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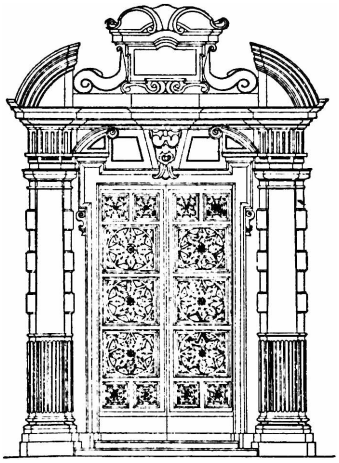

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ABSTRACT

The tongue shape and its epidermal structure was examined in a stock of palearctic and paleotropical lizards from Europe, Africa, the Middle East and south eastern Asia.

The results of this preliminary report clearly point out the systematic importance of this morphological feature in providing valuable generic and specific characters. The fundamental pattern described for the genera *Podarcis*, *Lacerta* sensu stricto and *Gallotia*, e. g., is very distinctive despite several features in common, likely due to ancient phyletic relationships. A number of similar morphological trends stress the reciprocal affinities between *Lacerta (Archaeolacerta)* and the widely spread genus *Podarcis* which is still undergoing speciation. Another case is the minor but significant affinities linking the genera *Lacerta* sensu stricto and *Gallotia*, the latter also undergoing more complicated speciation due to its insular isolation.

The interspecific differences in the taxa belonging to the so-called "species groups" such as *Podarcis*, are scanty or insignificant. Instead there are striking differences in the generic patterns of the tongue morphology in Afro-Asian lacertid lizards. However, a similar pattern was found in the African genera *Adolfus* and *Holaspis* or Centromastix (= *Gastropholis* according to Arnold, 1989) and *Ichnotropis*.

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INTRODUCTION

The tongue shape and epidermis have been often used as significant characters in discriminating zoological taxa, such as the phyletic lines of Autarchoglossa or Scleroglossa in Lacertilia (Schwenk, 1988), as well as in pointing out distinctive morphological features, such as in the specialized scincid stock of lizards.

Few scanning electron microscopic observations, or other recent comparative histological studies, have been reported for the lingual surface of reptiles, except for the preliminary works by Iwasaki and Miyata (1985) on the epithelial cell surface of the anterior and posterior portions of the tongue and their ridges, or microridges, in the Japanese lizard *Takydromus tachydromoides*, and by Iwasaki (1990) on the peculiar tongue of *Gekko japonicus*.

The use of meristic characters of the tongue as a tool in the defining generic species groups, likely supporting evolutionary interspecific relationships, was provided by Cei & Scrocchi (1991) and Cei (1993) for the neotropical teiid lizards of the genus *Cnemidophorus*. Significant differences appeared between the *lacertoides, lemniscatus* and *longicaudatus* species group, in agreement with other morphological evidence.

It was therefore interesting to examine if in a stock of palearctic and paleotropical lacertid lizards equivalent and distinctive structural features could be found. Several genera and species of this family were studied and a comparative screening of the observations made. The results of our research offer the basis for several tentative assumptions. This paper gives a preliminary report on these morphological trends in lacertid lizards from Europe, Africa, the Middle East and southeastern Asia.

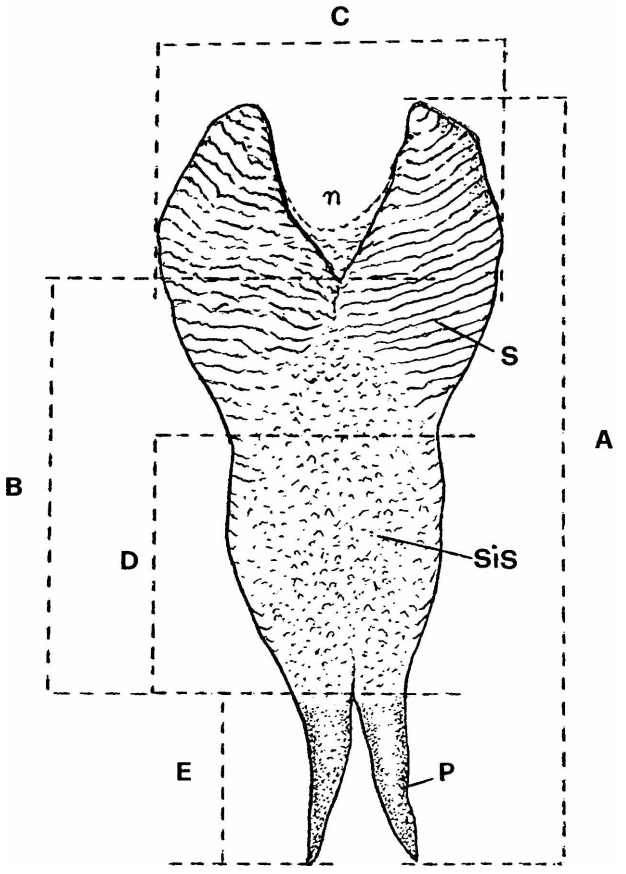
MATERIAL AND METHODS

Specimens in the collections of the Museo Zoologico "La Specola" of the University of Florence and the Zoologisches Forschungsinstitut und Museum "Alexander Koenig" of Bonn, were observed and measured with calipers, after dissection using optical magnification and computed reproduction. A total of 14 generic groups (*Podarcis*, *Archaeolacerta*, *Lacerta*, *Gallotia*, *Algyroides*, *Adolfus*, *Centromastix*, *Holaspis*, *Ichnotropis*, *Meroles*, *Nucras*, *Poromera*, *Psammodromus* and *Takydromus*) and 57 species and subspecies of European, African and Asian lacertid lizard were studied.

The measurements, in mm, were: A, the total length of the tongue from its proximal swollen border to the distal sharpened terminal points; B, the distance from the deep border of the medial notch on the proximal swollen part of the tongue to the beginning of the forked distal splitting of the sharpened terminal points; C, the maximum breadth of the proximal swollen part of the tongue; D, the distance from the narrowest part of the tongue to its distal forked split; E, the length of the distal forked tip and its relative ratio when compared with

the total tongue length (Fig. 1). The meristic or descriptive characters considered were: the depth of the median notch on the proximal swollen part of the tongue; the striation on the swollen proximal region and narrower median region of the entire tongue; the conic-cylindrical keratinous points of the distal forked tongue tip; the structure of the epithelial layers of the whole tongue (juxtaposed or subimbricate scales).

Eventual volumetric changes in the fixed organs of the preserved specimens in the collections can be disregarded given the standard conditions of preparation and storage in ethanol (75%). The video analysis was carried out using the Jandel software video Java analyses.



Legend Fig. 1 - General morphological features of a lacertid tongue and its fundamental metric and meristic parameters. The A, B, C, D, E parameters we explained in "Material and Methods"; n = notch; s = striation; sis = sub-imbricate scales; p = terminal points of the forked tip.

RESULTS

The observed genera and species of Lacertidae are listed according to taxonomic units and geographical area (Arnold, 1989).

1 - Generic groups Podarcis, Archaeolacerta, Lacerta from Palearctic regions and the genus Gallotia from the Canary Islands (Western West Africa)

The Mediterranean *Podarcis* species groups alphabetically considered here are: *filfolensis* (Linosa Island, Pelagian Archipelago, Italy); *muralis* with its subspecific taxa *brueggemanni* (Campocatino, Apuan Alps, Tuscany, Italy), *maculiventris* (San Giuliano, Venice, Italy), *muralis* (Savona, Bergeggi Island, Liguria, Italy); *peloponnesiaca* (Peloponnese, Larouka and Olympia, Greece); *raffonei* with the subspecies *antoninoi* (Vulcano Island, Aeolian Archipelago, Sicily, Italy); *sicula* with its subspecific taxa *campestris* (Florence, Tuscany; Ostia, Latium and Gallipoli, Apulia, Italy), *cettii* (Oristano, Sardinia, Italy) and *sicula* (Mirto Crosio, Cosenza, Calabria and Modica, Sicily); *wagleriana* with the subspecific taxa *marettimensis* (Marettimo Island, Egadian Archipelago, Sicily, Italy) and *wagleriana* (Favignana Island, Egadian Archipelago, Sicily, Italy). The tongue morphology of *Podarcis* can be summarized as follows:

- a moderate swelling of its proximal bulky portion, whose breadth (parameter C) fits 2-2.5 times in the total length (parameter A);
- deep central notch in the above mentioned proximal bulky portion which fits 3-4 times in the parameter B;
- a remarkably developed distal forked portion, which can be as long as half way to the distance between the deep central notch and extreme tip; histological differentiation between the transverse rugged stripes covering the swollen proximal portion - including the posterior part of the median lingua - and the scaled subimbricate surface of the median and distal part of the tongue from its narrowest part to the beginning of the cylindrical terminal points of the tip.

Some peculiar features of the *Podarcis* species groups should be pointed out. In *sicula*, there is a clear cut differentiation between the more swollen striated proximal portion and the scale-covered median and distal shares, particularly remarkable in *sicula campestris* and *sicula cettii* (Pl. 1). This trend, somewhat attenuated in the *muralis* (Pl. 2), is often weak or insignificant in the *wagleriana*, *raffonei* and *filfolensis* groups where the characteristic narrowing of the tongue at about the middle of its total length is very faint or almost invisible (Pls. 2-3). Instead, that character is emphasized in the *peloponnesiaca* group, leading to a nearly conical tongue showing a distinct epithelial differentiation between the striated -not too swollen- proximal notched share and the scale-covered, subimbricate, median and distal region, where the shortening of the acuminate terminal points is remarkable.

The swollen, notched proximal share of the tongue is less projecting in the genus *Lacerta (Archaeolacerta)* which results in a somewhat conical shape of the organ. The Spanish species *monticola* and *bonnali* show a reduced or plain median notch of their proximal swollen portion, particularly evident in *monticola cyreni* (4-5 times the B-parameter, versus 3-4 times in *Podarcis*). Rough spaced transversal striae extend into the faintly scaled median or distal portions, whose forked tip has stout acuminate points, above all in *bonnali* (Pl. 4). The forked tip length barely fits 2 times in the length of parameter B versus 2-3 times or more in *Podarcis*. The morphometric and meristic pattern of *Lacerta (Archaeolacerta) bedriagae* (*b. paessleri* from Limbara Mountains, Sardinia) is almost identical to that of the *monticola* group; however, the rough transverse striae of its moderately swollen proximal portion extend much farther in the median and distal part of its acuminate tongue as the two sharp points of the tip are shorter than in the *monticola* group (Pl. 4).

The tongue of the species belonging to the genus *Lacerta* sensu Boulenger has an impressively swollen proximal striated portion. The species examined are: *Lacerta (Timon) pater* (from Morocco), *L. lepida* (Almeria, Spain, and Liguria, Italy), *L. viridis* (Central Italy: Leghorn, Ravenna, Elba Island), *L. graeca* (Greece) and *L. princeps kurdistanica* (Derik, Turkey).

In these species the maximum breadth of the swollen proximal share (parameter C, mm 12-35, or more, in the adults) fits only once in the distance from its deep notch and the beginning of the distal forked share (parameter B), versus 1.5-2 times in the *Podarcis* group. The maximum breadth of *Lacerta* likewise fits 1.5-2 times in the total length of the organ (parameter A) versus 2-2.5 times, or more, in *Podarcis* (Pl. 5). The extent of the striation on the swollen proximal portion of the tongue in *Lacerta* is moderate. The median and distal parts are widely covered by subimbricate or juxtaposed scales, especially in *L. lepida*, *L. pater* and *L. viridis*, less so in *L. graeca* and *L. princeps kurdistanica*. The genus presents a peculiar thickness of the forked tip of the organ, whose extreme portion ends in very strong, sharpened points (Pl. 5).

Some general features of *Lacerta* are also found in the lingual morphology of the genus *Gallotia* from the Canary Islands: *Gallotia atlantica* with the subspecies *atlantica* (Arinaga, Gran Canaria, and Fuerteventura), *graciosa* and *laurae* (Lanzarote), *G. galloti* (Tenerife) and *G. stehlini* (Gran Canaria).

These lizards share some of the characters peculiar to the *Lacerta* species, in particular a remarkably wide swollen proximal portion, a roughly subtriangular tongue ending in a sharp forked point (Pls. 6-8). In *Gallotia* species the maximum breadth (parameter C) is almost as large or distinctly larger than the distance from the very deep proximal central notch and the beginning of the forked distal portion (parameter B). Their parameter ratio (C/B) is thus lower than in *Lacerta* or, of course, in *Archaeolacerta* or *Podarcis*: 0.5-1 versus 1.5-2, or more, mainly in *Archaeolacerta* and the *wagleriana*, *raffonei*, *filfolensis* and *muralis* groups of *Podarcis*.

The transverse irregular striation of the prominent proximal portion is weaker and not so extended in the *Gallotia* tongue (Pls. 6,7,8), as compared to similar structures in the above mentioned genera. The subimbricate scaled surface of the median and distal parts of the organ is extensive, often reaching the internal deep border of the wide central notch (Pls. 6,7,8). The short sharp points of the extreme forked tip are relatively thin and reduced, more so in *G. galloti* and *G. stehlini*, less so in *G. atlantica*. The subtriangular shape of the whole organ and the broadening of its proximal notch are accentuated in *G. stehlini* where the transverse striation of its wide proximal point is faint or reduced.

2- THE GENUS ALGYROIDES FROM THE TYRRHENIAN ISLANDS

Five specimens of the small insular *Algyroides fitzingeri lugodorensis* (Osilo, Sassari, Sardinia) were studied. This interesting taxon is characterized by a relatively reducted proximal swollen portion of its tongue which has an open subtriangular shape and a moderately deep, central notch. It also has a peculiarly large extent of coarse, spaced, striation generally reaching the median and distal part of the tongue (Pl. 9) where the scaled and subimbricate epithelial surface becomes very reduced or absent. The forked distal part of the tongue is poorly developed in *Algyroides*. Fits 4-5 times in the total length (parameter A), versus 2-3 times in *Lacerta pater*, 3-3.6 times in *L. viridis*, 2.5 times in *L. princeps*, 2.6 times in *Archaeolacerta monticola cyreni*, 3.5 times in *Archaeolacerta bonnali*, 2.5 times in *Podarcis muralis*, 3.5 times in *P. filfolensis*, 2.7-3 times in *P. sicula campestris*, 3 times in *P. sicula cettii*, 3.5-4 in *P. sicula sicula*, etc. However, a similar character state is found in a very different genus, such as the larger *Gallotia* from Canary Islands, whose diminished forked distal tip is contained in the parameter A: 5-7 times in *Gallotia stehlini*, 5-5.5 times in *G. atlantica*, 4.5-6 in *G. galloti*, etc.

3 - AFRICAN GENERA AND SPECIES OF LACERTID LIZARDS, REPORTED IN ALPHABETICAL ORDER

To look for any taxonomic-phyletical relationships on the basis of preliminary anatomical research, such as ours is neither rational nor of objective interest. However, it could be a very useful tool for further systematic studies or assessments and increase our information on the probable systematic value of organs and structures of primary physiological and/or morphological importance such as the tongue in reptiles of vicarious physiognomy like teiid and lacertid lizards. Thus, the following genera from Africa and neighboring regions have also been taken into account here.

a -Adolfus from Central Africa, with the species *africanus* (Zaire), *jacksoni* (Zaire) and *vaueresselli* (Ruanda).

These middle-sized taxa show a general, almost unusual, uniformity in their tongue morphology, pointed out by: a subtriangular shape; moderate

broadness of the deeply notched proximal major portion; a prevailing forked and sharply pointed distal portion fits about 2.5 times in the total lingual length; a closely striated proximal pattern which extend its coarse ridges from the moderately swollen posterior portion to the terminal distal region; relatively scarce subimbricate scales even in the median and distal portions (Pl. 10-1).

No other morphology specific to the above-mentioned palearctic taxa from Europe and the Canary islands can be compared to the peculiar features of the tongue of the *Adolfus* species.

b - Genus *Centromastix*, with the species *echinata* (Cameroon, West Africa).

A middle-sized form, also with moderately developed proximal swollen portion. It shows a moderate, triangular, central notch; a very short forked tip in the distal share which fits 5.5 times in the total length of the tongue (parameter A); a weak transverse striation, barely distinguishable but extending to the terminal forked points; a reduced and scarcely distinct scaled surface (Pl. 10-2).

No other lingual morphology specific to the above mentioned palearctic taxa can be compared with the peculiar features of *Centromastix echinata.*

c - Genus *Holaspis*, with the species H. *guentheri* (Cameroon, West Africa).

Several morphological characters of this form can obviously be referred to the above mentioned *Adolfus* species from Zaire (Pl. 10-3). The coarsely ridged transverse ornamentation extends over the whole surface of the tongue, from the moderate proximal notched portion to the strong distal sharpened forked point which is short and fits more than 4 times in the total length (parameter A). Like *Adolfus*, none of the above-mentioned palearctic forms shows a tongue comparable in morphology to the peculiar pattern of *Holaspis guentheri.*

d - Genus *Ichnotropis*, with the species *capensis* (Molepolole, Botswana) and *squamulosa* (Tanzania, South Africa and Witvlei, Namibia).

At first sight the middle-sized species *capensis* appears very similar to the lingual morphology of *Centromastix echinata* (Pl. 11-1,-2). The transverse striation is almost similar as is the shape and length of the terminal forked point - which fits 5-6 times in the total length of the tongue - and also the subimbricate scaled surface of the central, median and distal portions of the organ. Thus, evident morphology affinities between *I. capensis* and *Centromastix* cannot be disregarded. Similar observations should be made on the South African forms of *I. squamulosa*, both on their metric and meristic characters.

e - Genus *Meroles,* with the species *cuneirostris* (Namibia), *depressa* (Africa, no locality), *suborbitalis* (Namibia), *reticulata* (Namibia).

This well defined distinct assemblage of species is easily recognizable by

a unique combination of characters. The tongue has a dilated bulky curved proximal portion encircling a large deep subcircular notch. It exhibits a distinct transversal striation whose regular and close ridges laterally enter the median but not the distal portion whose surface is covered by fine, subimbricate scales.

This condition is scarcely visible in *M. reticulata* but more evident in *M. suborbitalis* or *M. cuneirostris* (Pl. 12).

The terminal, forked point is short but very strong and sharpe. It fits in the total length 4.5-5 times in *M. reticulatus*, 5-6 times in *M. depressa*, 6-6.5 times in *M. cuneirostris*, and 5.5-8.5 in *M. suborbitalis*. That makes it one of the shortest terminal forked points observed in lacertid lizards in our present study. No significant affinities were observed between the genus *Meroles* and any other taxa examined during our comparison.

f - Genus *Nucras*, with the species *boulengeri* (Kenya), *lalandii* (Ubombo, South Africa), *taeniolata* (Botswana) and *tessellata* (South Africa and Namibia).

Peculiar characters shared by several *Nucras* species were taken into account during our sampling: a relatively moderate proximal region, facing the medial and distal portions of the tongue, most evident evident in *N. boulengeri* and *N. lalandii*; a somewhat unusual swelling of the medial and distal parts noted in all the species (Pls. 13, 14-1); a rather developed distal forked tip followed by a large deep, median wrinkle (Fig. 14-1); the strong, acuminated terminal points, which fit 3.5-4.5 times in the total length of the organ (parameter A); the remarkable distance from the narrowest part of the tongue to its distal forked tip (parameter D); the moderate, or weak, transverse proximal striation, very faint in *N. taeniolata* , *N. tessellata* and *N. lalandii*, stronger in *N. boulengeri*. A deep black pigmentation in the distal tongue region is strikingly evident in all the species of the genus.

A careful preliminary comparison of such a character combination shows that none of the lacertid lizards examined has any affinities with the genus *Nucras* and its representatives.

g - Genus *Poromera*, with the taxon *fordii* (Cameroon).

This taxon has a strikingly different tongue morphology. Its pattern shows a regular, rounded but dilated proximal portion with a deep circular median notch; a regularly narrowing medial and distal portions, symmetrically and widely covered by regular transverse striation which extends from the proximal borders to the beginning of the forked pointed tip (Pl. 14-2): relatively large and sharpened terminal ends of the tip, which fits 4 times in the total length (parameter A).

The lingual morphology of *Poromera fordii* is unmistakable. No apparent affinities with other genera of Lacertidae were found.

h - Genus *Psammodromus,* with the species *microdactylus* (Morocco) and *algirus* (Spain and Portugal).

The tongue of these lacertids is enlarged, subtriangular in shape, narrowing regularly from the moderately swollen proximal region to the forked distal tip and its conical points. A not too evident median notch is present: its shape is somewhat irregular and its size is often reduced. The softly curved proximal portion presents a weak transversally spaced ornamentation whose faint ridges can extend into the neighboring lateral regions of the medial share of the tongue, as in *microdactylus* (Pl. 15-2). Subimbricate almost indistinct scales cover the medial and distal surface of the organ. The acuminated points of the tip are strong and evident: they fit almost 4 times in the total length (parameter A).

At first sight there seem to be no special affinities between the tongue of *Psammodromus* and that of the other species reported above.

4 - Genus Takydromus from the Eastern Orient with T. septentrionalis and kuehnei (China), sexlineatus (Thailand and Vietnam) and tachydromoides (Japan).

Together with a very short and frail tip, the tongue is narrow and enlarged with a general subtriangular shape among these middle-sized lizards. The weak, acuminated tip point fit up to 10 times, or more, in the total length (parameter A) in *T. septentrionalis*, 8-8.5 times in *T. tachydromoides*, 6-6.5 times in *T. sexlineatus* and 4.5 times in *T. kuehnei*. The proximal median notch is deep but irregular in *T. kuehnei*, rounded or subtriangular in *T. septentrionalis*, *sexlineatus*, and *tachydromoides*. A faint, spaced, transverse ornamentation extends from the moderately swollen proximal share into the median and distal regions of the tongue. That character is more distinct in *T. kuehnei* (Pl. 15-3), *sexlineatus* or *takydromoides*, less distinguishable in *T. septentrionalis*.

It is obvious enough that the character combination of these middle-sized oriental lizards is not comparable to the different patterns shown by the palearctic or paleotropical lizards analyzed here.

DISCUSSION AND CONCLUSION

The results point out the systematic importance of the reptilian tongue morphology in providing valuable generic and specific characters. The fundamental pattern described for the genera *Podarcis*, *Archaeolacerta*, *Lacerta* and *Gallotia* is very distinctive for each taxa despite several features in common, which are probably due to ancient phyletic relationships. Such similar morphological trends can help to clarify some reciprocal affinities between *Archaeolacerta* and the widely spread genus *Podarcis* which is still undergoing active speciation. Another case is the minor but significant affinities link-

ing the genera *Lacerta* and *Gallotia*, the latter also undergoing more complicated speciation due to its insular isolation (Mayer & Bischoff, 1991).

At the level of the taxa assembled in the somewhat pragmatic evolutionary units currently named as "species groups" the interspecific differences prove to be scanty or insignificant. That was steadily observed both in the complex, still speciating "species groups" of the genus *Podarcis*, and in some more limited extra-palearctic "species groups" submitted to a remarkable dispersal and to prolonged phases of geographic disjunction.

A striking diversity was found in the morphological characters of the tongue in the several Afro-Asiatic lacertid lizards checked. Among the nine genera studied a similar pattern was found only in the African genera *Adolfus* and *Holaspis* or *Centromastix* and *Ichnotropis*. All the other genera exhibit distinct character combination which do not seem to have any reciprocity. But the apparent affinities between *Adolfus* and *Holaspis*, or *Centromastix* and *Ichnotropis*, may be due to either a real phyletic bond or to the result of convergent evolution through some parallel adaptive processes, in different environmental conditions. As stated earlier such a discussion is outside the scope of our present research.

In conclusion, the comparative results provided appear to be significant. The role of morphological tongue characters in lacertid lizards is therefore confirmed as a valuable tool in clarifying the systematic status of their taxa at the most different evolutionary levels.

Further comparative research on histological structures and their sensorial receptors should be carried out.

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RIASSUNTO

Nel presente lavoro sono state esaminate la forma della lingua e la struttura della sua superficie in alcune specie di Lacertidi dell'Europa, dell'Africa, del Medio Oriente e dell'Asia sud-orientale.

I risultati di questo lavoro preliminare mostrano l'importanza che in sistematica può avere la morfologia della lingua nel procurare validi caratteri distintivi a livello di genere e di specie. A esempio il pattern descritto per i gruppi generici *Podarcis*, *Lacerta* (*Archaeolacerta*), *Lacerta* sensu stricto e *Gallotia* si presenta peculiare nonostante siano state rilevate numerose caratteristiche in comune, quest'ultime probabilmente dovute ad antiche relazioni filogenetiche. Un certo numero di similarità morfologiche evidenziano le affinità fra il genere *Archaeolacerta* e l'ampiamente distribuito genere *Podarcis*, peraltro in corso di speciazione. Un altro esempio riguarda le affinità, anche se minori, che legano i generi *Lacerta* e *Gallotia*, quest'ultimo sottoposto a un processo di speciazione più complesso, tenuto conto del suo isolamento insulare.

Le differenze interspecifiche dei taxa appartenenti ai cosiddetti "species groups" come a esempio *Podarcis*, sono scarse e insignificanti. Sono state invece rilevate notevoli differenze nella morfologia della lingua dei generi afro-asiatici, nonostante che l'aspetto dei generi africani *Adolfus* e *Holaspis* o *Centromastix* (= *Gastropholis sensu* Arnold, 1989) e *Ichnotropis* sia simile.

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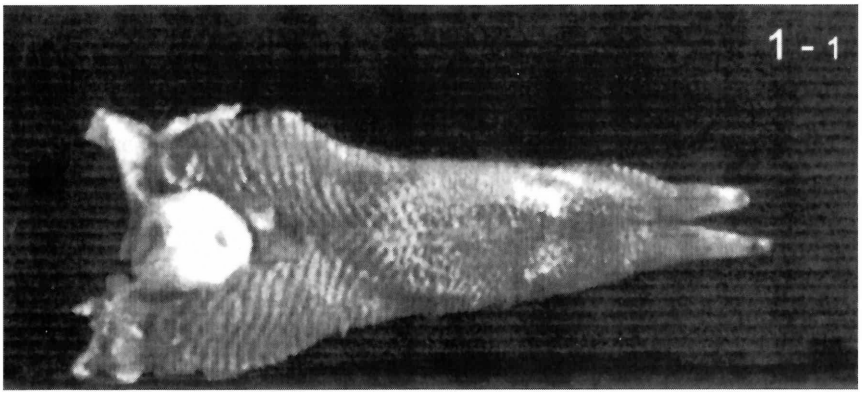
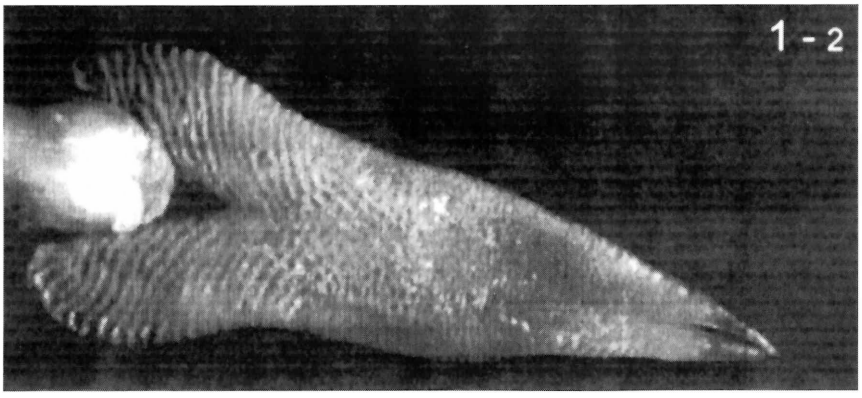
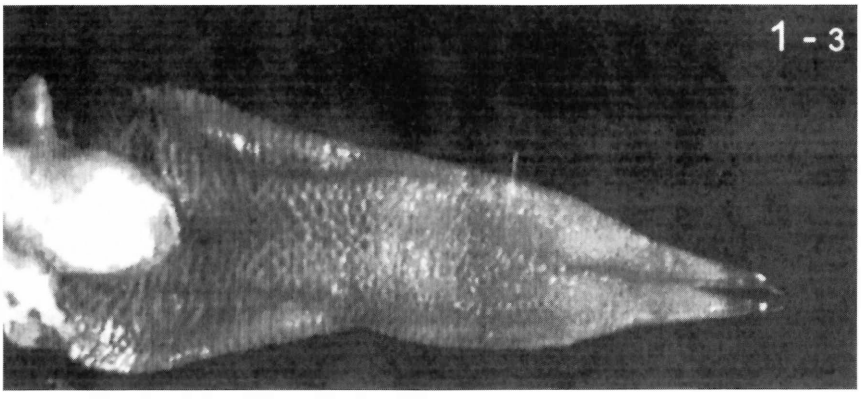


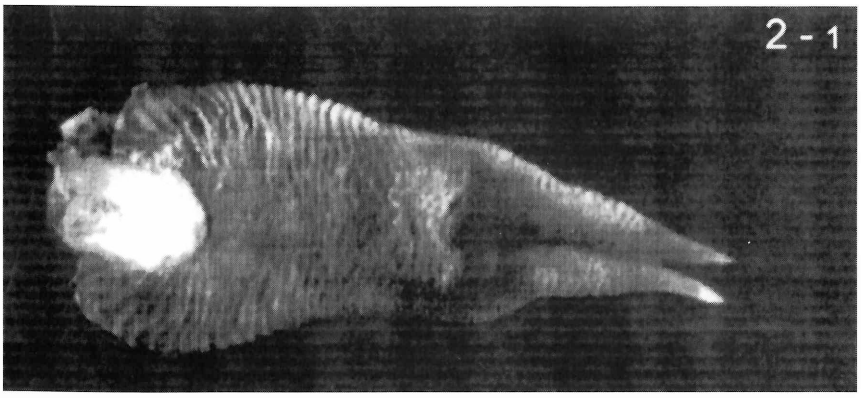
Podarcis sicula campestris (Apulia, Italy)



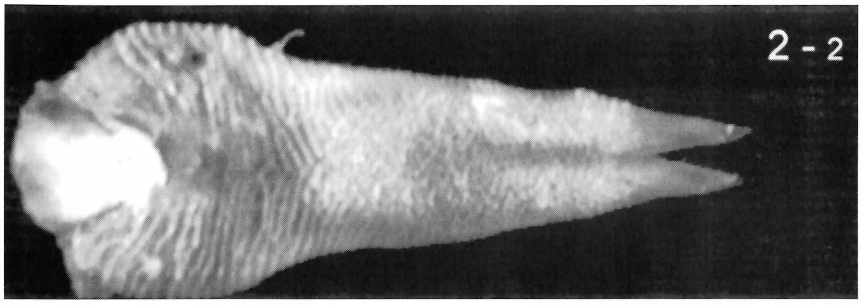
Podarcis sicula cettii (Sardinia, Italy)



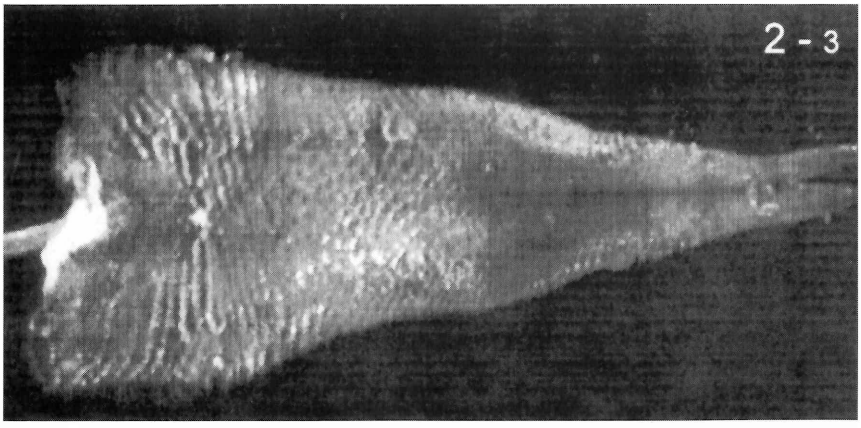
Podarcis sicula sicula (Calabria, Italy)



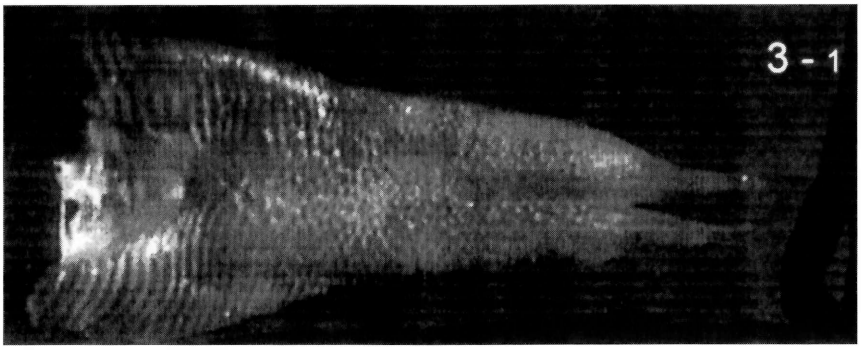
Podarcis muralis bruggemanni (Tuscany, Italy)



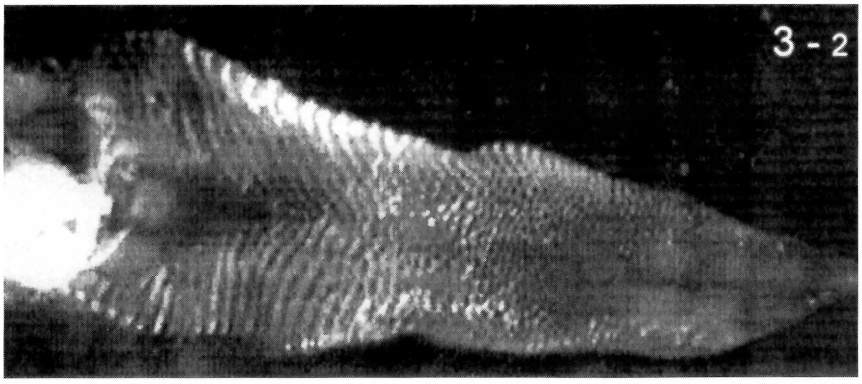
Podarcis muralis maculiventris (Veneto, Italy)



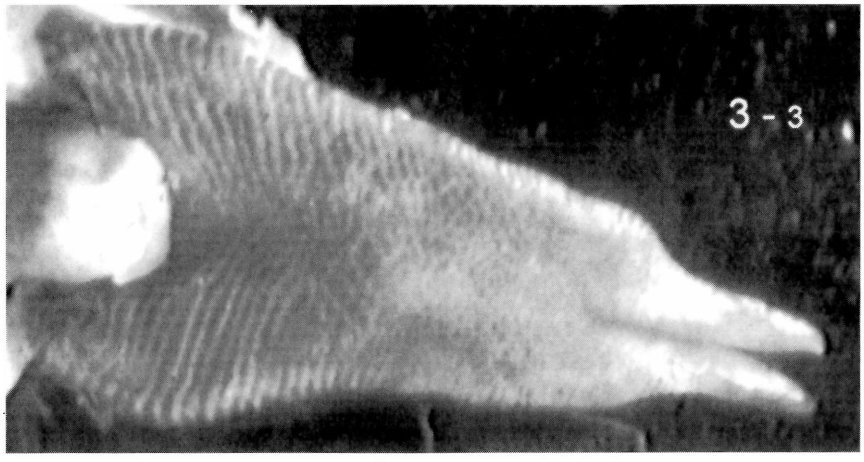
Podarcis w. wagleriana (Favignana Island, Italy)



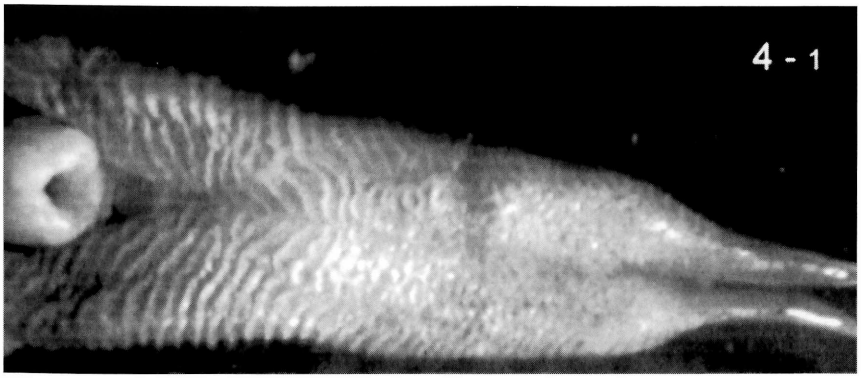
Podarcis filfolensis (Linosa Island, Italy)



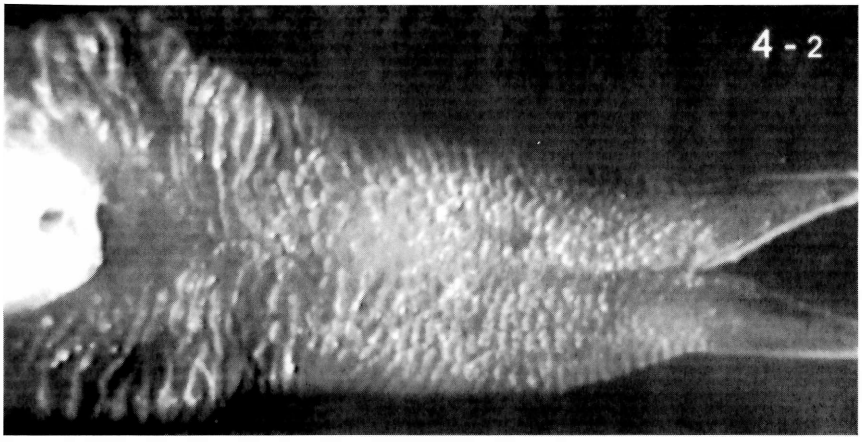
Podarcis raffonei antoninoi (Volcano Island, Italy)



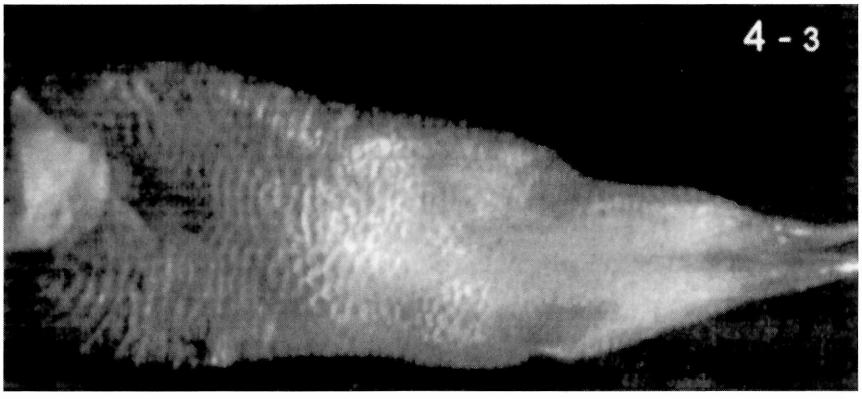
Podarcis peloponnesiaca (Peloponneso, Greece)



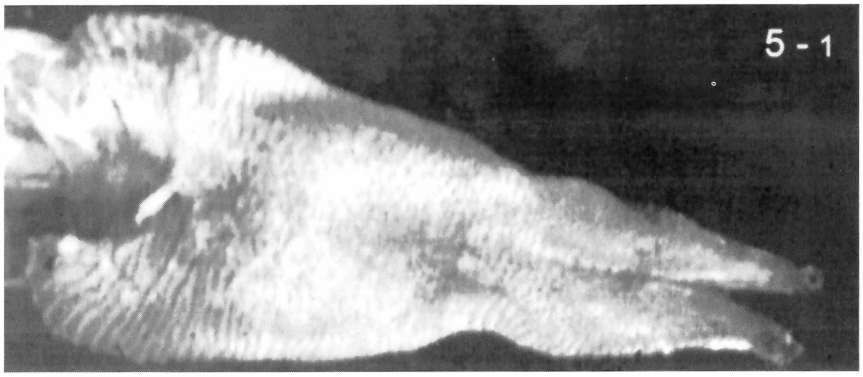
Lacerta monticola cyreni (Avila, Spain)



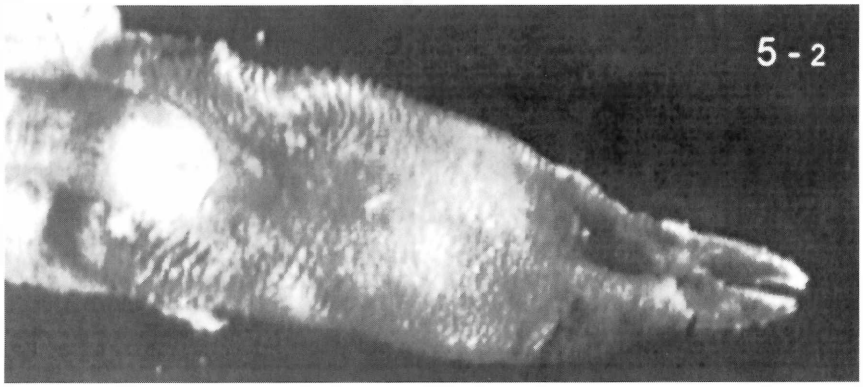
Archaeolacerta bonnali (Huesca, Spain)



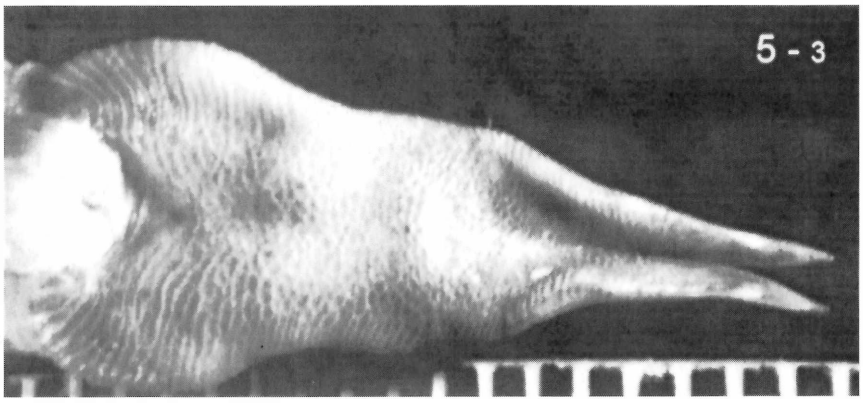
Archaeolacerta bedriagae (Sardinia, Italy)



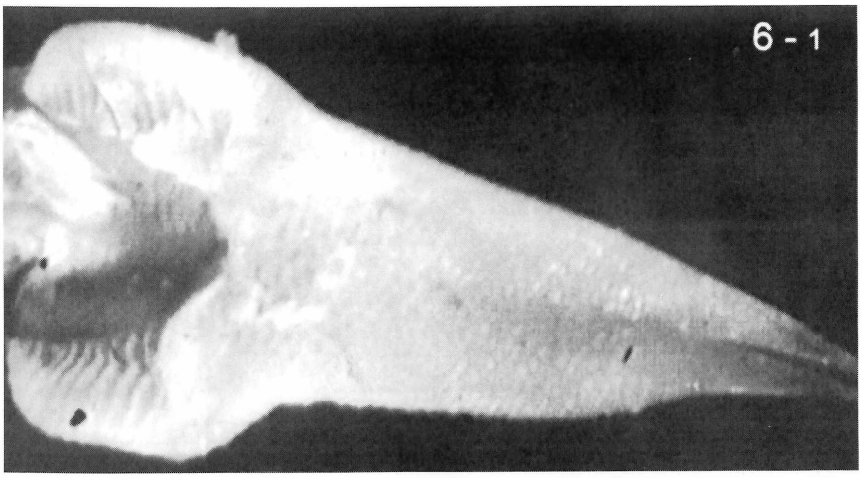
Lacerta graeca (Greece)



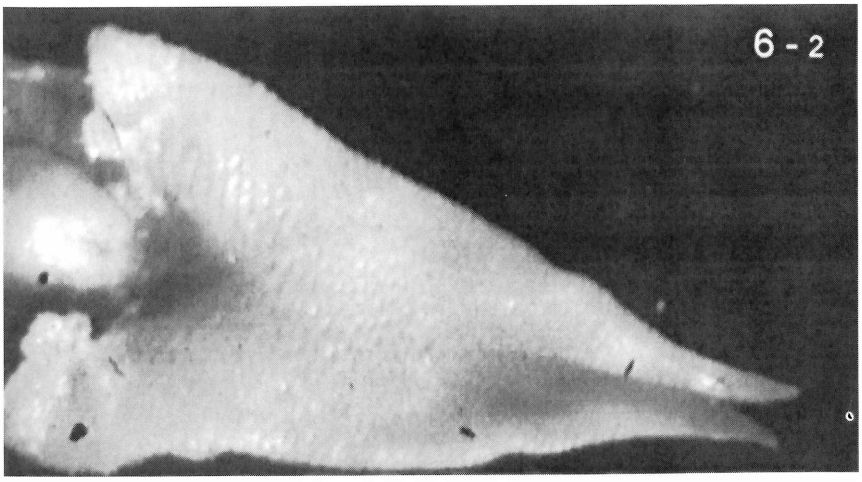
Lacerta princeps kurdistanica (East Turkey)



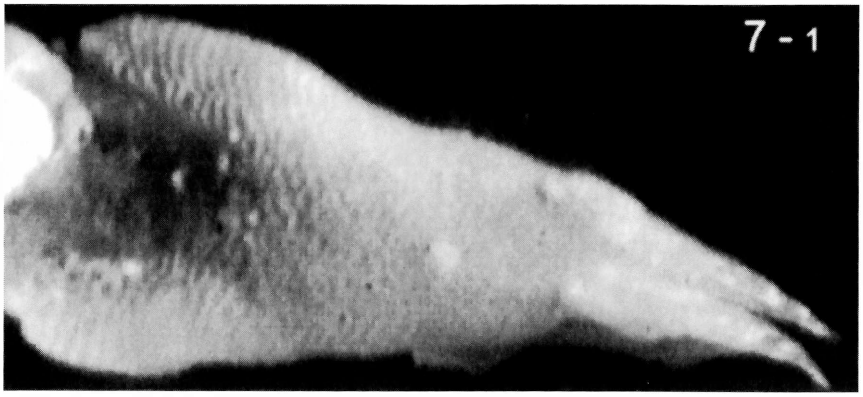
Lacerta viridis (Tuscany, Italy)



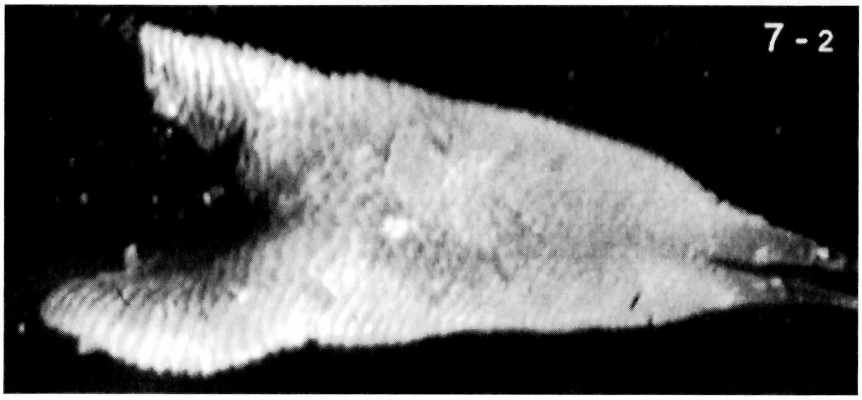
Gallotia atlantica (Canary Islands)



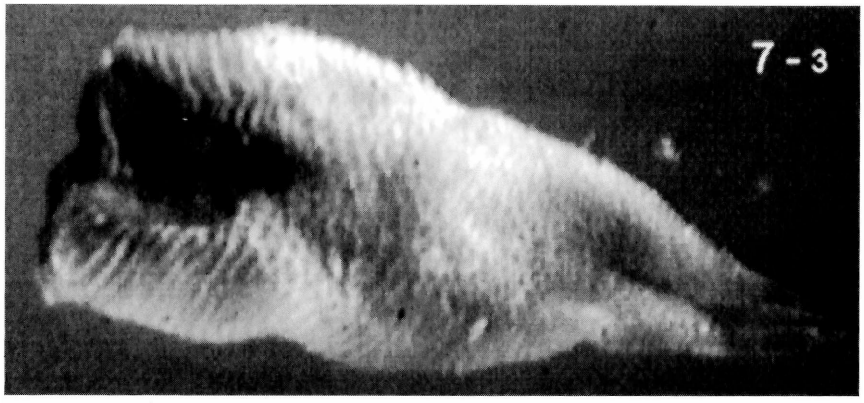
Gallotia atlantica (Gran Canaria, Canary Islands)



Gallotia atlantica atlantica (Canary Islands)

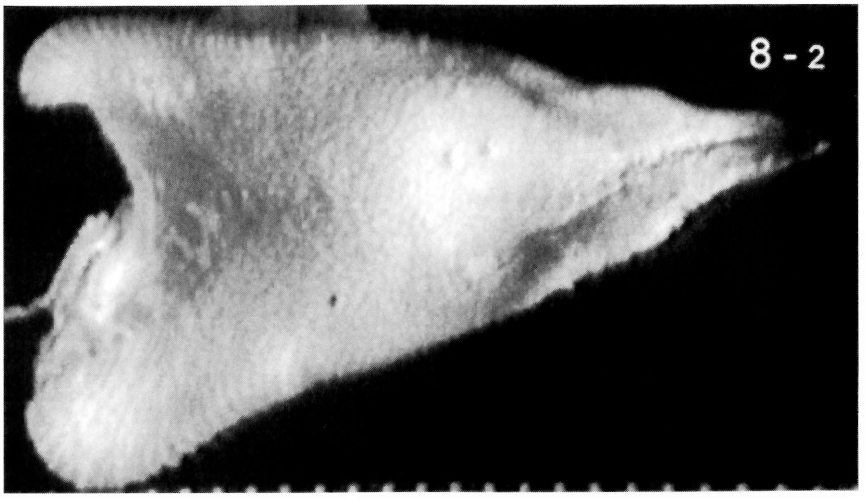


Gallotia atlantica graciosa (Canary Islands)

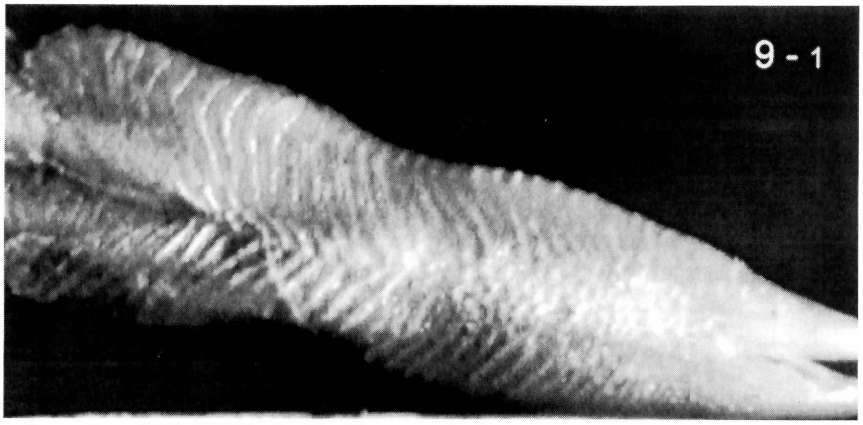


Gallotia atlantica laurae (Canary Islands)

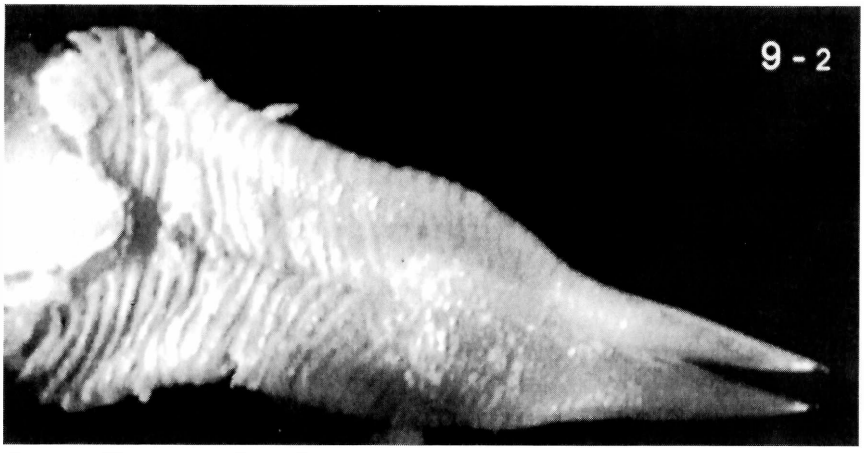
Gallotia galloti (Tenerife, Canary Islands)



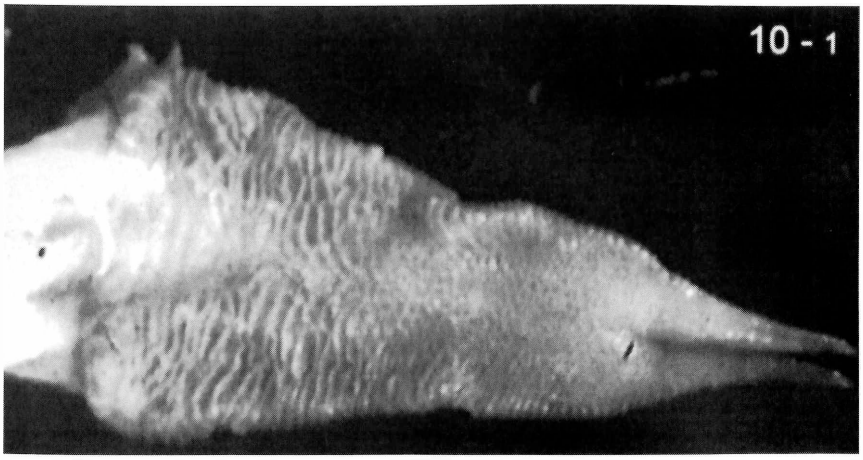
Gallotia stehlini (Gran Canaria, Canary Islands)



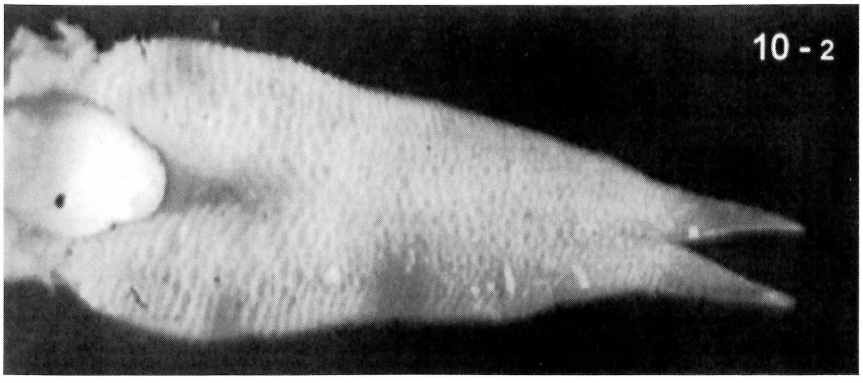
Algyroides fitzingeri (Sardinia, Italy)



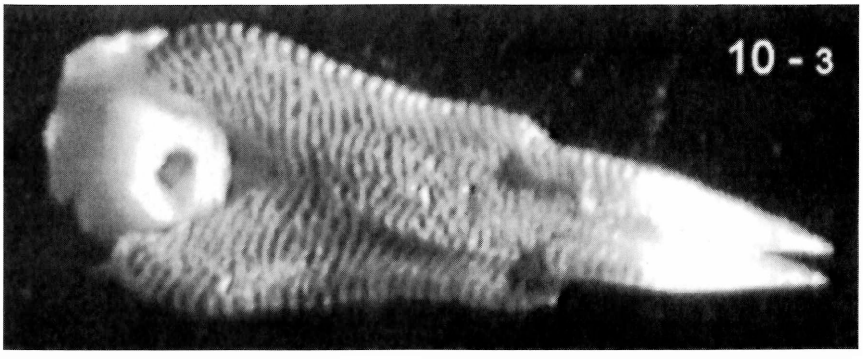
Algyroides fitzingeri (Sardinia, Italy)



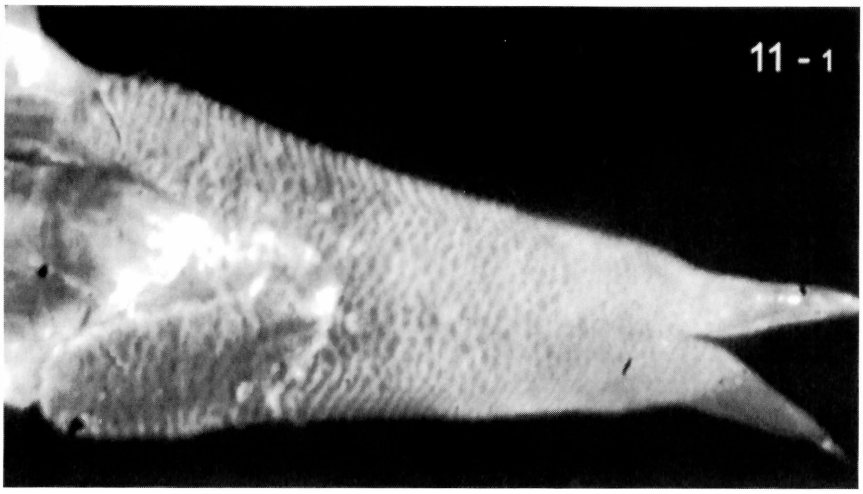
Adolfus jacksoni (Zaire)



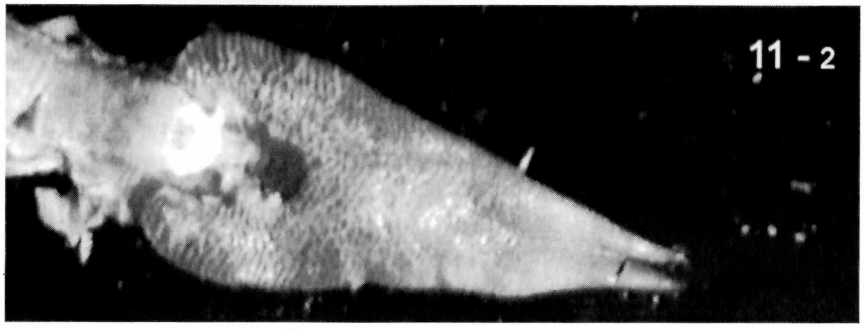
Centromastix echinata langi (Cameroon)



Holaspis guentheri (Cameroon)

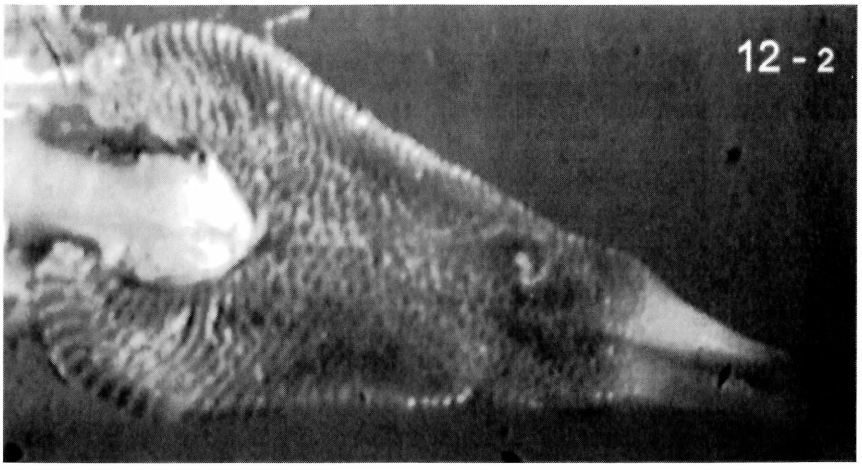


Ichnotropis capensis (Botswana)

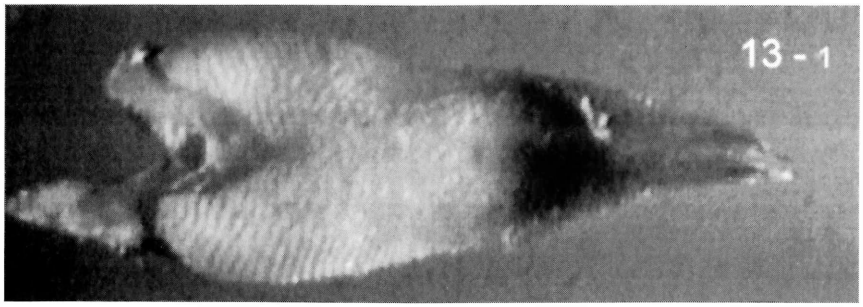


Ichnotropis squamulosa (Namibia)

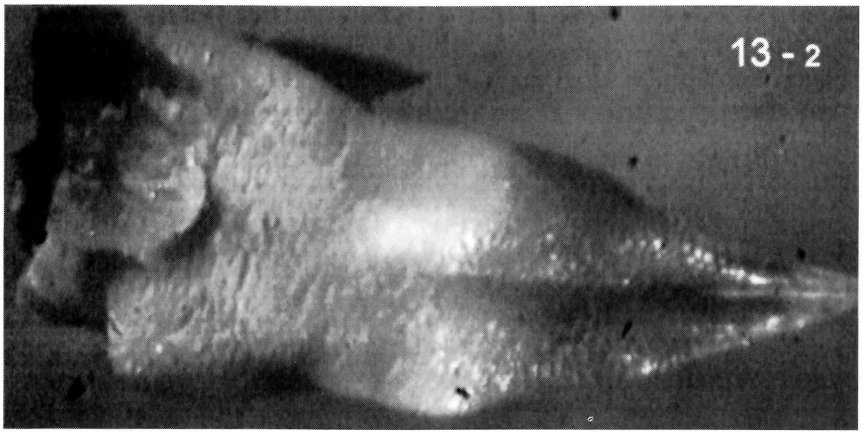
Meroles cuneirostris (Namibia)



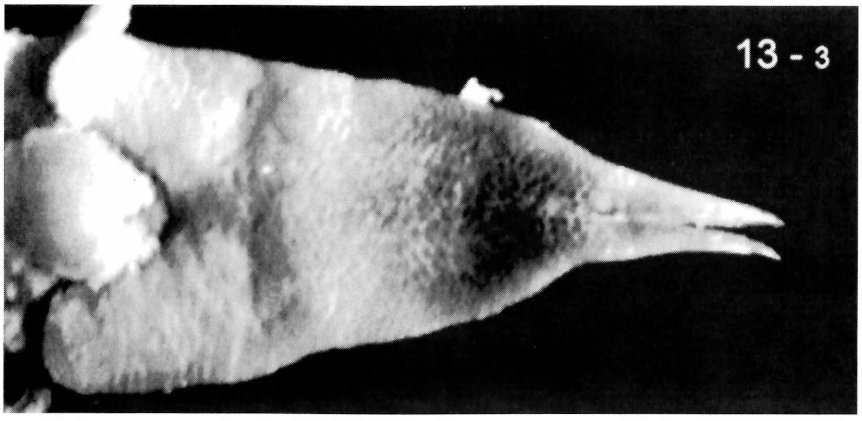
Meroles depressa (Africa)



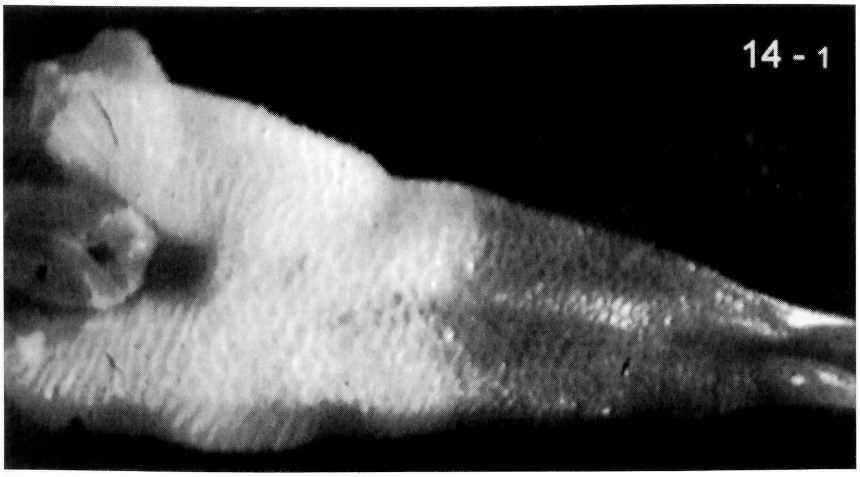
Nucras boulengeri (Kenya)



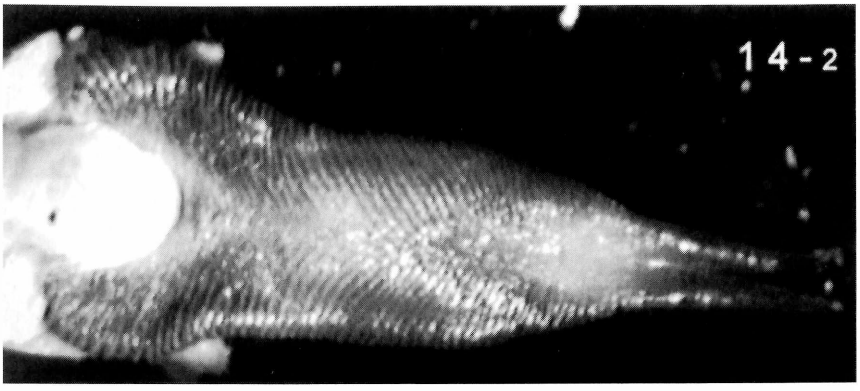
Nucras lalandii (South Africa)



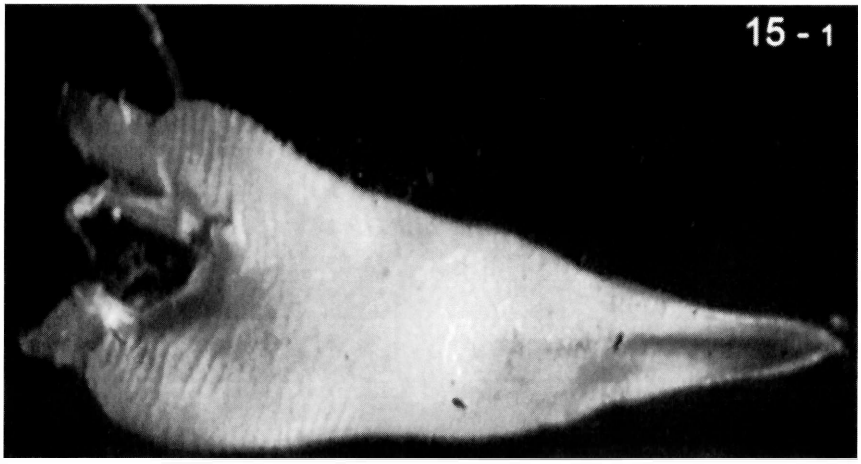
Nucras taeniolata (Botswana)



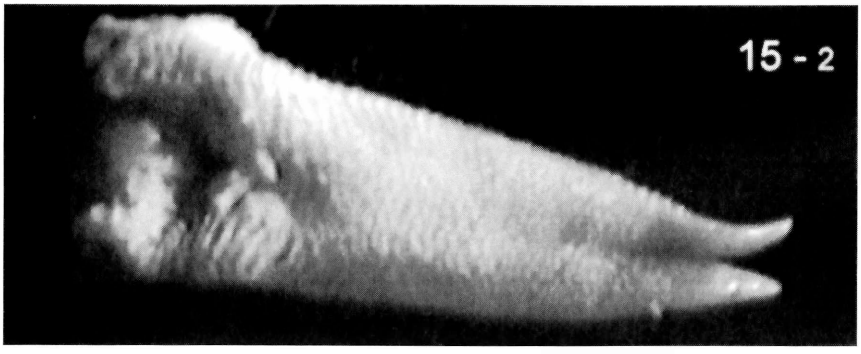
Nucras tessellata (South Africa)



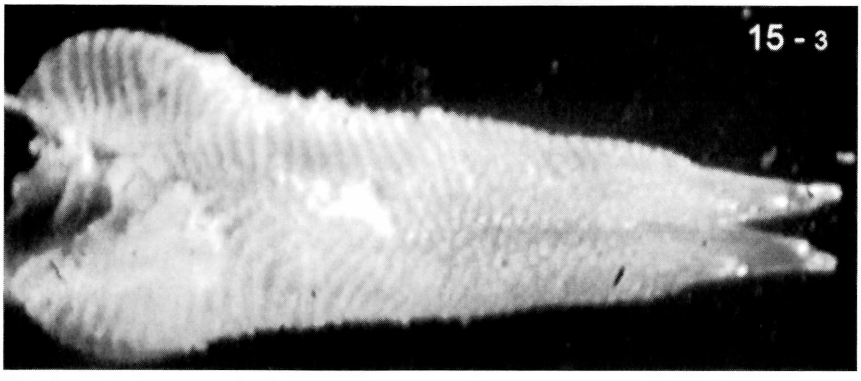
Poromera fordii (Cameroon)



Psammodromus algirus (Spain)



Psammodromus microdactylus (Morocco)



Takydromus tachydromoides (Japan)