

**The life-history ecology of *Platycephalus bassensis*
and *Nemadactylus macropterus***

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Statements

I declare that this thesis contains no material which has been accepted for the award of any other degree or diploma in any tertiary institution and, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text

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A handwritten signature in cursive script, appearing to read 'Gund'.

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Abstract

The ecology of all life-history stages of two species of demersal fish, sand flathead (*Platycephalus bassensis*) and jackass morwong (*Nemadactylus macropterus*) found in coastal and continental shelf waters of southern and eastern Tasmania was investigated to determine the spatial and temporal patterns of spawning distribution and larval transport, recruitment, abundance and distribution, and size and age composition. The seasonal and interannual variations of the hydrography of shelf waters are described and the influence of such variability on the life-history stages assessed.

Spawning in *P. bassensis* occurred for an extended period of up to six months between October and March in estuaries, coastal embayments and shelf waters of southern and eastern Tasmania. The distribution of spawning fish, larvae and patterns of hydrography indicate that spawning on the shelf is primarily inshore. Larval development of *P. bassensis* is described. Larvae are concentrated in mid-water which retain larvae inshore as cross-shelf subsurface currents are predominantly onshore.

Spawning in *N. macropterus* occurred between early January and late April in mid- and outer-shelf waters. Ichthyoplankton data indicate *N. macropterus* larvae are concentrated in surface waters, with few larvae caught during subsurface sampling of shelf waters over three years, despite large interannual differences in the extent of vertical mixing and stratification. The surface distribution of larvae appears to be a strategy to maximise offshore transport as movement of surface waters of the shelf are generally offshore. However, large interannual variations in the influence of subtropical and subantarctic waters on the shelf are described and the influence of such variations on larval transport assessed.

Significant seasonal and spatial variations in abundance of mature *P. bassensis* were evident, the variations attributed primarily to the seasonal movement of fish between shelf and nearshore waters. Overlying the seasonal trends in abundance were interannual variations that were at least an order of magnitude in difference. Mature *P. bassensis* were generally more abundant on the inner-shelf, with little evidence of size-structuring with increasing depth. Settlement occurred over an extended period in summer with juveniles showing a strong preference for unvegetated habitats in

nearshore waters, compared to beds of the seagrass, *Heterozostera tasmanica*. However, mature *P. bassensis* in nearshore waters showed no preference between vegetated and unvegetated habitats. There is evidence of a seasonal movement of these nearshore fish out onto the shelf close to the size at maturity.

In contrast, *N. macropterus* on the shelf showed size-structuring between depths and regions, with juveniles dominating the inner-shelf in both regions surveyed, while the mid- and outer-shelf of the east coast was dominated by mature fish. Settlement from the pelagic post-larval phase occurred in spring and early summer at between 7 to 9 cm and 9 to 12 months old. Storm Bay appears to be principally a nursery area for the species with migration from the region occurring upon maturity. In addition, the size-structuring by depth was one of the main factors attributed to the significant variations in abundance across the shelf. Significant seasonal variations in abundance were also apparent, which is attributed to the seasonal movement of fish from south-eastern Tasmanian shelf waters.

The age, growth and spatial and interannual trends in age composition of *P. bassensis* and *N. macropterus* were examined using transverse sections of sagittal otoliths. The first annual increment was defined in both species by examination of the progression of otolith radius and length of the 0+ cohort. Sex specific growth curves are presented for both species. Maximum ages of *P. bassensis* was 17 years for males and 13 for females, while *N. macropterus* reached 41 years for males and 30 for females. The age composition of both species was dominated by 4 to 7 years olds with considerable recruitment variability evident with a strong year-class in 1986 for *P. bassensis* and in 1988 for *N. macropterus*. The relationship between the life-history strategies of *P. bassensis* and *N. macropterus* and recruitment variability is discussed.

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