CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

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REVIEW OF THE STATUS OF NORTHERN GASTRIC-BROODING FROG (*RHEOBATRACHUS VITELLINUS*)

The attached information document has been submitted by Australia in relation to agenda item 13[*].

[*] *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat or the United Nations Environment Programme concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

Review of the status of southern gastric-brooding frog (*Rheobatrachus silus*)

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Introduction

At the 24th meeting of the Animals Committee (Geneva, April 2009), the southern gastric-brooding frog (*Rheobatrachus silus*) was selected for the periodic review of animal species included in the CITES Appendices. In response, the Australian Scientific Authority has provided information on the southern gastric-brooding frog for the review of the species by the CITES Animals Committee.

A. Proposal

The southern gastric-brooding frog (*Rheobatrachus silus*) is extinct. Despite extensive surveys, the species has not been seen in the wild since 1981. The last known individual died in captivity in 1983. Trade is not considered to be a factor in the extinction of the species and, should the species be rediscovered, is unlikely to become a threatening factor. Australia, therefore, proposes to remove *R. silus* from CITES Appendix II.

B. Proponent

Australia

C. Supporting statement

1. Taxonomy

1.1	Class:	Amphibia
1.2	Order:	Anura
1.3	Family:	Myobatrachidae

1.4 Species: *Rheobatrachus silus* Liem, 1973

1.5 Scientific synonyms: none

1.6 Common names:

English: southern gastric-brooding frog, southern platypus frog

Dutch: zuidelijke maagbroedkikker

French: grenouille plate à incubation gastrique

German: Australische magenbrüterfrosch

Spanish: rana incubadora gástrica de Australia

Swedish: magruvargroda

1.7 Code number:

2. Overview

The southern gastric-brooding frog was discovered in 1972, although some reports suggest that it was collected as early as 1914 (Liem 1973; Ingram 1991). It was endemic to south-east Queensland of Australia in the Blackhall and Cononale Ranges at elevations between 350 m and 800 m (1100 and 2600 ft) above sea level. The entire distribution of the species was estimated to be limited to an area of less than 1,400 km^2 (540 mi^2).

The southern gastric-brooding frog had a unique reproductive mode in that once the eggs were fertilised externally, they were swallowed by the female for further development in her stomach. Fully formed metamorphs (i.e. a young frog that has almost completed metamorphosis from a tadpole into an adult) were then released through the female's mouth after 36 to 43 days (Ingram 1983).

The southern gastric-brooding frog was last sighted in the wild in September 1981 in the Blackall Range (Richards *et al.* 1983). The last known specimen died in captivity in November 1983 (Tyler & Davies 1985). *R. silus* is listed as Extinct nationally under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) and internationally under the International Union for Conservation of Nature (IUCN) Red List 2011.

The cause(s) of the declines of wild populations, and extinction of the species, are not known. It is suspected that the chytrid fungus is responsible for the extinction of the southern gastric-brooding frog and is also responsible for the extinctions and declines of at least 13 other high –elevation rainforest frog species in Queensland, Australia (Laurance *et al.* 1996, 1997; Retallick *et al.* 2004).

Trade has not been implicated as a factor contributing to the extinction of *R. silus*. Should the species be rediscovered, it is unlikely to become threatened by trade activities.

3. Species characteristics

3.1 Distribution

The southern gastric-brooding frog was discovered in 1972 but Ingram (1991) reported that the first specimen was collected in 1914 from the Blackall Ranges. The species was restricted to elevations between 350 m and 800 m (1100 and 2600 ft) above sea level in the Blackhall and Cononale Ranges between Coonoon Gibber Creek (26° 33'S, 152° 42'E) and Kilcoy Creek (26° 47'S, 152° 38'E) in south-eastern Queensland, Australia. It inhabited streams in the catchments of the Mary, Stanley and Molloolah Rivers. It was also found in Kondalilla and Conondale National Parks, Sunday Creek, State Forest 311, Kenilworth State Forest and from private land outside these areas (Hines et al. 1999). The geographic range of the species was limited to less than 1,400 km^2 (540 mi^2).

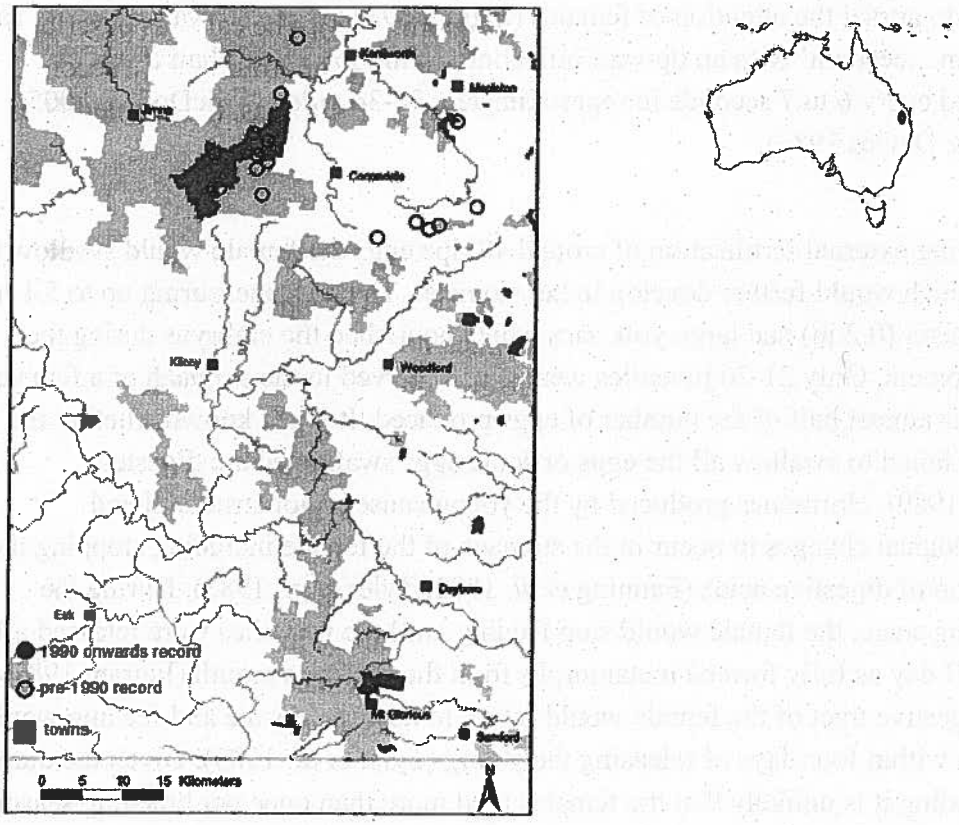

Figure 1: Records of the southern gastric-brooding (*Rheobatrachus silus*) frog sightings (Image reproduced with permission from Hines and the South-east Queensland Threatened Frogs Recovery Team, 2002).

3.2 Habitat

The southern gastric-brooding frog lived in rainforest, wet sclerophyll forests and tall open forest with a closed understorey where it was closely associated with rocky mountain streams, rock pools and soaks (Czechura 1991). It was predominantly an aquatic species inhabiting mostly permanent water bodies that ceased to flow only in years of very low rainfall (Myer *et al.* 2001) and not recorded more than 4 m (13 ft) from water (Ingram 1983). The non-breeding winter habitat is unknown although the species was suspected to hibernate in deep crevices in rocks, terrestrial or underwater, during the colder months (Ingram 1983).

3.3 Biological characteristics

The minimum age at which *R. silus* females are suspected to reproduce is 2-3 years old. The minimum age for breeding for males was not determined before the species become extinct (Ingram 1983). Breeding was during the warmer months (between October and December) and appeared to be dependent on the summer rains (Ingram 1983). Males called from rock crevices above pools during the breeding season to attract the attention of females (Ingram 1983). The call was described as an 'eeeehm....eeeehm' with an upward inflection lasting for around half a second repeated every 6 to 7 seconds for approximately 30-34 pulses. (McDonald 2005; Tyler & Davies 1983).

Following external fertilisation of around 40 ripe eggs the female would swallow the eggs which would further develop in her stomach. The eggs measuring up to 5.1 mm in diameter (0.2 in) had large yolk sacs which nourished the embryos during their development. Only 21-26 juveniles were ever observed in the stomach of a female which is almost half of the number of eggs produced. It is not known whether the female failed to swallow all the eggs or some eggs swallowed are digested (Tyler 1989). Hormones produced by the young cause major structural and physiological changes to occur in the stomach of the female including stopping the secretion of digestive acids (Fanning *et al.* 1982; Tyler *et al.* 1983). During the brooding stage, the female would stop feeding until the juveniles were released after 36 to 43 day as fully formed metamorphs from the female's mouth (Ingram 1983). The digestive tract of the female would return to its normal state and feeding would resume within four days of releasing the young (Tyler *et al.* 1983). Given the duration of brooding it is unlikely that the females bred more than once per breeding season (Ingram 1983).

Juveniles were mobile and would move into newly created pools where they then tended to stay. Ingram (1983) recorded the largest distance travelled by an individual

as 53 m (173 ft) between seasons. During the breeding season, movements by individuals tended to remain within the same pool or group of pools moving distances of less than 7 m (22 ft) except during periods of high flow or flooding (Ingram 1983).

3.4 Morphological characteristics

The southern gastric-brooding frog was a medium size frog with males approximately 33 mm (1.3 in) to 41 mm (1.6 in) and females 44 mm (1.7 in) to 54 mm (2.1 in) in length. Colouration on the dorsal surface ranged from olive, olive-brown to almost black with small scattered darker and lighter patches (Tyler & Davies 1983). A dark streak ran from the eye to the base of the forelimb. There were darker cross-bars on the limbs and pale and dark patches and variegations on the digits and webbing. The ventral surface was white or cream with yellow markings on the limbs. The skin was finely granular above and smooth below. The snout was blunt and rounded, with the eyes and nostrils directed upwards. The species' eyes were large and prominent, located close together and to the front of the head. The tympanum (ear cavity) was hidden. The fingers lacked webbing, while the toes were fully webbed. Digits had small discs (Cogger 2000; Liem 1973; Tyler & Davies 1983).

3.5 Role of the species in its ecosystem

The southern gastric-brooding frog foraged on insects from both land and water (Ingam 1983). The species was a food source for other species of higher trophic levels such as birds, fish and other aquatic fauna.

4 Status and trends

4.1 Habitat trends

The habitat of the southern gastric brooding frog was subject to logging activities in some areas between 1972 and 1979.

4.2 Population structure

There are no published studies on the population structure of *R. silus*.

4.3 Population trends

Since its discovery in 1972, there was little known about the wild populations of *R. silus*. There were reports that the species underwent a decline in 1979 (Czechura & Ingram 1990; Tyler & Davies 1985) and the last sighting in the wild was in September 1981 in the Blackall Range (Richards *et al.* 1983). The species declined rapidly and disappeared the same time as a sympatric species – the southern day frog *Taudactylus diurnus*. The last known specimen of *R. silus* died in captivity in November 1983 (Tyler & Davies 1985).

Ingram (1983) studied one population of *R. silus* in the headwaters of Boolumba Creek, Conondale Range and estimated that there were 78 individuals present in 1976. No other estimates of population size are available.

4.4 Geographic trends

R. silus inhabited streams in the Mary, Stanley and Mooloolah Rivers of the Blackall and Cononale Ranges in south-east Queensland. Populations declined across its entire range in 1979 and disappeared by 1981. Rapid population declines and extinction occurred at the same time for the southern day frog, *Taudactylus diurnus.*

5 Threats

The reason(s) for the declines and subsequent extinctions of populations of *R. silus* remain unknown (Tyler & Davies 1985). Logging of catchments occurred between 1972 and 1979. The effects of logging on populations was not investigated, however the southern gastric-brooding frog did continue to persist during logging activities (McDonald 1990).

It is suspected that the chytrid fungus caused declines in *R. silus*. The chytrid fungus, *Batrachochytrium dendrobatidis*, has been implicated in the declines and extinctions of at least 13 other high-elevation rainforest frog species in Queensland, Australia (Berger *et al.* 1999; Laurance *et al.* 1996; McDonald & Alford 1999).

Current threats to potential *R. silus* habitat include feral pigs, invasion by weeds (especially the Mistflower, *Ageratina riparia*) and altered water flow due to upstream disturbances (Hines *et al.* 1999).

6 Utilization and trade

6.1 National utilization

Given its extinct status it is unlikely that any national utilization is occurring. Historical data suggest that it was unlikely that the southern gastric-brooding frog was subject to any form of trade activities.

6.2 Legal trade

Southern gastric-brooding frogs were collected from the wild for research purposes. Over-collection has been speculated as one of the causes for declines and extinction of the species (Tyler, 1985).

6.3 Parts and derivatives in trade

There were no part or derivatives of the southern gastric-brooding frog used in trade.

6.4 Illegal trade

There was, and is currently, no indication of illegal trade.

6.5 Actual or potential trade impacts

The southern gastric-brooding frog was not subject to legal or illegal trade before its extinction. Should the species be rediscovered, international trade would be regulated by Australian environmental law. Under the EPBC Act a permit is required before native species can be exported from Australia for commercial or non-commercial purposes.

7 Legal Instruments

7.1 National

Rheobatrachus silus is listed nationally as Extinct under the EPBC Act and listed as Endangered in Queensland (*Nature Conservation Act 1992*). The species is also

listed as Extinct under the International Union for Conservation of Nature (IUCN) Red List 2011.

7.2 International

Rheobatrachus silus is listed in Appendix II under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Under the Convention, permits are required for the import and export of CITES Appendix II listed species.

8 Species Management

8.1 Management measures

The *National Recovery Plan for Stream Frogs of South-East Queensland (2001-2005)* included the southern-gastric brooding frog (Hines, H. B. and the South-east Queensland Threatened Frogs Recovery Team 2002). Management actions included surveys and population monitoring to re-establish species and populations.

The Queensland Government developed a threat abatement plan, *Infection of amphibians with chytrid fungus resulting in chytridiomycosis* to address the spread and impact of the disease. Chytrid most likely caused the extinction of the southern gastric-brooding frog and contributed to the extinction of 13 other high-elevation rainforest frog species (Berger *et al.* 1999; Laurance *et al.* 1996; Hines *et al.* 1999; McDonald & Alford 1999).

8.2 Population monitoring

Despite continued efforts, *R. silus* has not been re-located in the wild since its disappearance in 1981 (Richards *et al.* 1993). Efforts since 1993 to find the species have been (as summarised by Hines *et al.* 1999):

a. Regular monitoring at Ingram's (1983) study site - Beauty Spot 100 on Booloumba Creek, Bundaroo, Peters and East Kilcoy Creeks in the Conondale Range and at Picnic Creek (the type locality near Kondalilla) on the Blackall Range.

b. 1995 intensive "frog search" of Conondale Range.

c. 1997 "frog search" of the headwaters of Kilcoy, North Booloumba and Bundoomba Creeks, Conondale Range.

d. Since 1996, systematic surveys of many streams in the Conondale and Blackall Ranges. Some sections of streams were visited on many occasions over a range of weather conditions. Poorly surveyed streams in the Upper Stanley River were targeted.

e. Opportunistic surveys by various frog biologists.

8.3 Control measures

8.3.1 International

The import and export of species included on the CITES Appendices is regulated and controlled by the EPBC Act. A CITES permit is required for export and import of CITES listed species including products derived from CITES listed species.

8.3.2 Domestic

The EPBC Act prohibits the export of live Australian native amphibians for commercial purposes under any circumstances. Permits are required for exporting live native Amphibians for non-commercial purposes (e.g. for research, education or exhibitions) and for products derived from native amphibians.

8.4 Captive breeding and artificial propagation

Captive breeding programs were not established before the extinction of *R. silus*. The last known specimen died in captivity in November 1983 (Tyler & Davies 1985).

8.5 Habitat conservation

The southern-gastric brooding frog was formerly found in the Kondalilla and Conondale National Parks which are currently managed by Queensland Department of Environment and Resource Management.

8.6 Safeguards

Should the species be rediscovered, the southern gastric-brooding frog will be afforded protection from over-collection for trade by provisions of the EPBC Act (see section 8.3.2 for further information).

9 Information on similar species

The southern gastric-brooding frog was one of two species of gastric brooding frog. It sister species, the northern gastric-brooding frog (*Rheobatrachus vitellinus)* is also considered to be extinct and has not been located in the wild since 1985 (McDonald 1990).

The southern gastric-brooding frog could be readily distinguished from the northern gastric-brooding frog by its distribution, colour pattern and mottled webbing. The calls of the northern gastric-brooding frog are similar to the southern gastric-brooding frog but of a deeper pitch, shorter and with less repeats.

10 Conclusion

The southern gastric-brooding frog has been declared extinct nationally and internationally. Trade has not been implicated as one of the factors contributing to declines, and subsequent extinction, of the species. Should the species be rediscovered it is unlikely that trade will pose a threat to wild populations. Therefore, Australia proposes that *Rheobatrachus silus* no longer warrants listing under CITES Appendix II and suggests the removal of *R. silus* from all CITES Appendices.

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