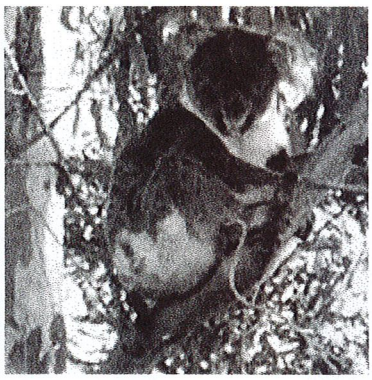
Port Macquarie-Hastings Koala Habitat & Population Assessment





Final Report to Port Macquarie-Hastings Council

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biolink pty ltd
ecological consultants
PO Box 3196 Uki NSW 2484
T 02 6679 5593
F 02 6679 5523
www.biolink.com.au

Executive Summary

The Port Macquarie-Hastings Local Government Area (PMHLGA) encompasses 368,113ha of land between Taree and Kempsey on the mid-north coast of NSW. While there have been a number of earlier studies covering parts of the study area this report describes the results of the first assessment of koala distribution and abundance across the entire PMHLGA.

Analysis of 6,205 koala records confirms that koalas have a long history of occupation in the study area, with little change in the key range parameter *Extent of Occurrence* over the time period 1949-2011, the current extent of which approximates almost the entire PMHLGA. The records further imply a current *Area of Occupancy* approximating 24% of available habitat. During the time period 1949-1993, koala records for the PMHLGA indicate two major areas of generational persistence, the first coinciding with Lake Innes and adjacent habitat areas, the second associated with the coastal villages of Lake Cathie and Bonny Hills to the south. Five smaller areas of generational persistence are also apparent over the time period 1949-1993: Telegraph Point, Wauchope, Bago and the coastal villages of Laurieton and Dunbogan. With the exception of the Lake Innes cell, latter localities suggest the presence of generally small and quite localized populations. The subsequent three-generation subset (years 1994-2011) confirms the continued persistence of a significant source population in the Lake Innes area while the population at Telegraph Point appears to have expanded. In contrast, populations at Laurieton, Bago and Wauchope do not appear to have persisted, while additional localities in more western areas of the PMHLGA such as Ellenborough, Debenham, Mt. Seaview and the Upper Pappinbarra - Mt. Boss areas have become apparent.

Koala habitat assessments involved application of a systematic sampling strategy using Spot Assessment Technique (SAT) methodology at 4,000m, 2,000m, 1,000m and 500m (supplementary) intervals to gather data on koala presence/absence, food tree preferences, density and activity in all land tenures across the PMHLGA. Collectively, 405 field sites were sampled comprising 354 primary and 51 supplementary field sites, the latter focused around areas of significant koala activity within the coastal portion of the PMHLGA. Evidence of habitat use by koalas, specifically the presence of koala faecal pellets, was recorded in 84 of the primary field sites to provide a current *Area of Occupancy* estimate for the PMHLGA of

approximately 24% of available habitat, or 30,500ha ± 1,220ha when calculated on the basis of spatial variation associated with the scale of sampling.

Koala activity was generally widespread across the PMHLGA but was most commonly recorded from freehold lands and national park estate. Surprisingly, koala activity was recorded less commonly from areas of State Forest where field data and other knowledge strongly points to cumulative impacts of logging over time resulting in significantly lower size classes of preferred food tree species which in turn results in a lower koala carrying capacity.

Survey data indicates a conservative population size estimate for the PMHLGA of approximately 2,000 koalas, more than half of which occur in the coastal strip east of the Pacific Highway between the Hastings and Camden Haven Rivers. This includes a nationally significant source population with an estimated population size of greater than 500 individuals located on public and freehold lands surrounding Lake Innes. Coarsely defined but otherwise substantive population cell(s) is/are also present in the Yarras - Debenham area. Based on current population configuration in the coastal strip and the presence of records in higher elevation areas to the west, at least four distinctive koala genomes are considered likely to be represented within the PMHLGA.

Data from 10,186 trees collected during the course of the field assessment were augmented by that from other local studies in order to more thoroughly investigate utilisation of preferred koala food trees. Collectively, a total of 16,889 trees comprised the tree use data set. Consistent with previous work, four species: Forest Red Gum (*Eucalyptus tereticornis*), Swamp Mahogany (*E. robusta*), Tallowwood (*E. microcorys*) and Grey Gum (*E. propinqua*), were identified as the tree species most preferred by koalas within the PMHLGA. All these tree species were confirmed as primary food trees when growing on medium to high nutrient soil landscapes, while size-class based variation in the use of Tallowwood confirmed that this species functions as a secondary food tree when growing on low nutrient soils. Knowledge of tree preferences and the influence of the soil landscape on tree use by koalas facilitated development of a hierarchical koala habitat classification system which enabled areas of Primary, Secondary (A) and Secondary (B) koala habitat to be identified. Despite the size of the tree use data set and the extent of habitat sampling, preference data on species such as Cabbage Gum (*Eucalyptus amplifolia*), Bancroft's Red Gum (*E. bancroftii*), Narrow-leaved Red Gum (*E. seanna*) and

Mountain Grey Gum (*E. punctata* - formerly *E. biturbinata*) was unable to be quantified.

Overall, the current estimated *Area of Occupancy* by free-ranging koala populations in the PMHLGA is considered to be less than optimal, while the concentration of a large proportion of the total population in two relatively localised areas of habitat, the first surrounding Lake Innes and the second in the Yarras – Debenham area, imposes a measure of vulnerability upon the population as a whole. Major threats to the continued viability of the broader koala meta-population inhabiting both the coastal and western portions of the PMHLGA include fire, logging, urban expansion, road mortalities and domestic dog attack.

Koala activity was recorded across all land tenures but most commonly from private land and national park estate, least commonly from State Forests (Table 3.3). Because of this result, variation amongst number of active sites was further examined *post-hoc* using log-likelihood ratios, with land tenures arranged for analysis in order of decreasing proportion of active sites so as to enable an unplanned test for homogeneity using simultaneous test procedures (Sokal and Rohlf 1995). To this end, the number of active sites in State Forests was identified as being significantly lower when compared to the number of active sites on the other two land tenures (G = 6.2027, 2*df*, P < 0.05).

Table 3.3: Tenure-based breakdown of survey effort (primary field sites only) across PMHLGA (n = no. of primary field sites, n^k = no of primary field sites within which koala scats were recorded, * = based on 10 randomly selected sites).

Land Tenure	n	n^k	% Active Sites	Mean Activity
National Park	50	16	32.00	23.00*
Other lands	232	58	25.00	12.31*
State Forest	72	10	13.88	5.33

3.3.2 Population Modelling

Within the 74,000ha UGMS area, koala activity was spatially auto-correlated (clustered) and recorded most frequently to the east of the Pacific Highway in the general area between the Hastings and Camden Haven Rivers. The resulting koala population model for the UGMS area is illustrated in Figure 3.2. As already alluded to by the historical records analysis, modelling clearly identifies the presence of a significant population cell in the Lake Innes area, components of which extend to the south and east across the Christmas Bell Plain and into urban areas of Port Macquarie. Other coastal population cells are located at the southwest corner of the Lake Innes Nature Reserve, at the southwestern edges of Lake Cathie and at Bonny Hills. Significant activity was also recorded at Sancrox, Fernbank Creek and Thrumster, and within lands adjacent to the Port Macquarie Airport. Two further cells worthy of note include small populations at Riverside on the north bank of the Hastings River and another south of the Camden Haven River at Dunbogan; these latter populations likely represent northern and southern outliers of koala genomes that potentially differ from those of the typical Port Macquarie koala.