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## SOME NOTES UPON THE ANATOMY OF TROPIDOPHIS AND TRACHYBOA (SERPENTES)

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With 8 text-figures

In literature only very scanty information is to be found about the viscera of the Boid genera *Tropidophis* and *Trachyboa*, and therefore I believed it worth while to publish some notes which I made during dissections of the following species and subspecies: *Tropidophis melanurus* (Schleg.), *Tropidophis maculatus haetianus* (Cope), *Tropidophis pardalis pardalis* (Gundl.) and *Trachyboa gularis* Ptrs. The notes are in no way exhaustive; the specimens have been preserved in alcohol for a long time, and therefore it was not possible to study all features in detail.

All but two genera of the Boidae have two well developed lungs. One of these two exceptions was mentioned already by Cope (1894, pp. 218, 220: *Ungalia*; 1900, p. 697), viz., the genus *Ungalia* (i.e., *Tropidophis* of present day nomenclature). In this genus only one lung is present, and besides, a tracheal lung has developed. The second exception is the genus *Trachyboa*; the fact that in this genus too a tracheal lung and only one true lung have developed, seems to have escaped notice up till now. As will be shown below there are also other features in which *Tropidophis* and *Trachyboa* agree with one another, while they differ from the other Boidae.

### ***Tropidophis melanurus* (Schleg.)**

Specimens examined:

1 ♂, Cuba, leg. Ramon de la Sagra, Mus. Leiden reg. no. 1299.

1 ♂ juv., Cuba, leg. Ramon de la Sagra, Mus. Leiden reg. no. 1298.

Both specimens were labelled "*Ungalia maculata*", but after due considera-

tion I refer them to *Tropidophis melanurus* (Schleg.). Especially the identification of the male no. 1299 caused me some difficulties, and therefore I may give my reasons for this identification. This male has a quadrifurcate hemipenis, while the sulcus spermaticus is only bifurcate; the specimen has distinct anal spurs; it has 199 ventrals and 40 subcaudals; the anteriormost part of the ventral surface is immaculate, while the remaining part of the ventral surface shows two series of square dark spots. These characters all agree with the description of *Tropidophis melanurus*, such as it has been given by Stull (1928, p. 40). From the latter description the specimen differs in having the scales in 23, 25, 19 rows, instead of in 25, 27, 19 or 27, 29, 19 rows; the scales do not show any trace of keels; there are 17 maxillary teeth instead of 15. However, the characters in which the specimen agrees with *Tr. melanurus* seem to me to be of more importance than the differences.

The juvenile male no. 1298 has the scales in 25, 27, 19 rows; the most dorsal rows show traces of keels; anal spurs are present; ventrals 202, subcaudals 36. The umbilicus is still indicated between the halves of the 159th to 161st ventrals.

To indicate the position of the viscera, I have measured the distance from the tip of the snout to the anterior and/or posterior end of these viscera. These measurements are given in Table I; the relative position of the viscera is also indicated in fig. 1a, b, in which the length of head and body has been reduced to 100 mm.

Table I. Measurements in mm

	<i>Tropidophis melanurus</i> ♂, no. 1299	<i>Tropidophis melanurus</i> ♂, no. 1298	<i>Tr. maculatus haetianus</i> ♀, no. 4314	<i>Tr. p. pardalis</i> ♀, no. 1300	<i>Trachyboa gularis</i> ♂, no. 1297
Length of head and body	348	230	414	159	258
Length of tail	35	28	67	22.5	31
Distance of anterior and/or posterior end of viscera from tip of snout					
Heart	114-125	72-80	127-137	48.2-54.4	72-83
Liver	122-211	78-118	134-212	54.4-86	80-135
Gallbladder	220-225	132-135	238-—	—	152-155
Caudal end of lung	219	130	231	81.6	131
Right testis	254-263	170-175	—	—	175-186
Left testis	272-280	181-185	—	—	193-201
Right ovary	—	—	265-310	—	—
Left ovary	—	—	293-322	—	—
Right kidney	299-317	200-214	357-391	139.6-148.3	220-232
Left kidney	310-328	207-220	363-393	144.3-150.5	225-239
Umbilicus	—	189-192	—	—	—

As has been stated above a tracheal lung is present. The tracheal cartilages do not form closed rings; their dorsal ends remain free from those of the other side. The dorsal wall of the trachea is formed by a ligament which has greatly expanded, and which bears alveoli; it forms the tracheal lung. Moreover the dorsal ends of the cartilages project somewhat into the tracheal lung. Thus the borders of the row of tracheal cartilages are not straight, but each border shows projecting parts that alternate with notches. The projecting parts of one border fit into the notches of the opposite border. In the anteriormost part of the trachea the alveolar part thus may be more or less completely shut off from the lumen of the trachea. In this part the alveoli are very deep, and the tracheal lung does not show a distinct continuous lumen; when the borders of the cartilages are drawn apart, the alveoli open into the lumen of the trachea (cf. fig. 4, in which a cross section of the anterior part of the tracheal lung of *Tropidophis maculatus haetianus* (Cope) is shown). More posteriorly the alveoli become less deep, and there the tracheal lung has a continuous lumen that is in open communication with the lumen of the trachea itself, as the borders of the tracheal cartilages fail to meet. There is no distinct demarcation between the tracheal lung and the true lung, except for the fact that the respiratory tube widens considerably in the region of the heart. The series of tracheal cartilages is continued in the true lung as a series of bronchial cartilages, which form an open bronchial gutter. The series of cartilages ends at 8 mm from the caudal end of the lung in no. 1299, and at 1.5 mm in no. 1298. The lung shows alveolar structure over the whole of its length, but the alveoli are less deep than in the tracheal lung; at the posterior end of the lung the alveoli are separated by very low ridges only; however, there is no smooth-walled air-sac as in most other Boidae. The lung reaches to slightly beyond the caudal tip of the liver, viz., 8 mm in no. 1299, and 1.9 mm in no. 1298.

The pulmonary artery arises from the ventricle as a single trunk; close to the anterior level of the auricles this trunk divides into two branches. The left branch is very short, its length is about one fifth of that of the common pulmonary trunk. Although this branch is so extremely short, it curves around the anterior tip of the left auricle, as does the left pulmonary artery in snakes with two well developed lungs. The dead end of this branch is connected to the left aortic arch by a ligamentum arteriosum Botalli. The right branch of the pulmonary trunk curves dorsally and to the right, where it divides into an anterior and a posterior artery. The anterior artery passes anteriorly along the dorsal side of the tracheal lung, while the posterior artery goes to the true lung (cf. fig. 7, in which the major branches of the pulmonary artery in *Tr. pardalis pardalis* (Gundl.) are shown).

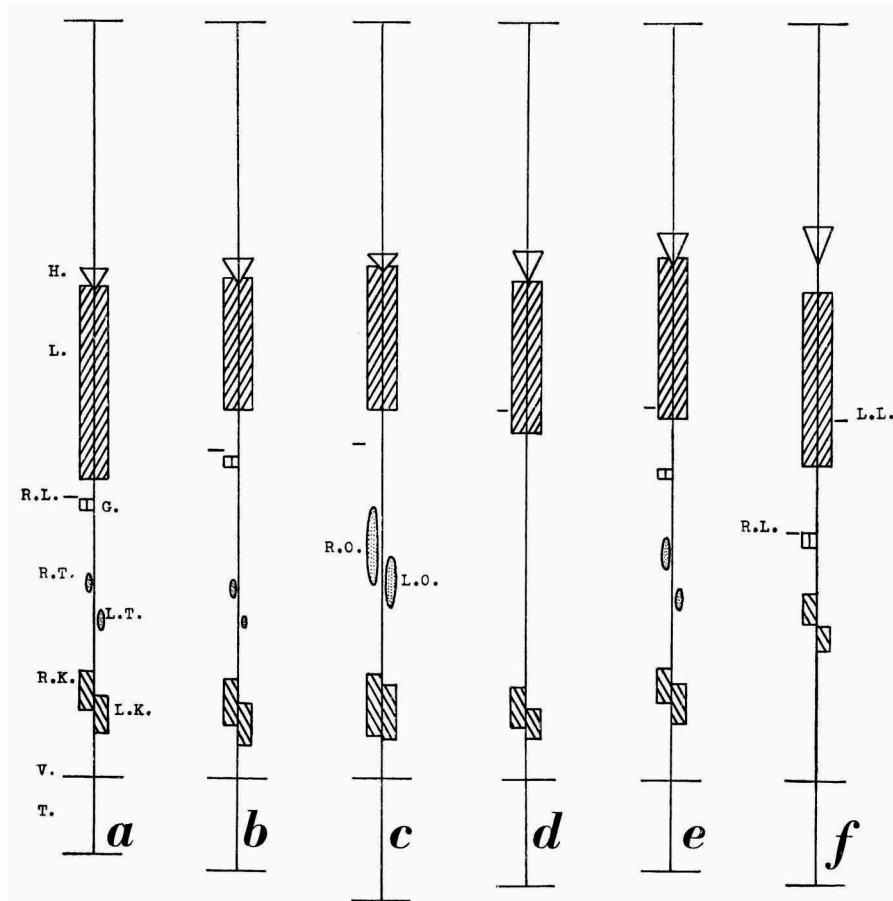


Fig. 1. Diagrams of the position of some of the viscera in a number of Boidae; *a*, *Tropidophis melanurus* (Schleg.), ♂, reg. no. 1299; *b*, idem, ♂, reg. no. 1298; *c*, *Tropidophis maculatus haetianus* (Cope), ♀, reg. no. 4314; *d*, *Tropidophis pardalis pardalis* (Gundl.), ♀, reg. no. 1300; *e*, *Trachyboa gularis* Ptrs., ♂, reg. no. 1297; *f*, *Epicrates cenchria cenchria* (L.).

The right aortic arch gives off two carotid arteries, the vertebral artery, and some intercostal arteries. The left aortic arch does not give off any branches. The vertebral artery can be traced to close behind the head, where it enters the body wall. In its course it gives off a number of intercostal arteries. These intercostals arise at more or less irregular intervals; close to the vertebral region these intercostals bifurcate into an anterior and a posterior branch. The posterior and anterior branches of successive intercostals join to form a longitudinal artery that lies close to the vertebral region. From this longitudinal artery arise the small vessels that enter the body wall at regular intervals, one to each segment.

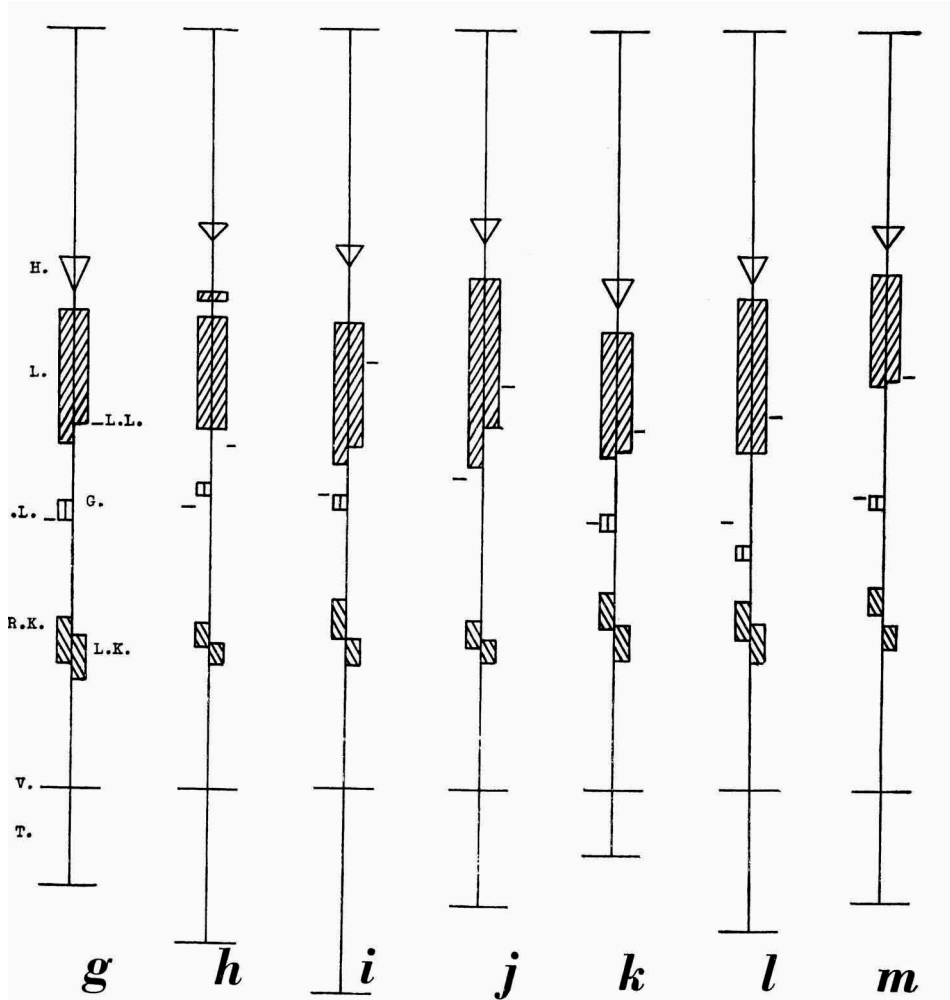


Fig. 1g, *Constrictor constrictor constrictor* (L.); h, *Boa canina* (L.); i, *Boa enydris cookii* (Gray); j, *Enygrus bibronii bibronii* Hombr. & Jacq.; k, *Python regius* (Shaw); l, *Python sebae* (Gmel.); m, *Morelia argus* (L.).

G., gallbladder; H., heart; L., liver; L.K., left kidney; L.L., left lung; L.O., left ovary; L.T., left testis; R.K., right kidney; R.L., right lung; R.O., right ovary; R.T., right testis; T., tail; V., position of vent. In all diagrams the length of head and body has been reduced to 100 mm. The diagrams show that the kidneys are placed nearer to the vent in *Tropidophis* and *Trachyboa* (figs. a-e).

The common or dorsal aorta gives off a series of intercostal arteries. These intercostals (like those branching off from the vertebral artery) do not arise regularly, one for each segment, such as is the case in *Python reticulatus* (Schn.), but these arteries arise at rather great distances from one another.

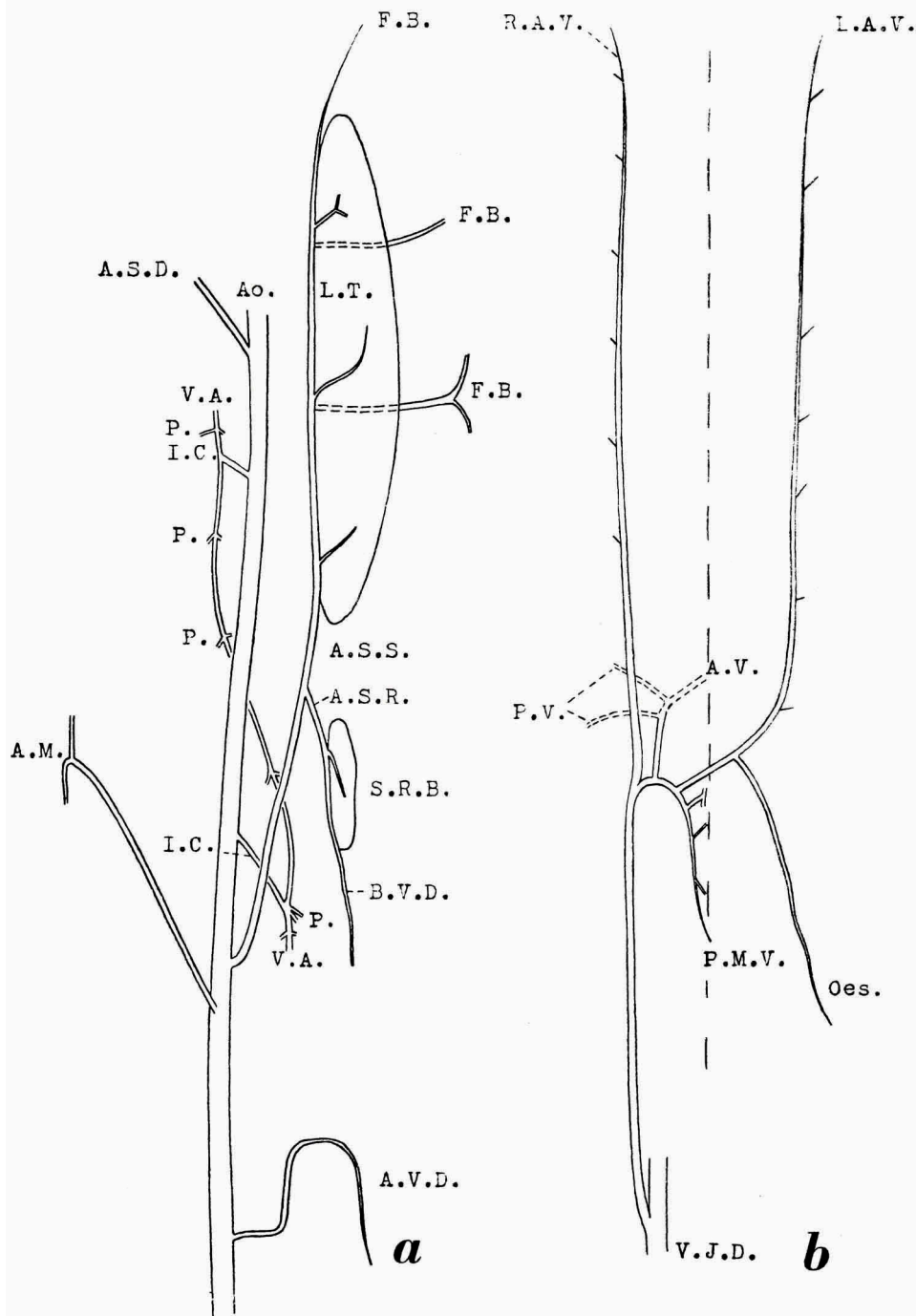


Fig. 2a. *Tropidophis melanurus* (Schleg.), ♂, arteries in the region of the left testis.  
 Fig. 2b. *Tropidophis maculatus haetianus* (Cope), veins of the vertebral region of the anterior part of the body.

A.M., mesenteric artery; Ao., dorsal aorta; A.S.D., right spermatic artery; A.S.R., suprarenal branch of left spermatic artery; A.S.S., left spermatic artery; A.V., anterior median vertebral vein; A.V.D., artery to the left vas deferens; B.V.D., branch of the left spermatic artery that passes to the vas deferens; F.B., arteries to the fat-body; I.C., intercostal arteries arising from the dorsal aorta; L.A.V., left anterior vertebral vein; L.T., left testis; Oes., vein that possibly comes from the oesophagus; P., pairs of arteries that enter the parietes; P.M.V., posterior median vertebral vein; P.V., veins from the right side of the body; R.A.V., right anterior vertebral vein; S.R.B., suprarenal body; V.A., artery formed by branches of the intercostals; V.J.D., right jugular vein.

Close to the vertebral region each artery ramifies. Two branches arise side by side; they enter into the body wall, one on the right and one on the left side. Another branch goes anteriorly below the vertebral column, and a further branch runs posteriorly. These longitudinal branches of successive intercostal arteries join to form a longitudinal artery (fig. 2a: V.A.), from which at regular intervals arise pairs of arteries (fig. 2a: P) that enter the body wall, one pair to each segment. In each interval between two intercostals three or four pairs of arteries arise. This situation is found from the origin of the dorsal aorta to the region of the kidneys. A similar situation with regard to the intercostals has been described by Beddard (1904, p. 108, fig. 19) for the anterior part of the body in *Eryx jaculus* (L.); it occurs also in other Boinae (Beddard, 1908, p. 143).

The spermatic arteries arise caudally of the testes and of the suprarenal bodies (fig. 2a). Each artery goes anteriorly, and at a point just anterior to the suprarenal body (S.R.B.) it bifurcates into an anterior and a posterior branch. The posterior branch (A.S.R.) passes to the suprarenal body to which it sends (at least) one ramus; the branch itself (B.V.D.) runs posteriorly along the vas deferens. The anterior branch (A.S.S.) goes to the testis, to which it sends rami; in its course along the testis this artery gives off two rami (F.B.) to the fat-body, while the artery itself passes cranially beyond the testis also to the fat-body. The right spermatic artery gives off a rather strong branch to the fat-body at about half the distance between its origin and the suprarenal body. On the left side this branch was not found, but it may have been overlooked.

There is only one renal artery to each kidney.

In most Boidae the vena cava posterior runs anteriorly along the middle of the ventral surface of the liver, while the portal vein runs along the middle of the dorsal surface. Thus the liver in these snakes may be divided into a right and a left lobe of nearly equal width by a plane connecting the portal vein to the postcaval vein (fig. 3d, e). In *Tropidophis melanurus* (fig. 3b), as well as in the two other *Tropidophis* and in *Trachyboa*, the situation is different. The postcaval vein and the portal vein are placed much nearer to each other; the portal vein runs along the dorsal surface of the liver, while the postcaval vein runs along the right side of the liver. The position of these veins is indicated in the cross sections through the middle of the liver shown in fig. 3.

The right jugular vein gives off a branch to the right side at some distance in front of the heart (at 13 mm from the anterior border of the right auricle in specimen no. 1299). This branch goes to the right, and then bends cranially; after a short cranial course it passes through a short and

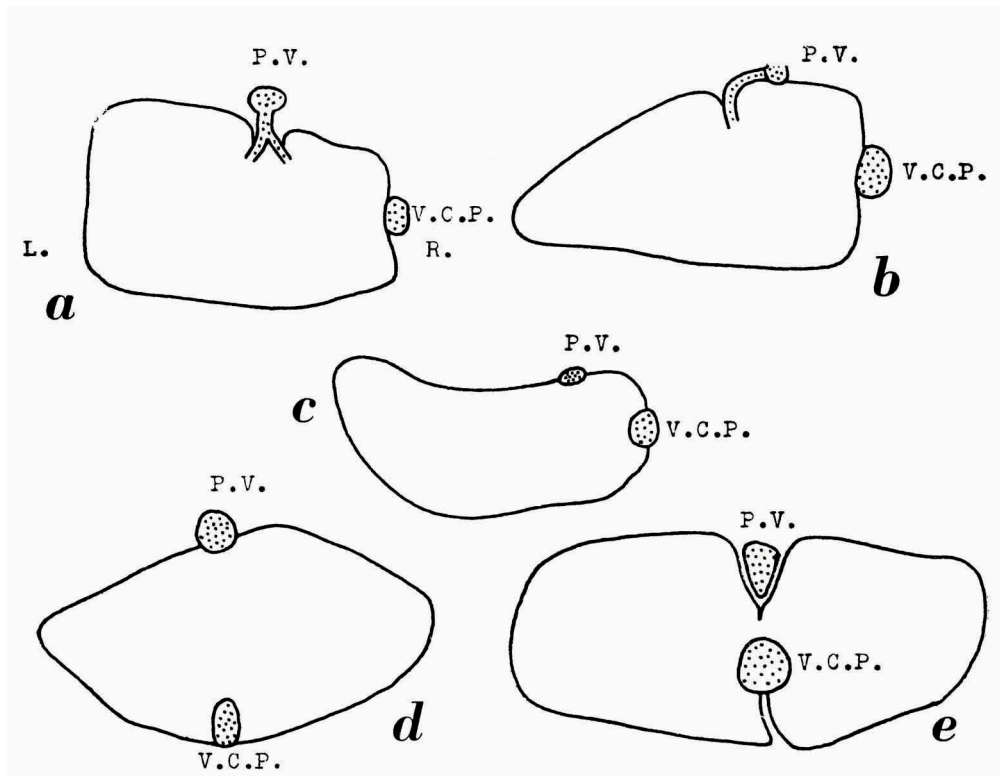


Fig. 3. Cross sections through the middle of the liver in some Boidae; *a*, *Trachyboa gularis* Ptrs.; *b*, *Tropidophis melanurus* (Schleg.); *c*, *Tropidophis pardalis pardalis* (Gundl.); *d*, *Boa endrisc cookii* (Gray); *e*, *Constrictor constrictor constrictor* (L.).

L., left side; P.V., portal vein; R., right side; V.C.P., postcaval vein.

strong curve dorsally and caudally. At the top of the curve two veins arise; one of these goes cranially to enter the body wall at 11 mm from its origin, while in its course it gives off three branches to the vertebral region; the other is only 1.5 mm long, and it enters the body wall cranially of the curve from which it arose. The vein itself goes posteriorly; it enters into the body wall at 13 mm from the curve; in its course it gives off six branches to the body wall.

The gallbladder is placed at some distance caudally of the liver (Table I; fig. 1 *a*, *b*). The liver extends cranially to beyond the apex of the heart.

The kidneys are remarkable for their smooth surface; they do not show any trace of lobes. Moreover, they are placed much more caudally (fig. 1*a*, *b*) than in other Boidae (fig. 1*f-m*).

The suprarenal bodies are situated at a short distance caudally of the testes (fig. 2*a*).

***Tropidophis maculatus haetianus* (Cope)**

Specimens examined:

1 ♀, 1 juv., Haiti, received from Linnaea, Berlin, 1888, Mus. Leiden reg. no. 4314.

The viscera were examined in the female only (fig. 1c). The juvenile was used to ascertain the position of the umbilicus, which is found between the halves of the 155th to 157th ventrals (total number of ventrals 184).

Except for the fact that the specimen of *Tropidophis maculatus haetianus* is a female, and hence shows differences from the two specimens of *Tr. melanurus*, the general structure is about the same. Therefore I have limited my notes to the description of features peculiar to this specimen. A cross section through the anterior part of the tracheal lung is given in fig. 4.

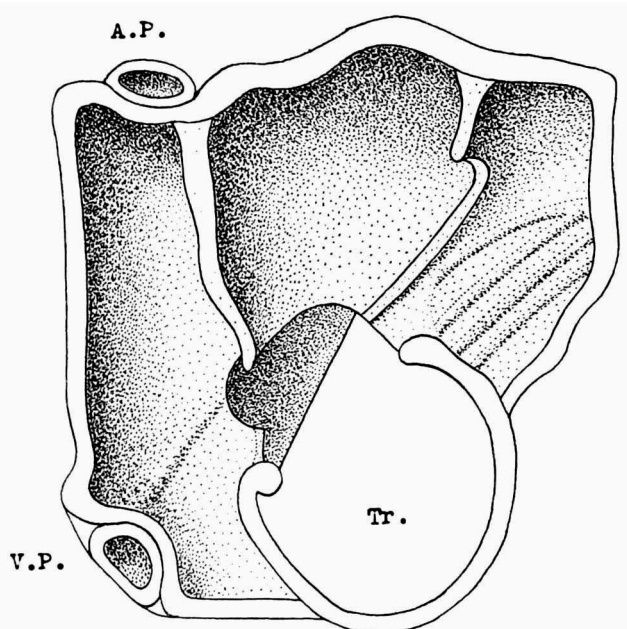


Fig. 4. *Tropidophis maculatus haetianus* (Cope), cross section through the anterior part of the tracheal lung,  $\times 33$ .

A.P., pulmonary artery; Tr., lumen of trachea; V. P., pulmonary vein.

The series of bronchial cartilages ends at 11 mm from the posterior end of the lung.

The ovaries are long, and the suprarenal bodies are placed at the level of the posterior third of the ovaries (fig. 5b). The Wolffian duct is well developed; it is present as a strongly contorted tube between the ovary and the oviduct, and it can be traced from the anterior tip of the ovary caudally to the cloaca. In the region of the kidney and caudally of this it accompanies the ureter.

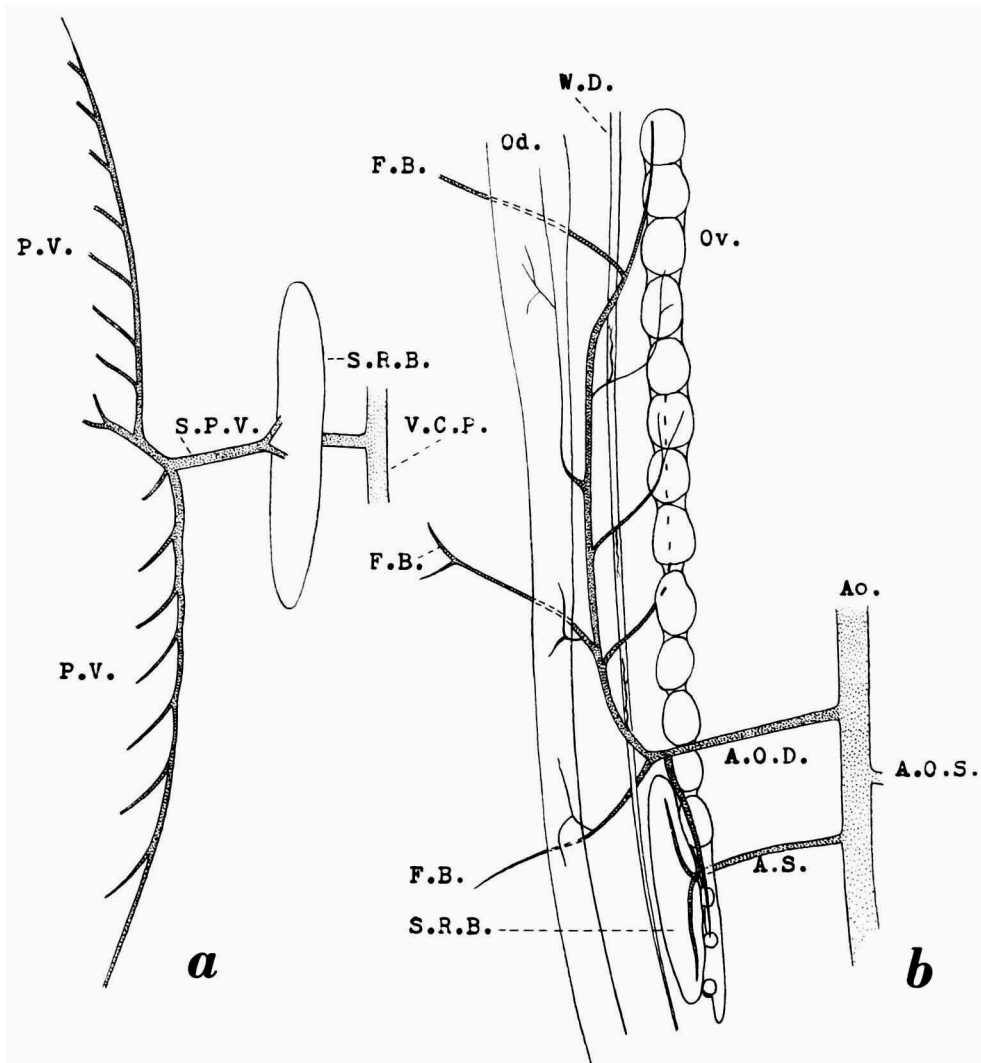


Fig. 5. *Tropidophis maculatus haetianus* (Cope); *a*, suprenal portal vein; *b*, arteries of the right ovary.

Ao., dorsal aorta; A.O.D., right ovarian artery; A.O.S., left ovarian artery; A.S., artery to right suprenal body; F.B., arteries to fat-body; Od., oviduct; Ov., ovary; P.V., veins from the vertebral region; S.P.V., suprenal portal vein; S.R.B., suprenal body; V.C.P., postcaval vein; W.D., Wolffian duct.

In this specimen some parts of the circulatory system were examined in more detail.

The intercostals arise at unequal distances from the dorsal aorta. Their ramifications form a longitudinal artery below the vertebral column, just

as in *Tr. melanurus*. From the longitudinal artery arise the pairs of arteries that enter into the parietes. At the level of the anterior tip of the right ovary the superior mesenteric artery branches off from the dorsal aorta; it reaches the intestine at some distance caudally of the pancreas. On reaching the intestine the artery bifurcates. One branch runs anteriorly; it sends rami to the intestine, to the pyloric region of the stomach, and to the pancreas. The other branch runs caudally; it supplies the coils of the intestine, and it ends at the level of the left suprarenal body.

The right ovarian artery (fig. 5*b*: A.O.D.) arises from the dorsal aorta and it reaches the right ovary (Ov.) at two thirds of the length of that organ. It sends a branch cranially along the ovary, while a caudal branch goes along the posterior third part of the ovary. The anterior branch sends several small arteries to the ovary, while others pass to the Wolffian duct, to the oviduct (Od.), and to the fat-body (F.B.). The left ovarian artery (A.O.S.) arises from the aorta somewhat more caudally; it is similar to the right artery, except that it reaches the left ovary at the end of its anterior third part; hence the posterior branch is the longer.

The suprarenal bodies (fig. 5*b*: S.R.B.) are supplied by special arteries, that arise at some distance caudally of the ovarian arteries of the same side (A.S.). The left suprarenal artery continues caudally along the Wolffian to the oviduct (Od.), and to the fat-body (F.B.). The left ovarian artery arises. Between the points of origin of these oviducal arteries the inferior mesenteric artery arises, it passes to the intestine.

The right kidney shows only one renal artery. With the left kidney the situation is slightly more complicated (fig. 6). A strong renal artery (A.R.) branches off from the aorta, and it reaches the left kidney at some distance from its anterior tip. This renal artery gives off branches to the anterior part of the kidney, while the artery itself runs caudally along the kidney. Caudally of the kidney a small artery (A) arises from the aorta; it runs obliquely anteriorly, and it gives off two small branches to the left ureter (A.U.S.); the artery itself continues its course anteriorly to the left kidney. As far as I could ascertain this small artery is connected to the caudal end of the renal artery. On the right side a corresponding small artery (A.U.D.) is present; it goes to the right ureter, but no connection with the right renal artery was found.

There are two anterior vertebral veins (fig. 2*b*: L.A.V., R.A.V.), which run posteriorly at equal distances from the median vertebral artery; they lie in a furrow formed by the angle between the M. costo-vertebralis and the M. abdominis internus. In their course these two veins receive affluent branches from the parietes. While in other Boidae, e.g., *Eunectes notaeus*

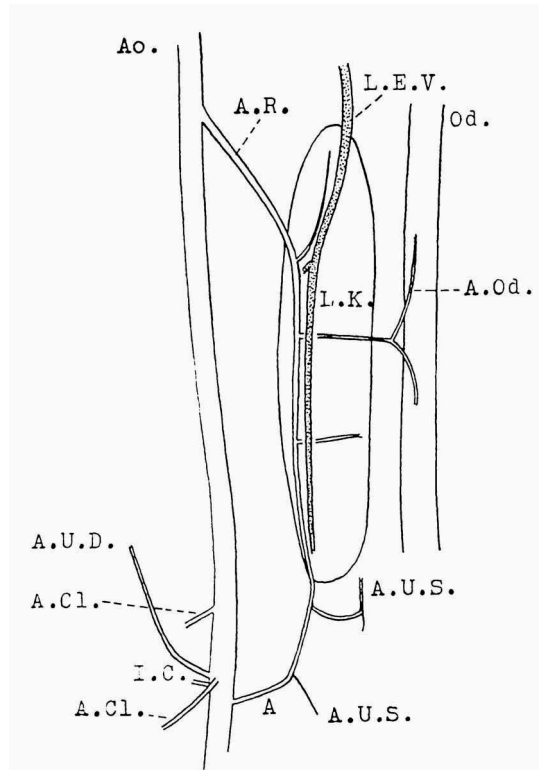


Fig. 6. *Tropidophis maculatus haetianus* (Cope), left kidney and arteries; A, artery that goes anteriorly and joins the renal artery; A.Cl., arteries to the cloaca; Ao., dorsal aorta; A.Od., artery to the oviduct; A.R., left renal artery; A.U.D., artery to the right ureter; A.U.S., artery to the left ureter; I.C., intercostal artery; L.E.V., efferent vein of the left kidney; L.K., left kidney; Od., oviduct.

Cope (Beddard, 1906, p. 20), each vertebral artery unites with the more ventro-medially placed jugular vein of its side, this is not the case in *Tropidophis maculatus haetianus*. The left anterior vertebral vein crosses to the right side ventrally of the vertebral artery. To the right of the median line it unites with a posterior median vertebral vein (P.M.V.). The latter arises from the vertebral region, and in its course anteriorly it receives three affluent branches that also arise from the vertebral region. The vein resulting from the fusion of the left anterior and the median posterior vertebral veins curves posteriorly and ventrally; in this curve it is joined by an anterior median vertebral vein (A.V.); the anterior part of this median anterior vein is covered by the M. costo-vertebralis, receiving affluent branches (P.V.) from the right side of the body. The vein thus formed by the subsequent fusion of the left anterior vertebral vein and the two median

vertebral veins, unites with the right anterior vertebral vein (R.A.V.), and this latter unites with the right jugular vein (V.J.D.). It may be mentioned that the left anterior vertebral vein also receives an affluent branch (Oes.) from a more posterior region; the origin of this branch could not be traced; it may be that it comes from the oesophagus.

The portal vein of the suprarenal body is well developed (fig. 5a). The following notes refer to the situation on the right side. Both cranially and caudally of the suprarenal body, veins (P.V.) coming from the vertebral region join to form a single vein (S.P.V.) that passes to the suprarenal body (S.R.B.). On entering this organ the vein divides into two branches. From the suprarenal body the blood is transported to the vena cava posterior (V.C.P.).

#### *Tropidophis pardalis pardalis* (Gundl.)

Specimen examined:

1 ♀, Cuba, Mus. Leiden reg. no. 1300.

In general structure this specimen agrees well with the other *Tropidophis*

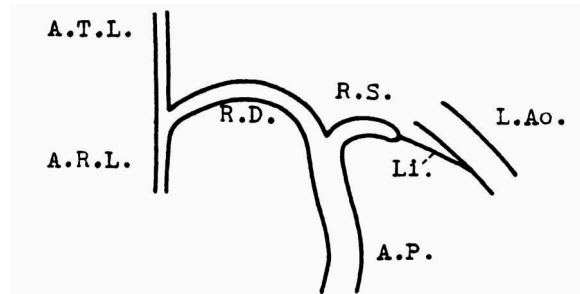


Fig. 7. *Tropidophis pardalis pardalis* (Gundl.), pulmonary artery.

A.P., common trunk of the pulmonary artery; A.R.L., branch of the pulmonary artery to the true lung; A.T.L., branch to the tracheal lung; L.Ao., left aortic arch; Li., ligamentum arteriosum Botalli; R.D., right pulmonary artery; R.S., remnant of the left pulmonary artery.

examined by me. The position of the viscera is indicated in Table I and in fig. 1d. The series of bronchial cartilages ends at 1.8 mm from the caudal tip of the lung. The liver extends cranially to the apex of the heart. The major branches of the pulmonary artery are shown in fig. 7.

The stomach of this specimen contained an *Anolis*.

#### *Trachyboa gularis* Ptrs.

Specimen examined:

1 ♂, Guayaquil, Ecuador, received from the Berlin Museum 1862, Mus. Leiden reg. no. 1297.

It is possible that this specimen is one of the two cotypes; it agrees well

with the description given by Peters (1860, p. 200), and the length of head and body is about the same as that mentioned by that author. Scales in 27, 29, 21 rows; 147 ventrals (if the scales separating the first ventral from the mental groove are also counted as ventrals, the number becomes 151 as mentioned by Peters); subcaudals 1/1 + 28; 11 upper labials of which the 6th enters the orbit; the orbit is surrounded by 12 scales and one labial; 7 scales between the orbits; 13 lower labials; 18 maxillary teeth.

The species generally is described as lacking a rostral shield (e.g., Boulenger, 1893, p. 109). In this respect the description by Peters (1860, pp. 200-201) is somewhat confusing; his statement that a rostral shield is absent means only that the snout is not covered by a single large shield, but by a number of small shields. In the specimen examined by me a very low rostral is present; its width is 9 times its height. In fact Peters mentioned this shield, and it is shown in his plate (Peters, 1860, Pl. —, fig. 1c); Peters states that the median upper labials are separated from the border of the mouth by a very broad and low shield. Above this rostral the snout is covered by five shields. Three shields in a row border the rostral; they separate the 1st upper labials; these shields together with the 1st upper labials are the five median upper labials mentioned by Peters. Above this row of three shields a pair of shields is present; they separate the nasals from one another. The mental groove is bordered by three shields on the right and by five shields on the left side.

The position of the viscera is indicated in Table I and in fig. 1e.

As in *Tropidophis* a tracheal lung is present. The alveolar structure commences at 21.4 mm from the snout. The tracheal lung gradually passes into the single lung. Well anteriorly of the heart, viz., at 51 mm from the snout, the tracheal lung begins gradually to widen. It does not show differences of any importance from the tracheal lung of *Tropidophis*. The series of tracheal cartilages is continued in the lung as a series of bronchial cartilages; this series ends at 2.3 mm from the posterior end of the lung. The lung shows an alveolar structure over the whole of its length, but caudally the alveoli gradually become less deep. There is no trace of a left lung.

The common pulmonary trunk divides into two branches. The left branch is only 1.5 mm long; it curves to the left and posteriorly around the anterior tip of the left auricle. The right branch curves dorsally and to the right, where it bifurcates; one ramus runs anteriorly along the dorsal surface of the tracheal lung, the other goes caudally to the true lung. The pulmonary vein consists also of two main branches, one that runs caudally along the ventral surface of the tracheal lung, and one that runs anteriorly along the true lung; these two branches unite before reaching the left auricle.

On the right side the suprarenal body lies close to the testis, its posterior half extending caudally of the testis. On the left the suprarenal body (fig. 8b: S.R.B.) is placed against the testis over its whole length.

The spermatic arteries arise cranially of the testes. The right spermatic artery reaches the testis close to the latter's posterior end; at this point the artery bifurcates. One branch goes anteriorly along the whole length of the testis; in its course it gives off three small arteries to the suprarenal body, and some collaterals enter the testis. The second branch runs posteriorly along the posterior half of the suprarenal body; it gives off a ramus to the vas deferens, and the artery itself continues its course along the vas deferens too. I did not find any rami that pass from the right spermatic artery to the fat-body, although these may have been present. The left spermatic artery (fig. 8b: A.S.S.) arises from the aorta (Ao.) at a distance of 6.7 mm caudally of the origin of the right spermatic artery. At about half the distance from its origin to the anterior tip of the testis, it gives off a relatively strong branch (F.B.) to the fat-body. At the anterior tip of the suprarenal body the spermatic artery bifurcates; one branch (A) goes to the left testis and ramifies in the anterior half of that organ, the other branch passes posteriorly along the suprarenal body. This second branch sends a ramus (P) to the posterior part of the testis, while the branch itself continues caudally along the suprarenal body; finally it (A.V.D.) passes to the left vas deferens.

The intercostal arteries arise from the dorsal aorta in a similar way as in *Tropidophis*; in the region from the junction of the two aortic arches to region cranially of the heart the intercostals arise from the vertebral artery ventrally of the vertebral column. From this longitudinal artery arise the pairs of arteries that enter the parietes. As far as I could ascertain the situation is slightly different in the region of the kidneys; here the intercostals arise from distance to distance, and each has an anterior and a posterior branch, but apparently the posterior and anterior branches of subsequent intercostals do not form a continuous longitudinal artery; each intercostal thus supplies three or four segments. In the region of the cloaca the intercostals arise regularly, and no longitudinal vessel is formed. In the region cranially of the heart the intercostals arise from the vertebral artery at regular intervals; they do not divide into a left and a right branch before entering the parietes. Of this anterior series of intercostals two bifurcate close to their origin from the vertebral artery, and each of these intercostals supplies two segments; all the others supply only one segment each.

In fig. 8a a diagram is given of the veins that bring blood to the afferent renal vein of the left side. Veins (V.V.) from the vertebral region join to

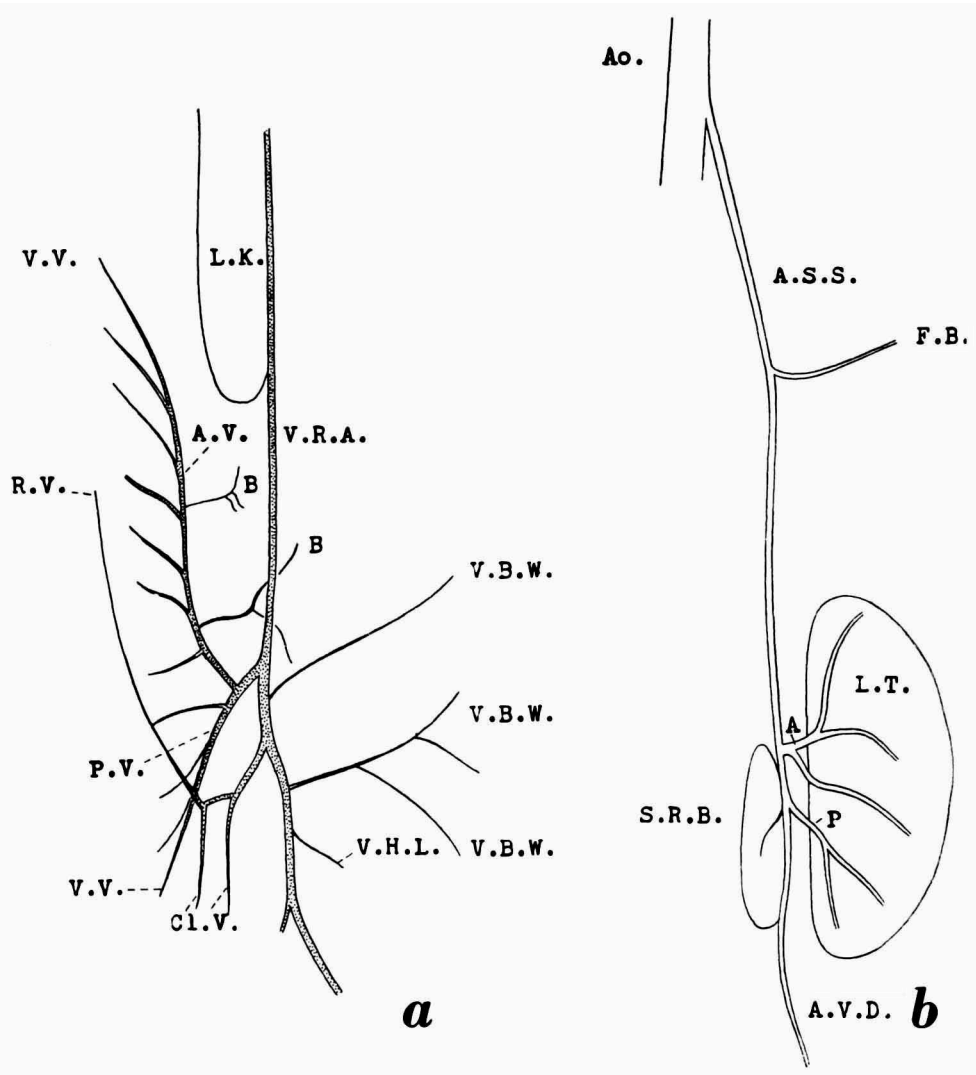


Fig. 8. *Trachyboa gularis* Ptrs.; a, veins in the region of the left kidney; b, artery of the left testis.

A, branch of the left spermatic artery that supplies the anterior half of the testis; Ao., dorsal aorta; A.S.S., left spermatic artery; A.V., anterior longitudinal vein; A.V.D., branch of left spermatic artery that goes to the vas deferens; B, veins from the left body wall; Cl.V., veins from the cloaca; F.B., artery to the fat-body; L.K., left kidney; L.T., testis; P, branch of the left spermatic artery that supplies the posterior part of the testis; P.V., posterior longitudinal vein; R.V., vein from rectum; S.R.B., suprarenal body; V.B.W., veins from ventral body wall; V.H.L., vein from rudimentary hind limb; V.R.A., afferent vein of left kidney; V.V., veins arising in the vertebral region.

form two longitudinal veins, one anterior (A.V.) and one posterior (P.V.), into which also small veins (B) from the body wall empty themselves. The anterior and posterior veins unite and then empty into the afferent renal vein. This latter also receives blood from veins that come from the rectum (R.V.), from the cloaca (Cl. V.), from the ventral body wall (V.B.W.), and from the rudimentary hind limb (V.H.L.).

The liver is similar to that of *Tropidophis*. In *Trachyboa* too the vena cava posterior is placed close to the portal vein; a cross section of the liver is shown in fig. 3a. The gallbladder is situated at 17 mm caudally of the posterior tip of the liver. The liver reaches anteriorly beyond the apex of the heart; thus, like in *Tropidophis*, there is no interval between the heart and the liver as in most other Boidae.

The kidneys (fig. 1e) are placed close to the vent; their surface is smooth, without any indication of lobes.

The hemipenis is 10.7 mm long; it reaches to the 10th subcaudal shield. At 5.9 mm from its base the hemipenis bifurcates; the single basal part shows weak longitudinal folds; the two lobes are covered by strong oblique folds with scalloped borders. Just proximal to the bifurcation there is an elongate papilla on each side of the sulcus spermaticus. The sulcus spermaticus is bifurcate.

All modern authors divide the Boidae into two subfamilies: the Pythoninae that have a supraorbital bone, and the Boinae in which this bone is absent. With regard to this character both *Tropidophis* and *Trachyboa* agree with the Boinae. As mentioned by Smith (1943, p. 103) it is doubtful whether the presence or absence of a supraorbital bone is an indication of the true relationship between the genera concerned. It is my belief that the classification of the Boidae can be placed on a more certain base by the study of the anatomy of these snakes. Cope (1894; 1900, p. 697) gave much attention to the respiratory organs as supplying valuable characters for classification. This author divided the Peropoda (containing the Boidae of modern classifications) into four families. On account of the absence of the second lung, and the presence of a tracheal lung, Cope placed *Ungalia* (i.e., *Tropidophis*) in a separate family: Ungaliidae (Cope 1894, p. 220: Ungaliidae; 1900, p. 697). This point of view has not been accepted by later authors, and *Tropidophis* has been placed with the Boidae again (e.g., by Stull, 1935). However, *Tropidophis* and *Trachyboa* differ from the other Boid snakes (as far as these have been studied in this respect) not only in the respiratory system, but also in the form and position of the kidneys. Taking these points into consideration, I believe that there is sufficient reason to assign

the genera *Tropidophis* and *Trachyboa* to a distinct subfamily, which may be named **Tropidophinae**.

The Tropidophinae may be characterized as Boid snakes in which only the right lung and a tracheal lung are present; the kidneys are not lobed and they are placed more posteriorly than in other Boidae. The supraorbital bone is present as in the Boinae, and they show the Boine type (Beddard, 1908, p. 143) of intercostal arteries. In connection with the disappearance of the left lung, the left pulmonary artery has been reduced to a mere rudiment that is functional only in the embryo as forming part of the ductus arteriosus Botalli. The postcaval vein and the portal vein are placed close to one another in the region of the liver. Type of the subfamily is the genus *Tropidophis* Cocteau & Bibron, 1843.

Further studies on more adequate material will have to show whether other differences in structure are present between *Tropidophis* and *Trachyboa* on one side, and the other Boidae on the other side. Stull (1928, p. 6) mentions that the genera that are most closely related to *Tropidophis* are *Epicrates* and *Ungaliophis* (i.e., *Peropodum*). I have not examined the latter genus, and it may still prove to be closely related to *Tropidophis*. *Epicrates*, however, has two lungs and the kidneys are distinctly lobed.

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