

# A Redescription of *Heteroclinus adelaidae* Castelnau (Pisces: Clinidae), With Description of a Related New Species

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## ABSTRACT

*Heteroclinus adelaidae*, a southern Australian clinid, is redescribed from the holotype and numerous specimens from Tasmania, Victoria, South Australia and Western Australia. A new and closely related species is described from Tasmania and South Australia. The generic classification of the Australian clinids is briefly discussed.

## INTRODUCTION

Clinids are one of the more poorly known groups of Australian marine fishes. The previous taxonomic studies have been based on limited material, primarily from one geographical area at a time. Castelnau described several species from southern Australia in the late 1800s, while Günther described various species from eastern and western Australia. McCulloch (1908) was the first Australian worker to extensively examine the group, although he treated only eight species, primarily from eastern Australia. Little subsequent work was done on the group until Whitley (1941, 1945) examined types in Europe. Scott (1955, 1966 and 1967) has treated the known Tasmanian species extensively. Milward (1967) revised the species known from Western Australia, and McKay (1970) described an additional Western Australian species.

At present 34 species have been described from Australia. Whitley (1964) recognized 18 species, two of which had been regarded as uncertain species. Types of these two species, *Heteroclinus adelaidae* and *Neoblennius fasciatus*, were examined in this study. Previously no thorough attempt has been made to examine the group on a widespread geographical basis, due to lack of adequate material. Recent field work in New South Wales, Victoria, Tasmania and South Australia has alleviated this problem to some extent, with 25 species now being known, but many of the species are still represented by few specimens. Most of the collecting has been restricted to depths shallower than five metres. Springer (pers. comm.) suggested that the ophiclinids are clinids, bringing the total number of Australian species to over 30, comparable in number to the South African fauna.



## DESCRIPTIONS OF *HETEROCLINUS* SPECIES

Many of the Australian species are superficially similar, although many differ in live colour pattern, particularly of the head. In alcohol the colour fades, and important species characters are often lost. The body colouration, however, tends to be highly variable. Inadequate comparative material has led earlier workers to incorrectly synonymize species and not separate closely related ones. It is apparent that the range of variation in meristics within a species is narrower than previously suspected.

With the exception of a species of *Springeratus*, the Australian species are confined to temperate regions of eastern, southern, and south-western Australia. Two of the Australian species occur at Lord Howe Island and one occurs in New Zealand. The species occur in rocky tidepools, in association with algae around rocky reefs, or in grass flats over mud or sand bottoms. All the species are undoubtedly live-bearers.

## METHODS

The following abbreviations are used in reference to material examined: AMS, Australian Museum, Sydney; MNHN, Museum National d'Histoire Naturelle; NMV, National Museum of Victoria, Melbourne; QM, Queensland Museum, Brisbane; QVM, Queen Victoria Museum, Launceston; SAM, South Australian Museum, Adelaide; TM, Tasmanian Museum and Art Gallery, Hobart; WAM, Western Australian Museum, Perth.

In material examined lists, the number of specimens are given followed by the size range of standard length in mm. All fish lengths given are standard lengths (SL).

Counts and measurements follow those given by Hubbs and Lagler (1958). The last anal ray and last dorsal ray are counted as separate. Vertebral counts were determined from radiographs and cleared and stained specimens.

## GENERIC CLASSIFICATION OF AUSTRALIAN CLINIDS

The generic classification of Australian clinids has not been thoroughly studied. Five nominal genera (*Heteroclinus*, *Neoblennius*, *Petraites*, *Clinus*, and *Cristiceps*) have been recorded from Australia, and a sixth, *Springeratus*, has been collected from the Great Barrier Reef. *Cristiceps* has long been regarded as distinct. Some Australian species have been placed in the African genus *Clinus* while other species have been placed in *Petraites*, with the two genera separated on the basis of the dorsal spine count. Recently, Penrith (1969) suggested that *Petraites* was a synonym of *Clinus*, and McKay (1970) has followed Penrith. Shen (1971), however, has noted that African clinids lack the genital flaps characteristic of Australian species. While it is apparent that the Australian species, all of which are undoubtedly live bearers, are related to African genera, no thorough comparison



has been made. Two of the Australian genera, *Heteroclinus* and *Neoblennius*, have been treated as uncertain genera. Examination of the holotype of *Heteroclinus adalaidae* Castelnau (1873) reveals it to be a distinct species subsequently described as *Cristiceps phillipi* Lucas (1891). Similarly, the syntypes of *Neoblennius fasciatus* Castelnau are representatives of the previously described *Cristiceps perspicillatus* Cuvier and Valenciennes (1836). At present no attempt is made to resolve *Heteroclinus*, *Petraites*, and *Neoblennius* problem. However, since *Heteroclinus* is the oldest of the three genera, the type species is redescribed and compared with a new closely related species.

The type species of *Petraites*, *P. heptaeolus*, and four closely related species (*P. wilsoni* and three undescribed species) differ from *H. adalaidae* complex in having three stout pelvic rays, a strongly compressed head, and the last two dorsal rays widely separated from the preceding. It is unlikely that *P. roseus* and *P. fosteri* also are referable to *Heteroclinus*. Other Australian species generally have a more robust head, and many species have biserial head pores. Whether or not these species belong in other genera is the subject of further study.

The species of the *H. adalaidae* and *H. heptaeolus* complexes differ substantially from the African genus *Clinus*. Of the characters used to define *Clinus* (Penrith, 1969), the shape of the orbital tentacle and presence of clusters of cirri on the dorsal spines are often different between closely related Australian species and do not seem of generic importance in these species. The species of these two complexes differ from *Clinus* in the arrangement of lateral line pores, in having three or more rows of teeth in the upper jaw, in having a more compressed head and body, and in always having the anterior scales overlapping. In general body form *Heteroclinus* is more similar to the African genus *Pavoclinus* than *Clinus*.

#### *Heteroclinus* Castelnau

*Heteroclinus* Castelnau 1873: 68 (type species, *Heteroclinus adalaidae* Castelnau, by monotypy)

Since the Australian clinids are heterogeneous and require further study, only the two species of the *Heteroclinus adalaidae* complex are characterized below:

Last two dorsal rays evenly spaced, not widely separated from the preceding ray or spine. Head moderately compressed; body strongly compressed. Snout pointed to rounded in lateral view. Body elevated along first dorsal margin. Infra-orbital and preopercular mandibular pores small and uniserial. Nasal tentacle short to moderately elongate, simple or weakly bilobed. Orbital tentacle short and rounded, elongate and pointed, or elongate with numerous lateral lobes. Dorsal origin above a point before preopercular margin to near end of eye. First three dorsal spines usually separate from rest; membrane of first dorsal connected at very base of first spine of second dorsal fin or to back before spine, rarely connected to tip of first spine of second dorsal fin. Segmented caudal rays 11. Pectoral rays typically 11 or 12. Second dorsal spines typically 29-31. Segmented



## DESCRIPTIONS OF *HETEROCLINUS* SPECIES

dorsal rays 2-5. Branchiostegals 6. Mouth small, ending below eye. Pelvics 1, 2, two segmented rays slender and elongate reaching to near anal fin; an inner rudimentary ray, visible only by dissection. Vomer with 1-2 rows of teeth forming an inverted V. Precaudal vertebrae 13 to 15. Anteriorly, lateral line scales overlapping, with a posteromedian pore; posteriorly, near end of pectoral fin scales separated with tubes at each end; behind pectoral fin lateral line scales few and separate or absent.

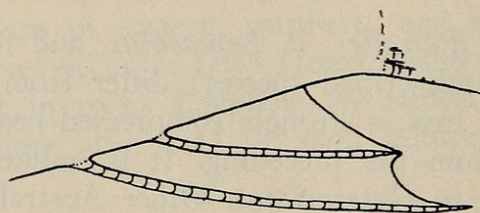


Fig. 1. Attachment of last anal ray to caudal peduncle in *Heteroclinus adelaidae* and *H. macrophthalmus*.

Considerable confusion has occurred over the identity of *Heteroclinus adelaidae* and *H. antinectes*. Whitley (1945) designated a lectotype of *Cristiceps antinectes* Günther (1861) and indicated that it was a senior synonym of *Petraites phillipi* (= *H. adelaidae*). Although one paralectotype is *H. adelaidae*, the lectotype and two paralectotypes are of a different and distinct species. Milward (1967) followed Whitley in treating *Cristiceps phillipi* Lucas as a synonym of *Petraites antinectes*. However, the species treated by Milward (1967) as *P. antinectes* is an undescribed species with biserial circumorbital pores not closely related to *H. antinectes*. Recent sampling has revealed a new species closely related to *H. adelaidae* from South Australia and Tasmania.

The two species treated here are easily distinguished from other Australian clinids by the combination of the two slender pelvic rays, the broad connection of the last anal ray to the caudal peduncle (Fig. 1) and the reduction of the lateral line.

### *Heteroclinus adelaidae* Castelnau

Figures 2, 3a, and 4

*Heteroclinus adelaidae* Castelnau 1873: 68 (type locality, Adelaide, South Australia).

*Cristiceps phillipi* Lucas 1891: 11, pl. 3, fig. 2 (type locality, Port Phillip Bay, Victoria).

*Petraites phillipi* — McCulloch 1908: 43, pl. 10, fig. 3 (Western Port, Victoria).

Scott 1966: 109, fig. 1d (Green's Beach, northern Tasmania). Scott 1967: 194 (in part, Green's Beach, Tasmania).



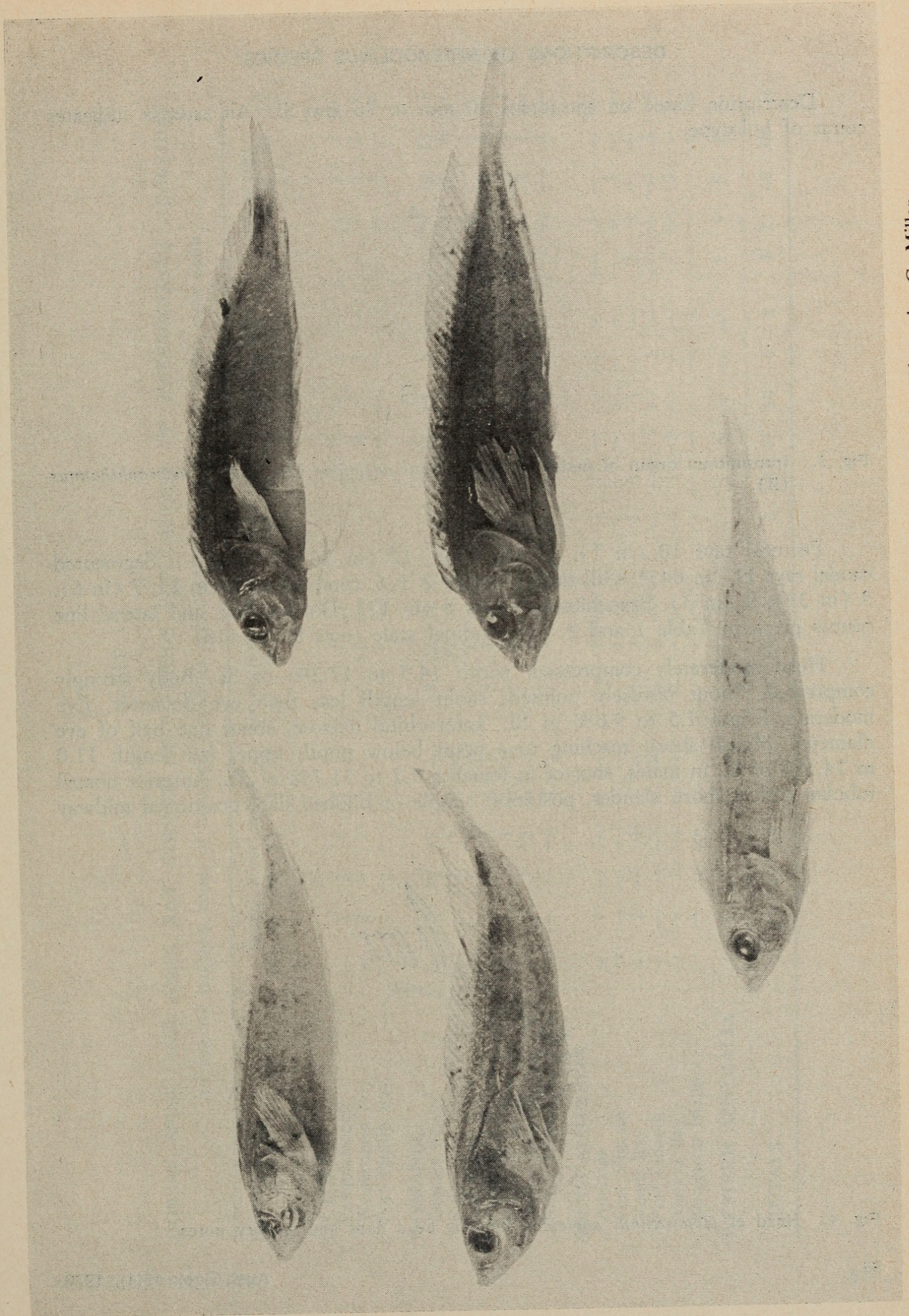


Fig. 2. Colour variation in *Heteroclinus adelaidae* from northern Tasmania. Photo by G. Millen.



## DESCRIPTIONS OF *HETEROCLINUS* SPECIES

Description based on specimens 30 mm to 76 mm SL. An asterisk indicates count of holotype.

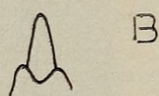
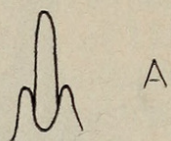


Fig. 3. Intromittant organ of males of *Heteroclinus adelaidae* (A) and *H. macrophthalmus* (B).

Pectoral rays 10 (in 1), 11 (in 71)\*, 12 (in 10), 13 (in 1). Segmented caudal rays 11 (in 84)\*. Gill rakers usually 2 + 6, total rakers 6 (in 1), 7 (in 6), 8 (in 39), 9 (in 3). Branchiostegal rays 6 (in 17). Dorsal, anal, and lateral line counts given in Table 1 and 2. Longitudinal scale rows 86 to 118.

Head moderately compressed, width 14.5 to 17.2% of SL. Body strongly compressed. Snout obtusely pointed, snout length less than eye diameter. Eye moderate, length 7.5 to 9.0% of SL. Interorbital narrow, about one half of eye diameter. Mouth short, reaching to a point below pupil; upper jaw length 11.0 to 14.3% of SL in males, shorter in females, 9.7 to 11.7% of SL. Anterior nostril tubular with a short, slender, posterior, simple or bilobed flap, positioned midway

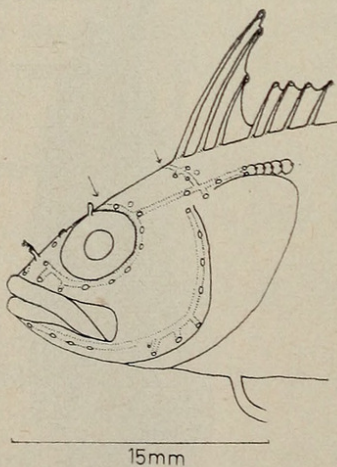


Fig. 4. Head of *Heteroclinus adelaidae* showing head flaps and sensory pores.



TABLE 1

DORSAL SPINE AND ANAL RAY COUNTS OF VARIOUS POPULATIONS OF *HETEROCLINUS ADELAIDAE*.

An asterisk indicates count of holotype. Localities are arranged north to south within each State

Population	Second dorsal spines						Second dorsal rays			Total dorsal spines and rays							Anal rays				
	28	29	30	31	32	33	2	3	4	34	35	36	37	38	39	21	22	23	24	25	
<b>VICTORIA</b>																					
Petersborough	—	1	2	4	1	—	—	7	1	—	1	2	4	1	—	—	2	5	1	—	
Westernport Bay	—	2	4	2	3	—	—	11	—	—	2	4	4	1	—	—	2	6	2	1	
Port Phillip Bay	—	1	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	1	—	—	
<b>TASMANIA</b>																					
Green's Beach	—	2	10	17	3	—	9	22	1	—	—	4	14	11	3	—	4	14	13	1	
Kelso	—	—	15	5	1	—	—	20	1	—	—	—	14	7	—	—	3	12	6	—	
Port Latta	—	—	1	1	—	—	—	2	—	—	—	—	1	1	—	—	1	—	1	—	
Coles Bay	—	2	2	2	1	—	3	3	1	—	2	3	2	—	—	—	4	2	1	—	
Port Arthur	—	—	—	1	—	1	—	1	1	—	—	—	1	—	1	—	—	—	1	1	
Wedge Bay	—	—	—	2	—	—	1	2	—	—	—	—	2	—	—	—	—	1	1	—	
Bruny Island	—	—	—	—	1	—	1	—	—	—	—	—	1	—	—	—	—	—	1	—	
<b>SOUTH AUSTRALIA</b>																					
Adelaide	—	1*	—	—	—	—	—	1*	—	—	1*	—	—	—	—	—	1*	—	—	—	
Port Vincent	1	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	1	—	—	
Venus Bay	—	2	—	1	—	—	1	2	—	—	1	—	1	—	—	2	1	—	—	—	
Port Lincoln	—	—	—	—	1	—	—	1	—	—	—	—	—	1	—	—	—	—	1	—	
Marion Bay	—	—	1	1	—	—	2	—	—	—	1	1	—	—	—	—	—	2	—	—	
Kangaroo Island	—	—	—	—	—	1	—	1	—	—	—	—	—	—	1	—	—	—	—	1	
<b>WESTERN AUSTRALIA</b>																					
	1	4	4	3	—	—	2	9	1	—	—	5	6	1	—	2	3	5	2	—	
<b>TOTALS</b>																					
	2	15	39	39	11	2	18	84	6	2	18	46	34	6	2	4	21	49	30	4	



TABLE 2  
LATERAL LINE SCALE COUNTS OF VARIOUS POPULATIONS OF *HETEROCLINUS ADELAIDAE*  
An asterisk indicates count of holotype

Population	Scales in arched part of lateral line										Scales in straight part of lateral line								
	18	19	20	21	22	23	24	25	26	27	0	1	2	3	4	5	6	7	8
VICTORIA																			
Petersborough	—	—	—	—	—	3	3	3	—	—	—	1	—	3	1	2	—	—	1
Westernport Bay	—	—	—	1	1	3	1	—	—	—	5	—	1	—	—	—	—	—	—
TASMANIA																			
Green's Beach	—	2	5	6	4	3	7	2	—	1	30	2	—	—	—	—	—	—	—
Kelso	—	—	2	1	6	3	4	2	3	—	18	3	—	—	—	—	—	—	—
Port Latta	—	—	—	—	—	—	1	1	—	—	1	1	—	—	—	—	—	—	—
Coles Bay	—	—	—	—	—	—	2	—	1	—	5	—	—	—	2	—	—	—	—
Port Arthur	1	—	—	1	1	2	—	—	—	—	2	—	—	—	—	—	—	—	—
Wedge Bay	—	—	1	1	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—
Bruny Island	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—
SOUTH AUSTRALIA																			
Adelaide	—	—	1*	—	—	—	—	—	—	—	—	—	—	—	—	1*	—	—	—
Port Vincent	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
Venus Bay	—	—	1	—	—	—	1	—	—	1	2	1	—	—	—	—	—	—	—
Port Lincoln	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
Marion Bay	—	—	—	1	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—
Kangaroo Island	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—
WESTERN AUSTRALIA																			
	—	1	2	2	3	1	3	—	—	—	5	1	1	1	1	3	—	—	—
TOTALS																			
	2	3	12	14	17	15	23	8	4	2	57	6	3	4	4	4	0	0	1



between upper jaw and posterior nostril. Posterior nostril a pore above anterior margin of eye. Orbital tentacle (Fig. 4) low and rounded, sometimes elongate, width varying from equal to length to twice as long as length; margin smooth; length 1.0 to 3.4% of SL.

First dorsal fin higher than second; first and second spines longest and about equal in length, third spine slightly shorter; fin lower in females. Second dorsal spine varying from about 10.5% of SL in young males, less than 50 mm SL to 14-17% of SL in larger males; varying from 8.6 to 15.3% of SL in females. First dorsal origin over end of preopercular margin, last spine above a point behind middle of operculum. Membrane of first dorsal usually connected basally to second dorsal, varying from attaching to body before second dorsal fin to tip of first spine of second dorsal. Flaps from dorsal spines bound in interspinal membranes, never free. Second dorsal origin above a point behind pelvic insertion. Anteriorly spines in second dorsal short, becoming progressively longer posteriorly, last spine 10.0 to 12.5% of SL; first ray longer than last spine. Dorsal rays evenly spaced. Last dorsal ray connected by membrane to caudal base. Anal origin below 10th or 11th spine in second dorsal fin. Anal II, 21-25, posterior rays becoming progressively longer; last ray shorter than preceding and broadly connected to two thirds of caudal peduncle. Caudal short and rounded, with 11 segmented rays and smaller procurent rays above and below. Caudal length 19 to 22% of SL. Pectoral rays elongate, middle rays largest reaching to a point above or behind anal origin. Pelvics with a hidden spine, 2 elongate rays and a third rudimentary ray visible only upon dissection; two developed rays slender and about equal in length or inner ray slightly longer, reaching approximately to anal origin.

Gill rakers short and simple. Tongue tip broadly rounded, or tapering to a point. Intromittant organ elongate and curved forward, with bilobed papillae attached anteriorly at base. (Fig. 3a).

Head pores shown in Figure 4. Circumorbital and preopercular pores uniserial. Circumorbital pores (exclusive of median pores and pore below anterior nostril) 12 (in 47), 13 (in 9), 14 (in 17), 15 (in 1), number constant over size range studied.

Head naked, body scales small and cycloid, extending forward to above operculum below first dorsal. Scales overlapping and forming rows anteriorly, becoming nonimbricate and irregular posteriorly. Anterior lateral line scales overlapping with a small terminal and median or dorsomedian pore; first scale also with a ventral pore; posteriorly scales separate with pores at each end, extending in an elevated arch curving downward near end of pectoral fin; usually no scales along midside beyond pectoral tip, but occasionally up to 8 widely spaced scales in a line extending to below middle of second dorsal.

Upper jaw with outer row of conical teeth slightly enlarged extending over most of premaxilla. Anteriorly five inner rows of small conical teeth tapering posteriorly to a single row. Lower jaw with outer row of conical teeth slightly



# DESCRIPTIONS OF *HETEROCLINUS* SPECIES

TABLE 3

## VERTEBRAL COUNTS OF VARIOUS POPULATIONS OF *HETEROCLINUS ADELAIDAE*

Population	Precaudal vertebrae			Caudal vertebrae					Total vertebrae					
	13	14	15	28	29	30	31	32	41	42	43	44	45	46
N. E. Tasmania	2	11	—	—	8	5	—	—	—	1	8	4	—	—
S. Tasmania	—	1	1	—	—	—	1	1	—	—	—	—	—	2
South Australian Gulfs	4	1	1	3	2	1	—	—	1	3	2	—	—	—
Kangaroo Island	—	—	1	—	—	1	—	—	—	—	—	—	—	—



enlarged covering all of dentary. Anteriorly three inner rows of smaller conical teeth tapering posteriorly to a single row. In males smaller than 50 mm a single row of vomerine teeth in an inverted V. In larger males an incomplete inner row present. In females, usually only a single row of vomerine teeth. Palatine edentulous.

Colouration in alcohol variable (Fig. 2). Head and body varying from tan to dark brown. In some (including holotype) an oblique white bar extending from eye across preoperculum and operculum to pectoral base, continuing onto pectoral base divided by a dark brown bar. Stripe continues on body from base of pectoral to end of caudal peduncle. Head often with several dark brown spots, less than pupil diameter; spots occasionally extending onto body. Spots usually larger and forming a row along margins of head bar when present. In holotype a second white stripe present directly below anterior base of dorsal fins. Body often with 5 to 8 dark brown irregular vertical bands, sometimes broken into one upper and one lower row of larger irregular shaped blotches, with upper blotches darkest. Some specimens uniform tan or brown. Lateral line scales usually black anteriorly. Fins varying from uniform tan to mottled to banded. First dorsal fin sometimes black and darker than second dorsal fin. Banded individuals often with narrow extensions of bands onto second dorsal and anal fins either continuous with body bands or as separate blotches. Caudal and pectoral clear, dusky, or narrowly banded (pectoral banded in holotype). Pelvic fins light tan.

A moderate sized species reaching a size of 80 mm.

Variation.—*H. adelaidae* is peculiar among Australian clinids in being sexually dimorphic in jaw length and first dorsal spine height (Table 4). Males have a larger mouth and a higher dorsal fin than in females.

Lateral scale counts show considerable variation. Counts of 8 specimens from each of 3 States gives counts of 86 to 99 for South Australia, 95 to 103 for Victoria and northern Tasmania and 97 to 118 for southern Tasmania.

TABLE 4

SEXUAL DIMORPHISM OF *HETEROCLINUS ADELAIDAE* IN JAW LENGTH AND SECOND DORSAL SPINE LENGTH

Measurements expressed as a percentage of standard length, rounded to the nearest per cent. The size distributions for the two sexes are similar, ranging from 47 to 65 mm SL. Based on sample from Green's Beach, Tasmania, January 1968.

Sex	Jaw length as a per cent of standard length					Second dorsal spine length as a per cent of standard length									
	10	11	12	13	14	8	9	10	11	12	13	14	15	16	
Males	1	5	9	8	1	—	—	1	2	6	6	4	4	1	
Females	7	14	2	—	—	2	3	11	3	4	—	—	—	—	



## DESCRIPTIONS OF *HETEROCLINUS* SPECIES

As noted above colouration is highly variable. Although variation within a sample is high, from the limited material available it appears that the variation is greater between samples from different geographical areas.

Too few specimens are available to determine the extent of geographical variation. However, the data suggest that there is probably population variation in the height of the first dorsal fin and in the number of the lateral line scales along the straight portion of the lateral line. The meristic data suggest that there may be clinal variation in the number of second dorsal spines and anal rays and vertebrae in South Australia and Tasmania, with counts tending to be higher in the southern areas of these States (Tables 1 and 3).

The species ranges throughout Tasmania, Victoria, South Australia and is known from southern Western Australia.

In general head shape, body form, reduction of the lateral line, the broad connection of the last anal ray to the caudal peduncle, the presence of two slender pelvic rays and in the shape of the intermittent organ *H. adalaidae* is closest to *H. macrophthalmus*. *H. adalaidae* differs from that species in lacking free lobes from the dorsal spines, supraorbital and tentacle shapes and in segmented dorsal ray counts.

While most Australian clinids occur in association with algae around rocky reefs, *H. adalaidae* was taken in this study only from seagrass beds in shallow water. One specimen was dredged from 10 to 18 metres.

### MATERIAL EXAMINED

Holotype. MNHN A.1077, a female 76.0 mm SL.

Victoria: Petersborough, AMS I.16987-011 8 (35-40). Port Phillip Bay, AMS I.2511, 1 (33). Westernport Bay, NMV (uncatalogued, dredged between Crawfish Point and Eagle Rock), 7 (28-79); AMS IA.1318, 1 (64); AMS I.7610, 2 (48-69); AMS I.9006-9008, 3 (60-75).

Tasmania: Green's Beach, QVM (out of 1972/5/231 (B)), 2 (47-90). QVM (out of 1972/5/225 (B)), 63 (46-66). Kelso, QVM (out of 1972/5/212 (C)), 10 (46-65); QVM 1972/51377, 11 (51-67). Port Latta, AMS I.17588-001, 2 (60-80). Port Arthur, AMS I.17550-003, 2 (41-63). Coles Bay, AMS I.17553-006, 7 (50-74). Wedge Bay, AMS I.17193-001, 2 (27-33). Bruny Island, TM D.593, 1 (53).

South Australia: Port Vincent, AMS IB.7133, 1 (71). Venus Bay, SAM F.3410, 2 (68-69). Port Lincoln, NMV (uncatalogued), dredged 10-18 m Spencer Gulf off Port Lincoln, taken with holotype of *H. macrophthalmus*, 1 (64). Marion Bay, Yorke Peninsula, SAM F.3629, 2 (30-55). Kangaroo Island, SAM F.348, 1 (75).



Western Australia: Emu Point, near Albany, WAM P.21687, 1 (66). Freycinet Harbour, BM (NH) 1974.11.29.3 (formerly part of 1858.12.27.67), male 66.5 mm SL, a paralectotype of *Cristiceps antinectes*. Cockburn Sound off Rockingham, WAM P.25258-002, 10 (38-64).

*Heteroclinus macrophthalmus* n. sp.

Figures 3b, 5, 6 and 7

*Petrates phillipi*.—Scott 1967: 194 (in part, "abnormal specimen" from Green's Beach only).

Based on 39 mm male and 64 to 83 mm females.

Measurements of types given in Table 5. Counts of holotype marked with an asterisk. Pectoral rays 12\* (in 4), 13 (in 1). Segmented caudal rays 11\* (in 5). Gill rakers 2 + 6 (in 1), 3 + 6 (in 1). Branchiostegal rays 6 (in 2). Dorsal III, XXXI, 4 (in 1); III, XXXI, 5\* (in 4). Anal rays II, 25\* (in 3); II, 26 (in 1); II, 27 (in 1). Lateral line scales — arched and straight part of lateral line 28 + 14 (in 1), 25 + 12 (in 1), 26 + 24 (in 1), 25 + 13\* (in 1), 23 + 19 (in 1). Longitudinal scale rows 127 (in 1), 119 (in 1), 110 (in 1).

TABLE 5

MEASUREMENTS OF HOLOTYPES OF TWO SPECIES OF *HETEROCLINUS*  
(in millimetres)

Measurement	<i>H. adalaidae</i> MNHN A 1077	<i>H. macrophthalmus</i> NMV A.495
Standard length	76.0	64.0
Head length	21.6	18.0
Predorsal length	15.0	11.2
Body depth at anal origin	15.5	13.8
Caudal peduncle depth	3.5	3.0
Caudal peduncle length	6.9	6.2
Upper jaw length	8.3	8.2
Eye length	6.3	6.9
Snout length	4.1	3.4
Pectoral length	14.5	12.8
Pelvic length	15.1	15.0
First dorsal spine length	8.8	8.2
Last dorsal spine length	9.5	7.6
First dorsal ray length	11.4	9.1
Caudal length	15.1	14.3
Orbital tentacle length	1.5	3.1



## DESCRIPTIONS OF *HETEROCLINUS* SPECIES

Head moderately compressed, width 17.0 to 17.3% of SL. Body strongly compressed. Snout blunt, rounded in dorsal view, much shorter than eye diameter. Eye large 9.7 to 10.8% of SL. Interorbital narrow, about half eye diameter. Mouth short reaching to a point below middle to end of pupil. Upper jaw length 11.6 to 12.7% SL in females and 11.7% SL in male. Anterior nostril tubular with a large posterior branched tentacle, composed of 3 to 6 elongate lobes; anterior nostril positioned about half way between snout tip and posterior nostril. Posterior nostril with a raised rim, positioned above anterior margin of eye. Orbital tentacle (Fig. 7) flattened with 5 to 10 slender lobes extending from base; length 4.9 to 6.1% of SL.

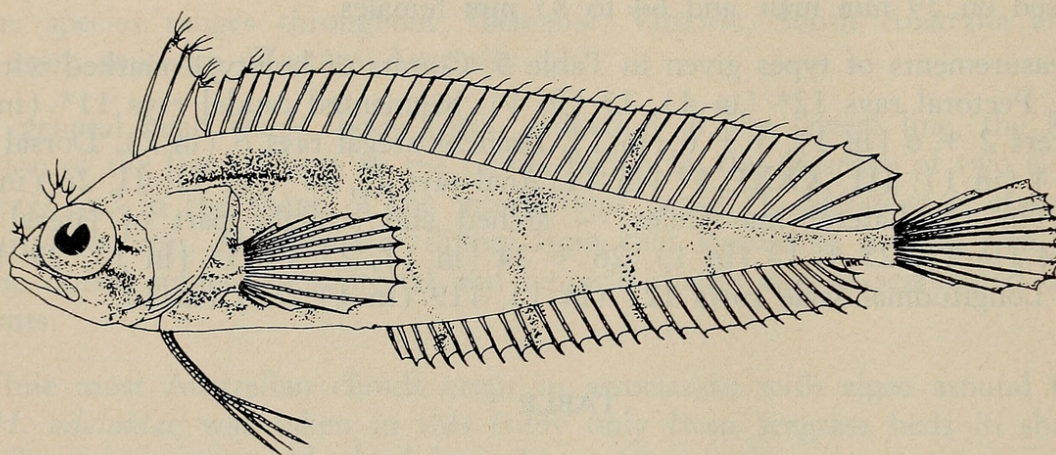


Fig. 5. Female holotype of *Heteroclinus macrophthalmus*, 64 mm SL, based on preserved colouration.

First dorsal fin higher than second; first and second dorsal spines about equal in length, third spine slightly shorter. Second spine 9.2% SL in 39 mm male and 12.6 and 14.6% SL in large females. First dorsal origin over end of posterior margin of preoperculum, last spine above a point behind middle of operculum. Membrane of first dorsal fin separate from second dorsal or connected to second dorsal at very base. Tips of first 3 dorsal spines with 3-6 elongate free flaps. First spine in second dorsal fin without flaps. Tip of second spine in second dorsal fin with 1 or 2 free flaps. Tips of remaining dorsal spines with an elongate free flap. Second dorsal origin above a point behind pelvic insertion. Anteriorly spines in second dorsal fin short, becoming progressively longer posteriorly, last spine 10.2 to 11.8% of SL; first ray longer than last dorsal spine. Dorsal rays evenly spaced. Last dorsal ray connected by membrane to caudal base. Anal origin below 11th and 12th spine in second dorsal fin. Posterior rays of anal becoming progressively longer; last ray shorter than preceding and broadly connected to about two thirds of caudal peduncle. Caudal short 17.9 to 22.4% of SL and rounded, with 11 segmented rays and smaller procurrent rays above and below. Pectoral rays elongate, middle rays longest. Pelvic rays I, 3, third ray a short rudiment visible



only upon dissection; 2 slender outer rays about equal in length, reaching approximately to anal origin.

Gill-raker short and simple. Tongue tip free, tapering to a point.

Intromittent organ elongate and curved forward, with bilobed papillae attached anteriorly at base (Fig. 3b).

Head pores shown in figure 7. Circumorbital and preopercular pores uniserial. Circumorbital pores (exclusive of median pore below anterior nostril) 13 (in 3).

Squamation as in *H. adalaidae*, except that straight part of lateral line more extensive, with 12-24 scales, reaching well beyond tip of pectoral fin.

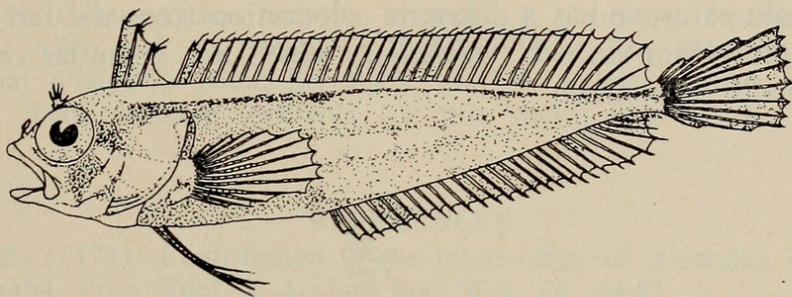


Fig. 6. Male paratype of *Heteroclinus macrophthalmus*, 39 mm SL, based on Kodachrome of fresh specimen.

Live colouration of male paratype from Kodachrome. Head and anterior half of body dark with brown or maroon; belly black; posterior half of body lighter brown. A prominent oblique silver bar, less than an eye diameter in width, extending from posteroventral margin of eye over preoperculum and operculum. Midside of body with silver stripe anteriorly, broken into irregular shaped silver blotches, posteriorly. Two faint narrow vertical bars below eye. Two white spots at angle of preoperculum. a broken black stripe on body below dorsal fin. Second dorsal fin with 2 narrow reddish brown longitudinal stripes, more prominent posteriorly. Six broad, faint yellow vertical bands on second dorsal fin. Anal fin reddish brown, with some yellow along base. Caudal clear with 7 reddish brown irregular bands. Pectoral clear with several narrow irregular reddish brown bands. Ventrals maroon. No black along anterior part of lateral line.

Colouration in alcohol of male paratype. Head and body tan. Silver and white blotches and stripes of fresh specimens tan in alcohol. Dark brown stripe behind eye continuing on body to near caudal base, upper margin of stripe below dorsal base sharply defined; ventral margin diffuse. Cheek dark brown. Sides of belly dark brown; rest of belly tan. First dorsal black anteriorly. Second dorsal dusky with 2 faint narrow horizontal dark stripes. Caudal clear with 7 irregular dusky bands. Anal dusky. Pectoral clear with several faint wavy dusky bands. Pelvic fin



## DESCRIPTIONS OF *HETEROCLINUS* SPECIES

clear. Female colouration. Colour pattern of holotype shown in figure 5. Head and body tan. A diffuse dark brown, broken stripe on back, from behind eye to caudal peduncle. Six narrow transverse bands extend dorsally and ventrally from stripe, some extending on to dorsal and anal fins. Sides of head with dark brown mottling. Fins clear.

The Tasmanian and the largest South Australian paratype differ from the South Australian specimens in having a more extensive lateral line and in having 2 (rather than 1) rows of vomerine teeth. Since the extent of the lateral line raises geographically in *H. adalaidae* and the number of vomerine teeth increase in size in *H. adalaidae* these differences are not regarded as indicating any specific differences. Since only one small male has been studied, it is not known if *H. macrophthalmus* exhibits the sexual dimorphism characteristic of *H. adalaidae*. Although the male paratype has a different colouration from the female, it may not reflect sexual dimorphism since *H. adalaidae*, which has a similar colour variation, may not be sexually dichromatic.

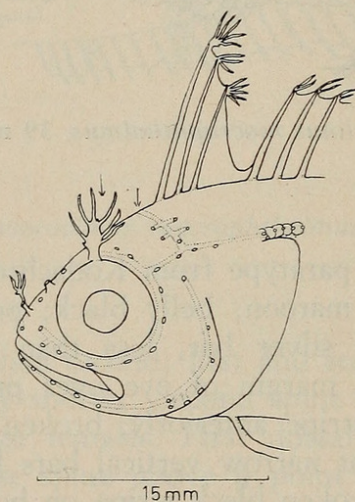


Fig. 7. Head of *Heteroclinus macrophthalmus* showing head flaps and sensory pores.

The species is known only from South Australia and northern Tasmania. It is closest to *H. adalaidae* (see discussion of that species). *H. macrophthalmus* differs from that species in having a larger eye, the free lobes on the dorsal spines, the branched orbital and nasal tentacles with numerous elongate lobes, a typically higher number of dorsal, anal and pectoral rays, a different snout shape, and more numerous lateral line scales.

This species has been taken only from grass flats subtidally and from 10-18 metres, twice in association with *H. adalaidae*.



D. F. HOESE

MATERIAL EXAMINED

Holotype — NMV A.495, a 64 mm female, off Port Lincoln South Australia. Coll. J. Vestch 13 Mar. 1969. Dredged 10-18 m.

Paratypes — AMS I.17609-001, a 39 mm male, Victor Harbour, South Australia, West Island Aquatic Reserve; coll. D. F. Hoese and W. Ivantsoff, 20 Dec. 1973. 0-2 m, grass flat and algae, boulders. QVM 1974/5/131, a 75 mm female, Green's Beach, Tasmania; coll. R. H. Green, 9 Dec. 1965, grass flat and rocks. SAM F.1540, an 83 mm female, Spencer or St. Vincents Gulf, 19 Feb. 1931. SAM F.2589, a 73 mm female, Spencer or St. Vincents Gulf.

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