

Report to LIBBY MATISKE

THE MOLLUSCAN FAUNA OF THE CAPE
LEEWIN SWAMP, WESTERN AUSTRALIA,
PARTICULARLY THE ENDANGERED SPECIES,
AUSTROASSIMINEA LETHA

**collected by the Western Australian Museum
during June 2005**



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Executive Summary

The presence, density and distribution of the amphibious snail, *Austroassiminea lethae*, were surveyed at established sites around the Cape Leeuwin Swamp, Western Australia.

Living and dead specimens of this species were collected from the sample areas, together with any specimens of other molluscan species, both terrestrial and aquatic.

Observed changes in the distribution of *Austroassiminea* and of the other snail groups, together with observations on the composition of the vegetation at and surrounding the survey stations, seems to indicate a trend towards a shrinking of the swamp area and so, a lessening of the area suitable as a habitat for *Austroassiminea*.

1.0 Introduction

1.1 Project Background

The Cape Leeuwin Swamp supports the largest of the few known populations of the snail species, *Austroassiminea lethae* Solem, Girardi, Slack-Smith and Kendrick, 1982. This species was recognised as being rare and possibly endangered from the time of its original description.

The health of the Cape Leeuwin Swamp population of *Austroassiminea* has been of concern for some years, as has the wellbeing of the swamp itself and its total biota. With the seepage of water from beneath a large hill to the east, the inflow to the swamp has decreased over the years.

Changes have occurred in the floral and faunal assemblages of the swamp since surveys began in the mid 1990s, and concern is felt for the welfare of the *Austroassiminea* population there.

1.2 Regional Background

The non-marine molluscan fauna of the southwest of Western Australia has not been adequately documented, even though the collections of the Western Australian Museum contain a considerable quantity and diversity of material and records. Most of the taxa belong to genera proposed by Iredale in his report on the land molluscs of Western Australia in 1939, although the diversity of species is now much greater than was recognised then.

The only southwest Australian species of the family Assimineidae known at the time of Iredale's work were those which belong to high intertidal saltmarsh communities, and so did not feature in Iredale's 1939 publication. Like *Austroassiminea lethae*, the brackish water and marine species dwell in damp situations and are able to cope with immersion.

Austroassiminea lethae is still a species that is unique in the mainland Australian assimineid fauna, although some forest-dwelling species have been recorded from the Australian territories of Lord Howe and Norfolk Islands.

This prosobranch snail species has a distributional range along the coastal areas of the southwest of Western Australia from the Ellen Brook area, north of the Margaret River

estuary, to the Cape Leeuwin area. Within this small geographic area the species exists as about 6 separate and isolated populations. However, its fossil record indicates that it has had a much wider distribution in the past.

The remainder of the molluscan fauna of the southwestern region of Western Australia consists of both native and introduced species. The native species are, in general, endemic to the southern part of the State, and the distributional ranges of some of those species is limited to its southwestern corner.

Most of the introduced species are derived initially from the temperate regions of the Northern Hemisphere and are recorded, in Western Australia, only from its southern region.

2.0 Methodology

2.1 Scope and Purpose

The survey of the molluscan biota of the Cape Leeuwin Swamp on June 3 and 4, 2005, aimed to record the identity and abundance of molluscan species at various survey stations sited around the periphery of the swamp.

2.2 Procedures

A total of 14 survey stations (see Table 1) were established, their locations corresponding with those of most of the survey stations established during previous surveys, although time and manpower restrictions did not allow for as many substations as had been surveyed in past years.

At each station, two substations were established, close to one another but providing slightly different habitats. Notes on the vegetation and on the litter and soil characteristics were recorded at each substation. The search area at each substation was of approximately 1/9th of a square metre in area.

All substation search areas were examined on the surface of the substrate and to a depth of up to 1 cm. All snails, living or dead (or shell fragments), were initially collected. Living specimens of *Austroassiminea lethae* were counted and returned.

Dead snail specimens, litter and soil samples were brought back to the laboratory. There they were examined using a stereomicroscope where necessary and compared with descriptions in the relevant literature and specimens in the collections of the Western Australian Museum.

Table 1. Survey Stations

Survey Station Number	Date	Location	Co-ordinates	Habitat Description
CLS 05/01S	3/06/05	Dry wooden flume 10 m upstream of waterwheel; S side	34°22'07.9"S, 115°08'08.2"E	Beneath flume among grasses and herbs
CLS 05/01N	"	Dry wooden flume 10 m upstream of waterwheel; N side	"	Beneath flume among grasses and herbs
CLS 05/02S	"	Dry wooden flume 20 m upstream of waterwheel; south side	34°22'07.7"S, 115°08'08.9"E	Beneath flume among grasses and herbs
CLS 05/02N	"	Dry wooden flume 20 m upstream of waterwheel; north side	"	Beneath flume among grasses and herbs
CLS 05/03S	"	Dry fibreglass flume 15 m upstream of CLS 05/02, S side	34°22'07.6"S, 115°08'10.0"E	Under buffalo grass; soil slightly damp & granular
CLS 05/03N	"	Dry fibreglass flume 15 m upstream of CLS 05/02, N side	"	Under buffalo grass; soil dry
CLS 05/04S	"	W swamp bed at piezometer, S side	34°22'06.1"S, 115°08'12.1"E	Reeds, creepers and few low shrubs on little damp soil, abundant litter & rhizomes
CLS 05/04N	"	W swamp bed at piezometer, N side	"	"
CLS 05/05S	"	W edge of swamp adjacent to base of sloping bank	34°22'06.5"S, 115°08'11.7"E	Reeds, shrubs & creepers, litter with little soil, roots & dead reed rhizomes
CLS 05/05N	"	W edge of swamp adjacent to base of sloping bank, just N of CLS 05S	"	"
CLS 05/06S	"	S side of swamp near base of slope	34°22'08.0"S, 115°08'14.4"E	<i>Lepidospermum</i> clumps, grasses; soil & litter damp
CLS 05/06N	"	S side of swamp near base of slope just NE of & slightly lower than CLS 05/06S	"	Reeds, creepers, <i>Lepidospermum</i> clump and shrubs; soil slightly damp but not granular
CLS 05/07E	"	SE corner of swamp at piezometer	34°22'01.5"S, 115°08'39.5"E	<i>Lepidospermum</i> clump, reeds, bracken, creepers, little grass
CLS 05/07W	"	SE corner of swamp few metres to W of piezometer	"	Reeds, few herbaceous plants, soil very damp under litter
CLS 05/08E	"	W of CLS 05/07	34°22'01.5"S, 115°08'38.5"E	Reeds, bracken & large clump of <i>Lepidospermum</i> sedge
CLS 05/08W	"	W of CLS 05/07, just 3 m W of CLS 05/07E	"	At base of large <i>Gahnia</i> clump, reeds;
CLS 05/09E	4/06/05	At SW corner of Water Corporation compound under peppermint trees	34°21'58.1"S, 115°08'29.4"E	Creepers & soft grasses; litter & soil damp
CLS 05/09W	"	At SW corner of Water Corporation compound under small <i>Gahnia</i> clump	"	Little litter, soil damp but not granular
CLS 05/10E	"	Immediately outside lower boundary fence of Water Corporation compound, NW of power lines; adjacent to fence	34°21'58.6"S, 115°08'26.2"E	At base of <i>Lepidospermum</i> clump, <i>Phebalium</i> , dodder, creepers; much recent leaf litter, soil very damp & granular
CLS 05/10W	"	Immediately outside lower boundary fence of Water Corporation compound, NW of power lines; 3 m from fence	"	Bracken, <i>Baumia</i> , some <i>Gahnia</i> ; little litter, soil slightly damp & granular

Survey Station Number	Date	Location	Co-ordinates	Habitat Description
CLS 05/11E	"	Immediately outside lower boundary fence of Water Corporation compound, under power lines; adjacent to fence	34°21'58.5"S, 115°08'26.6"E	<i>Phebalium</i> shrubs, much reed growth, creepers and dodder; little litter, soil damp and slightly granular
CLS 05/11W	"	Immediately outside lower boundary fence of Water Corporation compound, under power lines; 3 m from fence	"	Low <i>Agonis</i> tree, <i>Gahnia</i> clump, reeds and bracken; dry <i>Agonis</i> leaf litter, soil slightly damp and granular
CLS 05/12E	"	Immediately outside lower boundary fence of Water Corporation compound, half way between power lines and SE corner; adjacent to fence	34°21'58.5"S, 115°08'28.1"E,	Reeds, little litter; soil wet but not granular;
CLS 05/12W	"	Immediately outside lower boundary fence of Water Corporation compound, half way between power lines and SE corner; 3 m from fence	"	Reeds & word sedge thicket, grass, reeds & herbs; little litter; soil slightly granular
CLS 05/13A	"	Dry land beyond N side of swamp,	34°21'59.0"S, 115°08'16.1"E	under <i>Agonis</i> trees, some sword sedge; <i>Agonis</i> leaf litter up to 1 cm thick; soil slightly damp, not granular
CLS 05/13B	"	Dry land beyond N side of swamp,	"	Sword sedge under sparse <i>Agonis</i> , many reeds & grass; fibrous soil, barely damp
CLS 05/14A	"	W side of swamp, S of Quarry Bay; edge of swamp below slope from granitic rock outcrop	34°22'01.4"S, 115°08'16.1"	Reeds, bracken & "couch" grass; soil very slightly damp & covered with tangled fine roots to 1.5 cm
CLS 05/14B	"	W side of swamp, S of Quarry Bay, animal-made path into swamp	"	Remnants of reed bed overgrown with bracken, creepers, "couch" grass and herbaceous plants; little soil, much litter and living & dead rhizomes

3.0 Survey Results (See Tables 2 and 3)

Living and dead specimens of the terrestrial gastropod families Charopidae, Succineidae, Bulimulidae and Punctidae, and of the aquatic gastropod families Hydrobiidae and Physidae were collected and recorded, as well as the specimens of *Austroassiminea*. These numbers are given in Table 2.

All except the physids are native snails endemic to the southwest of Western Australia. The genus *Physa* is native to the temperate regions of the Northern Hemisphere and was, apparently, introduced into southern Australian states in the early days of settlement.

A comparison of the numbers of living and dead specimens of *Austroassiminea* taken at corresponding survey stations in the 2003 and 2005 surveys are given in Table 3.

4.0 Molluscan Fauna

- Family Assimineidae

Genus *Austroassiminea*

Species *A. letha*

Solem, Girardi, Slack-Smith and Kendrick, 1982

This species is recorded from 12 of the 14 survey stations, being found at all except the first two (CLS 05/01 and /02), which were located on the wooden section of the flume leading to the waterwheel. Similar negative results from these stations have been recorded in the past, the flume and the rock, soil and vegetation beneath it being exposed to sun and wind.

At survey stations CLS 05/03 and CLS 05/13 no live specimens were found. At CLS 05/03 very many dead specimens of *Austroassiminea* were taken beside and within the dry fibreglass flume, indicating a recent and drastic mortality. While more than a half of the shells show signs of predation, the others are intact. On and in the nearly dry but litter-strewn soil at Station CLS 05/13 (on the north side of the swamp), by contrast, only one dead snail shell was found. There the soil was not granular, seeming to indicate that the habitat had not been suitable for this species for some time.

Damp well-sheltered habitats on the southern, southeastern and northwestern perimeters of the swamp, and particularly those along the southern boundary of the Water Corporation compound supported fair to good populations of *Austroassiminea*. The substrate of most of these was of moist soil that, in general, was granular – indicating a lengthy residency by actively feeding snails. At most of these stations, the adult snails were accompanied by living or recently dead juveniles.

The samples of dead-taken shells from most stations showed some level of predation, although at none was there such a high level as at survey station CLS 05/03.

Table 2. Molluscan species

Survey Stn Number	Assimineidae <i>Austroassiminea</i> live/dead	Charopidae <i>(Luinodiscus)</i> Live/dead	Succineidae <i>(Succinea)</i> Live/dead	Hydrobiidae Genus indet. Live/dead	Physidae <i>(Physa)</i> Live/dead	Bulimulidae <i>(Bothriembryon)</i> Live/dead	Punctidae <i>(Westralaoma)</i> Live/dead	Charopidae Genus indet. Live/dead
CLS 05/01S	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/01N	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/02S	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/02N	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/03S	0/74	0/5	0/0	0/12	0/0	0/0	0/0	0/0
CLS 05/03N	0/24	0/2	0/2	0/2	0/0	0/0	0/0	0/0
CLS 05/04S	4/11	0/2	0/1	0/2	0/0	0/0	0/0	0/0
CLS 05/04N	1/24	0/2	0/2	0/1	0/0	0/0	0/0	0/0
CLS 05/05S	5/13	0/1	0/0	0/14	0/0	0/0	0/0	0/0
CLS 05/05N	0/12	0/1	0/0	0/9	0/1	0/0	0/0	0/0
CLS 05/06S	3/18	0/0	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/06N	1/8	0/2	0/0	0/0	0/7	0/0	0/1	0/0
CLS 05/07E	3/3	0/4	0/0	0/0	0/0	0/0	3/1	0/0
CLS 05/07W	7/5	1/1	0/3	0/0	0/0	0/0	3/0	0/0
CLS 05/08E	4/5	0/0	0/0	0/0	0/0	0/1	0/0	0/0
CLS 05/08W	8/11	0/1	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/09E	5/5	0/0	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/09W	10/27	1/2	0/4	0/0	0/2	0/0	0/0	0/0
CLS 05/10E	6/5	2/1	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/10W	5/31	1/15	0/1	0/1	0/0	0/1	0/1	0/0
CLS 05/11E	8/23	3/2	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/11W	1/1	1/1	1/4	0/0	0/0	0/0	0/0	1/0
CLS 05/12E	1/3	0/0	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/12W	2/2	1/2	1/0	0/0	0/0	0/0	0/0	0/0
CLS 05/13A	0/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/13B	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/14A	9/65	0/0	0/0	0/0	0/0	0/0	0/0	0/0
CLS 05/14B	1/33	0/0	0/0	0/0	0/0	0/0	0/0	0/0

Table 3. Comparison of *Austroassiminea* figures of 2003 and 2005 Surveys

Survey Station No. 2005	<i>Austroassiminea</i> Numbers 2003 (living/dead)	<i>Austroassiminea</i> Numbers 2005 (living/dead)	Change in <i>Austroassiminea</i> numbers
CLS 05/01	0.5 / 2.5	0.0 / 0.0	Decrease in both live and dead specimens
CLS 05/02	0.0 / 1.5	0.0 / 0.0	Decrease in dead specimens
CLS 05/03	10.0 / 35.0	0.0 / 49.0	Decrease in live, increase in dead specimens
CLS 05/04	1.5 / 1.0	2.5 / 17.5	Increase in both live and dead specimens
CLS 05/05	1.5 / 4.0	2.5 / 12.5	Increase in both live and dead specimens
CLS 05/06	0.0 / 2.5	2.0 / 13.0	Increase in both live and dead specimens
CLS 05/07	3.5 / 6.0	5.0 / 4.0	Increase in live, decrease in dead specimens
CLS 05/08	3.0 / 46.0	6.0 / 8.0	Increase in live, decrease in dead specimens
CLS 05/09	5.0 / 21.0	7.5 / 16.0	Increase in live, decrease in dead specimens
CLS 05/10	6.0 / 3.5	5.5 / 18.0	Decrease in live, increase in dead specimens
CLS 05/11	10.5 / 13.0	4.5 / 12.0	Decrease in both live and dead specimens
CLS 05/12	2.0 / 3.5	1.5 / 2.5	Decrease in both live and dead specimens
CLS 05/13	0.25 / 0.25	0.0 / 0.5	Decrease in live, slight increase in dead specimens
CLS 05/14	10.0 / 34.0	5.0 / 49.0	Decrease in live, increase in dead specimens

- Family Charopidae
Genus *Luinodiscus* Iredale, 1937
Species indet.

The single species belonging to the genus *Luinodiscus* was slightly less prevalent than *Austroassiminea*, having been found in 10 of the survey station samples. However live specimens were found only at survey stations CLS 05/11 and CLS 05/12. The dead-taken shells were, in general, showing signs of disintegration.

- Family Charopidae
Genus and species indet.

Only a single dead specimen of this species was found in the soil and litter sample of survey station CLS 05/11

- Family Succineidae
Genus *Succinea* (*Succinea*)
Species indet.

Generally freshly dead shells of *Succinea* were found at 7 stations. The lack of living specimens was not surprising, as collecting here and elsewhere has shown that these snails have a very short period of annual activity.

- Family Bulimulidae
Genus *Bothriembryon*
Species *B. sayi* (Pfeiffer, 1847)

This well-known species from the southwestern corner of the State is large by comparison with the other species surveyed here. Only dead-taken shells (or shell fragments) were found at CLS 05/08 and CLS 05/10, although some live snails have been taken in previous surveys. Another species of this genus is known to be present in the heavily vegetated parts of this swamp, but was not encountered at this time.

- Family Punctidae
Genus *Westralaoma*
Species indet.

This small but distinctive snail was found alive at CLS 05/07 and dead at CLS 05/06 and CLS 05/10. The dead-taken shells were in good condition, indicating that they had died only recently.

- Family Hydrobiidae
Genus and species indet.

The sturdy shells of this aquatic species seem to persist long after death. During this survey they were found at CLS 05/03, CLS 05/04, CLS 05/05 and CLS 05/10. On this occasion and at all other surveys of this swamp the species has never been found alive. In contrast to most other surveys here no specimens of this species were found at CLS 05/14 on the western perimeter of the swamp.

- Family Physidae
Genus *Physa* Draparnaud, 1801
Species indet.

This introduced aquatic/semi-aquatic species was found at survey stations CLS 05/05, CLS 05/06 and CLS 05/09.

5.0 Discussion

As was mentioned in the report to the Water Corporation in 2003, the snail *Austroassiminea lethia* depends on water for providing a humid environment so that:

- the animal can remain active long enough to allow for adequate feeding and for reproduction
- the accumulation and decomposition of plant litter can occur

However, a sudden flushing of surface water may wash away not only the snails, but also the detrital material on which they depend. For these reasons, organisms such as *Austroassiminea lethra* flourish in areas of constant or near-constant seepage rather than in exposed areas, temporary or permanent streams or in areas wet only or mainly by sudden surface inundation.

It appears to be able to withstand the threat of desiccation by sheltering within the bases of clumping monocotyledonous species such as *Gahnia* and *Lepidospermum*, or by burrowing into the litter and soil. However there would obviously be a limit in its tolerance to such conditions.

The comparison of the *Austroassiminea* numbers obtained in this survey, when compared with the corresponding results for 2003, show a number of changes.

There was a decrease in the numbers of both live and dead snails in and around the raised downstream section of the flume (i.e. the wooden section) at stations CLS 05/01 and CLS 05/02. Such a change has occurred previously and seems to be mainly related to the input and flow of water along this exposed part of the flume. Further upstream (CLS 05/03) the flume is of fibreglass, has been embedded into the ground and is partly shaded by dense buffalo grass. Conditions there were similarly dry as at the two previous stations but had probably been moist in the recent past, as evidenced by the larger numbers of dead shells – in contrast with the lower numbers of living snails.

At survey stations on the western and southern sides of the swamp (CLS 05/04, CLS 05/05 and CLS 05/06) the numbers of both living and dead snails were up on those of the 2003 survey. At each of these stations the depth of the plant cover and so the shelter to the snails had increased, although many of the plants were terrestrial rather than swamp species.

At both of the stations in the southeastern corner of the swamp (CLS 05/07 and CLS 05/08) the numbers of living snails were up on the 2003 figures but the numbers of dead snails were down. However, in the area adjacent to the lower boundary of the Water Corporation's compound (CLS 05/09, CLS 05/10, CLS 05/11 and CLS 05/12) only that station nearest to the southeastern corner of the swamp and situated at the southwestern corner of the compound (CLS 05/09) showed a similar increase in living snails and drop in dead ones. The three nearby stations, all having undergone heavy shrub growth, had decreased numbers of living snails and, of these, only that station furthest from the southwestern corner (CLS 05/10) had an increase in dead shells.

The single station surveyed on the northern side of the swamp (CLS 05/13) exhibited a very slight drop in living snails and a similarly slight increase in dead shells. This station was very difficult to reach because of the greatly increase growth of shrubs.

The survey station on the western side of the swamp (CLS 05/14) exhibited a significant drop in the number of live snails but, at one of its substations, a large rise in dead snails. Particularly at the other substation along a pathway apparently formed by the passage of the larger marsupials, the continued trend of the growth of terrestrial plants at the expense of aquatic forms is very noticeable.

6.0 Conclusion

The pattern of change at the survey stations indicates a continuing growth of terrestrial plants in areas formerly occupied by aquatic plants. This seems to be associated with an

overall drying of the swamp, evidenced not only by the vegetation structure but also by the increased amount of litter among the rushes towards the centre of the swamp – areas that once had a substrate of clean washed sand.

The *Austroassimineae* seem to be least affected in areas that lie at the bases of the slopes forming the periphery of the swamp (CLS 05/ 04, CLS 05/05, CLS 05/06, CLS 05/07, CLS 05/08, CLS 05/09 and CLS 05/14), even when the terrestrial plant growth has increased. It seems possible that here might be a greater inflow of water seepage in such situations, whether from underground water or more directly from rainfall. Other stations, which are on flat ground, have not been so favourable to these snails.

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