. Black 777.004 (5)'. Notes on the folder (in Black's hand) indicate that he sent a duplicate of this material to Boivin as '777.004 (5) A' (N.G. Karunajeewa, 26.Oct.2006; B.J. Conn, pers. comm.). This is the material cited in the protologue (Boivin 1949), however, the collection date was inadvertently cited as '1 Jan 1946'. The 'fragment' material sent to BRI, as referred to in the protologue, is probably replicate material sent to C.T. White (BRI) as 'ex herbarium Raleigh A. Black 777.006 (1) A' (N.G.Karunajeewa, 26.Oct.2006; B.J. Conn, pers. comm.). The 'fragment' material at MEL (namely MEL622059) retained the 'ex herbarium Raleigh A. Black 777.004 (5) A,' whereas the other MEL material (MEL2299820) was re-numbered 'ex herbarium Raleigh A. Black 777.009 (1)' after Black learnt that Boivin intended to publish the new name *W. quaterna* (N.G. Karunajeewa, 26.Oct.2006; B.J. Conn, pers. comm.).

Westringia brevifolia Benth., *Labiat. Gen. Spec.* 459 (1834)

TYPE CITATION: 'in Terra Van Diemen. Gunn! (h.s. sp. comm. a cl. Lindley.)'

Westringia raleighii B.Boivin, *Proc. Roy. Soc. Queensland* 60: 108 (1949); *W. brevifolia* var. *raleighii* (B.Boivin) W.M.Curtis, *The Student's Flora of Tasmania* 3: 650 (1967), *syn. nov.* Type citation: 'TASMANIA: Raleigh A. Black, 777–001(2)A, Hobart, Sandy Bay, Feb. 14, 1946 (B [Boivin], TYPE; Q [BRI], V [MEL], fragments).' Type: Sandy Bay, Hobart, Tasmania, *R.A. Black* 777.001(2)A, 14.Feb.1946 (holo: not located; iso: BRI-AQ340412, MEL614464, *R.A. Black, 777.005 (1)* MEL2299818 – see notes below).

NOTES ON THE TYPE MATERIAL OF *W. RALEIGHII*:

Annotations in R.A. Black's hand on ex herbarium *Raleigh A. Black 777.005 (1)*

(MEL2299818) indicate that he sent a duplicate of this collection to Boivin at BRI as '*777.001 (2) A*' (N.G. Karunajeewa, 31.Oct.2006; B.J. Conn, pers. comm.). It is thought that some of the MEL material of ex herbarium *Raleigh A. Black 777.001 (2) A* was changed to *777.005 (1)* when Black realised that Boivin intended to publish the new name *W. raleighii* (N.G. Karunajeewa, 31.Oct.2006; B.J. Conn, pers. comm.).

Acknowledgements

I would like to thank: Gisèle Mitrow (DAO), Serge Payette (QFS), James J. White (Hunt Institute for Botanical Documentation, Carnegie Mellon University, USA), Juliet Wege (PERTH, while working as Australian Botanical Liaison Officer at K), and staff at BRI and MEL for looking for type material of *Westringia quaterna* and *W. raleighii*; an anonymous reviewer and especially Barry Conn (NSW) for comments on the manuscript and for making available information about Boivin's herbarium and Raleigh's collections; Pina Milne and Nimal Karunajeewa (both MEL) for assistance interpreting R.A. Black's type collections of *Westringia* referred to in this paper; and the directors of BRI and MEL for the loan of material.

References

Anonymous (1995) *Threatened Species Protection Act, No. 83* (Government Printer: Tasmania).

Anonymous (2003) *Threatened Flora of Tasmania Note Sheet:* Westringia brevifolia *var.* raleighii (Department of Primary Industries, Parks, Water & Environment: Hobart) http://www.dpiw.tas.gov.au/inter.nsf/Attachments/LJEM-76QVUK/$FILE/Westringia%20brevifolia%20var.%20raleighii.pdf

Bean AR, Forster PI (2007) Lamiaceae. In *Census of the Queensland Flora* (Eds PD Bostock, AE Holland) pp. 162–169. (Queensland Herbarium, Queensland Government Environmental Protection Agency: Brisbane)

Boivin B (1949) *Westringia*, and Australian genus of Labiatae. *Proceedings of the Royal Society of Queensland* **60(9)**, 99–111.

Conn BJ (1992) Lamiaceae. *Flora of New South Wales* **1**, 623–664.

Conn BJ (1999) Lamiaceae. *Flora of Victoria* **4**, 418–459.

Curtis WM (1967) Labiatae. *The Student's Flora of Tasmania* **3**, 542–557.

Duretto MF (Ed.) (2009+) *Flora of Tasmania Online*. (Tasmanian Herbarium, Tasmanian Museum & Art Gallery). www.tmag.tas.gov.au/floratasmania

Holmgren PK, Holmgren NH, Barnett L (1999) *Index Herbariorum. Part 1. The Herbaria of the World*, 8th edition. (New York Botanical Gardens: New York)

Stanley TD (1986) Lamiaceae. *Flora of South-eastern Queensland* **2**, 378–398.

Stearn WT (1960) An Introduction to Robert Brown's 'Prodromus Florae Novae Hollandiae'. In R Brown, *Prodromus Florae Novae Hollandiae et Insulae Van-Diemen*, fascimile edition. pp. v–lii, (H.R. Englemann (J. Cramer) and Wheldon & Wesley Ltd: Weinheim)

Thiers B (2008+) *Index Herbariorum: A global directory of public herbaria and associated staff.* (New York Botanical Garden's Virtual Herbarium: New York) http://sweetgum.nybg.org/ih/ (accessed November 2009)

Walsh NG, Stajsic V (2007) *A Census of the Vascular Plants of Victoria*, 8th Edition. (Royal Botanic Gardens Melbourne: Melbourne)

Willis JH (1967) Systematic notes on the indigenous Australian flora. *Muelleria* **1(3)**, 117–163.

NEW SPECIES OF *CRASPEDIA* (ASTERACEAE: GNAPHALIEAE) FROM TASMANIA AND DETERMINATION OF THE IDENTITY OF *C. MACROCEPHALA* HOOK.

Andrew C. Rozefelds, Alex M. Buchanan and Kerry A. Ford

Rozefelds A.C., Buchanan A.M., Ford K.A. 2011. New species of *Craspedia* (Asteraceae: Gnaphalieae) from Tasmania and determination of the identity of *C. macrocephala* Hook. *Kanunnah* 4: 93–116. ISSN 1832-536X. The identity of *Craspedia macrocephala* Hook. is determined and it is shown to be conspecific with *C. alpina* Backh. ex Hook.f., which, being the younger name, is therefore placed in synonymy. J.D.Hooker (1847, 1857) misapplied the name *C. macrocephala* and recognised two informal varieties. One of these varieties is described, herein, as a new species, *C. cynurica* Rozefelds & A.M.Buchanan, *sp. nov.*, and the other is *C. paludicola* J.Everett & Doust. *Craspedia cynurica* has a restricted distribution and should be assessed as 'Rare' under the Tasmanian *Threatened Species Protection Act 1995*. In addition, a distinctive, widespread species, *C. rosulata* Rozefelds & A.M.Buchanan, *sp. nov.*, which occurs in grassland communities in Tasmania, is also described. The phylogenetic and biogeographical relationships of these taxa are discussed and a key to the species currently known from Tasmania is provided.

Andrew C Rozefelds, Tasmanian Museum and Art Gallery,
GPO Box 1164, Hobart, Tasmania 7001; Present address: Queensland Museum,
GPO Box 3300, South Brisbane, Qld 4101,Australia.
Email: andrew.rozefelds@qm.qld.gov.au

Alex M Buchanan, Tasmanian Herbarium, Tasmanian Museum and Art Gallery,
Private Bag 4, Hobart, Tasmania 7001, Australia.

Kerry A Ford, Allan Herbarium, Landcare Research,
PO Box 40, Lincoln 7640, New Zealand.

KEY WORDS: *Craspedia alpina*, *Craspedia cynurica*, *Craspedia macrocephala*, *Craspedia rosulata*, *Craspedia*, Asteraceae, Gnaphalieae, Tasmania, Billy Buttons

Introduction

Craspedia G.Forst. (Asteraceae: Gnaphalieae) is a genus of 20+ species restricted to Australia and New Zealand. The early literature has not been critically re-examined and the taxonomic history of the genus, as it pertains to Tasmania, is briefly reviewed below.

Craspedia was described by G. Forster in *Florulae insularum australium prodromus*

(1786) based upon New Zealand material, with *C. uniflora* G.Forst. the sole species. Cassini (1818) recognised that *Richea glauca* Labill., described by Labillardière (1800) from Tasmania, should be transferred to *Craspedia*. His new combination, *C. richea* Cass., however, is illegitimate, since it was based on *R. glauca* whose epithet should have been adopted. In 1826, Sprengel successfully transferred this species to *Craspedia*, i.e. *C. glauca* (Labill.) Spreng.

The focus of this paper is on the application of the names *Craspedia macrocephala* Hook. and *C. alpina* Backh. ex Hook.f. Craspedia *macrocephala* was the second species described from Tasmania (W.J.Hooker 1835; Fig. 1), but its taxonomic status has become unclear and it was not included in the most recent census for the Tasmanian Flora (Buchanan 2009). It was recorded, by W.J.Hooker (1835), as occurring in the 'western mountains' of Tasmania and Mt Wellington. *Craspedia alpina* was described by J.D.Hooker (1847) from plants that were also collected from Mt Wellington.

J.D.Hooker (1847) described an additional species from Tasmania, *C. gracilis* Hook.f. from Middlesex Plains and recognised two new varieties of *C. richea*, viz. *C. richea* var. *glabrata* Hook.f. from the western mountains and *C. richea* var. *linearis* Hook.f. from Marlborough. In a later treatment, J.D.Hooker (1857) reduced *C. gracilis* to a variety, *C. richea* var. *gracilis* (Hook.f) Hook.f. Bentham (1867) treated *C. alpina* and *C. macrocephala* as varieties of *C. richea* while Rodway (1903) recognised only a single, broadly defined species, *C. richea*.

The last flora treatment of *Craspedia* in Tasmania was undertaken by Curtis (1963) who recognised that the species epithet, *C. richea*, used by Hooker (1847, 1857), Bentham (1867) and Rodway (1903) was incorrect and the correct combination was *C. glauca*. She recorded two species, *C. alpina* from alpine areas in the State, and *C. glauca*, which was interpreted as being a widespread and morphologically variable taxon.

Curtis (1963, p. 346) noted that among the 'variants which I am including under *C. glauca* included several further spp. and varieties [that] have been named'. She also recognised (Curtis 1963, p. 346) that while 'their characteristic representatives are very distinctive, they appear to be connected by intermediates and further field work is necessary to determine their status'. Curtis (1963) recognised four varieties within *C. glauca*, including the type variety *C. glauca* var. *glauca*. The three new combinations proposed by Curtis (1963), i.e. *C. glauca* var. *glabrata*, *C. glauca* var. *gracilis* and *C. glauca* var. *macrocephala*, were invalid as the place of valid publication, original references and dates of publication for the basionyms were not cited (see article 33.4, I.C.B.N., McNeill *et al.* 2006).

Only limited research has occurred on *Craspedia* in Tasmania over the last 40 years. Two species were added to the flora, through the studies of Joy Everett and colleagues: *C. coolaminica* J.Everett & Joy Thomps., a sub-alpine taxon, and *C. paludicola* J.Everett & Doust, a swamp-dwelling species (Everett and Doust 1992; Everett and Thompson 1992); both are also found on the Australian mainland. Their studies (Everett and Doust 1992; Everett and Thompson 1992), provided a finer resolution to species limits in the

genus for mainland Australia, but they did not examine the remaining Tasmanian species in detail.

Rozefelds (2002) described an endemic species, *C. preminghana* Rozefelds, from the West Coast of Tasmania and a new combination *C. glabrata* (Hook.f.) Rozefelds, which elevated *C. richea* var. *glabrata* Hook.f. to species rank. Gilfedder *et al.* (2003, p. 79), recorded an undescribed species, *C.* aff. *glauca* [= *C.* sp. Tunbridge *sensu* Ford *et al.* 2007] from the midlands of the state. In the most recent census of the Tasmanian flora Buchanan (2009) recorded six species of *Craspedia* from Tasmania.

The aims of this paper are therefore to clarify the application of the names *C. macrocephala* Hook. and *C. alpina* Backh. ex Hook.f. An undescribed Tasmanian entity, *C. sp.* (Tunbridge) is also formally described. The formal taxonomic treatments are provided together with descriptions of the morphology, distribution, ecology and conservation status of each species.

Methods and Materials

This revision was based upon a morphological study of herbarium specimens from the Tasmanian Herbarium (HO), together with comparative material of mainland species from the New South Wales Herbarium (NSW). Cibachromes of all relevant early Tasmanian collections held at Kew (K) were obtained. The study was also supported by field observations over a number of years, and the descriptions of taxa are augmented by notes on some, in vivo, characters, such as floret colour, leaf appearance and leaf colour.

Morphological variation in *Craspedia*

Craspedia is a difficult genus, taxonomically, mainly because the species are morphologically variable. Furthermore, the size of the plant and various organs (e.g. leaves, scape, bracts on the scape, and compound head) are phenotypically plastic. Plants growing in nutrient-poor, drying soils can be stunted with smaller organs while those grown under nutrient-rich, moist conditions have larger organs and are much more luxuriant in appearance (ACR, pers. obs.). Recent studies by Byars and Hoffmann (2009), using reciprocal transplants, showed that lowland plants of *C. lamicola* J.Everett & Joy Thomps. have larger, but fewer, leaves when compared to higher altitude plants and they concluded from their studies that this variation was environmentally determined.

For these reasons a 'population approach' that entails collecting multiple specimens, supported by field-based observations as noted by Curtis (1963), is recommended to understand species limits within the genus. An added complication, as Rozefelds (2002) pointed out, is that older herbarium collections often lack critical information such as floret colour, leaf appearance and colour in life, flowering times and habitat information.

Floret colour, in particular, is a useful character in identifying species but is not retained in dried herbarium specimens, and was invariably not recorded by the earlier collectors. Hence, confusion exists in the literature regarding the floret colour of some species. For example, J.D.Hooker (1857, p. 197) erroneously noted that all species of *Craspedia* have 'minute yellow flowers'. Curtis (1963)

indicated that *C. glauca* may have yellow, cream or white florets; her treatment is inconsistent, however, in that she does not indicate which of the varieties she recognised had cream florets. Curtis (1963) was unaware that *C. macrocephala* (*sensu* J.D.Hooker 1847) included forms that had either white or yellow florets. Floret colour is shown in this paper to be an extremely useful character in resolving the status of material referred to *C. macrocephala*.

The status of *Craspedia macrocephala* Hook. and *C. alpina* Backh. ex Hook.f.

W.J.Hooker (1835; Fig. 1) based his description of *Craspedia macrocephala* on plant specimens, collected by Robert Lawrence on 'the summits of the western mountains of Van Diemen's Land [= Tasmania]', and an illustration by William Curtis. The cultivated plant illustrated by Curtis was grown on from seed collected, by William Davidson, at an altitude of 3000 feet [c. 1000 m] from Mount Wellington.

W.J.Hooker (1835) attributes the delivery of the seed to a Dr Wilson, but a letter from Ronald Campbell Gunn to Hooker, dated 1 July 1833 (Burns and Skemp 1961, p. 30) records Captain Wilson as the courier: 'I now send you by the Brig *Camilla* of Greenock, Captn Wilson, bound to London, another case of specimens – wherein I have put duplicates of a considerable number of those I sent last year [1832], and have extended the No. of plants from 130 to 443.' And in a later paragraph (p. 31) he notes 'I have handed to Captn Wilson a box of seeds for Mr Murray (who was a personal friend of Capt Wilson (Burns and Skemp (1961, p. 30)), which I hope will reach safe'. The *Camilla* under the master/owner M. Wilson left Hobart on the 29 April 1833 for Sydney and left Sydney for London on the 10 June of the same year (Nicholson 1983). The manifest for the brig notes that it carried Col. [colonial] prod [produce] including wool and 2 boxes of plants.

Gunn notes, in a letter to W.J. Hooker in 1833 (Burns and Skemp 1961), that 'Mr Lawrence has sent you a large collection' and 'In his collection are some fine specimens of mountain plants'. Lawrence's family farm was 'Formosa', near Cressy, which borders the Western Tiers, and he undertook field trips into the mountains behind his property (Burns and Skemp 1961, p. 26). Gunn's next letter advises W.J. Hooker of the untimely death of Lawrence that same year (Burns and Skemp, 1961, p. 31). We can conclude, from the above letters, that herbarium specimens were sent to W.J. Hooker by both Gunn in 1832 and 1833 and Lawrence in 1833; and that the herbarium specimens are likely to have come from the western mountains [= Western Tiers].

Examination of the cibachromes supplied by Kew of *Craspedia* sheets from Tasmania, reveals only two specimens that were collected by Lawrence prior to 1835 (Fig. 2); i.e. before the formal publication of the description of *C. macrocephala*. Neither specimen has locality information, beyond V.D.L. [Van Diemen's Land = Tasmania], and only one of the specimens, labelled *Lawrence 133*, V.D.L, 1831, is consistent with the type description, and is therefore likely to have been used by W.J.Hooker (1835) in the description of this species (Fig. 2). It

Fig. 1. Reproduction of the original painting of *Craspedia macrocephala*.
From *Curtis's Botanical Magazine* 62, Tab. 3415 (1835)

Fig. 2. *Craspedia macrocephala*: lectotype (*Lawrence 133*, 1831, V.D.L. [Van Diemens Land], K), specimen above the label and to the right. *C. alpina*: lectotype (Gunn 1835/1842, 1 Mar. 1839, Mt Wellington, K), specimen in the bottom right hand corner.

can only be inferred, based on proximity between the label and specimens, as to which of the specimen/s on this sheet should be attributed to Lawrence (Fig. 2). All other specimens putatively labelled *C. macrocephala* at Kew either do not match W.J. Hooker's description of this species and/or were collected post-1835.

Craspedia alpina Backh. ex Hook.f. was described as occurring from 3000 feet (c. 1000 m) to the summit of Mount Wellington (J.D.Hooker 1847). A dated specimen is labelled '*Craspedia alpina* backh ms' collected by *Gunn 835*, 1 March 1839, and is designated, herein, as the lectotype for this species (Fig. 2). This is the only specimen at Kew from the type locality that was collected prior to the publication of this species in 1847.

The illustration of the habit and leaf shape of *C. macrocephala* in W.J.Hooker (1835) is sufficiently generalised that it could be based, on any one, of a number of species of *Craspedia*. The lush growth is typical of species of *Craspedia* grown in cultivation and atypical for plants collected from the field. Two characters illustrated in Curtis's painting, however, are taxonomically significant, that is, the indumentum and the colour of the florets, which are both useful in distinguishing species of *Craspedia* apart.

The description by W.J.Hooker (1835), of the leaves as of *C. macrocephala* as 'clothed with appressed rather silky hairs' excludes most species occurring in Tasmania. Only two species have somewhat similar indumentum characters, taxa currently called *C. alpina* and *C. coolaminica*. The indumentum in *C. alpina* typically has fine silky, arachose hairs on the upper and lower leaf surfaces, while in *C. coolaminica* the upper leaf surface is silvery with dense, long, fine, appressed hairs and the lower surface is grey-green with a sparser covering of fine appressed hairs. The colour illustration of *C. macrocephala* is of a white-floreted species (Fig. 1), which is consistent with *C. alpina* (Curtis 1963). *Craspedia coolaminica*, in contrast, has yellow florets (Everett and Thompson 1992).

Finally, *C. alpina* is the only species of *Craspedia* recorded from above 3000 feet (c. 1000 m) on Mount Wellington, based upon both Tasmanian Herbarium records and the personal observations of the authors. Gunn also notes on one of the herbarium sheets in Kew that *C. alpina* is 'common on all our mountains' and has been recorded from Mt Field, Ben Lomond and Central Highlands which would include Lawrence's 'western mountains', i.e. the Western Tiers.

All of the available evidence, which is drawn from the original description; the herbarium specimens in Kew; and our knowledge of the distribution of the species in Tasmania would indicate that *C. alpina* is conspecific with *C. macrocephala,* and as the latter is the older name it has priority. This is of particular significance because subsequent researchers, i.e. J.D.Hooker (1847, 1857), Bentham (1867) and Curtis (1963), have all treated *C. macrocephala* and *C. alpina* as distinctive at either the species or varietal level.

After examining the cibachromes of specimens in Kew that have been putatively assigned to *C. macrocephala*, it is also clearly evident that J.D.Hooker (1847, 1857) misidentified these specimens as they are inconsistent with W.J.Hooker's (1835) original description. W.J.Hooker (1835) proposed the common name 'Large

Headed Craspedia' for *C. macrocephala*. This common name may have influenced J.D.Hooker's (1847, 1857) thinking because in his various treatments he assigned the name *C. macrocephala* to those species of *Craspedia* with the largest heads.

J.D.Hooker (1847, 1857) also informally recognised two varieties of *C. macrocephala*, which he designated as var. α and var. β, and he was unaware that his species concept included forms that had either white or yellow florets. *Craspedia macrocephala* var. α (i.e. *Gunn 507*) was described as robust with narrowly linear, approaching glabrous (*pilosis glaberrimise*) leaves. It was recorded as occurring commonly in wet pastures and from ponds at George Town in northern Tasmania (Hooker 1857). Gunn similarly notes, on herbarium specimens of *C. macrocephala* (*sensu* J.D.Hooker) in Kew, that this form was common in wet marshes. Two herbarium sheets in Kew, *Lawrence 125*, 1832 and *Gunn 507*, which were collected from Tasmania but lack further detailed locality information, are consistent with this description and can be confidently identified as *C. paludicola* J.Everett & Doust. Everett and Doust (1992) note that *C. paludicola* typically occurs in swamps and it is the only species of *Craspedia,* based upon Tasmanian Herbarium records, which has been collected from swamps in the George Town area. *Craspedia paludicola* has yellow florets.

The second variety, *C. macrocephala* var. β, has sessile, foliose bracts with subauriculate bases on the scape. It was recorded from Eaglehawk Neck in southern Tasmania (Hooker 1857). Two sheets in Kew (i.e. *Gunn 1216, 1217*) can be referred to this taxon. These collections represent an undescribed species, *C. cynurica* Rozefelds & A.M.Buchanan, which is described below, and one of the distinguishing characters for this species is that it has white florets.

Species of *Craspedia* in Tasmania

In Tasmania, species of *Craspedia* occur from near sea level to alpine areas. Four previously described species are endemic to the State (*C. macrocephala, C. glabrata, C. glauca, C. preminghana*) while two (*C. paludicola* and *C. coolaminica*) also occur in mainland Australia. With the description of the two new endemics, herein (*C. rosulata* and *C. cynurica*), eight species are now recognised from Tasmania.

Craspedia often occur in grasslands and in association with open *Eucalyptus* forest, although some species also occur in open herbfields in swampy wet areas. *Craspedia* is excluded from more closed wet sclerophyll and rainforest communities and is absent from the infertile, acidic soils derived from the quartzose rocks of much of western Tasmania. It is, therefore, largely restricted to lowland eastern Tasmania, montane grassland, heath communities and to the narrow coastal grasslands of the West Coast.

Lowland coastal species, *Craspedia preminghana* and *C. cynurica* have a localised distribution. *Craspedia paludicola* occurs in north-eastern Tasmania while *C. glauca* is widespread throughout the eastern half of the State. *Craspedia rosulata* has a wide altitudinal range, occurring from near sea level to over 1000 m and

forms locally abundant populations. *Craspedia macrocephala*, *C. glabrata* and *C. coolaminica* are all subalpine-alpine species that appear to be largely restricted to the dolerite mountains of Tasmania.

Field studies show that different species flower at three broadly distinct times: spring (September-November), mid-summer (November-January) and late summer (January-March). Lowland species, *Craspedia cynurica* and lowland populations of *C. rosulata* flower in spring, while *C. glauca* and *C. paludicola* typically flower in mid-summer. Over its altitudinal range, *Craspedia rosulata* shows a staggered flowering from early to late spring presumably reflecting the altitude at which different populations are growing. At all localities, where it does occur, it is the earliest flowering species.

Montane populations of *Craspedia rosulata*, and *C. coolaminica*, occur together at the same locality, e.g. Liawenee, Central Highlands, but flower at different times, i.e. late spring and mid-summer respectively. Other montane species, e.g. *Craspedia macrocephala* and *C. glabrata* flower in late summer. This phenological diachronicity provides one mechanism for reproductive isolation within the genus. Other factors, such as floral or genetic incompatibility mechanisms, may also be responsible for the reproductive isolation of species (Breitwieser *et al.* 2010).

A phylogenetic analysis of relationships within *Craspedia* in Australia and New Zealand using analysis of ITS, ETS and *psbA-trnH* sequence data identified three lineages of *Craspedia* present in Australia (Ford *et al.* 2007) (Fig. 3). The two main Australian lineages, clades 2 and 3 (Fig. 3), are largely sympatric in Tasmania and south-east mainland Australia, have lowland and upland splits suggesting independent establishment into the subalpine and alpine zones (Ford *et al.* 2007). One of the Australian lineages, represented by clade 3, is sister to an endemic New Zealand lineage (not shown in detail here), which share a common ancestor in Australia (Ford *et al.* 2007).

The new species described in this paper are placed in Clade 2. *Craspedia macrocephala* is sister to a clade consisting of yellow-floreted alpine species mainly from Victoria and New South Wales (*C. lamicola* J.Everett & Joy Thomps., *C. maxgrayi* J.Everett & Joy Thomps., *C. costiniana* J.Everett & Joy Thomps., *C. aurantia* J.Everett & Joy Thomps.) and the white-floreted species, *C. cynurica,* from lowland Tasmania (Fig. 3). These species tend to be robust tall-scaped plants with large heads that are either white- (all Tasmanian species), yellow- or orange-flowered (all mainland Australian spp.). While floret colour is a useful character to differentiate species of *Craspedia,* the molecular study by Ford *et al.* (2007) indicates that white florets have evolved a number of times within the genus. *Craspedia rosulata* is sister to the mainland Australian species, *C. canens* J.Everett & Doust and *C. paludicola* that occur in south-eastern Australia, including Tasmania (Fig. 3).

Although further research is needed to elucidate the number of species of *Craspedia* in Tasmania a provisional key to the species currently known from the state is provided.

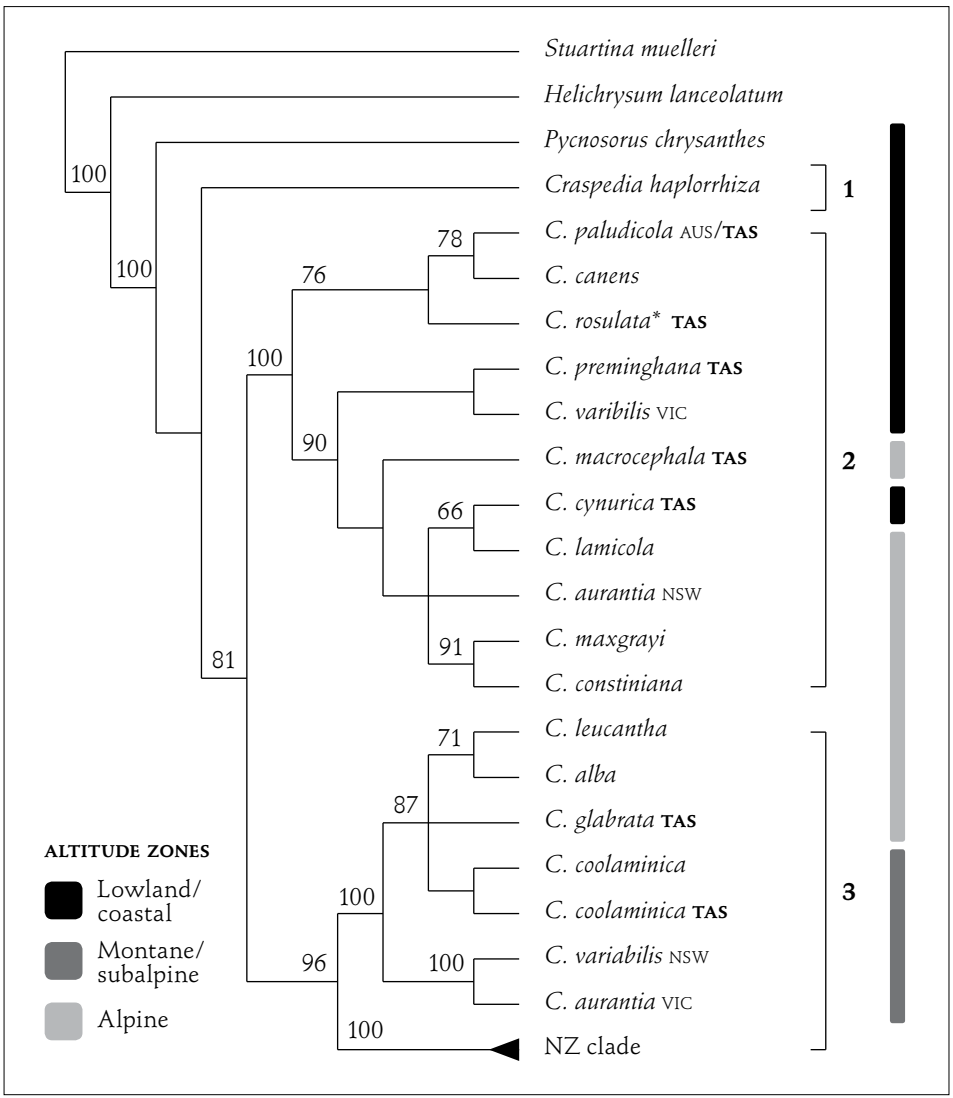

Fig. 3. Strict consensus tree, adapted from Ford *et al.* (2007), for combined ITS and ETS sequence data, with bootstrap values. Samples identified as either *Craspedia alpina*, *C. glauca* or informally as C. 'Tunbridge' in the original paper are updated to *C. macrocephala*, *C. cynurica* and *C. rosulata* respectively. **Craspedia rosulata* occupies an array of altitudinal zones from sea level to alpine.

Key to the species of *Craspedia* in Tasmania

1 Florets white **2**
Florets yellow **5**

2 Leaves with indumentum of scattered arachnose hairs which is more evident on the lower surface, lacking multiseptate hairs; roots appear naked or with few hairs ..... ***C. macrocephala***

Leave indumentum variable, glabrescent, or with scattered multiseptate hairs or a conspicuous indumentum of multiseptate hairs, arachnose hairs, if present, restricted to leaf margins; roots with a dense tomentose indumentum **3**

3 Small herb (8–18)–30 cm high; leaves narrowly oblanceolate to linear, glabrescent, with +/– arachnose hairs on leaf margins ..... ***C. glabrata***

Moderate to large sized herb, 15–60 cm high; leaves oblanceolate to spathulate or oblanceolate to elliptical, with multiseptate hairs **4**

4 Leaves broadly oblanceolate to spathulate, green in colour above; compound heads typically > 25 mm in diameter ..... ***C. preminghana***

Leaves oblanceolate to elliptical, pale green above; compound heads typically 15–28 mm in diameter ..... ***C. cynurica***

5 Leaves silvery green, with a dense indumentum of fine appressed hairs and +/- arachnose hairs on margins, secondary leaf veins conspicuous ..... ***C. coolaminica***

Leaves grey green or blackish green, with erect multiseptate hairs, sometimes with arachnose/multiseptate hairs on margins, secondary leaf veins inconspicuous **6**

6 Leaves narrow to oblanceolate, blackish-green, usually glabrous, sometimes with a few scattered hairs along leaf margins and main veins, swamp dwelling ..... ***C. paludicola***

Leaves obovate to oblanceolate to elliptical, grey green, with multiseptate hairs, growing in grasslands and open eucalypt forest **7**

7 Small to moderate sized herb, 20–35 cm high, leaves in basal rosette with typically an abrupt transition to the cauline leaves, usually with conspicuous indumentum of multiseptate hairs on both sides of leaves ..... ***C. rosulata***

Moderate to large sized herb, typically > 30 cm high, leaves not usually in a basal rosette but with a gradual transition to the cauline leaves, indumentum variable with scattered multiseptate hairs often on scape and leaf bases, with +/– arachnose or multiseptate hairs on leaf margins ..... ***C. glauca***

TAXONOMIC TREATMENT

1. *Craspedia macrocephala* Hook., *Bot. Mag.* Tab. 3415 (1835) (Fig. 1.); *C. richea* Cass. [nom illeg.] var. *macrocephala* (Hook.) Benth., *Fl. Austral.* 3: 580 (1867)

TYPE: V.D.L. [Van Diemen's Land = Tasmania], *Lawrence 133*, 1831 (lectotype, here designated, K *n.v.*; cibachrome HO). The two specimens at the bottom left-hand corner of the sheet have a similar colouration and appear to be associated with this label and the specimen above the label and to the right is selected as the lectotype (Fig. 2).

Craspedia alpina Backh. ex Hook.f., *Lond. J. Bot.* 6: 119 (1847); *C. richea* Cass. [nom. illeg.] var. *alpina* (Hook.f.) Benth., *Fl. Austral.* 3: 580 (1867). Type: Mt Wellington, from 3000 feet [c. 1000 m] to the top, *Gunn 835*, 1 Mar. 1839 (lectotype, here designated, K, *n.v.*; cibachrome HO) (Fig. 2).

Moderately robust *herb* with typically a single flowering scape, usually 20–30(–50) cm high, roots naked or with a few scattered, brown, hairs. *Leaves* stem-clasping, lacking a basal rosette, grading rapidly into bracts, narrowly oblanceolate-elliptical, 5–13(–20) cm long, 0.7–1.2(–2.0) cm wide, margins entire, arachnose, discolorous, pale green above, light green below (*in vivo*) due to the more continuous covering of arachnose hairs, flat to slightly concave in cross section (*in vivo*), mid-vein prominent; upper surface with a conspicuous indumentum of scattered arachnose hairs up to 3.0 mm long, and smaller, short, stalked, inconspicuous, glandular trichomes, c. 0.1 mm long; lower surface with a greater density of scattered arachnose hairs, up to 3.0 mm long, and smaller inconspicuous, short, stalked, glandular trichomes, c. 0.1 mm long, leaf bases greenish (*in vivo*); old leaf bases retained. *Bracts* 6–9, becoming progressively smaller distally; *basal bracts* leaf-like in size and shape, lanceolate up to 35 mm long and 8 mm wide, margins entire, covered in arachnose hairs; *middle bracts* ovate to lanceolate, up to 25 mm long and 5 mm wide, margins entire, stem-clasping with basal margins sometimes obscuring the scape, adaxial surface often lacking arachnose hairs; *distal bracts*, lanceolate-linear, up to 10 mm long and 3 mm wide, margins entire, wrapping halfway around stem but not obscuring scape, adaxial surface often lacking arachnose hairs. *Inflorescence* a single globose, terminal compound, homogamous head; *scape* pale grey-green (*in vivo*) grading to purplish depending on covering of hairs, 1.2–1.5 mm thick, surface slightly ridged, with long arachnose hairs up to c. 4 mm long, and short-stalked glandular trichomes; *compound head* spherical, c. 20–26 mm diam., with up to c. 70–100 partial heads; *partial heads* near base of compound head with 5–6 florets; *main bract* of the partial involucres, ovate-triangular, covered in arachnose hairs, with a green, ovate-triangular, glandular and herbaceous stereome with light golden-brown membranous margins. *Corolla* creamy white. *Anthers* yellow, tailed. *Achenes* 2.0–3.0 mm long, with scattered short, stalked, glandular trichomes covered with a dense indumentum of fine silky hairs; pappus of 12–16 colourless plumose bristles, 4.0–5.5 mm long.

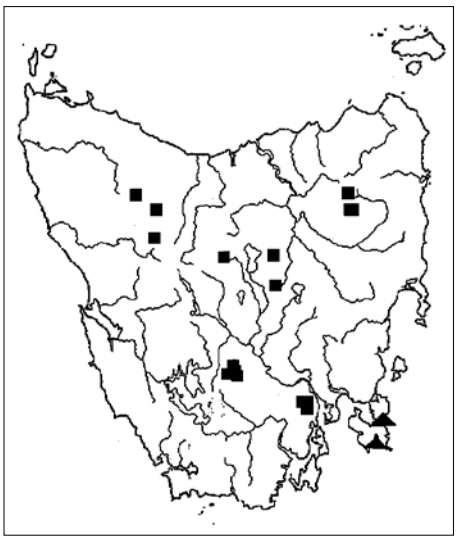

Fig. 4. Distribution of *Craspedia macrocephala* (squares) and *C. cynurica* (triangles) based primarily on Tasmanian Herbarium (HO) records.

DISTRIBUTION: *Craspedia macrocephala* is endemic to Tasmania and occurs on the dolerite mountains usually above 1000 m. It is recorded from Mt Wellington, Mt Field, the Central Highlands, as well as Ben Lomond and Mt Barrow in north-eastern Tasmania (Fig. 4).

HABITAT: *Craspedia macrocephala* occurs in the subalpine to alpine zone in open sedgeland and heath communities.

FLOWERING TIME: January–March

VERNACULAR NAME: Alpine Billy Button

CHROMOSOME COUNTS: Dawson *et al.* (1999) give a chromosome count for *C. alpina*, based upon samples from Ben Lomond in northern Tasmania, of $2n = 10x_2 (= 110)$.

ADDITIONAL MATERIAL EXAMINED:

TASMANIA: BEN LOMOND: Ben Nevis, 1350 m, *P.A.Collier 1286,* 18 Mar. 1986 (HO); Between Sprent Plains and Borrowdale Creek, Ben Lomond, *D.I.Morris 8327*, 25 Jan. 1983 (HO); Near Denison Crag Tarn, Ben Lomond, *M.G.Noble 28072* (HO); Land of Little Sticks, *M.G.Noble 28207* (HO); Ben Lomond National Park, along cross-country track E of ski village, 1475 m, *R.J.Bayer 6*, 17 Jan. 2000 (HO); Between Hamilton Crags & Tarns, Ben Lomond National Park, *K.A.Ford 18/03*, 11 Jan. 2003 (HO). **CENTRAL HIGHLANDS:** Vale of Belvoir, S of cattlemen's hut, 890 m, *M.Visoiu 589*, 18 Feb. 2009 (HO); Mt Inglis, 1160 m, *A.Moscal 1952*, 26 Feb. 1983 (HO, NSW); Pine Lake, *P.A.Collier 360* (HO); Lake Botsford, *A.C.Rozefelds s.n.*, 23 Jan. 2000 (CHR, HO, NSW); Road between Woods and Arthur Lakes, *A.Brown 260*, 2 Feb. 1981 (HO). **MT FIELD:** Mt Field National Park, 1200 m, *W.M.Curtis,* 23 Jan. 1944 (HO); Mt Mawson, Mt Field National Park, *N.T.Burbidge 3300,* 23 Jan. 1949 (HO); Rodway Range, near Mt Mawson, Mt Field, *J.M.B.Smith 427*, 15 Jan. 1978 (HO); Boronia Moor, Mt Field National Park, *W.M.Curtis,* 9 Jan. 1948 (HO); Florentine Peak, summit, *A.M.Buchanan 11893,* 2 Feb. 1991 (HO). **MT WELLINGTON:** Mt Wellington, *E.Atkinson 56*, 8 Jan. 1931 (HO); Mt Wellington, *W.M.Curtis*, 23 Jan. 1945 (HO); Mt Wellington, *K.A.Ford 20/03*, 13 Jan. 2003 (HO); Mt Wellington, *L.Rodway 378*, Feb. 1904 (HO); S side of Thark Ridge, *A.C.Rozefelds 1631*, 6 Feb. 2000 (CHR, HO, NSW); Dead Island, *A.C.Rozefelds 1632 & 1633,* 6 Feb. 2000 (HO); Plateau, *J.Somerville,* 15 Jan. 1959 (HO), moor near ski hut, *J.Somerville,* 1 Feb. 1947 (HO); The Springs, *J.H.Wilson,* 6

Dec. 1942 (HO); Headwaters of Mountain River, *A.E.Orchard 5205*, 13 Jan. 1981 (AK, CANB, CHR, HO, MEL, NSW, WELT).

REMARKS: *Craspedia macrocephala* can be distinguished from all other white-floreted Tasmanian species by its conspicuous indumentum of arachnose hairs. It is most similar in appearance to *C. alba* J.Everett & Joy Thomps. (from alpine areas of New South Wales and Victoria) but can be recognised by its longer, narrowly oblanceolate to elliptical leaves and larger heads. *Craspedia macrocephala* is a variable species showing some regional variation and further research is required to determine if this variation warrants taxonomic recognition.

CONSERVATION STATUS: *Craspedia macrocephala* is often protected from grazing by surrounding vegetation (ACR pers. obs). So while the species is not considered threatened, ongoing and selective grazing pressure, as noted by Bridle and Kirkpatrick (2001), is thought to be impacting negatively upon the abundance of this species in alpine communities.

2. **Craspedia cynurica** Rozefelds & A.M.Buchanan, **species nova**

A *Craspedia alba* J.Everett et Joy Thomps., *C. macrocephala* Hook., *C. leucantha* F.Muell., *C. glabrata* (Hook.f.) Rozefelds et *C. preminghana* Rozefelds combinatione characterorum sequentium distinguitur: folia oblanceolata-elliptica, rosulata, in bracteas scapi gradatim transientia folia oblanceolata-elliptica, viridula, (4–)13–20 cm longa, (1–)2–3.4 cm lata, cum pilis longis multiseptatis.

Differs from *Craspedia alba* J.Everett & Joy Thomps., *C. macrocephala* Hook., *C. leucantha* F.Muell., *C. glabrata* (Hook.f.) Rozefelds and *C. preminghana* Rozefelds in the following set of characters: leaves oblanceolate-elliptical grading into bracts, viridulus, (4–)13–20 cm long, (1–)2–3.4 cm wide with long multiseptate hairs

TYPE: Tessellated Pavement, Pirates Bay, Tasmania, *A.C.Rozefelds 3190 & J.Wood,* 3 Oct. 2010 (holotype HO; isotype CANB, CHR) (Fig. 5).

Craspedia macrocephala var. β Hook.f., *Lond. J. Bot.* 6: 118 (1847). Specimens cited: Eaglehawk Neck, *Gunn 1216 & 1217,* Oct. 1840 (K *n.v.*; cibachrome HO).

Robust to moderate sized *herb* with usually 1, rarely 2–3, flowering scapes, up to 30 cm high, roots with a tomentose covering of fine brown hairs. *Leaves* stem clasping grading into bracts, oblanceolate to elliptical, (4–)13–20 cm long, (1–)2–3.4 cm wide, margins entire +/– undulose, hispidulous, discolorous, pale green above, light green below, and flat to slighty concave or convex in cross section (*in vivo*), mid vein prominent and two lateral veins extending to the apex; upper surface with scattered hairs consisting of multi-multiseptate hairs to 0.4 mm long, and short, stalked, glandular trichomes, c. 0.1 mm long, with a slight rim of multiseptate and scattered arachnose hairs along the margins, lower surface with a greater density of scattered hairs, consisting of multiseptate

Fig. 5. *Craspedia cynurica:* holotype (*A.C.Rozefelds 3190 & J.Wood*; HO).

hairs to 0.5 mm long, and short, stalked, glandular trichomes, c. 0.1 mm long, particularly along margins and veins; leaf bases green (*in vivo*), old leaf bases retained. *Bracts* 3–8, becoming progressively smaller distally; *basal bracts* leaf-like in size and shape, up to 100 mm long and 15 mm wide, margins entire +/– undulose, wrapping halfway around scape; *middle bracts* broadly ovate to lanceolate, up to 30 mm long and 10 mm wide, margins entire, basal margins wrapping halfway around scape; *distal bracts*, lanceolate-linear, 5–10 mm long and 2–4 mm wide, margins entire, basal margins wrapping partially around scape. *Inflorescence* a single, globose, terminal, compound, homogamous head; *scape* greenish-grey (in vivo), 2–3 mm thick, slightly ridged, pilose with multiseptate hairs to c. 1 mm long, and short, stalked glandular trichomes; *compound head* spherical, c. 15–28 mm diam. with up to c. 60–120 partial heads; *partial heads* near base of compound head with 5–7 florets; *main bract* of the partial involucres, ovate-triangular, sparsely pilose, with a green, ovate, glandular and herbaceous stereome with dark brown membranous margins. *Corolla* creamy white. *Anthers* yellow, tailed. *Achenes* 2.0–2.8 mm long with small scattered glandular trichomes covered with a dense indumentum of fine silky hairs; pappus of 12–16 colourless plumose bristles, 4–5.5 mm long.

DISTRIBUTION: *Craspedia cynurica* has been collected from two areas in the Tasman and Forestier Peninsulas: the Pirates Bay area and near Remarkable Cave (ACR pers. obs.; Figs 4, 6). Field surveys

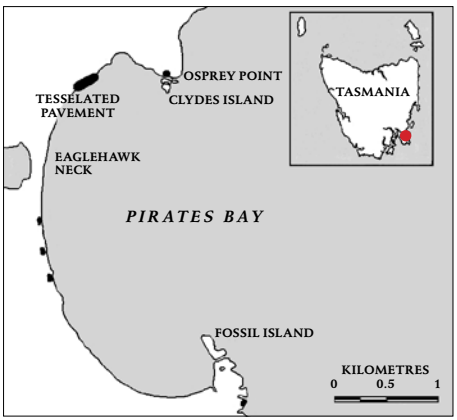

Fig. 6. Distribution of *Craspedia cynurica* based upon field observations in the Pirates Bay area (Forestier & Tasman Peninsulas).

show that it also occurs frequently on exposed sea cliffs from the Devils Kitchen to Waterfall Bluff (Fig. 4) and it was observed, at a distance, on the south side of Cape Hauy (ACR pers. obs., Oct. 2010). At Pirates Bay the species occurs at the Tessellated Pavement (State Reserve 1740), and small populations also occur at the southern side of Osprey Point on the northern side of the Bay and along the southern side of the Bay (Fig. 6).

The earliest known material (*Gunn 1216, 1217; Clemes 3, Somerville* HO52697) is recorded as having being collected from Eaglehawk Neck. In the strict geographic sense, Eaglehawk Neck is a narrow neck or sandy isthmus connecting the Forestier and Tasman Peninsulas. Most of the herbarium specimens were collected on cliffs at the Tessellated Pavement, one kilometre to the north of Eaglehawk Neck, and it seems likely that the early specimens were also collected from this locality.

HABITAT: *Craspedia cynurica* is known only from the skeletal soils of shelves and crevices in the coastal cliffs. These soils are derived from sedimentary mudstones or siltstones of the Malbina Formation at Pirates Bay or on stabilised dunes on sandstone at Remarkable Cave (Banks *et al*. 1986) and the unconfirmed record at Cape Hauy is on dolerite. Associated coastal plant species in the Pirates Bay area include the herbs: *Carpobrotus rossii*, *Pelargonium australe*, *Senecio pinnatifolius, Tetragonia implexicoma, Xerochrysum papillosum;* tussock grasses: *Austrostipa stipoides* and *Austrofestuca littoralis*; *Dianella tasmanica* and occasional shrubs including *Correa alba, Bedfordia salicina, Goodenia ovata*, *Leucopogon parviflorus*, *Olearia ramulosa and Ozothamnus reticulatus.* Trees are largely restricted to the cliff-tops and this surrounding forest is dominated by *Eucalyptus obliqua.*

FLOWERING TIME: September–November

DERIVATION: The species epithet *'cynurica'* is from the Greek *cynuro*, sea cliffs, and means belonging to sea cliffs.

VERNACULAR NAME (PROPOSED): Tasman Peninsula Billy Button

ADDITIONAL MATERIAL EXAMINED:

TASMANIA: EAST COAST: Forestier Peninsula. *W.H.Clemes,* 3 Sep. 1932 (HO); Eaglehawk Neck, *R.C.Gunn 1216, 1217,* Oct. 1840 (K *n.v.*, cibachrome HO); Tessellated Pavement, *A.Moscal 3865*, 4 Nov. 1983 (HO); Eaglehawk Neck, *J.Somerville,* Nov. 1945 (HO); Tessellated Pavement, *H.Wapstra & A.Wapstra,* 21 Nov. 2005 (HO); S of isthmus, Pirates Bay, Tasman Peninsula, A.C.Rozefelds & J.Wood, 3 Oct. 2010 (HO).

REMARKS: *Craspedia cynurica* can be distinguished from *C. macrocephala* (Tasmania) and *C. alba* (mainland Australia) by the greenish-grey foliage and the multiseptate hairs on the leaves and scape. *Craspedia cynurica* differs from *Craspedia leucantha* F.Muell. (New South Wales) in having conspicuous multiseptate hairs on leaves and scape and a larger compound head (J.Everett & Doust 1992). It can be distinguished from *C. glabrata* by its oblanceolate leaves, multiseptate hairs on leaves and scape, and also by its much larger compound head. *Craspedia cynurica* can be distinguished from *C. preminghana* by the narrower oblanceolate, smaller leaves and also leaf colour that is typically a pale green colour and smaller head. It shares with *C. preminghana* the transition from leaves to bracts, and the presence of multiseptate hairs.

The species is phenotypically plastic as shown by the variation in appearance of plants growing under different microhabitat conditions around Pirates Bay. Ex situ plants grown from seed at the Royal Tasmanian Botanical Gardens from Remarkable Cave and the Tessellated Pavement appear to remain distinct (James Wood 2010, pers. comm.) which implies some degree of reproductive isolation is occurring (Fig. 7).

The coastal plant community containing *C. cynurica* is distinct from that of the surrounding forest which is wet sclerophyll vegetation consisting of *Eucalyptus obliqua* woodland and a dense understorey of mesic shrubs. *Craspedia cynurica* is a 'narrow' endemic and it has probably evolved *in situ* being effectively isolated from related species by the barrier imposed by the surrounding wet sclerophyll vegetation.

Fig. 7. *Craspedia cynurica.* Variation in the habit of the species under varying environmental conditions. **A**. Plant growing in moist, sheltered conditions at Tessellated Pavement; **B.** Young shoots of *C. cynurica* growing in exposed condition on skeletal soils, derived from sedimentary rocks, at Tessellated Pavement; **C.** Plant growing on skeletal, drying soils on exposed rock on southern side of Pirates Bay.

Photographs by ACR

The Tasman Peninsula is recognised as a centre of local endemism in Tasmania (Kirkpatrick and Brown 1984).

CONSERVATION STATUS: Only a few specimens are represented in herbarium collections and ACR has undertaken fieldwork to assess the extent and number of populations in the Pirates Bay area (Fig. 6). The plants have been collected, or sighted occurring around Pirates Bay and on nearby sea cliffs that, in some cases, can only be viewed from the sea. The number of plants in the population is therefore difficult to ascertain and it is thought that in the 2009 flowering season, the entire population consisted of fewer than 2500 plants. Additional plants are known from near Remarkable Cave. The species therefore requires listing under the Australian *Environmental Protection and Biodiversity Conservation Act 1999* as vulnerable because, its population is limited with fewer than 2500 individual plants, and it has a restricted geographical distribution due to the limited area of suitable habitat.

Under the guidelines for the listing of species under the Tasmanian *Threatened Species Protection Act 1995* (Anon. 1995) the species should probably be listed as 'Rare' because the total population is estimated at fewer than 2500 individuals and the plants occur as localised sub-populations within an area of occupation less than 50 hectares. A higher listing seems unwarranted because most of the populations are reserved, and the impacts of human activities are therefore moderated.

3. **Craspedia rosulata** Rozefelds & A.M. Buchanan, **species nova**

A *C. canens* J.Everett et Doust et *C. paludicola* J.Everett et Doust combinatione characterorum sequentium distinguitur: folia in rosula basali, obovata-spathulata, pallide viridia, 1.5–7.0 cm longa, 0.5–2.0 cm lata, cum pilis longis multiseptatis, in bracteas scapi abrupte transientia; radices tenuiter tuberosae.

Differs from *C. canens* J.Everett & Doust and *C. paludicola* J.Everett & Doust in that the leaves are in a basal rosette, obovate-spathulate, pale green, 1.5–7 cm long, 0.5–2.0 cm wide, with long multiseptate hairs; slender tuberose roots.

TYPE: Tasmania, Midlands, Campbell Town Golf Course, *A.C.Rozefelds 2081*, 11 Oct. 2001 (holotype HO) (Fig. 8).

Craspedia sp. (Tunbridge), Ford *et al.*, *Taxon* 56: 3 (2007). Specimen cited: Campbell Town Golf Course, *K.A.Ford 27/03 & A.M.Purves* (CHR).

Moderate to small-sized erect *herb* and with usually 1, rarely 2–3, flowering scapes, 8–21 cm high; roots dark brown to black, thickened, and usually expanded for part of their length into slender tuber-like swellings 1–2 cm long and 0.2–0.3 cm thick, sparsely to densely tomentose covered with fine brown hairs. *Leaves* in a basal rosette and, typically, with an abrupt transition to the smaller cauline leaves, leaves somewhat flat to u-shaped in cross section, obovate, elliptical to spathulate, 1.5–7.0 (–10) cm long, 0.5–2.0 cm wide, margins entire, hirsute, light green, usually

Fig. 8. *Craspedia rosulata*: holotype (*A.C.Rozefelds 2081*; HO); illustrating the characteristic basal rosette of leaves, sharply differentiated bracts and enlarged roots.

mid-vein prominent; upper surface with abundant multiseptate hairs to 1 mm long, particularly along leaf margins and veins, and abundant short, stalked, glandular trichomes, and rare arachnose hairs on the leaf margins; lower surface with abundant, multiseptate hairs and short, stalked, glandular trichomes; leaf bases retained. *Bracts* 6–11, becoming progressively smaller distally; *basal bracts* narrowly elliptical, up to 30 mm long and 6 mm wide, margins entire +/– undulose, basal margins wrapping halfway around the scape; *distal bracts*, lanceolate to subulate, up to 12 mm long and 3 mm wide, margins entire, not stem-clasping. *Inflorescence* a single, globular, terminal, compound, homogamous head; *scape* green-purplish, slightly ridged, with a few, long, arachnose hairs and short, stalked, glandular trichomes; compound head spherical, 15–18 mm diam., with 45–60 partial heads; *partial heads* with 4–6 florets; *main bract* of the partial involucres, ovate-triangular, with an ovate-triangular glandular and herbaceous stereome with prominent dark brown membranous margins. *Corolla* bright yellow. *Anthers* yellow, due to pollen. *Achenes* 1.7–1.8 mm long covered with a dense indumentum of fine silky hairs; pappus of 12–15 colourless plumose bristles 2.5–2.8 mm long.

DISTRIBUTION: The species, although geographically widespread in Tasmania, has a somewhat restricted distribution due to habitat requirements. It is locally common in the Midlands, i.e., Campbell Town – Tunbridge area and at St Patricks Plain on the Central Highlands. Attempts to find and recollect the species from the north east of the State have been unsuccessful and its distribution on the West Coast of Tasmania is inadequately known because of the relatively few collections from this area (Fig. 9).

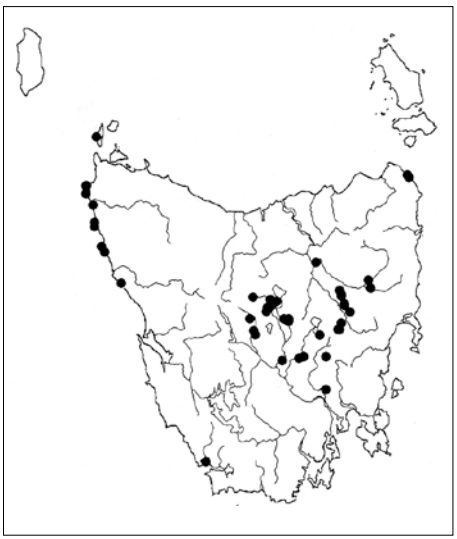

Fig. 9. Distribution of *Craspedia rosulata* based upon Tasmanian Herbarium (HO) records.

HABITAT: It is known to occur in a range of plant communities including *Themeda triandra* grasslands, *Poa labillardierei* grasslands, heathy grassland dominated by *Richea acerosa*, *Grevillea australis* and *Poa*, open *Eucalyptus pauciflora* forest and open sedgey herbfields.

FLOWERING TIME: September–November

DERIVATION: The epithet 'rosulata' refers to the basal rosette of leaves that is typical feature of this species and a useful character in identifying the species in the field.

VERNACULAR NAME (PROPOSED): Tasmanian Grassland Billy Button

Fig. 10. *Craspedia rosulata* in flower at the Campbell Town Golf Course.
Photographers Hans and Annie Wapstra

ADDITIONAL MATERIAL EXAMINED:
TASMANIA: NORTH EAST: Coast at Poole, *A.C.Rozefelds 943,* 25 Oct. 1998 (HO); 1 km west of Cape Naturaliste, *A.Moscal 3417,* 12 Oct. 1983 (HO). **East Coast**: Rajah Rock, Fingal Valley, *K.Williams,* 2 Nov. 1988 (HO). **MIDLANDS**: South Esk River, *C.Stuart 9,* Dec. [year not recorded] (HO); Near Conara, *A.C.Rozefelds 907,* 22 Oct. 1998 (HO); N of Campbell Town, *A.C.Rozefelds 2080,* 11 Oct. 2001 (HO); Campbell Town Cemetery, *M.Visoiu 359 & J.Wood*, 13 Nov. 2007 (HO); Campbell Town Golf Course, *R.Nicholson,* 28 Oct. 1999 (HO); Chiswick, Ross, *L.Gilfedder,* 21 Oct. 1999 (HO); White Lagoon near Tunbridge, *A.Moscal 8708,* 6 Nov 1984 (HO); Tunbridge, Township Lagoon, *A.C.Rozefelds 2075*, 11 Oct. 2001 (HO); Tunbridge Lagoon, *K.Bridle,* 28 Oct. 1999 (HO); Jericho Cemetery, *A.M.Buchanan 13504*, 31 Oct. 1993 (HO); Pontville Army Grounds, *M.Wapstra 423* (HO); Rifle Range, Pontville, *A.J.North,* 29 Oct. 1996 (HO). **CENTRAL PLATEAU:** Lake Ada, *W.M.Curtis,* 20 Jan. 1985 (HO); Liawenee Moor, *K.Bridle,* 5 Nov. 1999 (HO); Liawenee Moor, *K.Bridle,* 27 Nov. 1996 (HO); Great Lake, *S.J.Jarman,* 19 Nov. 1971 (HO); Liawenee Moor, *A.J.North,* 11 Jan. 1997 (HO); Stone Hut Plains, *K.Bridle,* 27 Nov. 1996 (HO); Stone Hut, near SW corner of Great Lake, *J.Yates,* 7 Jan. 1988 (HO); St Patricks Plains, *K.Bridle,* 5 Nov. 1999 (HO); St Patricks Plains, *A.C.Rozefelds 1004* (HO); Lake Highway, St Patricks Plains, *A.M.Gray 1179* (HO); Gowan Brae Road, N of Bronte Park, *P.Collier 1043*, 24 Nov. 1985 (HO); Along Marlborough Highway, *A.C.Rozefelds 2245* (HO); Lyell Highway corner Bronte Lagoon Road, *A.C.Rozefelds 2226* (HO); Bronte Lagoon, close to inlet, *A.J.North,* 23 Nov. 2004 (HO);

Old Mans Head, *S.J.Jarman,* 19 Nov. 1971 (HO); Bothwell, *L.Gilfedder 50* (HO); Clyde River Falls, *L.Gilfedder 44* (HO); Ousedale, Ouse River, *L.Gilfedder,* 26 Oct. 1994 (HO). **NORTH WEST:** Near homestead, Hunter Island, *E.Lazarus,* 14 Oct. 2001 (HO); Nettley Bay, *H.Wapstra & A.Wapstra,* 31 Oct. 2006 (HO); West Point, *R.B.Schahinger,* 4 Dec. 2001 (HO); Bluff Hill Point, *S.J.Jarman,* 22 Nov. 2001 (HO). **WEST COAST:** Tiger Flat, *R.B.Schahinger,* 3 Dec. 2001 (HO); Possum Banks, *R.B.Schahinger,* 2 Dec. 2001 (HO); 1.5 km N of Gannet Point, *R.B.Schahinger,* 2 Dec. 2001 (HO); Johnsons Banks, *R.B.Schahinger,* 30 Nov. 2001 (HO); c. 1 km NE of Lagoon River, *R.B.Schahinger,* 1 Dec. 2001 (HO); 3.8 km N–NW of Granville Harbour, *R.B.Schahinger,* 27 Nov. 2008 (HO). **SOUTH WEST**: Wallaby Bay, Port Davey, *A.M.Buchanan 9325*, 8 Jan. 1987 (HO).

REMARKS: *Craspedia* rosulata can be easily distinguished from other species in Tasmania by the distinctive basal rosette of leaves, conspicuous indumentum of multiseptate hairs on both sides of the leaf, its early flowering period (September–October), and the remarkably uniform appearance, size and height of plants growing within the same population (Fig. 10).This is, however, a variable species and more research is required to determine if this variation warrants taxonomic recognition.

CONSERVATION STATUS: This species has been seen by ACR in flower at St Patricks Plains and at Campbell Town and Tunbridge. In some years, particularly at St Patricks Plains and Campbell Town, it is locally abundant with thousands of plants but all populations are geographically restricted. As the species is largely restricted to grasslands it is therefore subject to anthropomorphic impacts such as grazing and farming. Careful and ongoing management of the Campbell Town Golf Course and cemetery and nearby pastures is required to allow for the survival of the species at these sites.

Acknowledgements

We are grateful for the support of Robert Pennicott and staff of Tasman Island Cruises who provided the opportunity to survey the otherwise inaccessible sea cliffs of the Tasman Peninsula for *Craspedia cynurica*. We thank Hans and Annie Wapstra for providing photos of *C. rosulata* and for also pointing out that the species of *Craspedia* at Tessellated Pavement had white florets. James Wood provided advice on plants of *C. cynurica* in cultivation at the Royal Tasmanian Botanical Gardens. We wish to thank Alex Chapman (ABLO) for obtaining cibachromes from K of Tasmanian type material. Alex George corrected, and significantly improved, the Latin diagnoses and provided advice on a suitable epithet for one of the species. NSW loaned comparative material of mainland species for study and Joy Everett (NSW) has provided advice on taxonomic problems within the genus and also recognised the distinctiveness of *C. rosulata*. Comments

from two anonymous referees and Marco Duretto have significantly improved the paper. Tony Marshall (State Library of Tasmania) provided information and advice on historical records. ACR thanks Belinda Bauer and Anthony Curtis for assistance with figures for this paper. We also acknowledge the Bush Blitz Tactical Taxonomic Grant received from the Australian Biological Resources Survey for this research.

References

Anonymous (1995) *Threatened Species Protection Act, No. 83* (Government Printer: Tasmania)

Banks MR, Colhoun EA, Ford RJ, Williams E (1986) A reconnaissance geology and geology of Tasman Peninsula. In SJ Smith (ed.) *Tasman Peninsula, Is history enough? Past, present and future use of the resources of Tasman Peninsula*, pp. 7–23. (Royal Society of Tasmania: Hobart)

Bentham G (1867) *Flora Australiensis. A description of the plants of the Australian Territory* vol. 3. Myrtaceae to Compositae. (Reeve: London)

Breitwieser I, Ford KA, Smissen RD (2010) A test for reproductive isolation among three sympatric putative species of *Craspedia* (Asteraceae: Gnaphalieae) at Mt Arthur in New Zealand. *New Zealand Journal of Botany* **48(2)**, 75-81.

Bridle KL, Kirkpatrick JB (2001) Impacts of grazing by vertebrate herbivores on the flower stem production of tall alpine herbs, Eastern Central Tablelands, Tasmania. *Australian Journal of Botany* **49**, 459–470.

Buchanan AM (2009) 'The Census of the Vascular Plants of Tasmania and Index to the Student's Flora of Tasmania.' http://www.tmag.tas.gov.au/file.aspx?id=4439

Burns TE, Skemp JR (1961) 'Van Diemen's Land Correspondents.' (Queen Victoria Museum: Launceston)

Byars SG, Hoffmann AA (2009) Lack of strong local adaptation in the alpine forb *Craspedia lamicola* in south eastern Australia. *International Journal of Plant Sciences* **170**: 906–917.

Cassini AHG de (1818) *Craspédie*, Craspedia. In *Dictionnaire des sciences naturelles, dans lequel on traite méthodiquement des différens êtres de la nature*. 2nd Edition. (F.G. Levrault: Strasbourg; Le Normant: Paris)

Curtis WM (1963) *The Student's Flora of Tasmania, Part 2*. (Government Printer: Hobart)

Dawson MI, Breitwieser I, Ward JM (1999) Chromosome numbers in *Craspedia*, *Ewartia* and *Pterygopappus* (Compositae: Gnaphalieae). *Australian Systematic Botany* **12(5)**, 671–674.

Everett J, Doust ANL (1992) Four new Australian species of *Craspedia sens. strict*. (Asteraceae: Gnaphalieae). *Telopea* **5**, 35–38.

Everett J, Thompson J (1992) New alpine and subalpine species in *Craspedia sens. strict*. (Asteraceae: Gnaphalieae). *Telopea* **5**, 45–51.

Ford KA, Ward JM, Smissen RD, Wagstaff SJ, Breitwieser I (2007) Phylogeny and biogeography of *Craspedia* (Asteraceae: Gnaphalieae) based on ITS, ETS and *psbA-trnH* sequence data. *Taxon* **56(3)**, 783–794.

Forster JGA (1786*) Florulae insularum australium prodromus*. (Joann Christian Dieterich: Goettingen)

Gilfedder L, Kirkpatrick J, Wapstra A, Wapstra H (2003) *The nature of the Midlands*. (Artemis: Launceston)

Hooker JD (1847) Florae Tasmaniae Spicilegium or Contributions towards a Flora of Van Diemens Land. *London Journal of Botany* **6**, 106–125.

Hooker JD (1857) *Botany of the Antarctic Voyage of H.M. Discovery ships* Erebus *and* Terror *in the years 1839–1843*. Vol 3(4). 'Flora Tasmaniae.' (Lovell Reeve: London)

Hooker WJ (1835) *Craspedia macrocephala*. Large-Headed *Craspedia*. *Curtis's Botanical Magazine, New Series*, **9**, T3415.

Kirkpatrick JB, Brown MJ (1984) The palaeogeographical significance of local endemism in Tasmanian higher plants. *Search* **15(3–4)**, 112–113.

Labillardière JJH de (1800) Relation du voyage à la recherche de La Pérouse, fait par ordre de L'assemblée Constituante, pendant les années 1791, 1792, et pendants 1ere la 2de année de la République Françoise. 2 vols. (H.J. Jansen: Paris)

McNeill J, Barrie FR, Burdet HM, Demoulin V, Hawksworth DL, Marhold K, Nicolson DH, Prado J, Silva PC, Skog JE, Wiersems JH, Turland NJ (2006) *International Code of Botanical Nomenclature (Vienna Code)*. (A.R.G. Gantner Verlag: Liechtenstein)

Nicholson I (1983) *Shipping arrivals and departures, Tasmania*, vol. 1: 1803–1833, p. 211. (Roebuck: Canberra)

Rodway LR (1903) *The Tasmanian Flora*. (John Vail, The Government Printer: Hobart)

Rozefelds AC (2002) A new species and new combination in *Craspedia* (Asteraceae) from Tasmania. *Telopea* **9**, 813–820.

Sprengel CPJ (1826) *Systemea Vegetabilium* 3. (Gottingae sumtibus librariae: Dieterichlanae)

SHORT COMMUNICATION

LIMONIUM AUSTRALE VAR. *BAUDINII* (LINCZ.) A.M.GRAY, A NEW COMBINATION IN PLUMBAGINACEAE

Alan M. Gray and Marco F. Duretto

Gray A.M., Duretto M.F. 2011. *Limonium australe* var. *baudinii* (Lincz.) A.M.Gray, a new combination in Plumbaginacae. *Kanunnah* 4: 117–118. ISSN 1832-536X.

Alan M. Gray, Tasmanian Herbarium, Tasmanian Museum and Art Gallery, Private Bag 4, Hobart, Tasmania 7001, Australia.
Email: Alan.Gray@tmag.tas.gov.au

Marco F. Duretto, Tasmanian Herbarium, Tasmanian Museum and Art Gallery, Private Bag 4, Hobart, Tasmania 7000; Present address: The Royal Botanic Gardens and Domain Trust, Mrs Macquaries Rd, Sydney, NSW 2000 Australia
Email: Marco.Duretto@rbgsyd.nsw.gov.au

Linczevski (1986) distinguished *Limonium baudinii* Lincz. from *L. australe* (R.Br.) Kuntze by its having glabrous as opposed to hairy calyces along the ridges. Linczevski (1986) considered *L. baudinii* to be confined to Tasmania and *L. australe* to New South Wales, Victoria and Tasmania. Walsh (1996), in the *Flora of Victoria*, did not consider *L. baudinii* to be sufficiently distinct from *L. australe* to warrant recognition. He noted a specimen from Point Lonsdale (collected before 1900) that had flowers with glabrous calyces as well as flowers with hairy calyces. This was determined by Linczevski as a hybrid between *L. baudinii* and *L. australe* (Walsh 1996, pers. com.) and was one of two specimens of *L. baudinii* known from Victoria. The other collection was made in 1904 and is from Tooradin though Walsh (1996) indicated that it is possibly Tasmanian in origin and was mistakenly mounted with Victorian material. The species is listed for Victoria in the state census (Walsh & Stajsic 2007).

In Tasmania, *L. baudinii* is confined to the east coast around Triabunna although there is a collection made in 1893 from Port Arthur (Tasman Peninsula). All plants have glabrous calyces. *Limonium australe* is known, in Tasmania, from the north coast and from a few collections along the River Derwent; all specimens have hairy calyces. Apart from the hairiness of the calyces the two taxa are very similar and can be considered conspecific. Given that *L. baudinii* and *L. australe* are disjunct, in Tasmania (its presence in Victoria requires confirmation, see above), and can be readily separated morphologically, we propose that the taxon called *L. baudinii* be recognised, but at the more appropriate rank of variety under *L. australe*. The new combination is formally

made below. A key and descriptions of the species and two varieties will be published in the forthcoming account of Plumbaginaceae in *Flora of Tasmania Online* (Duretto 2009+).

Limonium australe var. ***baudinii*** (Lincz.) A.M.Gray, ***comb. & stat. nov.***

BASIONYM: *Limonium baudinii* Lincz., *Novosti Sist. Vyssh. Rast.* 23: 107 (1986).

Currently, *L. baudinii* Lincz. is listed as 'Vulnerable' under both the Tasmanian *Threatened Species Protection Act 1995* (Anon. 1995) and the Australian *Environment Protection and Biodiversity Conservation Act 1999* (Anon. 1999).

References

Anonymous (1995) *Threatened Species Protection Act, No. 83*. (Government Printer: Tasmania)

Anonymous (1999) *Environment Protection and Biodiversity Conservation Act 1999*. http://www.environment.gov.au/epbc/key-assessments.html (accessed October 2010)

Duretto MF (Ed.) (2009+) *Flora of Tasmania Online*. (Tasmanian Herbarium, Tasmanian Museum & Art Gallery) www.tmag.tas.gov.au/floratasmania

Linczevski IA (1986) Generis *Limonium* Mill. (Limoniaceae) Species Novae Ex Australia. *Novosti Sistematiki Vysshikh Rastenii* **23**, 101–110.

Walsh NG (1996) Plumbaginaceae. *Flora of Victoria* **3**, 296–299.

Walsh NG, Stajsic V (2007) *A Census of the Vascular Plants of Victoria*, 8th edition. (Royal Botanic Gardens Melbourne: Melbourne)