

THE DISTRIBUTION OF FRESHWATER EELS IN SUMATRA AND BORNEO

by

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In a former ¹⁾ article I have given the results of an enquiry into the occurrence of freshwater eels on Java. It was shown that the distribution of the eels is determined by the depth of the sea beating against the different parts of the coast. In rivers emptying into the ocean freshwater eels are found. In the rivers emptying into the shallow Java Sea they are not found, with the exception of those rivers whose mouths are least remote from the Indian Ocean. The explanation lies at hand. As SCHMIDT has shown, the freshwater eels spawn in the ocean, above depths of several thousands of metres. The *Leptocephalus* larvae swim in the direction of the land and, arriving over the 100-fathom line, they begin to metamorphose into the elvers. The elvers of the European freshwater eel then travel over the continental shelf, often for considerable distances, before entering the mouths of the rivers.

We now have to assume that also the Indian freshwater eels migrate to the Ocean to spawn and that the *Leptocephalus*-larvae swim to the coast. It seems not improbable that metamorphosis into the elver-stage also occurs in the region of the 100-fathom line here, the border of the continental shelf. However this may be, it is evident that the Indian eel-larvae have not got the faculty of travelling over the continental shelf for long distances. They cannot reach the mouths of the greater part of the rivers of Java's north coast, emptying into the Java Sea. The most western and the most eastern rivers only of the north coast are populated with freshwater eels. The higher temperature of the tropical seas evidently accelerates the rate of development of the larvae, shortens larval life, so that the larvae cannot cover such considerable distances as the more northern elvers.

After finishing my enquiry into the distribution of freshwater eels on Java, I have continued these investigations for the Islands of Sumatra and Borneo, both situated on the continental shelf and with only part of their coasts facing the deep sea. The population of these islands being much less dense than that of Java, the evidence gathered there could not be so complete as for Java. On the other hand, the results for Java are so convincing that it seemed a priori hardly doubtful that similar conditions

¹⁾ Treubia IX, 1926.

would prevail in Sumatra and Borneo. And this has been quite sufficiently confirmed by the information gathered on these islands.

A look at the chart added to this article will show this at once. In Sumatra eels occur in all the rivers emptying on the west coast. On the east coast eels are found in none of the large rivers emptying there. They occur only in the northernmost and the southernmost rivers of this side, in Atchin and in the Lampong Districts. We find exactly the same conditions here as on Java.

Especially interesting are, of course, the transitional regions where the eels get rare. We find that the larvae swimming through Sunda Strait still reach the mouth of the Sipoetih- and Troesan-river (pron. Siputih and Trusan), as is shown by the information from Goenoeng Soegih and Kotaboemi. The freshwater eels are known as peloes (pron. pelus) here. I should not be surprised if they proved to occur in the Toelang Bawang River also, though, of course, rarely. I did not get positive evidence, however, from Menggala or Pakoean Ratoe. At any rate eels don't seem to occur north of this river.

Turning now to the northern part of the east coast, we find that freshwater eels are found as far southward as Medan. They are known in this region as ikan dendoeng, doendoeng¹⁾ and dondong, in Atchin as ilih.

They are common in Atchin and seem to become rarer in the region of Medan. They seem to be not wholly absent even as far as the region of Tandjoeng Balei, nor even as far as Asahan. I got a specimen of *Anguilla bicolor*, caught in the Aik Nantaloe, an affluent of the Asahan river. They are not known, however, from the Toba Lake, which is drained by the Asahan-River. Probably the high falls of the Asahan River form an obstacle for the elvers. Another suggestion is that only *A. bicolor* occurs so far south and that this species does not swim up the rivers as high as *A. mauritiana*. The information from Goenoeng Toea, on the upper course of the Baroemoen River, seems to point to the fact that even so far south eels are not entirely unknown, but if this is right, they must be extremely rare here. In all the great rivers of the middle part of the east coast, such as the Rokan, the Siak, the Kampar, the Batang Hari and the Moesi Rivers, no freshwater eels are found.

The same holds for the islands of Bangka and Billiton. A consignment of eels received from Billiton proved to consist of *Monopterus albus*, *Pisoodonophis boro* and *Muraenesox cinereus* only.

The occurrence or non-occurrence of eels in the lakes of Sumatra depends on the rivers draining them.

In Atchin we have the Laoet Tawar (the "freshwater sea" cf. chart, nr. 1), drained by the Peusangan River, emptying on the north coast. Eels occur here, WEBER²⁾ mentions from here *Anguilla mauritiana*.

¹⁾ In all these names the oe is to be pronounced as u.

²⁾ Fishes of the Indo-Australian Archipelago III, p. 247 (1916).

The great Toba Lake (cf. chart, nr. 2) is drained by the Asahan River, emptying likewise on the east coast. No eels are found here, but as they are not absent in the Asahan River (cf. above), this may be caused by the high falls of said river, as was suggested by one of my correspondents who sent me an *Anguilla bicolor* from the Aik Nantaloe, an affluent of the Asahan River.

In the Lake of Manindjau (cf. chart, nr. 3), drained by the Antokan River on the West coast, eels are found. They are caught by the natives especially where the Antokan River takes its origin from the lake. WEBER ¹⁾ also mentions *Anguilla mauritiana* from this lake.

Not far from the Manindjau Lake lies the Singkarak Lake (cf. chart, nr. 4). This, however, is drained by a confluent of the Indragiri River, which flows to the east coast. Consequently no eels occur here.

The same holds for the Danau di Bawah, the Danau di Atas (cf. chart, nr. 5) and the Lake of Korintji (cf. chart, nr. 6). The latter two are drained by a confluent of the Batang Hari River, the former sends its water into the Singkarak Lake. Finally we have the Ranau Lake (cf. chart, nr. 7), drained by a tributary of the Komering River flowing to the East coast, and in which no eels occur either.

As regards Borneo, I have information from the Dutch part only of this island. At my request the curator of the Serawak Museum wrote to me: "I regret that I know of no actual occurrence nor are there any specimens in this Museum." This is all I know about the British part.

As regards the Dutch part, a look at the chart allows us to conclude that freshwater eels may be expected only in the rivers of the East Coast. This is confirmed by my information. Freshwater eels are known here as *i k a n m a r s a p i* ²⁾ or *o e s s i* (pron. ussi). The boundary-line of their occurrence seems to lie east of Banjarmasin. They are found on Poeloe Laoet and in the rivers of Borneo emptying opposite this island, in the so-called Tanah Boemboe. Between Poeloe Laoet and the mouth of the Barito the freshwater eels get rarer, but are not absent, as is shown by the information from Pleihari. In the Barito and its tributaries, however, they do not seem to occur, as is shown by the information from Kandangan and Moeara Toweh.

In the Mahakkam- or Koetei-River the elvers appear in the month of July in dense crowds. They are known as *impoen*; the same name is used on the south coast of Java also. Mr. WITKAMP, of Tenggarong, has been so kind as to gather information about this phenomenon. The elvers are reported to swim close to the beach and only during the night. They may be seen one night only, or, sometimes, during a few subsequent nights. There is a special fishery for them and they are much appreciated as food, being prepared in various ways.

¹⁾ Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien III, p. 428 (1893-'94)

²⁾ According to WEBER (cf. ¹⁾) *Anguilla mauritiana* is known as *b a l e m a s a p i* in Tempe (Celebes).

It seems probable that freshwater eels will be found also in the rivers of the northern part of the British territory, in British North Borneo. It would be interesting to find out how far they reach along the north coast of Borneo.

As regards the Aiambas and Natuna Islands, I was informed that freshwater eels do not occur on the former, but were known on the latter. It seems fairly doubtful if this statement is reliable.

On the islands of the eastern half of the East Indian archipelago, which are surrounded by deep seas, eels are common everywhere.

After the publication of my paper on the distribution of freshwater eels on Java I got some information from the Kangean Islands. As mentioned in the above article freshwater eels appear to be unknown on the island of Madoera. They might be expected, however, on the Kangean Islands.

At my request, the district-officer (controleur) of Kangean wrote me that practically no rivers are found on these small islands but that, according to the native people, freshwater eels are present in certain wells, a. o. in the village Tembangan (Kangean) and Prembanan and Treboeng (Sapoedi). These wells, however, being considered as holy, the controleur had not succeeded in procuring specimens of these eels.

Summary of the Information.

SUMATRA, EAST COAST.

Kalianda, on the Lampong Bay (district-officer [controleur])

Eels met with in the upper course of the rivers, in those flowing to the East as well as in those flowing to the West coast. Rare, a few chiefs had only four or five times during their life-time seen one caught.

Soekanda, (district-officer)

Known as peloes, in the upper course of the rivers, under big stones. Make holes in the beach, their favourite food being freshwater crabs (kepiting soengei). Attain a large size.

Goenoeng Soegih, on the Sepoetih River (ass. demang)

Very rare in the Way Pengoebœan, affluent of the Sipoetih River, and the Troesan. Between tree roots along the river.

Kotaboemi, on the upper course of the Troesan River (district-officer). Known as ikan peloes, attaining a large size. Between stones. Is angled for and is eaten.

Menggala, on the Toelang Bawang River

No eels found here.

Pakoean Ratoe, on the upper course of the same river (demang)

The information from here, supplied by a native chief (demang), is not quite clear, but seems to point to the fact that the freshwater eel is not quite unknown here.

Moeara Doea, on the upper course of the Komeriing River (district officer)

Occurring neither in the Komeriing River nor in the Danau lake drained by same.

Lahat and Tebing Tinggi, on the upper course of the confluents of the Moesi River (ass. resident)

Unknown here according to the chiefs. According to later information not entirely unknown, but very rare.

Sumatra, East coast, Northern Part.

Bangko, on the S. Merangin (upper course of the Batang Hari, draining the lake of Korintji (district-officer).

No fresh-water eels in the S. Merangin.

Soengeipenoeh, (district-officer of Kerintji).

No fresh-water eels in the Lake of Kerintji.

Takegeun (ass. resident of the Gajo- and Alas Lands)

In all the rivers, also in those flowing to the East coast, as e.g. the Simpang kanan and its tributaries. Known as ilih (Atchin) or dendoeng (Gajo-language).

Pangkalan Brandan (district officer)

Present in both the Lepan- and the Besitang River; known as doendoeng and dondong.

Tandjoeng Poera

A grey and a mottled species, the former in the marshes. They are not caught in any great quantity.

Bindjei (Indian physician)

Known as ikan doendoeng, found in all the rivers of Upper Langkat, but not common. WEBER mentions *Anguilla australis* (i.e. *bicolor*) from Upper Langkat. They are well paid for by the Chinese, who like them.

Medan (ass. resident of Deli and Serdang)

Sums up quite a number of rivers in Deli, Serdang (east of Deli) and Padang and Bedagei (east of Serdang), in which freshwater eels occur. Known as dendoeng (Malay) or doendoeng (Batak). WEBER mentions *A. elphinstonei* from Serdang.

Tebing Tinggi, Padang and Bedagei (district officer)

Occurs in the Soengei Padang, but very rare.

Tandjong Balei (ass. resident of Asahan)

Doendoeng is found in Batoe Bara (east of Padang and Bedagei) and Asahan (east of Batoe Bara), but very rare, only in the higher regions. In Batoe Bara an eel is paid for with 5-10 florins.

A forester sent me a sample from the Aik Nantaloe, an affluent of the Asahan River. It proved to be *A. bicolor*.

Taroetoeng (ass. resident of the Batak Lands)

Common in the rivers flowing to the west coast, not met with in those flowing to the east coast, e.g. the Aek Bila. Not found in the Toba Lake and the small rivers emptying into it.

Goenoeng Toea (administrator ([gezaghebber] of Padang Lawas)

Practically not met with.

BORNEO.

Sambas (district officer)

Are not found here.

Bengkajang (district officer)

Entirely unknown in the Sei-Sambas.

Sintang (ass. resident)

In the Melawi (affluent of the Kapoeas) and tributaries only *Monopterus*.

Moeara Teweh (ass. resident of the Doesoen Lands)

Not found in the rivers of this section.

Kandangan (ass. resident of Hoeloe Soengei)

Only *Monopterus* and *Mastacembelus* (ikan tilan) occur here.

Pleihari (administrator)

Is found in the upper course of the rivers between the mouth of the Barito and the Islands of Poeloe Laoet, e.g. near the kampongs of Asam-asam and Kintap, east of Tandjong Selatan. Known as oessi (pron. ussi). Known, but rare, near Tabanio and Liang Anggang, west of Tandjong Selatan. Called here: oelar sapi (i.e. the cow snake, the snake with the cow's ears).

Stagen (Poeloe Laoet, manager of the coal-mines).

The marsapi is found everywhere in the rivulets and the buffalo pools. It is caught during the dry season only, by hand. It is eaten by the Chinese only.

Kota Baroe (Poeloe Laoet, ass. resident of S.E. Borneo.)

Marsapi occur in the upper course of the Baharoe River and other rivulets. They are found also in the rivers of the Tanah Boemboe, Borneo, opposite Poeloe Laoet, where they are known as marsapi and oessi (the non-spotted species). During a banjir one was caught of a length of 1½ metres.

Tenggarong (on the Mahakkam River)

Known as lengeoh mesapi, the lengeoh being *Monopterus*.

In the month of July the elvers, known as impoen, swim up the river in dense crowds (cf. text).

BEMERKUNGEN ÜBER TYPHLOPS FLORENSIS, SEINE RASSEN UND SEINE VERBREITUNG.

Von

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Frankfurt a. M.

1.

Im Jahre 1897 hat BOULENGER auf Grund der herpetologischen Ausbeute des bekannten Vogelsammlers A. EVERETT von der Kleinen Sunda-Insel Flores eine neue Art der Blindschlangen-Gattung *Typhlops* beschrieben, die er *florensis* nannte (Ann.Mag.Nat.Hist. ser.6, 19,S.505, 1897). Es lag ihm damals nur ein einziges Exemplar davon vor, das sich heute im British Museum befindet. Eine genauere Fundort-Angabe als „Flores“ ist bei diesem Stück von seinem Sammler offenbar nicht gemacht worden; doch ist wohl die Annahme berechtigt, dass dieses Exemplar, wie der grösste Teil des von EVERETT auf Flores zusammengebrachten herpetologischen Materials, aus dem Gebiete des Keo-Vulkans im südlichen Mittel-Flores stammt.— Mehrere Jahre später hat dann ROUX eine weitere neue *Typhlops*-Art aufgestellt, die von J. ELBERT aus der Nähe von Sadjang, im Gebiete des Rindjani auf Lombok, mitgebracht worden ist: *Typhlops elberti* (Zool. Jahrb.Syst. 30, S.499, 1911); der Typus davon befindet sich im Senckenberg-Museum in Frankfurt a.M. Aus den beiden Originalbeschreibungen, zu denen in beiden Fällen nur je ein einziges Exemplar vorlag, geht allerdings hervor, dass sich *Typhlops elberti* von *florensis* in mehreren, systematisch wesentlichen Punkten unterscheidet, so dass beide Formen tatsächlich zwei verschiedene Species zu repräsentieren scheinen. Indessen zeigte ein zweites, von mir selbst im Jahre 1927 von Lombok mitgebrachtes *elberti*-Exemplar, dass diese Ansicht nicht haltbar ist, sondern dass *Typhlops elberti* nichts anderes als eine Rasse (Subspecies) von *Typhlops florensis* (von dem ich auf Flores ein halbes Dutzend Exemplare zusammengebracht habe) darstellt. Aber auch auf der Insel Sumbawa, also zwischen Lombok und Flores, konnte ich diese, wegen ihrer Variabilität so bemerkenswerte *Typhlops*-Art nachweisen und als eine neue Rasse kürzlich beschreiben (Senckenbergiana 9, S. 239, 1927). Endlich wurde *Typhlops florensis* auch auf Sumba von K. W. DAMMERMAN, gelegentlich seiner Forschungsreise dorthin (1925), gefunden. Die beiden von ihm dort gesammelten Stücke, die ich durch die Freundlichkeit des Herrn L. D. BRONGERSMA vom Zoologischen Museum in Amsterdam zur

Nachprüfung erhielt, gehören nun einer weiteren Lokalform an, die in der vorliegenden Arbeit beschrieben sei. Daran anschliessend sollen noch einige kurze Mitteilungen über die anderen *florensis*-Formen gemacht werden; ausführlicher komme ich darauf in meiner, sich in Vorbereitung befindlichen Arbeit über die Amphibien und Reptilien der Inseln Bali, Lombok, Sumbawa und Flores zu sprechen. Dort ist auch näher begründet, warum *Typhlops elberti* nicht als eigene Species betrachtet werden darf.

2.

***Typhlops florensis brongersmai* n. subsp:**

Typus: ♂ (?) s. ad., Zool. Mus. Amsterdam. K. W. DAMMERMAN coll. 5 Mai 1925.

Terra typica: Mao Marroe, 450 m.H., Ost-Sumba.

Vorliegendes Material: Ausser dem Typus noch ein halb-wüchsiges Exemplar von Kananggar, 700 m.H., Südost-Sumba, vom gleichen Sammler.

Diagnose: Am nächsten mit der Nominatform verwandt, aber viel schlanker; das Verhältnis der Gesamtlänge zum grössten Körperdurchmesser schwankt zwischen 54 und 66 (bei der Nominatform: 33—47). Oberseite schwarzgrau, ohne Linienzeichnung; Unterseite rein weiss oder gelblichweiss.

Beschreibung des Typus. Schnauze vorspringend, abgerundet. Nasenlöcher unterständig. Rostrale schmal, $\frac{1}{4}$ — $\frac{1}{5}$ so breit wie der Kopf, gerade bis zur Augenhöhe reichend. Nasale fast vollständig geteilt, der Spalt geht vom zweiten Supralabiale aus. Praeoculare etwas schmaler als das Nasale oder Oculare, in Berührung mit dem zweiten und dritten Supralabiale. Augen deutlich. Praefrontale, Supraocularia und Parietalia etwas vergrössert. 4 Supralabialia. Durchmesser des Körpers 54 mal in der Gesamtlänge enthalten. Schwanz, der in einen Spitzen Stachel ausläuft, $2\frac{1}{2}$ mal so lang wie breit und etwa 23 mal in der Gesamtlänge enthalten. 22 Schuppen rund um den Körper. Oberseite dunkel, schwarzgrau. Auf dem Rücken keine schwarze Linienzeichnung bemerkbar; nur an den Flanken tritt sie etwas hervor. Bauch einfarbig, gelblichweiss, ziemlich scharf von der Dorsalfärbung abgesetzt. In der Kehregion reicht die dunkle Pigmentierung der Dorsalseite tiefer herab als an den Flanken.

Variation. Der Paratypus entspricht im Wesentlichen durchaus dem Typus. Nur ist er noch schlanker: der grösste Durchmesser des Körpers ist 66 mal in der Gesamtlänge enthalten. Das Praeoculare ist bei diesem Stück ebenso breit wie das Oculare, aber schmaler als das Nasale. Der Schwanz ist etwas länger als beim Typus, fast dreimal so lang wie breit, etwa 21 mal in der Gesamtlänge enthalten. Ebenfalls 22 Schuppen rund um den Körper. Färbung der Oberseite noch etwas dunkler als beim Typus. Unterseite rein weiss; die gesamte Kehregion dunkel pigmentiert.

M'a ß e.	Typus	Paratypus
Gesamtlänge	212 mm	211 mm
Grösster Körperdurchmesser	3.9 "	3.2 "
Schwanzlänge	9 "	10 "

Bemerkungen. Die Sumba-Rasse von *Typhlops florensis* ist vor allem durch ihren sehr schlanken Habitus von der Nominatform und den beiden anderen Rassen ausgezeichnet. Ausserdem scheint sie ein etwas schmäleres Rostrale zu haben. Auch die Färbung ist für diese Form sehr charakteristisch. In der rein weissen Unterseite stimmt sie mit *Typhlops florensis undecimlineatus* MERTENS von Sumbawa überein, während die Dorsalfärbung an manche junge Exemplare der Nominatform erinnert, obwohl sie bei *brongersmai* sehr wesentlich dunkler ist und von einer Linienzeichnung kaum etwas aufweist. Da *Typhlops florensis* eine Maximallänge von 422 mm erreicht, ist anzunehmen, dass von der Sumba-Rasse noch weit grössere Exemplare gefunden werden; allerdings sind die beiden bisher bekannten *elberti*-Stücke auch nicht grösser als 235 bzw. 212 mm.

Genannt ist die neue Form zu Ehren des Herrn L. D. BRONGERSMA in Amsterdam.

3.

Somit sind folgende Rassen von *Typhlops florensis* zu unterscheiden:

1. *Typhlops florensis elberti* ROUX. Rücken mit 11 schwarzen und 10 gelben Längslinien. Auf der Ventralseite 5 schwarze und 4 gelbe Längslinien. Zwischen der Dorsal- und Ventralzeichnung eine Zone mit verloschener Zeichnung, die sich auf 3 Schuppenreihen erstreckt und jederseits 3 schwarzen und 4 hellen (gelben) Längslinien entspricht. Grösster Körperdurchmesser 41–43 mal in der Gesamtlänge enthalten. — L o m b o k.

2. *Typhlops florensis undecimlineatus* MERTENS. Rücken mit 11 schwarzen und 10 gelben Längslinien. Bauch ohne dunkle Pigmentierung, einfarbig gelb oder weiss. Grösster Körperdurchmesser 38–41 mal in der Gesamtlänge enthalten. — S u m b a w a.

3. *Typhlops florensis florensis* BOULENGER. Entweder mit 22 dunklen (schwarzen) und 22 hellen (gelben) Längslinien rund um den Körper oder, offenbar in der Jugend, mehr einfarbig dunkelgrau. Doch auch in diesem Falle lässt die Verteilung des dunklen Pigments, namentlich auf der Bauchseite, die hellen und dunklen Längsstreifen recht deutlich erkennen. Grösster Körperdurchmesser 33–47 mal in der Gesamtlänge enthalten. — F l o r e s.

4. *Typhlops florensis brongersmai* MERTENS. Rücken sehr dunkel, schwarzgrau, ohne deutliche schwarze Längslinien; Bauch ohne dunkle Pigmentierung, einfarbig weiss oder gelblichweiss. Grösster Körperdurchmesser 54–66 mal in der Gesamtlänge enthalten. — S u m b a.

Der gesamte Formenkreis des *Typhlops florensis* gehört zu den wenigen für die Kleinen Sunda-Inseln endemischen Schlangen. Offenbar ist diese Blindschlangen-Art östlichen Ursprungs; vielleicht stammt sie vom *Typhlops polygrammicus* Schlegel ab, der eine ganz ähnliche Variabilität der Kopfschilder aufweist, wie ich es z.B. bei *Typhlops florensis elberti* beobachtet habe. Die von DAMMERMAN auf Sumba gefundenen *Typhlops florensis* stammen aus dem Gebirge, mit dem Vorkommen der übrigen *florensis*-Rassen also durchausübereinstimmend. Das montane Vorkommen begünstigte ohne Zweifel die Ausbildung verschiedener Rassen dieser Blindschlange.
