J. Fish Biol. (1982) **21**, 623–636

A new species of the deep-sea eel genus *Ilyophis* Gilbert (Synaphobranchidae) from the eastern North Atlantic, with comments on its ecology and intrafamilial relationships

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(Received 7 December 1981, Accepted 29 December 1981)

A new species of synaphobranchid eel, *Ilyophis blachei*, is described from the eastern North Atlantic. It is distinguished by 179–188 vertebrae, dorsal fin inserted half (or more) of the snout length posterior to extended tip of pectoral fin, gill slits obliquely inclined antero-ventrally from pectoral base, rounded posterior nostril bordered anteriorly by conspicuous triangular flap, long lateral line (87–95% S.L.), supraorbital canal pores 5–6, infraorbital 7–8 and preoperculomandibular 10–11, supraorbital and supratemporal commissures with 1 and 3 pores, respectively. The diagnosis of the genus *Ilyophis* is extended to embrace these characters. The transitional position of the genus between the subfamilies Synaphobranchinae and Dysomminae is discussed in the light of this new evidence. *Ilyophis blachei* occurs on the lower continental slope (1247–2070 m soundings) within the temperature range *c.* 7·0–3·3° C. The first record of *I. arx* in the Atlantic Ocean is also reported.

I. INTRODUCTION

Recently, demersal trawl collections from the continental slope to the west of the British Isles by the oceanographic research vessels ' Discovery ' (U.K.—Porcupine Sea-Bight area), ' Thalassa ' (France—north of Bay of Biscay area) and ' Walther Herwig ' (Germany—Hebridean Terrace) have included 12 specimens of an unusual anguilliform fish (Figs 2, 6). Examination has shown that these belong to a novel species within the family Synaphobranchidae. The systematics of this family have been elucidated largely as a result of studies by Castle (1960, 1964, 1975), Robins & Robins (1970, 1976) and Robins (1971). Nevertheless, illustrating the relatively incomplete state of the knowledge of the family, Robins & Robins (1976) pointed out that ' the discrepancies in larvae and adults suggest that as many as a dozen species await discovery ' and that ' the total number of species will probably be about 30 '.

Our specimens are found to conform with the genus *Ilyophis* on the basis of their inconsistent squamation, the proportions of trunk and gape, the inclination of the suspensorium, the number of pores in the cephalic lateralis system, the development of the lateral line, the positions of the dorsal fin origin and of the gill slits, together with the tooth pattern. This new form is the third known species

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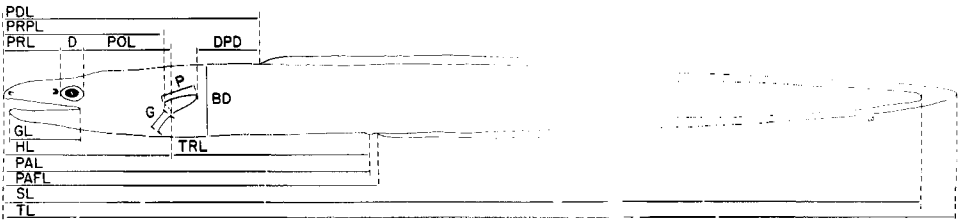

FIG. 1. Diagrammatic lateral view of a specimen of *Ilyophis* to indicate the measurements used in the description. (T.L.—total length, S.L.—standard length, H.L.—head length, TRL—trunk length, PRL—preorbital length, POL—postorbital length, D—horizontal eye diameter, G—gill slit length, PRPL—prepectoral length, PDL—predorsal length, PAL—preanal length, PAFL—preanal fin length, BD—body depth, GL—gape length of mouth, DPD—distance between pectoral fin tip and dorsal fin origin, P—pectoral fin length).

in the genus and in its sounding range of capture it conforms with the lower slope–continental rise distribution of its congeners (cf. Castle, 1964; Robins & Robins, 1976). This paper describes the species, provides preliminary evidence on its ecology and comments on the influence this new form has on the likely generic relationships within the family.

II. MATERIALS AND METHODS

The ' Discovery ' material was collected in a single warp semi-balloon otter trawl (OTSB 14) of 14 m headline length (Merrett & Marshall, 1981) and a mouth opening/closing epibenthic sledge of 1·5 m^2 mouth area (BN 1·5) (Aldred *et al.*, 1976). The ' Thalassa ' specimen was captured in a beam trawl; while the ' Walther Herwig ' fish was taken by a 31 m otter trawl (140 BT). The specimens were fixed in 10% saline formalin at sea and transferred ashore to 33% isopropanol. Measurements were made by vernier calipers to the nearest 0·5 mm following the usual procedures (Fig. 1). Vertebral counts, including the terminal vertebra (*sensu* Robins, 1971), were made from X-radiographs.

III. RESULTS

Ilyophis blachei sp. nov.

(Figs 2–5; Table I)

HOLOTYPE

Mature male, 524 mm total length (T.L.). British Museum (Natural History) (BM(NH)), London, register number 1981.3.17.1. ' Discovery ' Stn. 9774 # 1. Date: 21 April, 1978. Gear: OTSB14. Sounding: 1494–1572 m (1533 m mid-depth). Locality: 51°04·4′N, 11°59·3′W, Porcupine Sea-Bight, eastern North Atlantic. Bottom substrate: hard.

PARATYPES

(a) BM(NH) 1981.3.17.2. Gravid female, 772 mm T.L. ' Discovery ' Collection Stn. no. 50517 (' Challenger ' Cruise 8/79, haul no. 17). Date: 7 June, 1979. Gear: OTSB 14. Sounding: 1794–1785 m (1789 m mid-depth). Locality: 49°30·1′N, 13°19·9′W, Porcupine Sea-Bight. Bottom substrate: unknown. Bottom temperature: 3·8° C.

(b) BM(NH) 1981.6.16.1. Mature female, 540 mm T.L. ' Discovery ' Collection Stn. no. 51009 (' Challenger ' Cruise 7/81, haul no. 9). Date: 2 May, 1981. Gear: OTSB 14. Sounding: 1475–1485 m (1480 m mid-depth). Locality: 51°34·2′N, 12°54·2′W, Porcupine Sea-Bight. Bottom substrate: unknown. Bottom temperature: 4·9–5·1° C.

(c) BM(NH) 1981.6.16.2. Mature female, 486 mm T.L. 'Discovery' Collection Stn. no. 51022 ('Challenger' Cruise 7/81, haul no. 22). Date: 9 May, 1981. Gear: OTSB 14. Sounding: 1575–1600 m (1587 m mid-depth). Locality: 49°33·0′N, 12°38·8′W, Porcupine Sea-Bight. Bottom substrate: unknown. Bottom temperature: 3·9–4·0° C.

(d) Muséum National d'Histoire Naturelle, Paris, collection number 1981.613. Mature female 412 mm T.L. 'Thalassa' Stn. Z453. Date: 28 October, 1973. Gear: Beam trawl. Sounding: 1975–2070 m. Locality: 48°34·0′N, 10°51·6′W, Wittard Canyon, north of Bay of Biscay, eastern North Atlantic. Bottom substrate: soft mud with some stones.

(e) Museu Bocage, Lisbon, collection number T. 2531. Gravid female, 532 mm T.L. 'Discovery' Collection Stn. no. 50519 ('Challenger' Cruise 8/79, haul no. 19). Date: 8 June, 1979. Gear: OTSB 14. Sounding: 1465–1431 m (1448 m mid-depth). Locality: 49°29·5′N, 12°48·9′W, Porcupine Sea-Bight. Bottom substrate: unknown. Bottom temperature: 6·2–6·4° C.

(f) MB T. 2532. Mature male, 455 mm T.L. 'Discovery' Collection Stn. no. 50509 ('Challenger' Cruise 8/79, haul no. 9). Date: 3 June, 1979. Gear: OTSB 14. Sounding: 1490–1523 m (1506 m mid-depth). Locality: 51°14·7′N, 13°16·3′W, Porcupine Sea-Bight. Bottom substrate: unknown.

(g) Institut für Seefischerei, Hamburg (ISH) collection number 89/81. Adult 570 mm S.L. 'Walther Herwig' Stn. 608/81. Date: 13 October, 1981. Gear: 140BT. Sounding: 1500–1500 m. Locality: 56°35·1′N, 09°38·4′W, Hebridean Terrace, eastern North Atlantic. Bottom substrate: unknown. Bottom temperature: 4·8° C. (This specimen was identified on capture by one of us (N.R.M.) but, apart from vertebral number, detailed data are not included in the description.)

(h) 'Discovery' Collection uncatalogued. Mature male, 554 mm T.L. Stn. no. 51403 # 7 ('Challenger' cruise 5/82, haul no. 3 # 7). Date: 26 March, 1982. Gear: OTSB 14. Sounding: 1320–1247 m (1283 m mid-depth). Locality: 51°39·0′N, 12°58·8′W, Porcupine Sea-Bight. Bottom substrate: unknown. Bottom temperature: 6·2–6·6° C.

(i) 'Discovery' Collection uncatalogued. Mature male, 491 mm T.L. Stn. no. 51419 ('Challenger' cruise 5/82, haul no. 19). Date: 1 April, 1982. Gear: OTSB14. Sounding: 1500–1555 m (1527 m mid-depth). Locality: 51°16·9′N, 13°07·2′W, Porcupine Sea-Bight. Bottom substrate: unknown. Bottom temperature: 4·2–4·5° C.

(j) 'Discovery' Collection uncatalogued. Mature male, 510 mm T.L. Stn. no. 51419 ('Challenger cruise 5/82, haul no. 19). Details as above.

(k) 'Discovery' Collection uncatalogued. Mature male, 492 mm T.L. Stn. no. 51420 # 4 ('Challenger' cruise 5/82, haul no. 20 # 4). Date: 2 April, 1982. Gear: BN1.5. Sounding: 1320–1330 m (1325 m mid-depth). Locality: 51°37′N, 13°00′W, Porcupine Sea-Bight. Bottom substrate: soft pelagic sediment, densely strewn with the spherical hexactinellid sponge, *Pheronema* sp. (> 1 m^{-2}). Bottom temperature: 6·1° C.

DIAGNOSIS

Vertebrae—179–188. Origin of dorsal fin posterior to tip of pectoral fin, when laid back, by a distance equal to half or more than half of snout length. Gill slits oblique, inclined anteroventrally from pectoral base to ventral profile. Posterior nostril rounded and bordered anteriorly by a roughly triangular flap of sufficient size to close nostril. Lateral line long, extending close to tip of tail, approximately 87–95% S.L. Cephalic lateralis system bearing 5–6 pores on supraorbital canal, 7–8 on infraorbital and 10–11 on preoperculomandibular. Three pores present on supratemporal and 1 on supraorbital commissures.

DESCRIPTION OF HOLOTYPE

(Variations in paratypes given in parenthesis)

Body elongate and slender (Fig. 2 & cf. Table I), laterally compressed posteriorly; maximum depth anteriorly in trunk region, contained 21·8 (18·0–24·5) times in T.L., tapering gradually towards the caudal region. Trunk long, contained

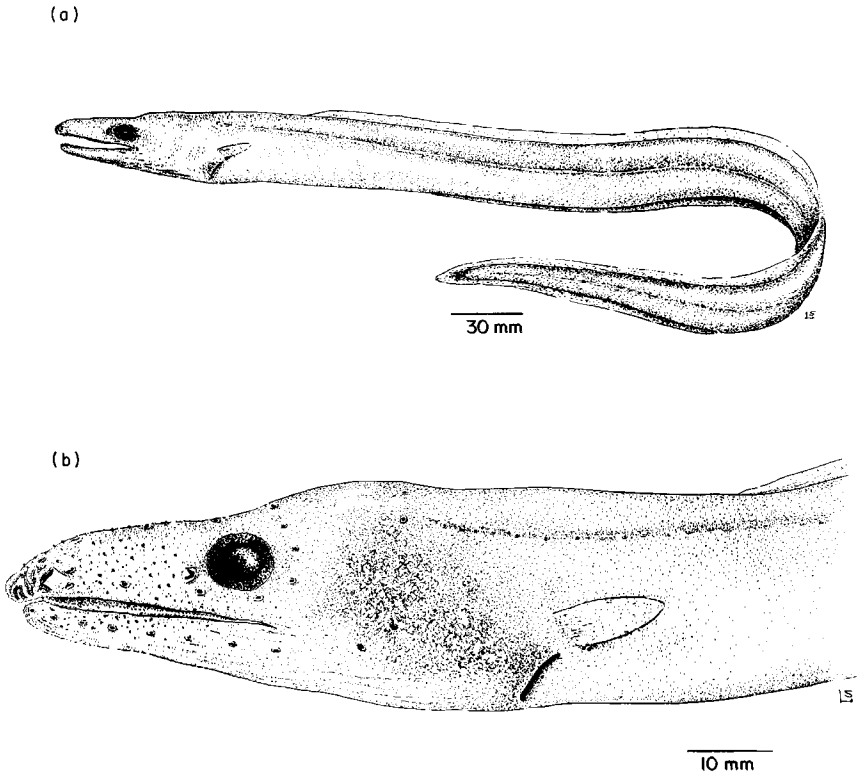

FIG. 2. ***Ilyophis blachei* sp. nov.** 524 mm T.L. male holotype, (a) lateral view, (b) enlargement of head.

6·2 (5·4–6·5) times in T.L., approximately 1·3 (1·2–1·6) times head length. Vent conspicuous, black, protruding slightly from ventral profile, inserted about one-third of body length from snout.

Head

Head differentiated from trunk, compressed and conical [Fig. 2(b)], contained some 2·3 (2·2–2·5) times in preanal length, snout projecting slightly beyond lower jaw, contained just over 2·5 (2·6–3·0) times in head length. Lips absent. Gape approximately horizontal, contained about twice in head length (measured from tip of lower jaw to bony commissure—Fig. 1); reaching level of posterior rim of orbit (or extending posteriorly by distance less than half eye diameter); cutaneous crease extends posteriorly by 0·7 (0·5–1·0) times eye diameter. Eye moderate in size, oval (or round) in shape and subcutaneous (not deeply so), contained 8·3 (7·9–9·8) times in head length and 3·6 (3·5–4·9) in mouth length. Snout tip ornate with fleshy plicae alternating with series of papillae, varying in number [Fig. 3(a)]. *Grosso modo* 2 median vertical symmetrical plicae separated by a central single smaller one; laterally a pair of horse-shoe shaped, concentrically arranged plicae, lie on either side of central complex; other less conspicuous ridges complete snout tip ornamentation; series of papillae on snout tip, single or double, some black, others colourless. Tip of lower jaw ornate with numerous vertical plicae [Fig. 3(b)], minutely papillated. These minute papillae distributed mainly

TABLE I. Body proportions of the holotype and overall ranges from the type series of ***Ilyophis blachei*** **sp. nov.** (cf. Fig. 1)

Body measurement	Percentage of total length		Percentage of preanal length		Percentage of head length	
	Holotype	Range	Holotype	Range	Holotype	Range
Standard length	98·1	97·4–98·7				
Head length	12·6	10·7–14·2				
Preorbital length (snout)					36·4	32·8–38·6
Postorbital length					51·5	47·7–57·8
Diameter of eye (horizontal)					12·1	10·2–12·7
Gill slit length					10·6	7·5–10·0
Prepectoral length	12·4	11·4–14·0	43·3	40·1–43·9		
Predorsal length	16·4	15·4–20·4	57·3	53·0–63·9		
Preanal length	28·6	26·7–31·9				
Preanal fin length	30·2	27·9–33·0				
Depth of body – gill slit level	4·6	3·6–5·3				
– midcaudal region	3·6	3·6–4·5				
– anus level	3·6	3·9–5·2				
– maximum	4·6	4·1–5·5				
Interorbital distance					12·1	11·4–17·3
Gape length					43·9	43·5–53·1
Distance between tip of pectoral and dorsal fin origin					13·6	15·7–29·0
Pectoral fin length					18·2	10·0–20·5

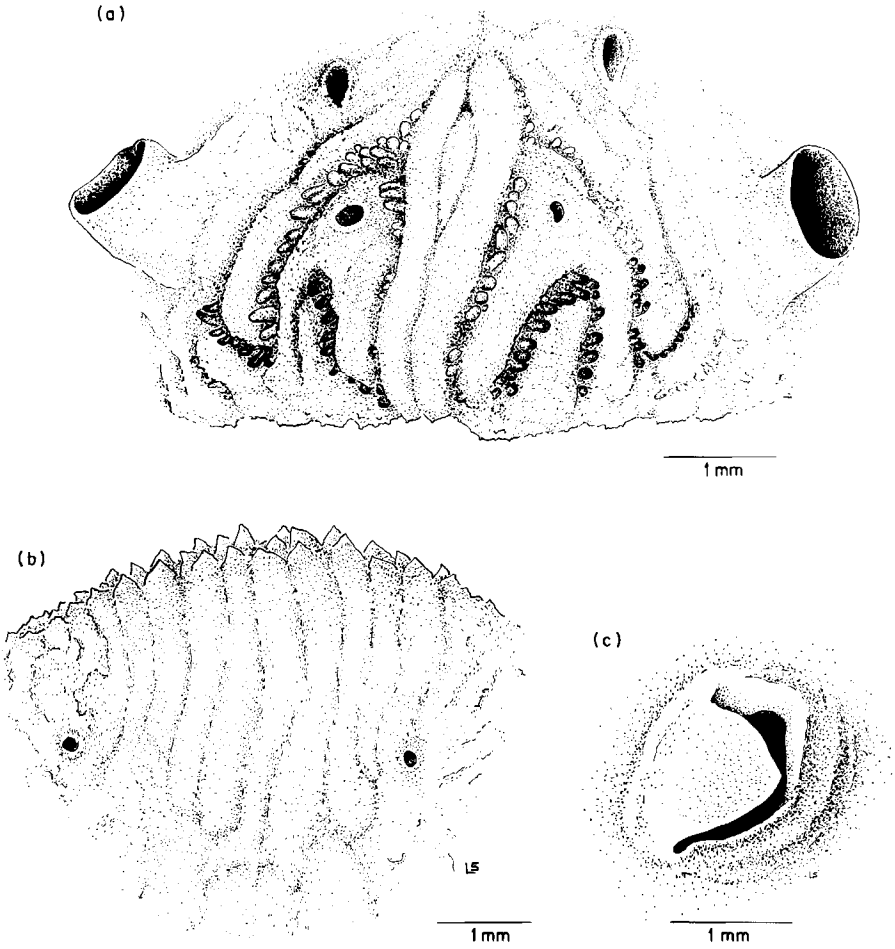

FIG. 3. *Ilyophis blachei* holotype (a) snout tip ornamentation, (b) jaw tip ornamentation, (c) posterior nostril.

dorsally and also present on snout tip, mouth and snout regions, again black or colourless. Anterior nostrils tubular and subterminal, adjacent to plicate and papillose region of snout tip, inserted at level of anterior maxillary teeth; tubules short and directed anterolaterally and dorsally. Posterior nostril roughly circular, close to eye and located on level with anterior nostril and ventral quarter of pupil; low fleshy rim borders dorsal, posterior and lateral edges, while enlarged triangular flap borders anterior edge capable of complete closure of aperture [Fig. 3(c)]; interspace between nostrils about 2 times eye diameter. Gill slits well separated, of moderate size and obliquely placed between pectoral base and ventral profile, anteriorly inclined from dorsal border, situated close to lower edge of pectoral insertion.

Dentition (described mainly from paratype (e))

Teeth caniniform, all simple and spearheaded, more or less acute depending

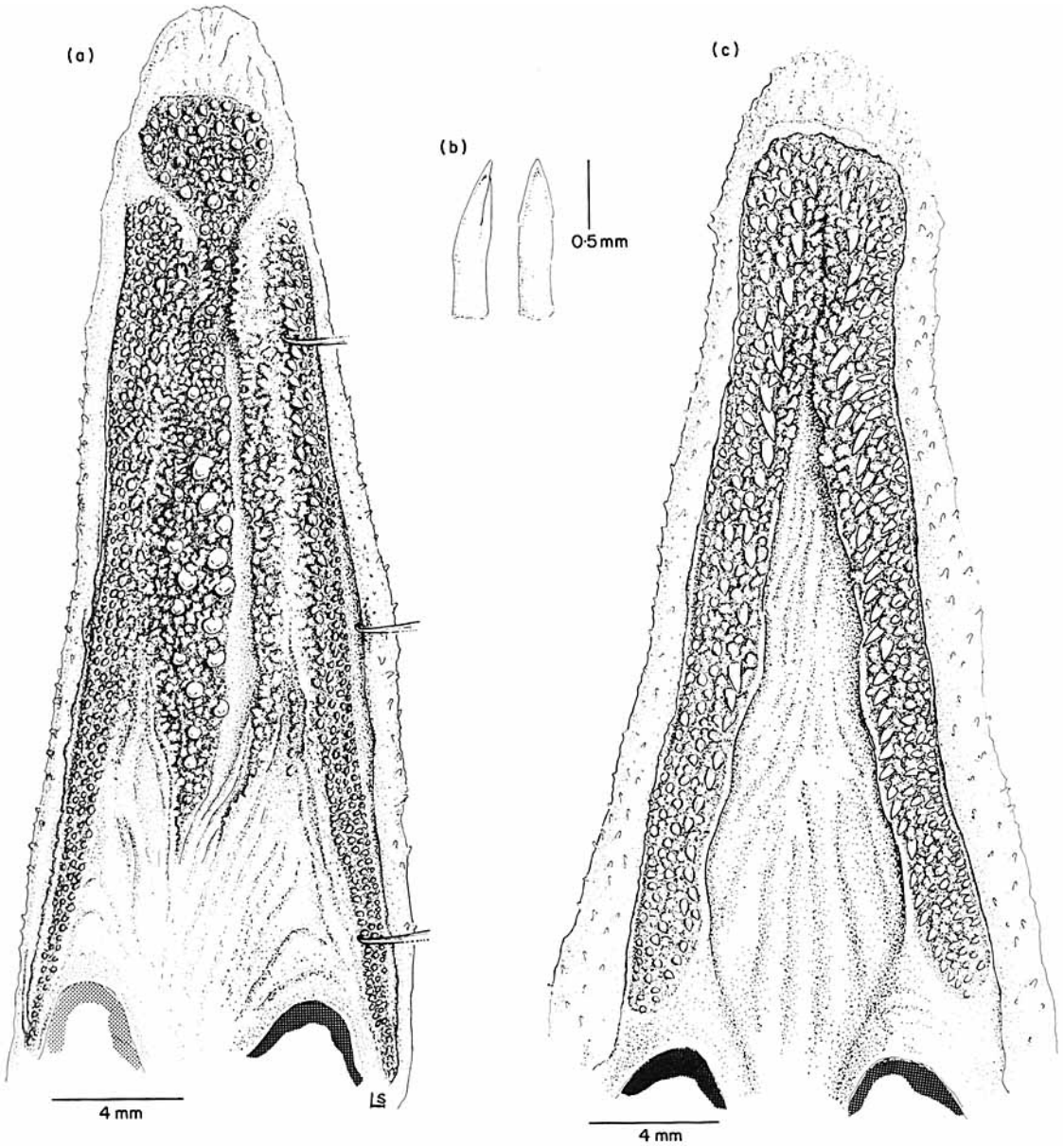

FIG. 4. *Ilyophis blachei* 532 mm T.L. female paratype (a) upper jaw dentition, (b) enlarged tooth: lateral and front views, (c) dentary dentition.

on location, slightly recurved and especially so on premaxillary–ethmoid pyriform patch where some 27 teeth occur (Fig. 4—paratype (e)). Vomer bears some 17–18 rows of teeth of which about 13–15 are biserial; bluntish and caniniform, most robust of all dentition. Maxillae generally with 3–4 rows of teeth, decreasing in size from inner to outer row and also anteroposteriorly; maxillary teeth separated from premaxillary–ethmoid patch by small edentate gap. Dentary

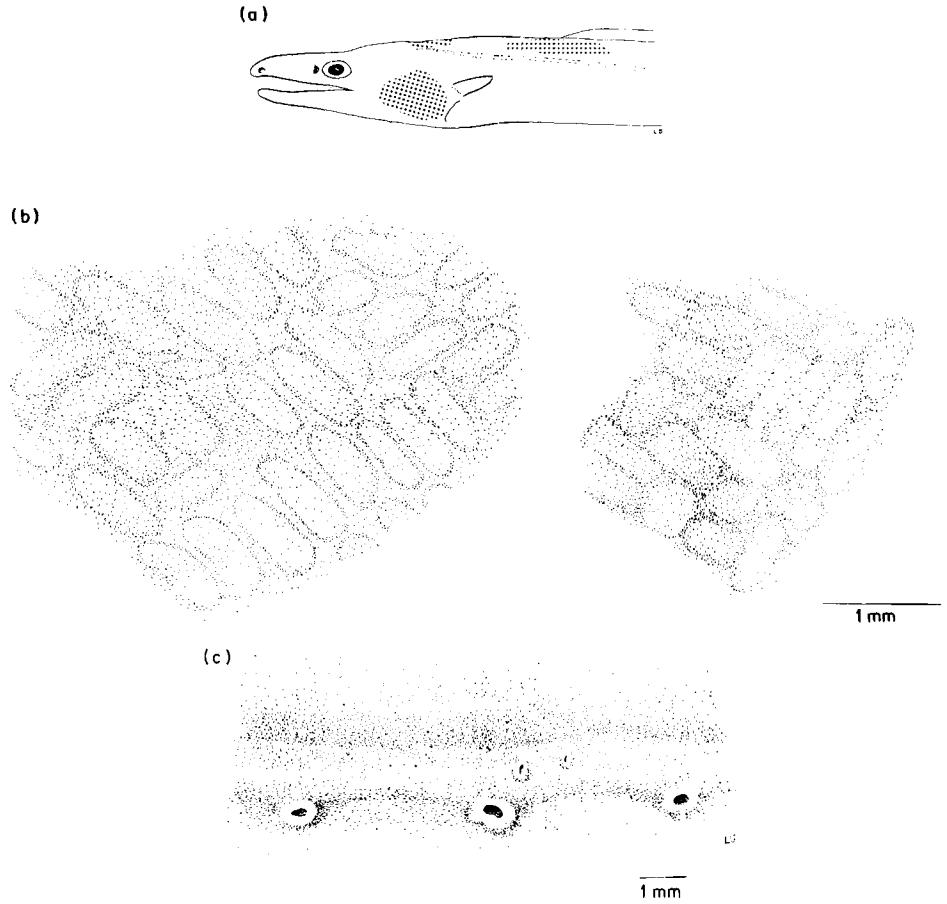

FIG. 5. *Ilyophis blachei* (a) diagram of overall pattern of squamation found in the type series, (b) examples of basket-weave pattern of squamation, (c) 772 mm T.L. female paratype, lateral line pores.

teeth in general irregularly arranged in 3 rows, decreasing in size antero-posteriorly and from inner to outer rows as in maxillary series; both these series smaller than premaxillary-ethmoid and vomerine dentition. All teeth surrounded by numerous, variable sized papillae, often of similar size to teeth or larger, especially so on vomer. Lateral to vomerine dentition is a cutaneous fold bearing large numbers of papillae, variable in size and shape, often bi- or trifid.

Squamation

Scales present (present also in paratypes (b) and (f), absent in paratypes (a), (c)–(e) and (g)–(k)) on anterior dorsal region of trunk and extending to small area between dorsal fin and lateral line, present at end of caudal region over lateral line on right hand side and under lateral line on left hand side, present at beginning of caudal region under lateral line on right hand side, present on posterior dorsal and lateral region of head mainly between level of horizontal diameter of

eye and throat [Fig. 5(a)] generally elongate in shape arranged in basket-weave pattern [Fig. 5(b)] (in paratype (b) there are few scales on right side of head; in paratype (f) there are scales in different regions of head and caudal region).

Lateralis system

Conspicuous portion of lateral line extending 90% S.L. (87–95%) along trunk and caudal region, an inconspicuous portion extends to end of caudal region; first pore of lateral line (generally) separated from remainder of series by a greater interspace than those posteriorly and (sometimes) on a higher level; 7 (4–7) lateral pores anterior to dorsal origin of pectoral fin and 43 (41–47) anterior to vent; in all type specimens minor subsidiary openings may occur in association with both pores and lateral line canal itself [Fig. 5(c)—paratype (a)]. Cephalic pores numerous [cf. Fig. 2(b)]; 6 (5–6) in supraorbital canal, 1st—anterior—placed on tip of snout over lateral plica (sometimes missing), 2nd over region anterior to anterior nostril, 3rd posterior to this nostril, 4th at midpoint between anterior nostril and eye, 5th dorsal to anterior quarter (or edge of eye), 6th dorsal to posterior edge of eye (or slightly behind it), dorsal to 6th pore of each series there is a supraorbital commissure bearing a single, sagittally placed pore; 8 (7–8) pores in infraorbital canal, 1st—anterior—is smallest and located ventral to posterior half of base of anterior nostril, dorsal to this is vertical branch of canal with single pore at posterodorsal base of anterior nostril, 2nd ventral to approximate mid-interspace between 3rd and 4th supraorbital pores, 3rd infraorbital pore occurs ventral to midpoint between posterior nostril and eye, 4th located at level of posterior half of eye diameter, 5th, 6th and 7th ascend in an arc posterior to eye, 5th level with inferior edge of eye, 6th at midpoint of vertical diameter and 7th slightly dorsal to dorsal edge of eye, below 6th supraorbital pore, 10 (10–11) pores in preopercu-lomandibular series, 8 (8–9) on mandibular branch of canal and 2 on preopercular branch, 1st pore—anterior—located in plicate region of jaw tip, subsequent pores distributed along jaw at intervals increasing slightly posteriorly, the 8th (and/or 9th) is placed ventral to posterior extremity of cutaneous crease of gape (number of mandibular pores variable even within individual, i.e. 8 on right hand side and 9 on left hand side), 2 preopercular pores separated from mandibular series by distance (generally) nearly equal to 1·5 times last two pores, interspace in mandibular series, located obliquely so that 1st is at level of mandibular series and 2nd at level of gape (a pore is sometimes placed between the two preopercular pores and lateral line: paratype (a)—on left hand side, on right hand side there is a double pore; paratype (c)—on right hand side only); supratemporal commissure of 3 (2) pores, one sagittally placed (if present) with 2 laterally located, each roughly midway between lateral line and mid-dorsal pore.

Fins

Dorsal and anal fins continuous with caudal. Height of dorsal moderate, increasing posteriorly, contained 9 times in body depth at level of vent and 4 times at mid-caudal region; dorsal origin well posterior to tip of pectoral fin when laid back, by distance corresponding to about half snout length. Height of anal fin greater than dorsal, contained slightly more than 3 times in body depth at mid-caudal region; origin of fin just posterior to vent. Pectoral moderate in size, with 15 (16–17) rays, tapering gently from base to tip.

Coloration

Fresh coloration observed on paratype (b) was metallic bronze with a reflective sheen dorsally. Isopropanol-preserved specimens irregularly brownish and creamish overall, with belly region either darker or paler than remaining parts of body but perianal ring always dark brown. Fins and lateral line pores whitish. Inside of mouth whitish on upper jaw and blackish on lower jaw, between dentary teeth. Peritoneum black.

Osteology

The general outline of the skull conforms to the generic pattern of *Ilyophis*. The suspensorium is almost vertical. (A more detailed osteological study is currently in preparation.)

Gonads

Such evidence that the type series provides (from 6♂ and 5♀) suggests that spawning occurs in June or July. Ovarian maturation was found to be close to completion in both females caught in June, while less advanced, but developing stages were found in those caught in May. Both sexes were apparently in a resting stage of gonad maturity in March and October.

Etymology

We dedicate this new species to our good friend, Jacques Blache, the French ichthyologist who has made such valuable contributions to anguilliform taxonomy.

DISTRIBUTION AND ECOLOGY

The distribution of *I. blachei* is known only from the type series and is restricted to the Hebridean Terrace, Porcupine Sea-Bight and Wittard Canyon areas of the slope region of the eastern North Atlantic (Fig. 6). The bathymetric range is 1247–2070 m and the species has been collected over a variety of bottom substrates. *In situ* temperature measurements, acoustically telemetered to the ship, during the course of 7 hauls (1283–1789 m mid-depth soundings) in which *I. blachei* was collected in the Porcupine Sea-Bight, gave a temperature range of 6·6–3·8° C. From other *in situ* temperature measurements taken while trawling in the Porcupine Sea-Bight (IOS, unpubl. data) the likely temperature range over the complete sounding distribution of *I. blachei* is 7·0–3·3° C.

On only one occasion has *I. blachei* occurred more than singly in a catch. In the Porcupine Sea-Bight, however, it is distributed in a zone of relatively high species diversity and biomass (IOS, unpubl. data). It was collected in OTSB14 samples containing 17–23 species and total (wet weight) fish biomass of 1·1–2·8 g m^{-2}. In all (8 samples), it occurred in company with 44 species, although characteristic of the sounding range (present in 7 or all of the tows, with mean relative catch densities per 1000 m^2 swept by the trawl in parenthesis) were: *Synaphobranchus kaupi* Johnson, 1862 (9·22), *Coryphaenoides (Coryphaenoides) rupestris* Gunnerus, 1765 (0·96), *C. (Coryphaenoides) guentheri* (Vaillant, 1888) (0·63), *Trachyrincus murrayi* Günther, 1887 (0·37), *Antimora rostrata* Günther, 1878 (0·36), *Polyacanthonotus (Polyacanthonotus) rissoanus* (De Filippi &

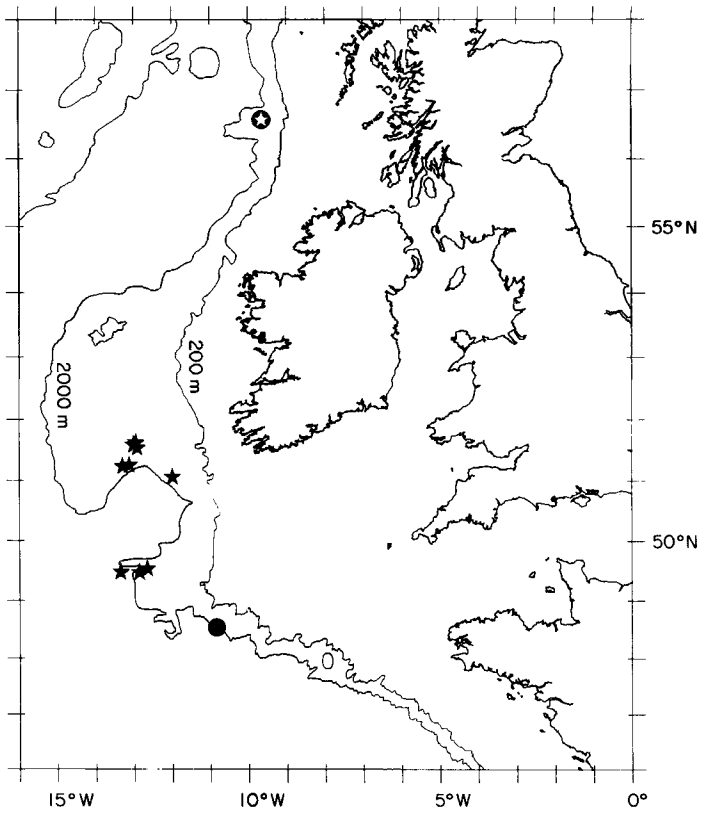

FIG. 6. Chart indicating the locality of capture of *Ilyophis blachei*. (★— 'Discovery' material; ●— 'Thalassa' specimen; ✪— 'Walther Herwig' specimen.)

Vérany, 1859) (0·32), *Coelorinchus occa* (Goode & Bean, 1885) (0·28), *Coryphaenoides (Chalinura) mediterranea* (Giglioli, 1893) (0·27), *Bathypterois (Bathypterois) dubius* Vaillant, 1888 (0·23) and *Notacanthus bonapartei* Risso, 1840 (0·06).

Synaphobranchus kaupi, confamilial with *I. blachei*, predominates, not only in these catches, but also over its entire sounding range (407–2420 m) in the Porcupine Sea-Bight (IOS, unpubl. data). Of particular note is the co-occurrence of one specimen each of both known congeners of *I. blachei*, *I. brunneus* Gilbert, 1892 and *I. arx* Robins, 1976, in the samples collected from 1533 m and 1789 m mid-depth, respectively. This is only the fifth reported specimen of *I. arx* (237 mm T.L., 132 vertebrae) and the first from the Atlantic Ocean.

The carnivorous feeding habits of *I. blachei* were demonstrated by the presence of two specimens (10 and 14 mm respectively) of a small benthic galatheid crustacean in the stomach of the holotype and paratype (d), and remains of a juvenile male *Geryon tridens* Krøyer, 1837 (h), a crab, probably *G. tridens*, (k), an unidentifiable decapod (i) and two unidentifiable gastropods (j). The stomachs of the other paratypes were empty or contained unidentifiable material. Such as it is, this evidence indicates a benthic feeding pattern. It contrasts with the benthopelagic

diet of *S. kaupi* (Marshall & Merrett, 1977; Saldanha, 1980; IOS, unpubl. data) and reduces competitive exclusion by this highly successful predator. The benthic nature of the feeding pattern of *I. blachei* is reinforced, on the one hand, by copious amounts of sand in the intestines, which may well be swallowed if the animal is feeding on the bottom on burrowing animals like gastropods and some galatheids. On the other hand, at least one specimen (k) is known to have been collected close to the bottom (<60 cm above), in the mouth closing BN1.5.

IV. DISCUSSION

Preliminary investigation suggested that our specimens while closely related to *Ilyophis,* did not fully fit the diagnosis of the genus given by Robins & Robins (1976). Nevertheless, careful examination proved that they were so close to *Ilyophis* that minor extension of this diagnosis would incorporate them. Such an extension is considered justifiable, in preference to erecting a new genus on the basis of rather trivial characters.

The proportions of the mouth and trunk, together with the nearly vertical angle of the suspensorium are consistent with the diagnosis of *Ilyophis* given by Robins & Robins (1976). Castle (1964) emphasized the value of these characters, 'the length of the abdomen and length of mouth, indicate rather gross anatomical differences (the length of the body cavity and the angle of the hyomandibula respectively) which can be of generic diagnostic value'. Except for the oblique position of the gill slits and the posterior origin of the dorsal fin relative to the tip of the pectoral fin, the number of cephalic lateral line pores, the posterior nostrils bearing flaps and the number of vertebrae (to which we attribute specific value) all other characters vary little from the general *Ilyophis* pattern.

Accordingly, we propose the following diagnosis of the genus *Ilyophis* modified from Robins & Robins (1976). Dysommine eels with scales present or absent. Dorsal fin over or posterior to tip of small pectoral fin by distance slightly more than one eye diameter. Anus *c.* 1·25–2·0 head lengths posterior to gill slits. Anal fin origin separated from rim of flesh surrounding anus by small space. Caudal fin continuous with dorsal and anal fins. Pectoral fins broad-based, small not attenuate. Gill slits crescentic, small and separate, originating from ventral region and inserted horizontally or obliquely. Eyes large, subcutaneous, but not deeply so. Gape moderately long; cutaneous crease reaching posterior edge of eye to slightly less than one eye diameter posterior to it. Lateral line canal on body short (anterior half of body only) or long (nearly entire body length, to within few millimetres of caudal fin). Five to seven infraorbital, 3–7 supraorbital and 7–11 pores in preoperculomandibular canal of cephalic lateralis system. Supratemporal (2–3 pores) and supraorbital (1 pore) commissures present or absent. A patch of caniniform teeth on premaxillary ethmoid complex, followed by irregularly biserial group on vomer. Smaller uniserial teeth on posterior region of vomer. Teeth surrounded by large conspicuous papillae, as large as teeth themselves. Anteriorly, on maxilla and dentary an inner row of enlarged caniniform teeth. Laterally and posteriorly, teeth biserial or triserial, small decreasing in size posteriorly. No teeth compound.

Anterior nostril opening through a short, anterolaterally directed tubule placed far forward on snout (about level of premaxillary–ethmoid tooth patch). Non-

tubular posterior nostril located just before lower half of eye. Both nostrils distinctly paler than surrounding skin. Vertebrae: 131–188.

As for particular osteological features, these cannot be confirmed until the study in preparation is complete. Such evidence as we have is based entirely on radiography.

The relationships within the revised family Synaphobranchidae were proposed by Robins & Robins (1976) on the basis of the absence of definitive boundaries among the former families Dysommidae, Dysomminidae, Nettodaridae, Ilyophidae, Simenchelyidae and Synaphobranchidae. Sufficiently trenchant characters existed, however, for the revised family to be subdivided into the subfamilies Simenchelyinae, Synaphobranchinae and Dysomminae. It is recognized that, while in general the Synaphobranchinae and Dysomminae are separable as groups, characters exist in some species and genera of one subfamily which coincide with those of some members of the other (Robins & Robins, 1976). A further example is provided by the present case; the characters of *I. brunneus* and *I. arx* largely associate the genus with the Dysomminae, but with the addition of *I. blachei* the relationships become confused. Hence, the species of *Ilyophis* display a series of characters which now stress the transitional position of the genus between the Synaphobranchinae and the Dysomminae.

Synaphobranchine characters of *I. blachei* are the well developed lateral line system, the relatively posterior insertion of the anal fin and the compressed form of the head. On the other hand, the development of oral papillae, rostral ridges and rostral papillae are characteristic of the Dysomminae. The dentition of *I. blachei* is evidently itself transitional between the two subfamilies. Similarly, the variable positioning of the gill slits within the genus indicate an intermediate situation; gill slits which are ventral and more or less horizontal (*I. brunneus* and *I. arx*) suggest an affinity with the Synaphobranchinae while those obliquely set (*I. blachei*) are nearer the general dysommine situation. Again, in squamation, the scaled *I. brunneus* represents a synaphobranchine character. In contrast to the specimens of *I. arx* described by Robins & Robins (1976) which were naked, the specimen caught in the Porcupine Sea-Bight bears scales all along its body (see p. 633). The variable extent of squamation on *I. arx* and *I. blachei*, therefore, suggests an intermediate situation.

On balance, the current evidence indicates that the genus *Ilyophis*, composed of *I. brunneus, I. arx* and *I. blachei*, can be more closely associated with the Dysomminae. Nevertheless, this same evidence questions the discreteness of the Synaphobranchinae and Dysomminae as subfamilies. Clarification of the validity of these taxonomic categories awaits the discovery of additional species whose existence has already been forecast (Robins & Robins, 1976—see p. 623 above).

We are indebted to L. Cabioch (Station Biologique de Roscoff—France) for having sent us a collection of fishes caught by the 'Thalassa' among which was a specimen of *I. blachei*. M. Stehmann (I.S.H.) kindly provided the capture data and X-radiograph of paratype (g). Our gratitude is also due to Catherine H. Robins (University of Miami – U.S.A.), J. Badcock and P. M. David (I.O.S.) for their critical reading of the manuscript. The X-radiographs upon which meristic counts were based were made by Mrs R. A. Russell (I.O.S.).

References

Aldred, R. G., Thurston, M. H., Rice, A. L. & Morley, D. R. (1976). An acoustically monitored opening and closing epibenthic sledge. *Deep-Sea Res.* **23**, 167–174.

Castle, P. H. J. (1960). Two eels of the genus *Synaphobranchus* from the Gulf of Mexico. *Fieldiana, Zool.* **39**, 387–398.

Castle, P. H. J. (1964). Deep-sea eels: Family Synaphobranchidae. *Galathea Rep.* **7**, 29–42.

Castle, P. H. J. (1975). Osteology and relationships of the eel *Diastobranchus capensis* (Pisces, Synaphobranchidae). *Pac. Sci.* **29**, 159–163.

Marshall, N. B. & Merrett, N. R. (1977). The existence of a benthopelagic fauna in the deep-sea. In: *A Voyage of Discovery. George Deacon 70th Anniversary Volume* (M. V. Angel, ed.), pp. 483–497. Supplement to *Deep-Sea Res.* **24.**

Merrett, N. R. & Marshall, N. B. (1981). Observations on the ecology of deep-sea bottom-living fishes collected off northwest Africa (08°–27°N). *Prog. Oceanogr.* **9**, 185–244.

Robins, C. H. (1971). The comparative morphology of the synaphobranchid eels of the Straits of Florida. *Proc. Acad. nat. Sci. Philad.* **123**, 153–204.

Robins, C. H. & Robins, C. R. (1970). The eel family Dysommidae (including the Dysomminidae and Nettodaridae), its osteology and composition, including a new genus and species. *Proc. Acad. nat. Sci. Philad.* **122**, 293–335.

Robins, C. H. & Robins, C. R. (1976). New genera and species of dysommine and synaphobranchine eels (Synaphobranchidae) with an analysis of the Dysomminae. *Proc. Acad. nat. Sci. Philad.* **127**, 249–280.

Saldanha, L. (1980). Régime alimentaire de *Synaphobranchus kaupi* Johnston, 1862 (Pisces Synaphobranchidae) au large des côtes européennes. *Cybium, 3^e ser.* **8**, 91–98.