

**DIFFERENCES IN LARVAL MORPHOLOGY  
OF ALLOPATRIC ISOLATED POPULATIONS  
OF THE *ODONTOPHRYNUS OCCIDENTALIS*  
GROUP FROM WESTERN ARGENTINA**

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DIFFERENCES IN LARVAL MORPHOLOGY  
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J. M. CEI\* & E. G. CRESPO\*\*

*ABSTRACT:* A morphological comparative study of two larval populations — one from Mendoza and the other an isolated one from Sierra Famatina (La Rioja) — of the Argentine toad, *Odontophrynus occidentalis*, is reported.

As a result of field studies and comparative karyological research on *Odontophrynus occidentalis* from western Argentina, some remarkable morphological and biological differences between most of its populations and an isolated mountain population from La Rioja became evident.

Toads of the La Rioja population were found at about 2000-2400 m high in the creek of Aguadita, at the geographically isolated Sierra Famatina, East of Andean mountains. Tadpoles at different stages were observed all over the year, in the running waters and ponds of the creek; adults were only exceptionally found, except in the short breeding season. Significant karyological differences between specimens of *Odontophrynus occidentalis* from Mendoza Province and from Famatina have been reported (RUIZ *in press*).

Our attention is drawn to the probable taxonomic value of their morphological larval characters. Tadpoles of the Famatina population are easily recognizable from those of the Mendoza populations by its larger

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size, darker coloration and a less acuminate tip of tail. Moreover, further examinations showed significant differences in shape and measurements of the head and/or other somatic characters. These differences in larval morphological parameters are often comparable to those observed in the adults of both forms.

The purpose of the present paper is therefore a more detailed analysis of tadpole morphology, at different stages of development, both in Famatina and in Mendoza samples. Larval character states may be of interest for a further definitive taxonomic recognition of the isolated *Odontophrynus* form from Famatina mountains.

## MATERIAL AND METHODS

*Odontophrynus occidentalis* tadpoles fixed in 5% formalin from the Mendoza region and Sierra Famatina (La Rioja), were available in stages of development between 26 and 38 (cf. GOSNER 1960). All the measurements were made through a stereoscopic microscope using compasses and accurated to 0.1 mm. For the study of the chondrocranial structures of tadpoles, some specimens of both populations were cleared and stained, in accordance with the methodology preconized by WASSERSUG (1976).

After a previous selection, the following exosomatic parameters under a ratio form, were used: total length, body length, spiracle-snout (dorsal and ventral) distance, internasal distance, interocular distance and eye-snout distance.

We mean by:

- total length — the distance between the anteriormost tip of the snout and the tip of the tail;
- body length — the distance between the snout end and the middle point of the anterior margin of the vent tube;
- spiracle-snout length (dorsal and ventral) — the distances, taken along the midline, dorsal and ventral, between the level of the posterior edge of the spiracular opening and the snout end;
- internasal distance — the distance between the margins of the external nares;
- interocular distance — the distance between the internal sides of the eyeballs;
- eye-snout distance — the distance taken in the dorsal midline, between the level of the posterior margins of the eyeballs and the snout tip.

## RESULTS AND DISCUSSION

From the several ratios considered as biometric parameters of the tadpoles, only the following differ significantly (by application of the *t* — STUDENT test):

## A) Total length / body length

	Mean	Min.	Max.	Standard deviation	n°
<i>Mendoza</i>	2.45	(2.33 — 2.60)		s = 0.077	n = 25
<i>Famatina</i>	2.52	(2.32 — 2.86)		s <sub>1</sub> = 0.143	n <sub>1</sub> = 25
	t = 2.14		0.05 < P < 0.02		

## B) Body length / spiracle-snout distance (ventral)

<i>Mendoza</i>	1.80	(1.60 — 2.00)		s = 0.100	n = 25
<i>Famatina</i>	1.62	(1.42 — 1.76)		s <sub>1</sub> = 0.082	n <sub>1</sub> = 25
	t = 6.75		P < 0.001		

## C) Body length / spiracle-snout distance (dorsal)

<i>Mendoza</i>	1.71	(1.52 — 1.93)		s = 0.094	n = 25
<i>Famatina</i>	1.57	(1.38 — 1.70)		s <sub>1</sub> = 0.080	n <sub>1</sub> = 25
	t = 5.62		P < 0.001		

## D) Internasal distance / body length

<i>Mendoza</i>	0.10	(0.05 — 0.13)		s = 0.025	n = 25
<i>Famatina</i>	0.17	(0.10 — 0.20)		s <sub>1</sub> = 0.017	n <sub>1</sub> = 25
	t = 11.53		P < 0.001		

## E) Interocular distance / body length

<i>Mendoza</i>	0.15	(0.13 — 0.16)		s = 0.008	n = 25
<i>Famatina</i>	0.17	(0.12 — 0.20)		s <sub>1</sub> = 0.017	n <sub>1</sub> = 25
	t = 5.73		P < 0.001		

## F) Eyes-snout / body length } × 10

<i>Mendoza</i>	1.00	(0.89 — 1.14)		s = 0.065	n = 25
<i>Famatina</i>	1.15	(0.87 — 1.41)		s <sub>1</sub> = 0.153	n <sub>1</sub> = 25
	t = 4.46		P < 0.001		

Therefore, from the comparison of these two populations, the Famatina one shows the following:

1) a smaller body length in relation to the total length; correlatively the tail length is proportionally greater (figs. 1-2); 2) the spiracular opening located in a posterior position; 3) in relation to the body length, greater inter-nasal and interocular distances (figs. 2-4, 9); 4) in relation to the body length, a greater distance between the posterior level of the eyeballs and the snout tip (figs. 2-4, 9).

Besides these differences, there are others, which if hardly in quantification, are notwithstanding well conspicuous.

The specimens of Sierra Famatina are also distinguished from those of Mendoza, because they have a very much pronounced corporal pigmentation, the snout end and tail tips more roundish (this difference is less evident in the younger samples) (figs. 2-6, 9) the spiracular opening directed more dorsally (figs. 7-8), the labial *papilla* more developed, the second superior row of labial teeth less extensively interrupted in the midline (figs. 12-13), the horny beaks more pigmented and with the margin much more serrated (figs. 14-15) and the eyeballs generally smaller and more lateral (figs. 2-4, 9).

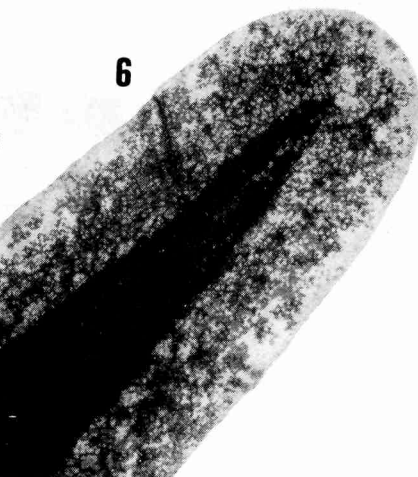
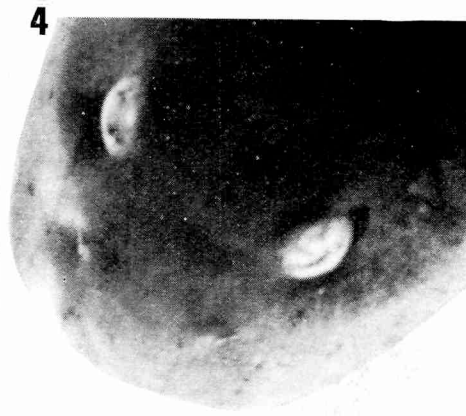
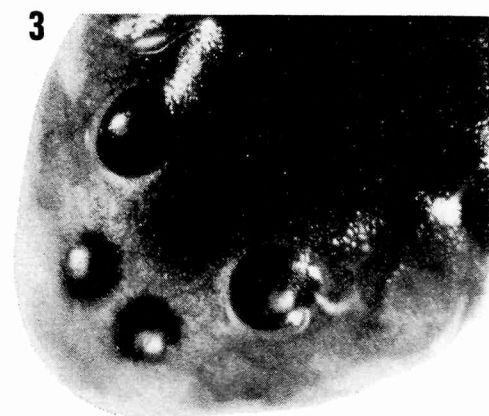
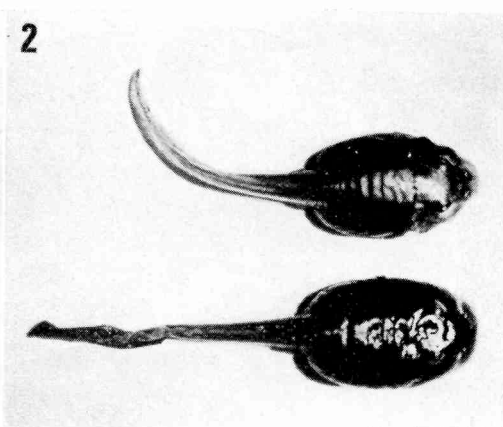
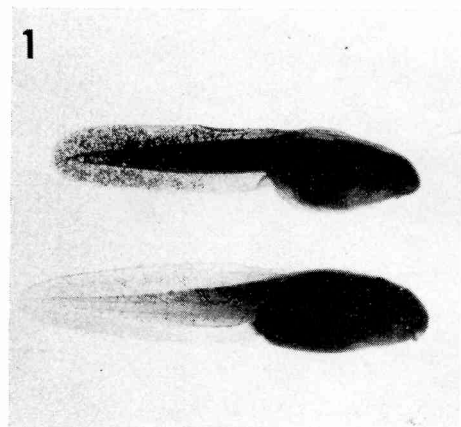
The architectural plan of the chondrocrania in individuals of both populations under study does not reveal any differences which are worth of mention (figs. 16-18). There exist only differences in the proportions that are however correlated with those detected at the level of the external morphology.

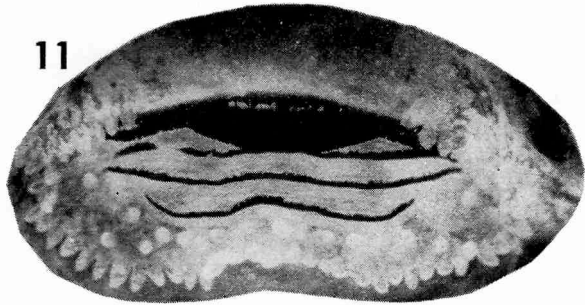
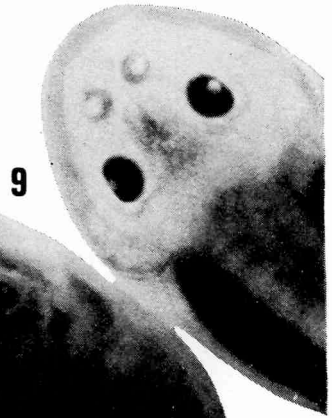
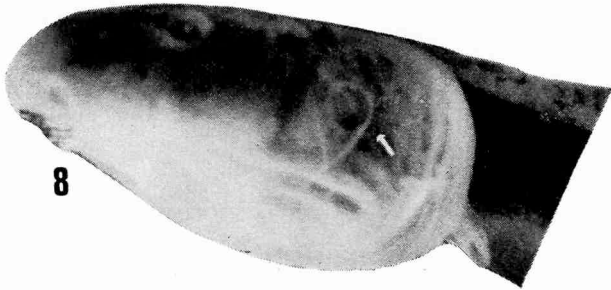
Although the larval characters are relatively labile, and so, a taxonomic criterion which meaning must be considered with prudence, we believe that we are facing such a kind of differences, which are based in a considerable degree of genetic differentiation.

The morphological differences between the samples of both populations, which we have the chance to observe are, for example, greater than those we have recorded between the Iberian species of *Alytes* (*A. obstetricans* and *A. cisternasii*) studied by one of us in some detail (CRESPO 1979). These differences also does not seem lesser than those existing between another pair of amphibian species of the European fauna, *Discoglossus pictus* and *D. sardus* (KNOEPFFLER 1962).

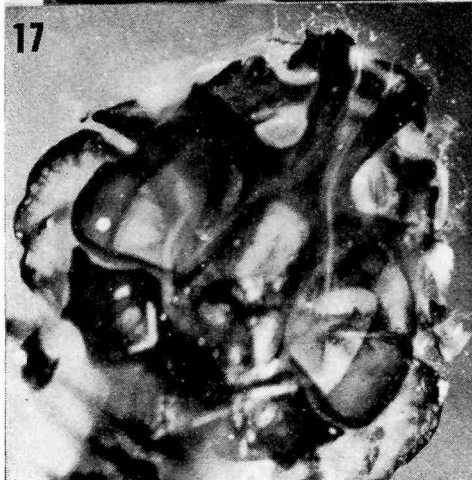
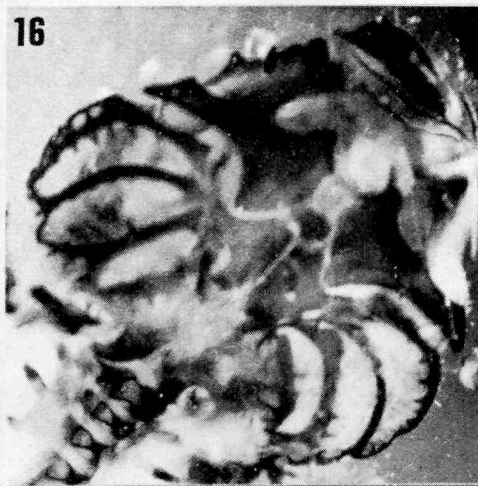
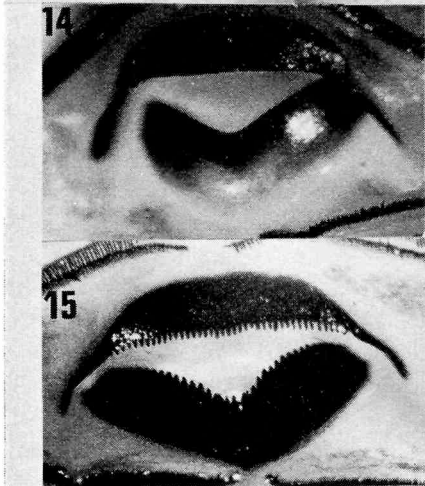
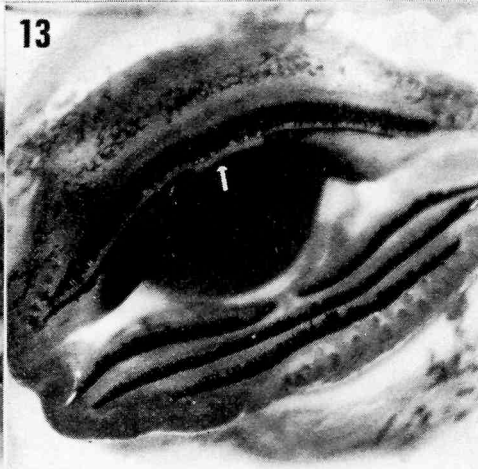
## SUMÁRIO

Observações de campo e a análise cariológica de várias populações de *O. occidentalis* da região ocidental da Argentina, revelaram a existência de diferenças bem marcadas numa população isolada da Serra de Famatina, em relação às demais populações conhecidas da espécie.









Relativamente à população de Mendoza, tomada como padrão das restantes, os espécimes da Serra de Famatina, têm:

1) menor comprimento do corpo em relação ao comprimento total (o mesmo é dizer que têm a cauda proporcionalmente maior); 2) a abertura espiracular em posição mais posterior; 3) em relação ao comprimento do corpo, maiores distâncias interoculares e internasais; 4) em relação ao comprimento do corpo, maior distância entre o nível posterior dos globos oculares e a extremidade do focinho.

Além destas diferenças, os indivíduos de Famatina têm ainda: pigmentação geral muito mais pronunciada; as extremidades do focinho e da cauda mais arredondadas (esta diferença é menos acentuada nos exemplares mais jovens); as aberturas espiraculares dirigidas mais dorsalmente; as papilas labiais mais desenvolvidas; a 2.<sup>a</sup> fiada superior de denticulos labiais menos extensivamente interrompida na parte média; o bico córneo mais pigmentado e com a margem muito mais serreada; os globos oculares geralmente menores e mais laterais.

Não existem diferenças significativas nos planos arquiteturais dos condrocânios dos exemplares das duas populações.

Embora com a prudência com que os caracteres larvares, devido à sua relativa labilidade, têm de ser considerados, cremos que neste caso as diferenças observadas reflectem uma acentuada diferenciação genética. Tendo por termo de comparação outros Anfíbios, nomeadamente da fauna europeia, pode atribuir-se a estas diferenças um nível específico.

#### LITERATURE CITED

- CRESPO, E. G. (1979) — Contribuição para o conhecimento da biologia dos *Alytes* ibéricos, *Alytes obstetricans boscai* Lataste, 1879 e *Alytes cisternasii* Boscá, 1879 (Amphibia, Salientia): — a problemática da especiação de *Alytes cisternasii*. Tese. Faculdade de Ciências. Universidade de Lisboa.
- GOSNER, K. L. (1960) — A simplified table for staging anuran embryos and larvae with notes on identification. *Herpetologica*, **16**: 183-190.
- KNOEPPFLER, L. P. (1962) — Contribution à l'étude du genre *Discoglossus* (Amphibians, Anoures), *Vie et Milieu* **13** (1): 1-94.
- WASSERSUG, R. J. (1976) — A procedure for differential staining of cartilage and bone in whole formalin — fixed Vertebrates. *Stain Technology* **51**. (2): 131-134.

## EXPLANATION OF PLATES

- 1 — Lateral views of the tadpoles of *O. occidentalis*. Above: population of La Rioja (stage 28); below: population of Mendoza (stage 29).
- 2 — Dorsal views of *O. occidentalis* tadpoles. Above: population of Mendoza (stage 30); below: population of La Rioja (stage 30).
- 3 — Dorsal view of the snout of the tadpole of *O. occidentalis*, population of Mendoza (stage 33).
- 4 — Dorsal view of the snout of the tadpole of *O. occidentalis*, population of L. Rioja (stage 32).
- 5 — Tail of the tadpole of *O. occidentalis*, population of Mendoza (stage 30).
- 6 — Tail of the tadpole of *O. occidentalis*, population of La Rioja (stage 28).
- 7 — Lateral view of the tadpole of *O. occidentalis*, population of Mendoza — stage 30 (position of the spiracle, *arrow*).
- 8 — Lateral view of the tadpole of *O. occidentalis*: population of La Rioja — stage 28 (position of the spiracle, *arrow*).
- 9 — Lateral views of the tadpoles of *O. occidentalis*. Above: population of Mendoza (stage 28); below: population of La Rioja (stage 27).
- 10 — Oral region of the tadpole of *O. occidentalis*, population of Mendoza (stage 37): development of the labial *papillae*.
- 11 — Oral region of the tadpole of *O. occidentalis*, population of La Rioja (stage 37): different development of the labial *papillae*.
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- 17 — Dorsal view of cleared and stained chondrocranium of the tadpole of *O. occidentalis*, population of La Rioja (stage 40).
- 18 — Dorsal view of cleared and stained chondrocranium of the tadpole of *O. occidentalis*, population of Mendoza (stage 40).

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SACARRÃO G. F. (1965) — On the origin and development of the epistellar body of the Octopus (*Octopus vulgaris* Lam.). *Arq. Mus. Boc.*, (2.<sup>a</sup> série), **1**, n.º 1, 1-8.

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