STUDIES IN THE BIOLOGY AND REPRODUCTIVE CHARACTERISTICS OF *PSEUDOMUGIL SIGNIFER*.

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B

Photographs of the southern male (A) and female (B) *Pseudomugil signifer*. Photographs courtesy of Mr R. H. Kuiter.

CERTIFICATE.

I certify that this thesis has not already been submitted for any degree and is not being submitted as part of candidature for any other degree.

I also certify that this thesis has been written by me and that any help that I have received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

Production Note:
Signature removed prior to publication.

Effie Howe

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"The fish in the creek said nothing. Fish never do. Few people know what fish think about injustice or anything else."

Catwings. Ursula Le Guin (1988)

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ABSTRACT.

The aims of this study were firstly to observe the breeding behaviour and embryology, and then to identify factors affecting the reproductive biology of the Australian native pseudomugilid *Pseudomugil signifer* (Pacific blue-eye) and the impact upon it of the presence of the exotic species *Gambusia holbrooki* (eastern gambusia). Six species of the genus *Pseudomugil*, and the related *Scaturiginichthys vermeilipinnis*, are found on the Australian continent. The normal breeding behaviour, egg surface morphology and embryology of four species of *Pseudomugil* (*P. signifer*, *P. gertrudae*, *P. tenellus* and *P. mellis*) were first investigated, using aquarium and microscopic (light and S.E.M.) studies. The four species were divided into two groups: *P. signifer* and *P. mellis*; and *P. tenellus* and *P. gertrudae*. The study provided further evidence for the view that the embryology of the genus *Pseudomugil* differs markedly from that of members of the family Melanotaeniidae, with which the pseudomugilids have previously been grouped.

The seasonal pattern of gonadal function in *P. signifer*, both in the field and in aquariums, was then investigated for populations of *P. signifer* from the Sydney region. It was found that *P. signifer* bred over the spring and summer months, commencing breeding as the temperature and daylength increased, and declining in breeding activity as daylength and temperature declined. There was no substantial difference in the pattern of reproductive activity between wild and captive stocks of *P. signifer* in the populations used.

The impact of the presence of the introduced *G. holbrooki* on *P. signifer* was then examined, first in open-air tank experiments, and then in the field. In the tank experiments the exotic species profoundly affected the breeding of the native species. When *G. holbrooki* were in the tanks *P. signifer* did not gain weight or grow in total length (except for females given supplementary feed); ovarian weight and fecundity was greatly reduced and the ovaries were morphologically undeveloped. No eggs from *P. signifer* were observed in tanks which also housed *G. holbrooki*. *G. holbrooki* were observed to actively hunt and eat young *P. signifer* and to nip the caudal fins of adult *P. signifer*. The results indicate clearly, that at least in a captive situation, the presence of the exotic species has a very deleterious effect on breeding and hence possible survival, of a native population.

A pilot study conducted at the same time as the harvest of the second tank study did not reveal such drastic consequences. However, even in the less confined field situation, some evidence of an interrelation between water quality, numbers of *P. signifer* and numbers of *G. holbrooki* were seen in one disturbed site (Homebush Bay). These findings suggest that a newly designed field experiment based on data collected from the power analysis of the pilot study could clarify whether *G. holbrooki* adversely affects *P. signifer* in the wild.

The information gained from these studies can be used in the management of *P. signifer* in the wild, and serve as a model of the possible effects upon other native species.