

A beachcomber's notes on bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata* (DC.) Norl.) in Queensland

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Abstract

Chrysanthemoides monilifera subsp. *rotundata* (DC.) Norl. (bitou bush) has been recognised as an invasive exotic weed of major concern along the east coast of Australia since the 1970s. Sea hydrochory (ocean currents) dispersal of bitou bush propagules is believed to play an important role along the Gold Coast. Weed control operators along the coast are advised to be aware of intermittent establishment of bitou bush along beachfronts.

Introduction

Since the 1970s, bitou bush has been recognised as an invasive plant species of major concern along the eastern coast of Australia (Humphries *et al.* 1991). Along the south-eastern Queensland coast at the present time, bitou bush is regarded as one of the more threatening environmental weeds. Present and future distribution of bitou bush depends on its seed dispersing agents, the history of coastal land use and control measures. Apart from people, who have distributed bitou bush deliberately and/or accidentally, there are many other means of seed distribution of this species along the coast. According to Donkin and Gilmore (1985) the succulent seeds of bitou bush are attractive to dispersers such as birds, foxes, rabbits and cattle. They also claim that the seeds are spread by machinery during road building and sand mining. Sand dredging may also be responsible for dispersal of bitou bush on the Gold Coast through sand nourishment programs. Sands used for these programs are dredged from the Nerang River and transported to Queensland beaches near the border of New South Wales (Saltmann personal communication 1997).

My observations indicate that *Chrysanthemoides monilifera* subsp. *rotundata* propagules are on occasions dispersed by ocean currents. However I wish to remark that hydrochory by ocean currents is very difficult to prove scientifically and as a result I intend to share my belief and findings from a beachcomber's point of view. For example Guppy (1906) provided us with many valuable 'beachcomber's' observations about sea dispersal of plant propagules in general. Ridley (1930) in his reports, has given additional examples of plant dispersal by ocean currents. Much of

Guppy's (1906) and Ridley's (1930) seed dispersal conclusions came from circumstantial evidence. Indeed, drift seeds and fruit were frequently used as one of the important pieces of evidence for sea dispersal in their studies.

The evidence of sea hydrochory

Many plants growing along the sea margins are sea dispersed. Mangroves, beach spinifex (*Spinifex sericeus* R.Br.), coconut (*Cocos nucifera* L.), beach she oak (*Casuarina equisetifolia* subsp. *incana* (Benth.) L.A.S. Johnson), sea bean (*Canavalia rosea* (Sw.) DC.), beach vigna (*Vigna marina* (Burm.) Merr.) and goat's foot convolvulus (*Ipomoea pes-caprae* L.) are all plants of the shore that are dispersed by ocean currents (Guppy 1906, Ridley 1930, Cribb and Cribb 1985). According to Love (1985) bitou bush is a true 'beachcomber', growing on littoral margins of sandy shores and headlands (Figure 1).

The second important piece of evidence of bitou bush being sea dispersed species comes from its arrival in Australia. According to Humphries *et al.* (1991), bitou bush was apparently introduced to Stockton, New South Wales in the ballast water from a South African ship in 1908. From this important piece of information I deduce that bitou seed can survive

prolonged sea-water immersion. I have also observed that fresh or dry seeds lack buoyancy until the seed coat begins to ferment. At this stage, the seed may float for one to two days. In addition mature and semi-mature inflorescence heads with fruits remained buoyant for 10–15 days depending on the rate of fleshy tissue decomposition (Batianoff unpublished data). As a result I deduce that, on occasions during summer storms, bitou bush has a chance of being transported by ocean currents and deposited on littoral margins by wave action.

In April 1976 after seasonal cyclonic weather I observed bitou bush fruiting branches and succulent fruits deposited along the litter line at Bogangar in New South Wales. On that occasion I picked the mature inflorescence heads and examined its healthy seeds for a moment and kept looking for a nice piece of drift wood for my garden. Some 25 years later (September 1991 and October 1992) I returned to the Bogangar seashore to study tropical drift seeds and fruits as part of my general seashore plant studies. This time I was not only looking for seeds but also collecting sand samples at 100 m intervals along a one kilometre transect within the drift line margins. This sand was placed in germination plastic trays and left in a glasshouse and regularly watered for about two years. Early results indicated about 90% of all seedlings were beach spinifex plants, 3% sea rocket (*Cakile edentula* (Bigelow) Hook.), 2% New Zealand spinach (*Tetragonia tetragonoides* (Pall.) Kuntze) and 5% miscellaneous. The miscellaneous plants included a few grass seedlings that I could not identify, as well as beach bean, beach vigna, beach she oak and one seedling plant identified as bitou bush.



Figure 1. Bitou bush vegetation growing on seaward margins, landward of beach spinifex grassland at Bogangar, New South Wales in October 1992.

In January 1997, while studying the distribution of environmental weeds along the Sunshine Coast and Gold Coast, I also recorded bitou bush distribution. About one fifth of Gold Coast transects recorded the presence of bitou bush. Small populations were recorded at scattered locations along Main Beach, Broadbeach, Miami, South Nobby Beach, Elephant Rock Headland, Tugun Beach and Coolangatta. With the exception of the mature population found at Elephant Rock, all other sightings of bitou bush consisted of young, recently established shrubs and seedlings located on foredunes, a few metres above the drift line (Batianoff and Franks in press). Figure 2 shows bitou bush seedlings growing on seaward margins with beach spinifex at Gold Coast (South Nobby Beach). I believe the propagules of bitou bush are being dispersed onto Gold Coast beaches by ocean currents. According to Pattearson and Patterson (1983), along the Gold Coast there are near shore currents that transport sand and possibly bitou bush propagules northwards. The same cannot be said for the Sunshine Coast. Currents here are less defined due to complex coastal alignments and river mouths interrupting the natural near shore northern currents (Jones 1992).

Bitou bush distribution notes

Table 1 presents summary data of bitou bush distribution based on Queensland Herbarium records. It shows that Sister M. Dominic was the first person to collect *Chrysanthemoides monilifera* subsp. *rotundata*, in Queensland in May 1970. The table also shows that the bitou bush population on Elephant Rock, Currumbin has been in existence for at least twenty-one years. According to Batianoff and Franks

(in press) the present distribution of bitou bush is scattered from Rainbow Beach, Inskip Point, Fraser Island, Moreton Island, North and South Stradbroke Islands to Coolangatta. During my field work in January 1997, I did not find bitou bush plants on the Sunshine Coast (Bribie Island to Noosa National Park).

In Queensland, since 19 May 1981, *Chrysanthemoides monilifera* has been declared under the Rural Plant Protection Act, as a Category P2 plant (plants that are to be destroyed throughout the State or the relevant parts thereof). According to Armstrong (personal communication 1997), bitou bush has been controlled along Queensland coasts successfully. Two or three repeated annual treatments will eradicate most bitou bush populations. However, according to Aveyard (1971) bitou bush seeds may remain viable in the soil seed bank for four to five years. Some operators have reported sporadic occurrences of bitou bush seedlings after what was assumed a complete eradication program along beachfronts. These factors are seen to suggest that bitou bush populations may arise through both viable seeds deposited by ocean currents and/or from older seeds present in the soil seed bank.

Concluding comments

It is my opinion that the succulent propagules of bitou bush can be distributed

by ocean currents and that new establishments in the upper littoral zone on the Gold Coast provides an important example of this. The northern currents and high density populations of bitou bush found along the New South Wales coast pose a



Figure 2. Two seedlings of bitou bush found growing on seaward margins with beach spinifex grass about two or three metres inland from drift line at South Nobby Beach, Gold Coast in January 1997.

Table 1. Bitou bush distribution and collector information in Queensland (Queensland Herbarium specimen data, February 1997).

Date	Collectors name	Notes
11/5/1970	M. Dominic	AQ246763 fertile specimen; approximate locality Burleigh Heads, Gold Coast.
-/11/1973	L. Durrington and B. Lebler	AQ246760 fertile specimen; Burleigh Heads National Park, Gold Coast, Headland.
30/09/1974	T.J. McDonald	AQ246761 fertile specimen; Inskip Point, Wide Bay; spreading population on high dunes.
21/08/1977	P. Christie	AQ198812 fertile specimen; South Stradbroke Island, foredunes.
08/08/1978	T. Anderson	AQ269209 fertile specimen; Elephant Rock, Currumbin growing on top of the headland.
-/09/1978	G.D. Elphinstone	AQ265489 fertile specimen; Rainbow Beach, Wide Bay, colonizing previously sand mined area.
15/09/1979	R. Coutts	AQ320996 fertile specimen; near Rainbow Beach, Wide Bay, growing on foredunes.
21/02/1980	C. Sandercoe	AQ332016 fertile specimen; Rainbow Beach, Wide Bay, on strand spreading population.
31/03/1981	R. Efford	AQ345516 fertile specimen; Rainbow Beach (voucher specimen for 9 May 1981 bitou bush noxious plant declaration by Queensland Government).
19/02/1989	G.N. Batianoff	AQ454776 fertile specimen; Miami Beach, Gold Coast, frontal dune.
19/09/1993	G.N. and J. Batianoff	AQ569451 fertile specimen; Golden Beach, Caloundra, foredune.
16/06/1996	G.N. Batianoff	AQ489264 fertile specimen; Elephant Rock, Currumbin, Gold Coast, several plants growing on top of grassy headland.
16/06/1996	G.N. Batianoff	AQ489265 fertile specimen; Currumbin Beach, Gold Coast, foredunes.

constant threat for new plant introductions of this environmental weed in Queensland. Weed control operators at the Gold Coast need to be aware of the intermittent arrivals and replenishment of the soil seed bank of bitou bush on beachfronts.

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