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I. Wissenschaftliche Mittheilungen.

1. Notes on tailed Batrachians without lungs.

By Dr. Einar Lönnberg, Upsala.

eingeg. 26. November 1895.

Two years ago while engaged in classifying my collection of vertebrate animals from Florida, I observed that some of the salamanders were by nature deprived of lungs, and I showed this peculiar fact to several zoologists in Upsala. However as I did not hurry with the publication I soon found in Anat. Anzeiger Bd. IX No. 7 of 20th Jan. 1894 that Dr. Harris Wilder at the same time or probably a little earlier had made the same observation. His paper is dated Northhampton, Mass. 1. Dec. 1893. Dr. H. Wilder thus had the priority and as he at the end of his paper says: »Seit einiger Zeit habe ich für diesen Punct etwas Material gesammelt, welches ich später zu veröffentlichen gedenke«, I did not want to interfere in any way before he had finished his investigations. But as two years have already passed and I have not seen anything more published on this subject by Dr. H. Wilder I think it cannot be unloyal to publish the following notes, the more so as possibly by the same, Dr. Wilder may find more material for a thorough investigation; and as during these two years of waiting an Italian zoologist, Professor Lorenzo Camerano, has written about similar occurrences in the European species *Spelerpes fuscus* (Bonap.) and *Salamandrina perspicillata* (Savi.)[1].

[1] In »Atti della R. Acad. delle scienze di Torino« Vol. XXIX, and a resumé »Rech. anat. physiol. sur les salamandres normalement déprivés de poumon«, »Arch. Ital. de Biol.«. T. XXI. Fasc. III. Turin 1894.

Dr. Wilder observed that: »ein vollständiger Mangel von Lungen und Luftwegen vorkommt« in

»*Desmognathus fuscus*,
Desmognathus ochrophaeus,
Plethodon erythronotus,
Gyrinophilus porphyriticus«.

Professor Camerano has found that:

1. »le *Spelerpes fuscus* manque totalement de poumons, de trachée, de larynx et d'aditus ad laryngem«

2. »la *Salamandrina perspicillata* a l'appareil pulmonaire et trachéo-laryngien tout à fait rudimentaires et ne fonctionnant pas«.

The author of these lines has had the opportunity to investigate these matters in the following species

Desmognathus auriculatus Cope from Savannah, Ga. and Florida.
Plethodon glutinosus (Green) from Savannah, Ga.
Manculus quadridigitatus (Holbrook) from Florida and
Amblystoma opacum (Gravenh.) from Savannah, Ga. (coll. Capt. C. Eckman).

The first two of these species belong to genera in which Wilder has already stated the absence of the lungs and there is no trace to be seen in these species either of lungs or of larynx. A median longitudinal groove is the only remaining rudiment of the aditus ad laryngem. In preparing transverse sections, for instance, of *Plethodon glutinosus* this groove can be most easily seen and followed from section to section, but does not extend so far back as to the anterior part of the laryngeal muscles. In some specimens it is however difficult to observe this groove, at least without preparing sections. The transverse laryngeal muscles (»eigentliche Kehlkopfmuskeln«, Wilder) are well developed in *Plethodon glutinosus* and are in the middle, where they meet, separated by a narrow, but tight and plainly visible strip of connective tissue at which the muscles insert themselves. This connective tissue which, as Wilder says, may represent the »Rest des verloren gegangenen Kehlkopfes« is not so broad and large as in *Desmognathus fusca* according to Wilder's figure (fig. 3 l. c.); it is however well developed and strong enough to be the point of insertion for the muscles, which is quite contrary to the case in *Plethodon erythronotus* where Wilder did not find any »mit Bindegewebe gefüllten Zwischenraum« between the »beiden lateralen Hälften, welch letztere direct auf einander stoßen« (l. c.) In dissecting *Manculus quadridigitatus* no trace of lungs etc. can be seen. Neither in dissecting nor in preparing microscopical sections with the microtome have I been able

to see any distinct median groove which could be distinguished from other grooves and folds as a rudiment of the aditus ad laryngem. The laryngeal muscles are well developed, but the connective tissue between the muscles is very feebly developed and partly broken so that especially anteriorly, many of the muscular fibres from both sides mingle, and many insert themselves at the pericard. In the central parts however a thin strip of connective tissue can be seen at which the muscular fibres insert themselves. In *Manculus quadridigitatus* we thus meet with the most reduced rudiments of the laryngeal apparatus.

In *Amblystoma opacum*, on the contrary, not only rudiments of lungs but also a small aditus ad laryngem can bee seen. The latter is about $^1/_2$ mm long and half as broad when dilated to its utmost. The lungs are small and narrow sacks measuring about 9 mm in length and $1^1/_2$ in width at the broadest place. (For a comparison may be mentioned that in a *Molge vulgaris* of about the same length and much less bulk the lungs measured about 21 mm in length.) The left lung extends along the oesophagus and the foremost part of the stomach, but does not reach to the spleen, which organ is much broader and nearly as long so that its volume is greater. The right lung is hidden behind the liver. The distance from the aditus ad laryngem to the tip of the lung is about equal to the length of the head. Although the pulmonary system of *Amblystoma opacum* is complete so far as there is no part wanting, I must regard it as rudimentary because the lungs are so very small and narrow[2] especially when compared with the size of the animal itself, so that is seems impossible that they can suffice for the breathing of the animal. However I do not doubt that they are used for the respiration together with some other organ, which may be the skin or »la cavité bucco-pharyngienne« as Camerano has found to be the case with *Salamandrina perspicillata* and *Spelerpes fuscus*. With *Amblystoma opacum* we have the fourth subfamily of *Salamandridae* represented among those with reduced pulmonary system:

Subfam. 1 Salamandrinae: *Salamandrina perspicillata.*
Subfam. 2 Amblystominae: *Amblystoma opacum.*
Subfam. 3 Plethodontinae: *Plethodon glutinosus,*
Plethodon erythronotus,
Spelerpes porphyriticus,

[2] We meet with a similar occurrence in *Chioglossa lusitanica* Bocage. The pulmonary system is complete, but the lungs are very narrow and small so that they do not reach to the posterior end of the stomach. It seems very probable that also in this form the bucco-pharyngeal cavity has to partake in the respiratory function.

Subfam. 3 Plethodontinae: *Spelerpes fuscus*,
Manculus quadridigitatus,

Subfam. 4 Desmognathinae: *Desmognathus ochrophaeus*,
Desmognathus fuscus,
Desmognathus f. auriculatus.

When we find that comparatively so many (10) and (6 genera) different forms have been transformed in such a retrograde direction to make the lungs more or less superfluous for the respiration, there is no doubt that in the future this list of forms will rapidly increase and that not only more species of the same genera, but also other genera will be added.

It seems rather early as yet to try to explain how and why these animals have lost or reduced their lungs as neither the ontogenetic development nor the anatomy, especially the circulatory system is sufficiently studied, but it may have happened in this way. When the animals lost the gills and increased in bulk the small and not very composite lungs were insufficient for the respiration, so that the buccopharyngeal cavity (?together with the exterior integument) even from the beginning had to play a certain part. In some of the forms the respiratory capacity of that cavity then increased more rapidly than that of the lungs which is the easier to understand as the air breathed first must pass through that cavity and because it is rather large in these animals. When this capacity had developed to a certain extent the lungs were not at all needed and thus without loss could and must be reduced as superfluous, not. used organs. — It seems probable that the development has taken this or at least a similar course as it is more than difficult to believe that fully developed lungs, which completely performed the respiration, could have been reduced.

All these Salamandridae which I have examined lead a more or less terrestrial life. *Desmognathus fuscus auriculatus* I found under boards, logs and similar objects in muddy and moist places; but never actually in the water[3]. *Manculus quadridigitatus* lived hidden under similar objects as the foregoing at the borders of the small lakes of Florida, hut I never saw it in the water. *Plethodon glutinosus* I did not catch myself but the food I have found in its stomach, various insects (as beetles, ants etc.) earthworms, indicates a terrestrial life and Cope says in »The Batrachia of North America«, p. 142, about this species: »This salamander is entirely terrestrial in its habits«. About

[3] Professor Cope however says: »this species lives chiefly among the stones in the many shallow rivulets and springs« etc. but also that it burrows »among stones and in earth« and that the eggs are concealed »in a comparatively dry spot«.

Amblystoma opacum the same author says (l. c. p. 55) »This species is found in drier ground than is congenial to most salamanders«.

But this peculiar characteristic is not only confined to terrestrial forms as for instance *Spelerpes* (*Gyrinophilus*) *porphyriticus* is aquatic in its habits. From this fact it can be concluded, that it is not necessarily the terrestrial life that has effected the reduction of the lungs.

Upsala im November 1895.

2. Zur Biologie der Lärchen-Chermes-Arten.

Von N. Cholodkovsky, St. Petersburg.

eingeg. 27. November 1895.

In der Nummer 463 dieser Zeitschrift habe ich eine Notiz veröffentlicht, in welcher ich darauf hinweise, daß der »*Chermes abietis* L.« sich in zwei Formenreihen spaltet, welche »zwei scharf gesonderte Rassen, wenn nicht zwei selbständige Species« darstellen. Im Sommer 1895 habe ich nun systematische Untersuchungen über diese Formenreihen angestellt und bin zum Schlusse gekommen, daß jene meine Annahme vollständig richtig war. Es erwies sich in der That, daß die beiden Varietäten oder Species nicht nur verschiedene Lebensweise haben, sondern sich auch durch gewisse morphologische Merkmale unterscheiden lassen.

Der *Chermes viridis* Ratz. unterscheidet sich nämlich vom *Ch. abietis* Kalt. dadurch, 1) daß der erstere einen zweijährigen, mit einer Migration verbundenen Lebenscyclus hat, während der Lebenscyclus von *Ch. abietis* Klt. einjährig ist, 2) daß folglich bei *Ch. abietis* Klt. alle zum zweiten Jahre des Cyclus gehörigen Generationen (Sexuparae, Sexuales) ausfallen, 3) daß die Fundatrix des *Ch. viridis* Ratz. breitoval und grün, die des *Ch. abietis* Klt. aber länglichoval und gelblich ist, 4) daß die Migrantes alatae von *Ch. viridis* Ratz. rothgelb und etwas größer sind, als die gelben *Abietis*-Geflügelten, und ihre grünen Eier auf Lärchennadeln ablegen, während die gelben *Abietis*-Eier normaler Weise nur auf der Fichte abgelegt werden, 5) daß bei den *Viridis*-Geflügelten das dritte Fühlerglied länger als das vierte, bei denjenigen von *Ch. abietis* Ratz. aber umgekehrt das vierte länger als das dritte ist. Der *Ch. abietis* Kalt. ist also höchst wahrscheinlich eine rein parthenogenetische Species.

Eine detaillierte Beschreibung beider Species werde ich im fünften (schon druckfertigen) Capitel meiner Chermes-Monographie[1] geben, hier will ich aber noch in aller Kürze über einen neuen Fund

[1] Beiträge zu einer Monographie der Coniferen-Läuse (Horae Societ. entomol. Rossicae, Bd. XXX). Die Capitel I—IV sind schon als Separata erschienen.