Discovery of *Kryptophanaron alfredi* (Pisces: Anomalopidae) at San Salvador, Bahamas, with notes on anomalopid light organs

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Resumen: Se informa de la presencia por primera vez en las Bahamas del Pez Linterna del Caribe. Probablemente se le encuentre en este mar con más frecuencia si se le busca sistemáticamente. Se discute la coloración de los ejemplares juveniles y la relación que existe entre el órgano luminoso y el crecimiento del cuerpo.

Four specimens of the Caribbean Flashlight Fish, *Kryptophanaron alfredi* Sylvester and Fowler 1926, were recently collected at San Salvador, Bahama Islands. The discovery of this anomalopid at the Bahamas, as well as information concerning its behavior, juvenile pigmentation and growth, has prompted this report.

The secretive and nocturnally active behavior of anomalopids has severely limited the knowledge about this group of fishes. *Kryptophanaron alfredi* was known from a single specimen since its discovery in Jamaica in 1907 until its rediscovery at Grand Cayman, Curaçao, and Puerto Rico in 1977 (Rosenblatt and Montgomery, 1976; McCosker, 1977; Colin *et al.*, 1979). Despite the intensive ichthyological surveys of the Bahama Islands undertaken by J. Böhlke, C. Chaplin, and numerous other scuba-diving ichthyologists, *K. alfredi* was unknown there, presumably because anomalopids are only encountered as a result of extraordinary diving conditions.

The Bahaman specimens (CAS 45763) were collected by the author and Jerry Schively, Hugh Downs, and Sylvia Earle at Fernandez Bay, along the west coast of San Salvador Island on 20 April 1980 between 2300 and 2400 hrs. The moon was entering the first quarter; however, the late afternoon and night sky was overcast with heavy cloud cover and occasional lightning flashes. The narrow sand, coral and rock reef encircling San Salvador is about 1 km wide at the capture site, dropping off rapidly from a 15 m ledge into several hundred meters depth. The dropoff is occasionally cut by narrow rock-walled crevices and sand channels. Divers first observed *Kryptophanaron* below the dropoff at about 20 m, and collected small fish using bright Scubapro dive lights which stunned the fish at close range. (It is important to note that because of the fish's sensitivity to light, it is imperative that divers avoid turning on their lights except to stun and capture specimens.) The lights of *Kryptophanaron* were difficult to differentiate from the ubiquitous bioluminescent plankton (presumably salps, siphonophores, and pyrosomes); however, upon careful examination the fish could be discerned by their occasional blinking behavior. All fishes seen were alone. The largest individual (63 mm SL) was captured at 40 m depth along the edge of a vertical reef channel; the smaller specimens (25.0, 33.0, 45.6 mm SL) were captured at the reef dropoff (20-25 m) or along the edge immediately above it. Prior to capture, all fish were observed a meter or less above the bottom, swimming slowly and occasionally blinking, in the food-search behavior typical of anomalopids.

The coloration of the smallest individual is of particular interest. The 25 mm specimen is less pigmented than the slightly larger individuals and adults (compare Figs. 1 and 2). When captured on the reef, its nearly

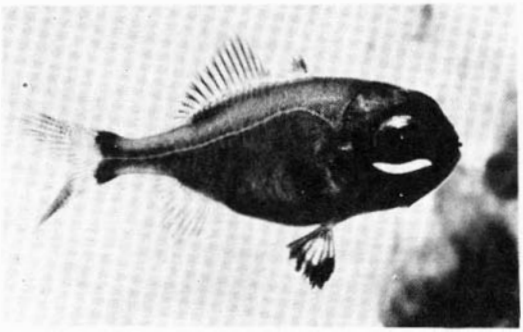

Fig. 1. Juvenile *Kryptophanaron alfredi*, 25.0 mm SL, alive in Steinhart Aquarium seven days after capture. Note the unpigmented portions of the fins and body. The light organ is partially occluded through partial ventrolateral rotation and the uplift of the opaque membrane.

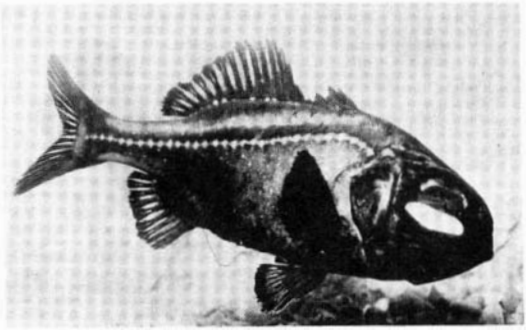

Fig. 2. Adult *Kryptophanaron alfredi*, 89 mm SL. Note the difference in pigmentation and the development of the lateral line scales and reflective scales along the median fin bases.

transparent hind body (particularly the caudal peduncle) gave it the appearance of a cardinal fish. Other transparent areas include the segmented dorsal fin and the central portions of the caudal and pelvic fins. The reflective scale band which lies along the dorsal-fin base of adults was limited to two pairs of shiny scales. The lateral-line scales and ventral scutes were not noticeably reflective, unlike the condition of adults. The 25 mm specimen lived in an aquarium for 10 days after capture, during which the caudal area but not the fins became darkened much like that of an adult. Its small size and translucent properties would indicate that it had recently settled from the plankton and onto the reef. (It is the smallest specimen of any anomalopid I have observed in museum collections or found reported in the literature.) The larval condition and habitus of anomalopids is unknown. It seems most likely that anomalopid larvae are pelagic for a limited duration, in a manner similar to other beryciforms.

The relatively large size of the light organ of the small specimen was immediately apparent. The organ is disproportionately large in smaller specimens (Table 1), a characteristic of obvious advantage to a small, nocturnally-active reef fish that depends on the light it produces to observe its prey (McCosker, 1977). Measurements taken by Colin *et al.* (1979, Table 1) from seven *Kryptophanaron* specimens (58-105.6 mm SL) demonstrate the same allometric relationship of light organ length and light organ depth to the standard length (those data were not included with mine because of

TABLE 1

Light Organ Length (LOL) of Kryptophanaron alfredi *expressed as a proportion of the Standard Length (SL), Head Length (HL), and Orbit Length (OL). Based upon CAS 40798, Grand Cayman (GC); CAS 45872, Puerto Rico (PR); and CAS 45873, San Salvador, Bahamas (SS)*

SL(mm)	LOL/SL	LOL/HL	LOL/OL	Locality
25.0	.184	.447	.885	SS
45.6	.145	.363	.846	SS
60.0	.137	.373	.812	GC
68.5	.131	.341	.857	GC
83.5	.123	.352	.861	PR
89.0	.121	.349	.874	PR

possible inconsistencies in our methodology). It should be noted that the relationship of eye size to light organ length follows a normal pattern of negative allometry in that it is obviously advantageous to this nocturnal fish to maximize its eye size throughout life. A similar comparison was made of the allometric growth of the light organ of another anomalopid, *Photoblepharon palpebratus;* the data indicated a similar, but less significant, trend.

The discovery of this presumably newly settled, partially pigmented juvenile with large, luminescent organs raises intriguing questions and suggests further study. In particular, are the light organs luminescent when the juvenile *Kryptophanaron* is in its (presumably) planktonic larval state? Further diving observations using the methodology described herein, as well as nearshore springtime plankton collections, should further enlighten the students of this curious group of luminous fishes.

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p.85 En la clave se omitió todo el punto 3.b. Debe leerse:

3.a. Perfil ventral casi recto; altura de la cabeza por el punto medio del ojo 1.8 a 1.9 en la longitud de la cabeza; tercera espina anal deflecionada no llega al extremo posterior de la base de la aleta anal, branquiespinas 11-13.....*P. elongatus*

3.b. Perfil ventral convexo; altura de la cabeza por el punto medio del ojo 1.6 a 1.7 en la longitud de la cabeza; tercera espina anal deflecionada llega o pasa el extremo posterior de la base de la aleta anal; branquiespinas 10-13.....*P. leuciscus.*

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pp. 296 y 297. Las leyendas de las figuras 1 y 2 están invertidas con las de las figuras 3 y 4.