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Perameles gunnii.

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Perameles Geoffroy, 1803

Perameles Geoffroy, 1803:149–150. Type species *Perameles nasuta* Geoffroy.
Thylacis Illiger, 1811:76. New name for *Perameles* Geoffroy.
Parameles Anon. [Gray, J. E.], 1827:194. Alternative spelling for *Perameles* Geoffroy.
Perimeles Lenz, 1831:158. Emendation of *Perameles* Geoffroy.
Peromeles Winge, 1893:124. Emendation of *Perameles* Geoffroy.

CONTEXT AND CONTENT. Subclass Marsupialia, order Peramelemorphia, family Peramelidae, subfamily Peramelinae. Members of the family Peramelidae are polyprotodont marsupials, with syndactylous toes on hind feet. *Perameles* is characterized externally as having elongate, pointed ears, relatively elongate hind feet; being generally lightly built; and often having transverse bars present in posterior pelage. Skull is long and narrow; length is more than twice maximum width. Five upper incisors are present, P5 about equidistant between adjacent incisor and canine. Upper molars have a large hypocone, and posterior molar is ca. 50% the size of other molars in occlusal view. Auditory bullae are small and nearly hemispherical. Dentary does not have a posterobuccal process. A key to the species of *Perameles* follows.

1 Fur orange ..... *Perameles eremiana*
Fur not orange 2
2 Body fur with bars on rump 3
Body fur not barred on rump ..... *P. nasuta*
3 Syndactylous toes arise posterior to 5th digit; tail dark dorsally along entire length ..... *P. bougainville*
Syndactylous toes arise level with 5th digit; tail dark dorsally only at proximal end ..... *P. gunnii*

Perameles gunnii Gray, 1838a

Eastern Barred Bandicoot

Perameles gunnii Gray, 1838a:107. Type locality "Van Diemen's Land" [= Tasmania].

CONTEXT AND CONTENT. Generic content given above. Only 1 form of this species is recognized at present, but 2 subspecies may be warranted (Robinson et al. 1993). The Tasmanian (nominate) form is separated geographically from the mainland form by the 200-km-wide Bass Strait and temporally by ca. 10,000 years (George et al. 1990).

DIAGNOSIS. *Perameles gunnii* (Fig. 1) is the most strikingly marked member of the genus, with 3 pale bars on the rump contrasting with darker yellow-brown dorsal fur (Seebeck 1995a). *P. bougainville*, formerly widespread but allopatric with *P. gunnii*, has similar barring but is much smaller and has a white venter in contrast to gray venter of *P. gunnii*; several named taxa with color, marking pattern, or range differences are synonymized with *P. bougainville* (Burbidge 1983). Tail of *P. gunnii* is dark dorsally only at the proximal end; in *P. bougainville* it is dark for its whole length. *P. eremiana*, now extinct, had orange dorsal fur and a dark middorsal stripe. *P. nasuta* is uniformly gray, although juveniles may have a temporary, single, paler, hip stripe (Seebeck et al. 1990b).

Skull of *P. gunnii* (Fig. 2) is similar to that of *P. nasuta* but is smaller and more delicate. No sagittal crest is formed. Alisphenoid bullae and tympanic bones are larger, and palatal vacuities are more extensive. Mandible is slender, with a narrow ascending ramus. Male canine is only slightly larger than that of the female; *P. nasuta* has much more marked sexual dimorphism. Skull of *P. bougainville*, although smaller, closely resembles that of *P. gunnii*, but canine is not sexually dimorphic (Freedman 1967; Freedman and Joffe 1967).

Perameles gunnii and *P. bougainville* also can be distinguished by structure of the feet. Syndactylous toes of *P. gunnii* arise at same level as 5th digit, whereas in *P. bougainville* they arise posterior to 5th digit (Lyne 1951; Seebeck et al. 1990b).

GENERAL CHARACTERS. *Perameles gunnii* is a medium-size bandicoot, the 2nd largest of the genus *Perameles*, and falls midway between the largest and smallest of the modern perameloids (Seebeck et al. 1990b). It exhibits sexual dimorphism; males are heavier than females and larger in most standard body measurements (Dufty 1991a). The Tasmanian form is somewhat larger than the mainland form. Average adult mass is ca. 750 g in Victoria and ca. 1,000 g in Tasmania (Mallick et al. 1997a; Seebeck 1995a). The following measurements are for Victorian animals; Tasmanian *P. gunnii* are 5–10% larger. Average external measurements (in mm; range and sample size in parentheses) of males and females, respectively, are: total length, 416 (380–477, 25), 407 (345–488, 16); length of tail, 87 (63–108, 25), 87 (68–96, 17); length of hind foot, 72 (63–80, 28), 70 (61–78, 19); and length of ear, 40 (32–48, 28), 39 (30–46, 19—George et al. 1990).

Skull has long, narrow maxillary, premaxillary, and nasal bones. Cartilagenous nasal septum extends beyond premaxillae and nasal bones. Palate is very long and narrows markedly anterior to premolar, with paired narrow anterior and posterior palatal vacuities; other palatal fenestrations are common. Large posterior vacuities typically lack a median partition. Alisphenoid bullae are not markedly inflated but are larger than those of *P. nasuta* and relatively smaller than those of *P. bougainville*. Foramen magnum is oval. Mandible is slender, with a narrow ascending ramus, a high coronoid process, and a deep mandibular notch. Dental formula is i 5/3, c 1/1, p 3/3, m 4/4, total 48 (Freedman 1967; Freedman and Joffe 1967; Thomas 1888). Mean cranial measurements (in mm; range in parentheses) of combined males and females are: basal length, 67.1 (61.3–74.2); nasal length, 33.2 (29.5–35.8); interorbital breadth, 14.3 (13.0–15.1); zygomatic breadth, 30.8 (27.7–32.8); length of bulla, 6.6 (6.0–7.4); breadth of bulla, 5.6 (5.2–6.1); alveolar length of maxillary molar row (M1–M4), 13.7 (13.0–14.4); mandibular length, 58.0 (51.7–63.8); alveolar length of mandibular molar row (m1–m4), 14.9 (14.1–15.6). A detailed analysis of variation in the skull and teeth of *P. gunnii* is available (Freedman and Joffe 1967).

Head and dorsum are grizzled, yellowish brown; erect, sharp ears are similarly colored. Bars on hindquarters are white to pale

FIG. 1. Adult male *Perameles gunnii* at Hamilton, Victoria. Photograph by Peter R. Brown.

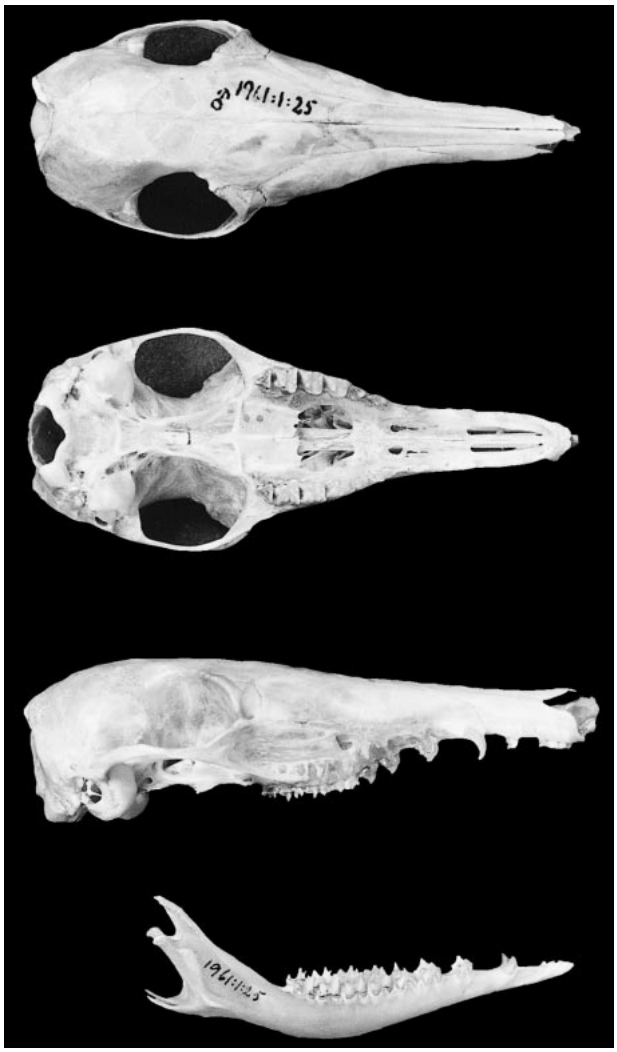

FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of an adult male *Perameles gunnii* from Tasmania (collection of the Queen Victoria Museum, Launceston, specimen 1961:1:25). Greatest length of cranium is 80.5 mm.

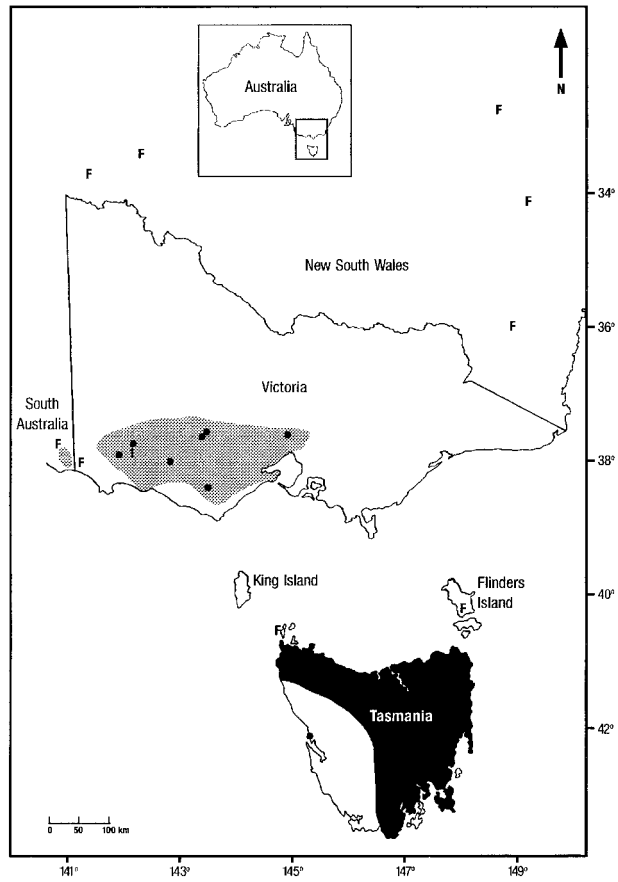

FIG. 3. Distribution of *Perameles gunnii*. Solid shading is present distribution, stipple is former range. Reintroduction sites in Victoria are indicated by dots. 1 = Hamilton; F = fossil localities. Map from Atlas of Victorian Wildlife database and TASPAWS database.

gray and are most obvious on young animals. As the eastern barred bandicoot ages, bars may become obscure. Ventral fur is generally pale, slaty gray but is white in some Tasmanian specimens. Feet and tail are basically white or pale gray, with tail having a short, darker, dorsal midline at distal end (Seebeck 1995a).

DISTRIBUTION. *Perameles gunnii* was formerly distributed in southeastern South Australia, southwestern Victoria, and Tasmania (Fig. 3). The South Australian population, now extinct, occurred in a small area between the Murray River and the Victorian border (Kemper 1990) and was geographically separated from the Victorian population. In Victoria, *P. gunnii* was virtually restricted to western basalt plains, which extend from near the South Australian border to the Melbourne area, a geomorphological feature bounded by the limits of the newer basalt flows (Menkhorst and Seebeck 1990; Seebeck 1979; Seebeck et al. 1990a). Altitudinal range on mainland Australia is from ca. 40 to 420 m, with most sites between 40 and 200 m (Seebeck 1995b). In Tasmania, the eastern barred bandicoot occurs between sea level and 950 m, with most populations below 400 m (Hocking 1990). By 1980, only a single, declining population was extant in Victoria. This decline prompted the establishment and implementation of a recovery program, which involved reintroduction of *P. gunnii* (principally from captive-bred stock) to 7 sites within its former range (Backhouse et al. 1994; Brown 1989; Seebeck 1990). In Tasmania, *P. gunnii* is widespread in the north and east (Hocking 1990) but is largely absent from the midlands (Mallick et al. 1997c). It is not known from any islands during the modern era, although it has been introduced to Maria Island, close to the Tasmanian southeastern coast (Hocking 1990; Rounsevell 1989).

FOSSIL RECORD. The earliest fossils of *P. gunnii* are Pleistocene (ca. 19,000 years ago) from Hunter Island off northwestern Tasmania (Bowdler 1974). Later fossils from Prime Seal Island, also in Bass Strait, are 8,000–17,000 years old (George et al. 1990). Pleistocene fossils are also known from cave deposits in southeastern South Australia (Pledge 1990; Smith 1972; Tidemann 1967), Flinders Island in Bass Strait (Hope 1973), and several widely separated sites in New South Wales (Davis 1996; Hope 1978; Marshall 1972, 1973). These New South Wales sites are geographically far removed from the historical range of the species. Holocene fossils have been reported from a number of sites in western Victoria (Chapman 1905; Wakefield 1963a, 1963b, 1964a, 1964b, 1967) and Tasmania (Wintle 1886).

FORM AND FUNCTION. Morphology of *P. gunnii* is typical of the conservative body form of bandicoots (Cockburn 1990). The slender head, poorly differentiated neck, strong shoulders and forelimbs, and muscular hindquarters are scarcely balanced by a thin, short tail. Feet are slender, with long toes and claws. Fur is coarse, and individual hairs are short and stiff, with a reniform cross-section and divided medulla (Brunner and Coman 1974). Hair tracts show patterns of whorls and currents that are characteristic of bandicoots (Boardman 1946; Lyne 1951), and facial and brachial vibrissae are also consistent among most peramelids (Lyne 1951, 1952, 1959). Subauricular cephalic glands may be associated with courtship behavior, and they exhibit prebreeding hypertrophy; a pungent odor is secreted by the gland complex (Stoddart 1980).

Postcranial skeleton is notable for syndactylous condition of hind feet. First and 5th digits of the forefeet are vestigial and clawless; 2nd and 3rd digits possess strong, long, curved claws, which

are used for digging subsurface food items; and 4th digit has a weaker straight claw. Hind feet are slender and elongate. First digit is vestigial; 2nd and 3rd are small and syndactylous, with small claws; 4th digit is greatly enlarged and furnished with a strong straight claw; and 5th digit is shorter, with a short straight claw (Lenghaus et al. 1990). Vertebral formula is 7 C, 13 T, 6 L, 2 S, 22 Ca, total 50. Clavicles are absent, but 13 pairs of ribs are present. A pair of long, thin epipubic bones are joined by cartilage to the ilium. Archer (1984:651) provided a photograph of an articulated skeleton of *P. gunnii*.

A detailed description of anatomy is available (Lenghaus et al. 1990; Tedman 1990). Tongue is long, narrow, thick, and pointed. Esophagus leads to a simple, oval, glandular stomach, from which emerges an intestinal tract of uniform diameter, except for a short tubular caecum towards cloaca. Liver has 4 main lobes, and kidneys are conventionally reniform. Left lung is unlobed, but right lung has 4 lobes.

Heart is globular with comparatively thick walls and is enclosed in a pericardial sac attached to sternum. Aortic arch gives off an innominate artery that branches into a right subclavian and 2 common carotid arteries. A separate coeliac branch of the dorsal aorta serves liver, spleen, pancreas, stomach, and duodenum, whereas a mesenteric branch goes to small and large intestines. External iliac arteries arise directly from aorta, which continues as the caudal artery from which the internal iliac arteries arise (Owen 1868). *P. gunnii* possesses 2 anterior vena cavae and a single posterior vena cava (Pearson 1940). Spleen is large, flattened, and triangular in shape (Lenghaus et al. 1990; Schulz 1976). *P. gunnii* possesses a bilobed thoracic thymus but no cervical thymus (Fraser 1915; Johnstone 1898; Yadav 1973).

Brain is superficially smooth due to the presence of an outer caudal folium, but typical mammalian structures are present beneath this covering (Lenghaus et al. 1990). *P. gunnii* has an architecturally simple dorsal lateral geniculate nucleus, and binocular vision may be restricted because of the long snout (Haight and Sanderson 1990).

Eastern barred bandicoots possess paired lobed submaxillary salivary glands located ventrocaudal to mandible, paired parotid salivary glands at base of each ear, a diffuse pancreas, aural sebaceous glands, a submucosal gland at entrance to small intestine, and rectal glands associated with accessory sex glands. Adrenal glands are attached at junction of vena cava and renal vein (Lenghaus et al. 1990; Tedman 1990).

Testes are external, anterior to cloaca, and enclosed in a lightly haired scrotum. Well-developed accessory sex glands, including a prostate gland, are subcutaneous and situated just anterior to cloaca. Size of this glandular complex varies little throughout the year. Penis is S-shaped and ends in a bifurcated spinous glans. Bladder lies dorsal to prostate (Lenghaus et al. 1990).

Perameles gunnii has a well-developed, backward-opening pouch situated ventrally between hind limbs. Eight nipples are normally present. Energy demands of lactation are met by increasing energy intake, effected by a change in diet (Reimer and Hindell 1996).

Perameles gunnii has paired hemispherical uteri, to which ovaries are attached laterally. Vaginal caeca, which are fused to present a bilobed appearance, cover each uterus. Bladder is ventral to these caeca, with paired ureters. The narrow urethra is flanked by 2 narrow lateral vaginae and enters a common urinogenital sinus opening to cloaca (Lenghaus et al. 1990).

ONTOGENY AND REPRODUCTION. *Perameles gunnii* is physiologically capable of breeding throughout the year, but in Tasmania reproduction may cease during autumn and early winter (Heinsohn 1966). In Victoria, reproduction may be reduced or may cease during hot, rainfall-deficient summers but will recommence within weeks of autumn rains (Dufty 1994b; Seebeck 1995b). Timing of breeding is strongly correlated with rate of change of minimum temperature (Barnes and Gemmell 1985). The eastern barred bandicoot has a gestation period of 12.5 days. *P. gunnii* is polyestrus, with an estrous cycle of ca. 26 days (Lyne 1964). Litter size ranges from 1 to 5. In Tasmania, litter size averaged 2.5 (n = 54—Heinsohn 1966; n = 174—Mallick et al. 1997a); in Victoria, litter size averaged 2.2 (n = 66—Dufty 1994b). In captivity, average litter size is 1.8 (Myroniuk 1993). Most litters (78% in Tasmania—Mallick et al. 1997a; 80% in Victoria—Dufty 1991b) contain 2 or 3 pups. Litter size may increase in spring because of an increase in available food (Dufty 1991b).

Sex ratio of pouch young is 1:1. Pouch life lasts ca. 55 days, after which young are left in a grass and leaf nest in a scraped depression until weaned at 70–80 days (Dufty 1991b). Survival of pouch young in Victoria was 92% but decreased markedly postweaning (Dufty 1994b). Both sexes may begin to breed at 4 months of age (Dufty 1994b; Heinsohn 1966; Mallick et al. 1997a). However, breeding may be delayed by 6–8 months when food resources are limited (Jenkins 1998).

Perameles gunnii has a chorioallantoic placenta, which forms at ca. 9.5 days of gestation and is retained in the uterus after parturition, perhaps preventing estrus during early stages of lactation. Neonates are ca. 13.5 mm long (crown to rump), have a head length of 5.75 mm, and weigh ca. 200 mg. Neonates are reddish pink with hairless, glossy skin. The mouth is circular, and the enlarged tongue firmly encloses a nipple. Nostrils are tubular and prominent, and a pigmented area represents the eyes. Neither ears nor sex are distinguishable at birth. Forelimbs are well developed, but hind limbs are rudimentary. Tail is well developed, ca. 3–4 mm long. Postnatal development is very rapid. Ears are visible, although fused to head, at ca. 5 days and are free at ca. 15 days. Eyes open at ca. 30–35 days. Fur begins to develop at ca. 35–40 days and the 50-day-old young is fully furred, open eyed, erect eared, vocal, and may voluntarily emerge from the pouch for short periods, although full coordination of movement has not developed. Length of head is directly correlated with age, enabling close estimates of birth dates and hence time of breeding from measurements of young in the field. Relationship between length of head and age holds well for at least the first 6 months of the bandicoot's life (Dufty 1995).

ECOLOGY. Habitat of *P. gunnii* is grassy woodland and grassland, normally on flat or gently undulating plains. Native grassy regions in Victoria have tussock grasses of the genera *Themeda, Danthonia, Stipa,* and *Poa,* together with associated forbs (e.g., Liliacae, Compositae, Orchidacae), many of which produce underground storage organs such as tubers or bulbs. These grasses have an average height of ca. 0.5 m. A sparse shrub layer is frequently present, which may include *Acacia, Banksia, Allocasuarina,* and *Hymenophyllum.* Where trees are present, they are species of *Eucalyptus,* commonly *E. camaldulensis,* which has a tall, spreading habit in maturity. In settled areas, *P. gunnii* uses heterogeneous habitat provided in gardens and along fence lines on farmland and will often use widespread introduced weeds such as *Ulex europaeus* or *Juncus acutus* for shelter. In housing developments, particularly long-established ones, eastern barred bandicoots shelter and often nest under outbuildings or in rubbish piles (Brown 1989; Dufty 1994c; Seebeck 1979). In Tasmania, *P. gunnii* colonized farmland created by clearing of former forest and is now rare in its presumed original grassland or grassy woodland habitat (Mallick et al. 1997c, 1997d).

Perameles gunnii is omnivorous, consuming a wide range of invertebrate and plant material, most of which is obtained from the soil or litter by the excavation of characteristic conical diggings, the incidence and number of which may be used as an index of population size (Mallick et al. 1997b). Earthworms (Lumbricidae) are a major food, especially in the wetter months. Insects and their larvae are also favored and include cockroaches (Blattidae), field crickets (*Teleogryllus commodus*), Coleoptera (especially Scarabaeidae), and moths and caterpillars (Lepidoptera). Bulbs and tubers of native and introduced plants are eaten, as are fruits of the introduced blackberry (*Rubus*) and windfall orchard fruits (Dufty 1991a, 1991b; Heinsohn 1996; Mallick et al. 1997a).

In Tasmania, adult sex ratio is 1:1 (n = 859—Mallick et al. 1997a), although fluctuations occur and different sites have different ratios (Heinsohn 1966; Mallick et al. 1997a). A remnant wild Victorian population was male biased, as were several reintroduced populations. Male-biased sex ratios may be a symptom of population stress, because a population that seemed vigorous and stable had a sex ratio near parity. As population size declined, a male bias was evident (Jenkins 1998).

Male home ranges exceed those of females but generally reflect habitat quality. Males may have ranges up to an order of magnitude larger than those of females (25.6 ha versus 3.2 ha—Heinsohn 1966), but core ranges are much smaller: 4–5 ha for males, 1.5–2.5 ha for females (Dufty 1994c; Mallick et al. 1997a). Home

ranges overlap, especially male ranges with those of females. Densities vary with habitat quality and range between 0.35 and 4.8 animals/ha (Brown 1989; Dufty 1994c; Heinsohn 1966; Mallick et al. 1997a). Young males may disperse up to 2.3 km, but most movements are <2 km (Dufty 1991a). Emigration rates are between 16.5% and 25.5% (Dufty 1994b; Mallick et al. 1997a).

In Victoria, few other native mammal species share habitats with *P. gunnii*. The introduced European rabbit (*Oryctolagus cuniculus*) is widespread throughout the range of *P. gunnii*. This rabbit competes with eastern barred bandicoots by reducing habitat through excessive grazing and may exclude eastern barred bandicoots from favored shelter areas (Seebeck 1984). In Tasmania, the southern brown bandicoot *Isoodon obesulus* is often sympatric but prefers heavier cover and is more cryptic in behavior. Nevertheless, it may compete for food (Heinsohn 1966).

Dingos, snakes, raptors, carnivorous marsupials, and aboriginal humans killed eastern barred bandicoots. Dingos and aboriginal humans no longer threaten bandicoot populations, and predation by native species is far outweighed by predation by the introduced red fox (*Vulpes vulpes*), cat (*Felis catus*), and dog (*Canis familiaris*). These predators may be responsible for some of the mainland bandicoot population declines (Seebeck et al. 1990a). At Hamilton, domestic cats were the major cause of mortality among juvenile bandicoots (Brown 1989), and red fox control is an essential component of conservation management at reintroduction sites. Wild and domestic dogs are important predators where bandicoots occupy farmland and suburban environments (Seebeck et al. 1990a).

Perameles gunnii hosts many protozoan and helminth parasites (Bettiol et al. 1996, 1997, 1998; Mawson 1960; Norman 1991; Obendorf and Munday 1990; Smales 1988, 1997; Spratt et al. 1990). Protozoa include the genera *Eimeria, Giardia, Hepatozoon, Klossiella, Octosporella, Sarcocystis,* and *Toxoplasma*. Cestodes are represented by *Hymenolepis peramelidarum*; nematodes by the genera *Capillaria, Cercopithifilaria, Labiobulura, Linstowinema, Marsupiostrongylus, Parastrongyloides, Peramelistrongylus*, and *Physaloptera*; Acanthocephala by *Australiformis* and *Plagiorhynchus*; and trematodes by *Mehlisia acuminata*.

Infection by the protozoan parasite *Toxoplasma gondii* commonly causes mortality in captive and wild populations. Cats are the definitive host and probable carrier of infection to bandicoots; infective oocysts are shed in cat feces and then ingested by bandicoots either directly from soil or via the gut content of invertebrates such as earthworms (Bettiol et al. 2000b). Toxoplasmosis has been reported from *P. gunnii* in both Tasmania (Miller et al. 2000; Obendorf and Munday 1990) and Victoria (Lenghaus et al. 1990; Miller et al. 2000). It has also been experimentally induced in captive *P. gunnii* via *T. gondii*-inoculated earthworms (Bettiol et al. 2000a).

Ectoparasites reported from *P. gunnii* include 4 species of dermanyssid mites from the genera *Haemolaelaps* and *Mesolaelaps,* 2 species of ixodid ticks (*Ixodes tasmani* and *Sternadixodes*), and 3 species of fleas from the genera *Pygiopsylla* and *Stephanocircus* (Obendorf and Munday 1990; Roberts 1970).

Perameles gunnii live 20–30 months in the wild (Dufty 1994b; Heinsohn 1966; Mallick et al. 1997a) but can live 5–6 years in captivity. Causes of mortality in the wild include predation, disease, poisoning by pesticides, and collision with motor vehicles. Cats killed predominantly juveniles, but road-killed animals were mainly adults (Brown 1989). Causes of death of 135 *P. gunnii* over a 10-year period were 63% roadkills, 18% cats, 8% disease, 5% trapping accident, 4% machinery (mowers), and 2% dogs (Dufty 1994b). The most common causes of death in 270 wild and captive bandicoots was trauma, including roadkills, predation, and trapping injury (71%); infection and poisoning were the cause in ca. 12% of deaths (Booth and McCracken 1994). Bandicoots suffering from toxoplasmosis may be more at risk from predators and motor vehicles because of uncoordinated and often aberrant behavior that results from the disease (Lenghaus et al. 1990). Pneumoconiosis may occur in lungs of *P. gunnii* and may reflect exposure to soil when digging for prey, although this condition rarely impairs respiratory function (Lenghaus et al. 1990).

Perameles gunnii breeds readily in captivity, and its husbandry is well documented (Kingston 1998; Krake and Halley 1993). The breeding program is managed by the Zoological Parks and Gardens Board of Victoria, using several zoos in Victoria, South Australia, and New South Wales (Myroniuk 1995). Population management is facilitated by a formal Studbook, maintained at the Melbourne Zoo (Myroniuk 1993).

Eastern barred bandicoots have little economic impact on the community, although they were captured and eaten by aboriginal Australians and probably by early European settlers. Their skins were used for clothing and other artifacts. Nuisance damage occurs when animals dig into private gardens. Rabbit trapping was an important local industry in the late 19th century, and trappers considered bandicoots a nuisance when they were captured (Seebeck et al. 1990a).

Live capture is most effectively done using baited wire-mesh cage traps. Protocols for trapping have been developed to reduce potential injury to the animal (Seebeck and Booth 1996). Marking methods include tagging ears (fingerling tags), tattooing ears, and implanting microchips (Seebeck 1998).

BEHAVIOR. *Perameles gunnii* is essentially solitary, other than when courtship and mating occurs or when females have dependent young. Mutual avoidance is usual. Males are more aggressive than females and occasionally chase and attack other males, although scarring or injury is rare (Clunie 1987; Dufty 1994a; Heinsohn 1966). In a confined reintroduced population with strong male bias, injury from fighting was more common. Most behavior in captivity mimicked that described for wild eastern barred bandicoots. Adults were tolerant of juveniles, even those of the same sex (Murphy 1993).

Males initiate courtship when a female becomes receptive; copulation is brief but frequent, and many males may mate with a single female over several hours. A maximum of 10 males mated with a single female, 3–4 times each; this behavior may have been the result of a male-dominated population (Dufty 1994a). Mating is achieved with the male standing erect behind the crouched female, with his forelegs folded back against his body. Contact is only in the genital region. Eastern barred bandicoots of both sexes usually resume normal foraging activity postcoitus (Dufty 1994a; Heinsohn 1966).

Eastern barred bandicoots have a limited range of vocalizations, visual displays, and social behaviors (Coulson 1990). "Honking" is associated with alarm, and "sniffing" is associated with recognition. The pale belly may be a visual signal of submission, although an erect stance with open, gaping mouth occurs during aggressive encounters (Clunie 1987).

Perameles gunnii is relatively long limbed and can move very rapidly quadrupedally using either a synchronous running or an asynchronous galloping gait. Sudden jumps (up to 1.5 m high) during escape responses and the capacity to rapidly change direction facilitate evasion of predators (Moloney 1982).

Olfaction plays a significant role in the feeding ecology of *P. gunnii* (Quin 1992). Food is normally obtained by digging conical holes in soil with front feet. After potential prey has been located by olfaction, smell may confirm presence of food during digging (Quin 1985). Feeding at 1 site may last >25 min, and >90% of the time may be spent actively foraging or consuming food items (Heinsohn 1966). Food may be rolled and kneaded in the forepaws; this behavior may be due to unfamiliarity with the item, a need to crush the exoskeleton of arthropods, or a way to remove irritative hairs from caterpillars. Drinking is rarely observed; water is lapped with a forward and upward movement of the tongue (Dufty 1994a).

Eastern barred bandicoots groom with syndactylous claws on hind feet. Face and head are groomed with saliva-moistened forefeet. The body, particularly the genital area, is cleaned with the mouth. Other comfort acts include stretching and yawning, usually upon emergence from the nest, body shaking when wet, and pouch cleaning by females (Clunie 1987).

Nests are constructed at or just below ground level, depending upon season and soil moisture. Nests are excavated, using only forefeet, in a rapid scratching motion. Soil and litter are pushed back through hind legs, and back is arched to accommodate accumulated material. Nests may be used for several days but may also be temporary. On occasion, nests are built in hollow logs or underneath rocks or other solid features. In suburban Hamilton, nests often are made under buildings or in piles of rubbish. Rabbit burrows are used for shelter and perhaps also for nesting (Dufty 1994c). Most (78%) of 20 nests located by radiotelemetry were within 3 m of a woody plant and were frequently very cryptic in placement. Nests may be at the base of a grass tussock and virtually

impossible to detect without disturbing the animal (Murphy and Serena 1993).

Perameles gunnii is principally nocturnal, often emerging from the nest only during complete darkness, although animals may be active during twilight (Heinsohn 1966). Captive animals did not emerge until almost 3 h after sunset (Moloney 1982). Activity pattern is governed by an endogenous circadian oscillator entrained to photoperiod (Lyne 1981).

GENETICS. Eastern barred bandicoots have a chromosome number of 2n = 14, with XX/XY sex chromosomes. Sex chromosomes are larger than autosomes and are eliminated from some somatic tissues of adults. Somatic cells may contain ca. 10–15% more DNA per cell than the eastern grey kangaroo, *Macropus giganteus* (Hayman and Martin 1974). No genetic variation in either the relict Hamilton or the Tasmanian population could be determined by blood proteins (Robinson et al. 1990; Sherwin et al. 1990). However, 2 simply inherited and highly variable nuclear genetic VNTR (variable number of tandem repeats) loci as well as VNTR APDs (average percent differences) and mitochondrial DNA data suggest that the Tasmanian population has less genomic variability than the Hamilton population, despite the great population reduction on the mainland. Recent subdivision of the Hamilton population has led to detectable genetic variation. At least 1 reintroduced population has retained a high degree of wild population heterozygosity, and the Tasmanian and Victorian populations exhibit substantial genetic differentiation (Robinson 1992, 1995; Robinson et al. 1990, 1993). Pedigree analysis of reintroduced and captive populations shows that high levels of heterozygosity were maintained (Macdonald 1997).

CONSERVATION STATUS. Due to the dramatic decline in numbers of *P. gunnii* on the mainland, a preliminary conservation program began in 1972 (Seebeck 1979), which both documented the decline and initiated experimental captive management and local conservation actions at Hamilton, the focus of the remaining population. A draft Management Plan was published (Brown 1987), and local actions to enhance and protect the wild population were extended. The final Management Plan (Brown 1989) established multiskilled recovery teams to manage statewide and local recovery (Arnold et al. 1990; Seebeck 1990). Establishment of a protected satellite colony was facilitated by creating of a captive breeding colony, and between 1989 and 1992 nearly 100 eastern barred bandicoots were released into a 400-ha fenced reserve where they were protected from predators. Although initial survival was low, by 1994 the population included 500+ animals (Dufty et al. 1995). A 2nd population was established at Hamilton. Between 1992 and 1997, 5 more satellite colonies were establised (Backhouse et al. 1994, 1995; Humphries and Seebeck 1995). This metapopulation is managed under a detailed Recovery Plan, which will remain in place until 2002 (Watson and Halley 1999).

Although apparently secure in Tasmania (Hocking 1990), evidence of *P. gunnii* decline in some parts of its range (Robinson et al. 1991) resulted in the federal Government funding a recovery program (Driessen and Hocking 1991). The concentration of the species' range has shifted, and it is now locally threatened in its postulated focal range (Mallick et al. 1997c). Conversely, the range has extended into areas where forest has been converted to agricultural land (Mallick et al. 1997a). Management of habitat focuses on habitat improvement and control of feral and domestic cats. Tasmania has no red foxes, and native carnivorous marsupials are not a great threat to *P. gunnii* (Mallick et al. 1997a).

REMARKS. The name *Perameles* is from the Greek *pera,* meaning pouched, and *meles,* meaning badger, alluding to the presumed habit of burrowing. The specific epithet *gunnii* is in recognition of Ronald C. Gunn, collector of the type specimen (Strahan 1981). The original description (Gray 1838a) was extended in a subsequent publication (Gray 1838b). Vernacular names include barred bandicoot, Tasmanian barred bandicoot, Gunn's bandicoot, striped bandicoot, and stripy-bummed rat (Seebeck 1995a).

Confusion as to the specific identity of the southeastern Australian populations was evident until the 1950s. Troughton (1941) and Brazenor (1950) both considered this form to be *P. fasciata,* a junior synonym for *P. bougainville,* but Lyne (1951) demonstrated that the mainland and Tasmanian populations were conspecific and referable to *P. gunnii. P. bougainville* formerly occurred in southeastern Australia in semiarid habitats but has long been extinct there. It now only occurs naturally on 2 offshore islands of Western Australia, although programs have been initiated to reintroduce the species to the adjacent mainland (Richards and Short 1997). A comprehensive annotated bibliography for *Perameles gunnii* has been published (Seebeck and Patrick 1995).

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