

WALLABY EXTINCTIONS AT THE MACROPODID FRONTIER: THE CHANGING STATUS OF THE NORTHERN PADEMELON *THYLOGALE BROWNI* (MARSUPIALIA: MACROPODIDAE) IN NEW IRELAND PROVINCE, PAPUA NEW GUINEA

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The northern pademelon (*Thylogale browni*) is a small to medium-sized macropodid that is native to northern and central New Guinea, but is also found on some of the islands of the Bismarck Archipelago, such as New Britain, New Ireland and Lavongai, where it appears to have been introduced. In New Ireland, archaeological evidence indicates that it may have been introduced by prehistoric human agency c. 7,000 years ago. In the chain of islands that constitutes New Ireland Province, historical evidence indicates that the species also recently occurred in the Tabar, Lihir, Tanga and Feni island groups prior to undergoing a series of local extinctions and range contractions during the first half of the 20th century. Furthermore *T. browni* also appears to have declined on New Ireland and Lavongai, where it is now restricted to the remote mountainous interior. Much of the sudden range contraction coincided with the Pacific War (1942-1945), during which time blockaded Japanese troops confiscated local food produce. It is postulated that the privations of war led to an extended period of over-hunting which drove the species into local extinction in much of its former range. Furthermore, since the war, ongoing human pressures and a breakdown in the traditional ethnozoological translocation / re-stocking regimes which would normally have re-introduced this species to satellite islands, appears to have prevented *T. browni* from regaining its former widespread distribution in the New Ireland Province Archipelago.

Key words: ethnozoology, extinctions, New Ireland Province, Pacific War impact, *Thylogale browni*, zoogeography.

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THE northern pademelon (*Thylogale browni*) is a relatively small, 4 - 9 kg tropical rainforest and forest-edge adapted macropod with a dark grey to brown pelage (Flannery 1995a,b; Heinsohn 1998a). Very little has been recorded of its ecology, but Siar people in New Ireland, Papua New Guinea, report that it will consume the foliage of grass, herbs, shrubs and certain favoured vines and climbers, such as *Merremia peltata*; with occasional opportunistic feeding on fallen fruit also reported (unpubl. data). Its continental distribution includes central and northern New Guinea from sea level to 3,800 m, with a possible additional occurrence on the land-bridge island of Japan (Flannery 1995a,b). Its non-continental or oceanic distribution, includes Bagabag, Umboi, New Britain, New Ireland and Lavongai in the Bismarck Archipelago (Flannery 1995b; Heinsohn 1998a, unpubl. data) (Fig. 1). On the New

Guinea mainland, Flannery (1995a) reports that *T. browni* has an apparent preference for disturbed habitats. This compares with the author's own observations in far southern New Ireland where the species appeared to be locally common well within large tracts of tall closed-canopy primary lowland and lower montane rainforest, as well as being observed in the disturbance ecotone, such as at the edges of natural clearings created by landslides and watercourses (Heinsohn 1998a, unpubl. data).

A combination of archaeological, ethnozoological and zoogeographic evidence indicates that *T. browni* was probably introduced to most, if not all, of its non-continental distribution by prehistoric human agency (Koopman 1979; Maynes 1989; Flannery and White 1991; Flannery 1992, 1995b; Spriggs 1997; Heinsohn 1997, 1998a,b, 2001,

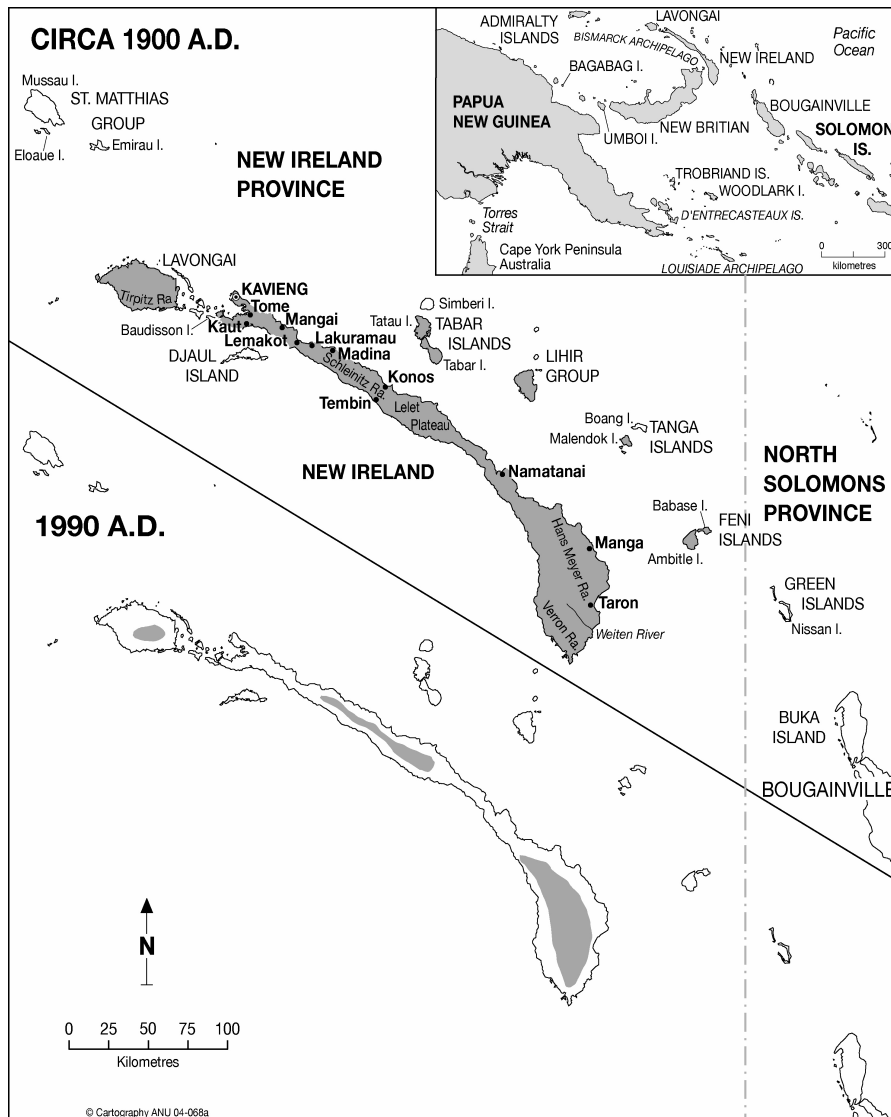


Fig. 1. Map of the New Ireland Province Archipelago, Papua New Guinea, showing the estimated contraction in range of *T. browni* in that region during the 20th century, from AD 1900 to AD 1990.

2003; Heinsohn and Hope 2005). As *T. browni* is the only macropodid on most of these islands, human-mediated dispersal appears to have artificially pushed the macropodid frontier out to the northeastern edge of the North Melanesian zoogeographic subregion. The clearest archaeological evidence comes from New Ireland, where the species appears to have been introduced around 7,000 years ago (Flannery and White 1991; Spriggs 1997). In addition to the aforementioned extant populations, archaeological evidence indicates that prehistoric ephemeral populations of introduced *T. browni*, may possibly have occurred on Buka in the North Solomons and

Eloaue Island in the St. Matthias Group in the mid to late Holocene, respectively (Egloff 1975; Flannery *et al.* 1988). However, the evidence for this is ambiguous, in that the scant skeletal remains found in sites on these islands, may merely represent traded captives that were butchered and eaten there; or possibly transported carcasses or carcass portions preserved for consumption through being smoked or salted.

Today, *T. browni* continues to be hunted throughout its range as a small to medium game animal and is typically caught with the aid of hunting

dogs (Flannery 1995a,b; Heinsohn 1998a, unpubl. data) (Figs 2–4). Indeed, so effective is hunting with dogs that the species appears to have suffered significant range contractions and local extinctions, across its broad continental and oceanic range, with a series of these having occurred within recent historical times (Flannery 1992, 1995a,b; Flannery and White 1991; Heinsohn 1998a). Combined historical and field survey evidence presented below, indicates that a significant range contraction has occurred within New Ireland Province, Papua New Guinea, in historic times, and particularly within the last 60 to 70 years. The purpose of this paper is to analyse the timing and probable causes of historic range contractions in the province.



Fig. 2. Carcass of a ~7 kg adult male *T. browni* killed by Siar hunters with specially trained dogs at c. 1,200 m, in primary lower montane rainforest, Hans Meyer Range, southern New Ireland, November 1990. Skull was collected for the Australian Museum (AM M1033-5), representing the first extant, as opposed to archaeological specimen to be collected from New Ireland. At the time the species appeared to be locally common in far southern New Ireland.



Fig. 3. Siar hunters at a camp in the Hans Meyer Range, Southern New Ireland, singing the fur from a *T. browni* carcass prior to cooking it in a ground oven with heated stones, November 1990.



Fig. 4. Siar hunters in the Hans Meyer Range of southern New Ireland, washing and parcelling portions of cooked *T. browni* and pig meat in November 1990. To the right are a pack of four specially trained hunting dogs used for catching *T. browni* and wild pigs.

STUDY AREA

New Ireland Province is comprised of a chain of islands lying at the outer northeastern arm of Papua New Guinea's vast Bismarck Archipelago. The principal island is 300 km-long, narrow and mountainous New Ireland, which attains altitudes of 2,300 m in the far-southern Hans Meyer Range and 1,500 m in the central Lelet Plateau. Lying off the northwestern tip of New Ireland is the next largest island Lavongai (New Hanover), which reaches altitudes in excess of 900 m. Further smaller satellites include the Feni, Tanga, Lihir, Tabar and St. Matthias groups, which stretch in a wide arc from the southeast to northwest (Fig. 1). New Ireland and its satellites are dominated by tropical Papuan rainforest and jungle regrowth, but with sizeable areas of mangroves, tree plantations, and anthropogenic kunai savanna. The only recorded marsupials in the province are the northern common cuscus (*Phalanger orientalis*), common spotted cuscus (*Spilogale maculatus*) and *T. browni*, all of which appear to have been introduced by Late Quaternary human agency as useful small to medium game animals from sources originating in New Guinea, but perhaps with other islands in the Bismarck Archipelago serving as intermediary colonisation stepping stones (Flannery and White 1991; Heinsohn 1998a,b, 2000, 2002, 2003, 2004a,b).

On the New Ireland mainland, a major period of copra plantation development commenced at the start of the 20th century under German colonial rule, leading to the transformation of large areas of the coastal plain into coconut plantation, and with many villagers being resettled on the coast (Reynolds 1972). A further upheaval in the province occurred during the Pacific War (1942-1945), when Japanese occupation combined with a very effective Allied

blockade and bombing campaign, led to an extended period of food shortages. With thousands of Japanese troops extracting a food tax from local villagers, and with a regime of strict martial law, this period was very hard on the indigenous population (Murray 1967; I Downs pers. comm. 1996).

METHODS

New Ireland was visited between June and November 1990. Data on *T. browni* was opportunistically gathered while working on a larger project on the island's phalangerid possums. Four principal methods were used to research the historical ecology of *T. browni* in New Ireland Province: **1)** analysis of written historical records regarding former distributions; **2)** collection of oral historical records from local people and some former residents regarding past and contemporary distributions and utilisation of the species; and **3)** some limited field survey transects into areas reputed to have remnant populations. In particular, a four-day sea to summit transect was walked from the coastal village of Taron to the top of the Hans Meyer Range (sea level to approximately 2300 m) during late November 1990. Much of this transect was through uninhabited primary lowland and lower montane rainforest, a 'bikbus' area that stretched across the rugged mountainous interior of far southern New Ireland. The primary method of detection was direct sightings, however, secondary observations of spoor such as tracks, droppings, hair, lays, and browse marks on low foliage were also recorded.

RESULTS

Oral and written records regarding the history and occurrence of *T. browni* on islands surrounding New Ireland are presented in Table 1; while records relating to the New Ireland mainland are presented in Table 2.

DISCUSSION

Evidence summarised in Tables 1 and 2 indicates that *T. browni* probably once had a much wider distribution in New Ireland Province. Whereas its contemporary distribution includes remote parts of the Hans Meyer and Verron Range in southern New Ireland, parts of the Lelet Plateau and Schleinitz Range in central New Ireland, and the Tirpitz Range in the remote mountainous interior of Lavongai; its past distribution appears to have included a much more extensive range on New Ireland and Lavongai as well as occurrences on some of the islands in the

Tabar, Lihir, Tanga and Feni groups to the east of New Ireland. Furthermore, many of the last sightings in the aforementioned island groups and in parts of the New Ireland mainland, date to the period leading up to or including the Pacific War. Indeed some oral records, such as those cited by Gunn (1986), Flannery and White (1991) and Flannery (1995b), refer to local extinctions which took place approximately 60 years ago. This indicates that the extinction events may have occurred during the Second World War. It is postulated here that over-hunting brought about by the privations of the Second World War, when island inhabitants were chronically short of food, caused a reduction in the range of *T. browni* in New Ireland Province.

Some clues to the probable cause of its extinction on the smaller satellite islands are provided by Bell's (1947) report on his anthropological fieldwork in the Tanga Group in the early 1930s:

"Another marsupial [other than *P. orientalis*] hunted by these [Tanga] people and also regarded as a particularly delicious dish is a species of wallaby (*Thylogale*)" (240).

"In times of scarcity, and such times are rare in Tanga, the whole island is scoured for animals and fruits which can supplement the meagre provisions of the garden and reef" (233).

Judging by the reports of Captain Murray, the famous New Ireland coastwatcher, a period of prolonged scarcity occurred during the Japanese occupation between 1942 and 1945, when a very successful Allied blockade and bombing campaign left the Japanese critically short of supplies:

"...the Japs were eating anything that they could lay their hands on. Native gardens were being uprooted long before the vegetables were mature; rice, their staple diet was almost non-existent." (Murray 1967, 91).

The worst impacts, however, appear to have been on the native peoples of New Ireland Province:

"...although the Japs were hard-pressed for rations, the natives were worse off, as everything they grew was confiscated to feed the Japanese garrisons along the coast. Two small launches were used to collect the food from the villages, and the natives were punished by death if they refused to hand over whatever they had. As the months went by their position became even more drastic. They began eating everything and anything that walked or crawled." (Murray 1967, 107).

Place	Oral or written historical record
Lavongai (New Hanover)	<p>(1) Lavongai resident Sebastian Valustaut (pers. comm. 1990) stated that 'sikau' [<i>T. browni</i>] was still found in the remote mountainous interior of Lavongai, however, it was more widespread before all the broad scale logging that commenced in the 1980s.</p> <p>(2) Lavongai man Charles Lamangau (pers. comm. 1990) reported a childhood memory of having seen a 'sikau' [<i>T. browni</i>] on the coastal plain of Lavongai.</p> <p>(3) Godfrey Reuter (pers. comm. 1990), a crocodile hunter from adjacent Baudisson Island, reported that he had heard that sikau [<i>T. browni</i>] was still to be found in the mountainous interior of Lavongai.</p> <p>(4) Anthropologist Dorothy Billings (pers. comm. 1990) reported seeing wood carvings on Lavongai that depict sikau [<i>T. browni</i>], and that local people reported the species to still be present in the mountainous interior of the island.</p>
Tabar Group = Simberi, Tatau and Tabar islands.	Gunn (1986) reports that a wallaby [probably <i>T. browni</i>] is depicted in rock art from the Tabar Group, and that this macropod became extinct on Tabar Island approximately 60 years ago. [It may have also occurred on the almost adjoining Tatau Island which is only separated from Tabar by a very narrow channel].
Lihir Group = Lihir Island and three small satellites.	Flannery (1992, 1995b) states that <i>T. browni</i> occurred on Lihir Island until becoming extinct there approximately 60 years ago.
Tanga Group = Malendok and Boang islands.	Bell (1947, 240) reporting on anthropological fieldwork conducted in the early 1930s stated that "a species of wallaby (<i>Thylogale</i>)" [probably <i>T. browni</i>] occurred on Malendok Island, but he had not seen any on Boang Island [Malendok is the more mountainous and forested of the two, and is less settled and cultivated than Boang Island].
Feni Group = Ambitle and Babase islands.	Bell (1947, 240) reporting on anthropological fieldwork conducted in the early 1930s, states that "a species of wallaby (<i>Thylogale</i>)" [probably <i>T. browni</i>] was then present in the Feni Group [probably Ambitle Island as it is large being 10 kilometres wide, mountainous and jungle covered, whereas adjacent Babase Island is smaller and much more heavily cultivated and settled].
Djaul Island	Djaul Island elder Mr. Gideon Kombeng (pers. comm. 1990) stated that there may have been sikau [<i>T. browni</i>] on Djaul Island "a long time ago".
Eloaue Island in the St. Matthias Group.	Egloff (1975), an archaeologist, records the finding of phalanges and metacarpal bones from a Lapita site on Eloaue Island, that were identified as <i>Thylogale</i> sp. by Dr. Jim Menzies. [As <i>T. browni</i> is not recorded from anywhere in the St. Matthias group these could be the remains of a carcass or carcass portion, perhaps preserved by smoking or salting, that was carried there; or a live trade animal that was carried there and consumed; or less likely, perhaps an animal from an ephemeral introduced population that once occurred on Eloaue Island or in the St. Matthias Group].

Table 1. Historical records regarding the occurrence of *T. browni* on New Ireland satellites.

Place	Oral or written historical record, or direct observation
Tome	Lowrance Nomaras (pers. comm. 1990) of Put Put and Tome, reported that he had heard that sikau [<i>T. browni</i>] once occurred in the forested hinterland of Tome, but was no longer found there.
Kaut	Gideon Kombeng (pers. comm. 1990) reported that sikau [<i>T. browni</i>] once occurred in the vicinity of Kaut, but is no longer found there.
Mangai	A group of villagers from Mangai (pers. comm. 1990) stated that sikau [<i>T. browni</i>] was no longer present in the hinterland of Mangai, but had once occurred there.
Lemakot	Leslie Bell (pers. comm. 1995) of Airlie Beach in Queensland, a former resident of New Ireland remembers that sikau [<i>T. browni</i>] were quite commonly seen at the forest edge in the 1930s on a track behind Lemakot that traversed the island. Numerous reports collected from local people in 1990, recorded a complete absence of sikau <i>T. browni</i> from the Lemakot area.
Lakuramau Plantation	Despite having lived on Lakuramau Plantation on the coastal plain of north central New Ireland in the 1950s, expatriate Australian plantation resident Mary Brine (pers. comm. 1995), had no recollection of any records of sikau [<i>T. browni</i>] in that area during the post-war years.
Madina	Flannery (1995b, 83) states that "According to Senila Talevat, a senior big man of the Madina area, while it [<i>T. browni</i>] was found in the limestone hills around Madina about 50 years ago [now 60 years ago], it has not been seen there for many years".
Konos - Tembin	(1) Palambo of Tembin village (pers. comm. 1990) reported that sikau [<i>T. browni</i>] could still be found in the Schleinitz Range between Tembin on the west coast and Konos on the east coast, but was not common. Its apparent rarity was supported by the fact that none were flushed out by his pack of hunting dogs during a cross-island walk from Tembin to Konos in July, 1990 (pers. obs.). [This is compared with the multiple sightings of <i>T. browni</i> made by the author in the Hans Meyer Range of far southern New Ireland in November 1990]. (2) Mike Tsang of Kavieng (pers. comm. 1990) reported seeing a sikau [<i>T. browni</i>] while logging the slopes of the Schleinitz Range above Konos in the late 1980s.
Lelet Plateau	(1) Anthropologist Richard Eves (pers. comm. 1994) believed that the sikau [<i>T. browni</i>] was present in the more remote parts of the Lelet Plateau. (2) A group of local people on the Lelet Plateau (no names recorded, pers. comm., 1990) reported that sikau [<i>T. browni</i>] was still present in parts of the Lelet Plateau.
Namatanai	Expatriate Australian administrator Ian Downs (pers. comm. 1995) reported seeing the sikau [<i>T. browni</i>] near the forest edge in grassland to the south of Namatanai in the late 1940s and early 1950s.
Manga Mission	Francis Bia (pers. comm. 1990) of Manga stated that the sikau [<i>T. browni</i>] had retreated as a result of disturbance from contemporary logging of the Danfu timber concession. He feared that they were now only found in the higher, more remote and unlogged parts of the adjacent mountains.
Taron	(1) Bik Man Gabriel Dwatahee of Taron, and three Taron hunters Sebastian, Seril and Freddy stated that sikau [<i>T. browni</i>] was locally common in the forests of the adjacent [then unlogged] Hans Meyer Range and Weiten River valley (pers. comm. 1990). (2) The author made multiple sighting of <i>T. browni</i> in then unlogged primary lowland rainforest and lower montane rainforest while walking a transect from Taron Village to the top of the adjacent Hans Meyer Range in late November 1990, with the species appearing to be locally common in that area. One specimen of an adult male c. 7 kg was collected for the Australian Museum (AM M1033-5) (Fig. 2).

Table 2. Historical records and some direct observations regarding the occurrence of *T. browni* on the New Ireland mainland.

A further exacerbation was that fear of air or naval attack, or accusations of spying, made the island natives reluctant to go out in canoes to fish for traditional marine foods. This made them even more reliant upon hunting and foraging on land, with many moving to safer more secluded inland camps (I Downs, pers. comm., 1996).

It seems very likely then, that over-hunting as a result of the privations of war, is the likely cause of the Tabar, Lihir, Tanga and Feni islands pademelon extinctions which appear to have occurred in the mid 1940s. This period also coincides with a reported range contraction for *T. browni* on the New Ireland mainland. It is also likely, that the massive upheaval of the war, in which an unknown number of indigenous New Ireland people perished (Murray 1967), caused a breakdown in the traditional trade networks and ethnozoological 'game park' strategies (Heinsohn 1998a,b, 2003) by which the satellite islands would normally have been re-stocked with *T. browni* from the New Ireland mainland. The end result is that today in New Ireland Province, northern pademelons are only found in the more remote parts of the two largest islands, New Ireland and Lavongai (New Hanover), with the species reported to be declining further in the face of increasing human disturbance such as broad scale logging and associated increases in hunting along logging access roads.

The Second World War overkill hypothesis is also supported by former Territory of Papua New Guinea administrator Mr. Ian Downs (pers. comm. 1996) who reported parallel declines in game animals such as introduced rusa deer near Rabaul in New Britain, and near Madang on the New Guinea mainland, which he attributed to over-hunting resulting from the privations of war.

It is also apparent that, rare tropical drought events, probably associated with El Nino, caused periodic crop failures, famines and bushfires, which also led to periodic over-hunting and decline of *T. browni* in the region. Government anthropologist Chinnery (1929, 45) for example, uses oral sources to provide the following description of a drought which affected New Ireland in circa 1914:

"Dry spells from time to time produce food shortages, but as a rule these are apparently not very serious. In 1914 (?), however, no rain fell for about a year (?), and the people were in great distress. The whole country [New Ireland] suffered from drought, and excepting from the sago swamps, there was practically no food procurable. The period of drought and famine culminated in a series of destructive bushfires along the whole line of coast, bush and mountain ranges, and, from the graphic description given to

me, everything perished - wallabies [*T. browni*], in fact, have scarcely been seen since" (Question marks in parentheses are those of Chinnery 1929).

It is possible that the major drought event of circa 1914 may have reduced *T. browni* populations in some areas, thus contributing to a general trend which culminated during the Second World War, although there are records from the 1930s of *T. browni* in a number of areas where they are no longer found. Thus populations may have recovered from the drought by the 1930s and 1940s, only to face the much more severe test of the Second World War, with its sustained war-induced famines. Based on the historical information (Tables 1, 2), a map of estimated range contractions by *T. browni* between circa 1900 AD (prior to New Ireland's extensive coconut plantation development) and 1990 AD has been produced (Fig. 1). It is a postulated estimate of the likely magnitude of recent historical range contraction on the part of *T. browni* during the 20th century. Furthermore, the pattern of sudden local extinctions in more accessible and populated parts of New Ireland Province during the hungry war years, and the retreat of the species from large tracts of suitable habitat, tends to support the human predation / overkill hypothesis over other commonly cited causes of species decline such as habitat modification or disease.

CONCLUSION

In New Ireland Province, *T. browni* appears to have undergone a significant range contraction in recent historical times, with much of the contraction coinciding with the Pacific War (1942-1945). This is manifest in a series of local extinctions in the Tabar, Lihir, Tanga and Feni groups, and retreat of the species to the most remote mountainous parts of New Ireland and Lavongai since the mid 1940s. It is postulated that this has probably occurred as a result of over-hunting with dogs, other forms of disturbance, and a breakdown in the traditional ethnozoological regimes by which animals would normally have been re-introduced to satellite islands. The principal cause of an extended period of over-hunting appears to be the privations of the Pacific War, during which New Ireland Province was occupied by tens of thousands of hungry Japanese troops and subjected to a very effective Allied sea and air blockade and bombing campaign. With the Japanese Imperial Armed Forces taking much of the traditional garden produce of villagers, local people were forced to rely ever more heavily on bush foods such as *T. browni*, with over-hunting leading to a series of local extinctions and range contractions during the war years. Ongoing human pressures and a breakdown in the traditional translocation / re-

stocking regimes, appears to have prevented the species from regaining its former widespread distribution. *T. browni* therefore presents an ethnozoologically illuminating case study of the vicissitudes of an ecologically sensitive introduced ethnotramp species (Heinsohn 2003), the fate of which closely parallels the vicissitudes of human history. The historically ephemeral nature of some of its island populations provides a valuable tool for interpreting the prehistoric archaeological / Quaternary palaeontological record on other islands in the region. It also provides material for modelling the general process of extinctions and human influences on zoogeography on islands of varying size and topography. Local extinction of *T. browni* from the Tabar, Lihir, Tanga and Feni islands, also represents a retreat of the Australasian macropodid frontier by about 50 km, with the only marsupial left on these small outer islands being a phalangerid possum, the introduced *P. orientalis*.

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