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Short Communication

Sea fishes spawning pelagic eggs in the St Lucia estuary

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During September 1993, after the St Lucia estuary had been closed to the sea for about nine months, two samples of live plankton were collected at the mouth inside the closed estuary. Fish eggs from these samples were hatched and identified by the characteristics of the eggs and early larvae. *Pomadasys commersonnii* and *Crenidens crenidens* were reared to confirm identification. Eggs of nine species were found and all but one were identified to at least genus level. The unidentified egg was probably that of a clupeiform, and the most common egg was the spotted grunter *Pomadasys commersonnii*. Subsequent sampling in the Charters Creek area in 1994 confirmed that five of the species also spawn in the main lake, while a further species was added to the list of marine fishes that will spawn in St Lucia given favourable conditions.

St Lucia is the largest estuarine system on the east coast of South Africa and as such is an important nursery area for the juveniles of many marine and estuarine fishes. This role has been emphasized by many researchers, including Wallace & van der Elst (1975); Wallace, Kok, Beckley, Blaber & Whitfield (1984); Cyrus & Blaber (1987).

A second factor in the importance of estuaries to a number of fishes, is whether they breed exclusively or opportunistically in estuaries. Whitfield (1994) lists nine species that he regards as breeding exclusively in estuaries, and another eleven that probably fall into the same category. All except *Gilchristella* and *Ambassis*, do not have pelagic eggs.

During late December 1992, St Lucia mouth became closed off from the sea. As a result of evaporative losses and very low rainfall the water level in the lakes fell, and the system become more saline. In late September 1993, the mouth was opened artificially, but before this occurred, the opportunity was taken to collect plankton samples near the mouth in the enclosed estuary.

On 23 September, and again on 29 September 1993, a 200 µm mesh aperture plankton net was hauled at the surface in the St Lucia estuary (28°23'20"S, 32°24'45"E), within about 500 m of the sandbar closing the mouth. Each sample was placed in a 25-l bucket of estuarine water for transport to Durban, a distance of some 360 km. The live eggs were picked out of the sample with the aid of a dissecting microscope, and separated into species from discernable differences in the eggs and the developing embryos. Further samples were subsequently (March to October 1994) collected in the Charters Creek area (28°12'30"S, 32°25'30"E) with a 40 cm diameter net of 200 µm mesh, buoyed to float at the surface during towing.

Eggs were hatched and the larvae examined to further aid or confirm identification. The most important features of the egg include:-

- presence or absence of an oil globule,
- size and shape of the egg and oil globule,
- whether the yolk is segmented or clear,
- chromatophore patterns and colours in the developing larva.

Important features of the early larva include:

- position of the oil globule in the yolk sac,
- myomere count and gut length relative to body length,
- chromatophore patterns and colours (which spoil within seconds of a larva dying).

Rearing was attempted in an effort to confirm identification of the eggs after careful separation into different species. The newly hatched larvae were placed in 50 l rectangular tank of seawater, to which an algal culture (*Chlorella*) was added at a density that made the water green. The rotifer *Brachionus plicatilis* was added as food for the larvae. Using yeast and cod liver oil as additional supplements for the rotifer, the author has succeeded in rearing over 40 species of marine fishes.

Nine species of pelagic fish eggs were encountered in the September 1993 samples, as shown in Table 1.

Gilchristella aestuaria (Family Clupeidae)

This egg measured 960–1080 µm in diameter with a small perivitelline space; some appeared slightly oval. There was no oil globule and the yolk was segmented. It has subsequently been reared and identified as *Gilchristella* from eggs collected at the mouth of Durban harbour (A.D. Connell pers. obs.). It is clearly different from the egg described by Gilchrist (1914) and suggested by Brownell (1979) as probably referrable to this species. Although Wooldridge & Bailey (1982) reported vast numbers of *Gilchristella* eggs in their samples from the Sundays estuary, the samples were not available for examination (T. Wooldridge pers. comm.). Wooldridge *et al.* collected most of their eggs in bottom samples, but in this study sampling was confined to the surface waters both in Durban Bay and in St Lucia estuary. In hatching these eggs in the laboratory they remained buoyant. The lower salinities of the upper Sundays estuary would have

Table 1 Species and numbers of eggs from the two plankton samples from St Lucia estuary mouth during September 1993

Species	Sample date	
	93.09.23	93.09.29
Gilchristella aestuaria	2	33
Unidentified clupeiform	2	3
Stolephorus holodon	–	181
Ambassis sp.	–	50
Pomadasys commersonnii	–	461
Sillago sihama	1	142
Crenidens crenidens	–	7
?Liza macrolepis	–	2
Solea bleekeri	–	10

contributed to their lack of buoyancy in that estuary.

Unidentified clupeiform

This egg measured 840 µm with a wide perivitelline space (130 µm) and 2–4 small oil globules. The yolk was indistinctly segmented. This was the only egg from the St Lucia samples that the author has not yet collected at the mouth of Durban harbour.

Stolephorus holodon (Family Engraulidae)

Stolephorus eggs were easily identified as they were oval, measuring 1295 × 700 mm and had a single light amber oil globule of 190 mm. As in all engraulids the yolk was finely segmented. The oil globule was posteriorly located in newly hatched larvae.Of the three *Stolephorus* in our area (Smith & Heemstra 1986), the egg of *S. indicus* has no oil globule and a knob on one end (Delsman 1931), while *S. punctifer* (= *zolingeri* of Delsman 1931 according to McGowan & Berry 1983) has an oval egg with no oil globule. In addition *S. holodon* is the only *Stolephorus* recorded from St Lucia (van der Elst, Wallace & Blaber 1976). This egg was also found in small numbers in the hauls from Charters Creek (Table 2), at salinities ranging from 25,4 to 33‰.

Ambassis sp. (Family Ambassidae)

The eggs of this species were small at 625–720 µm diameter with a single, relatively large oil globule (190 µm) and a clear, unsegmented yolk. Dense stellate yellow chromatophores clustered on the head, nape, anus and midtail of the larva, as well as on the oil globule, with some extending onto the yolk next to the oil globule (Figure 1A). The newly hatched larva had the oil globule in the anterior position in the yolk sac (Figure 1B). On a white background the egg was characterized by dark chromatophore patches on the eyes and anus of the developing larva. Leiognathids have a similar egg and early larva but the very early development of the supraoccipital crest (4–6 days) quickly identifies leiognathid larvae from ambassid larvae (Leis & Trnski 1989).

Eggs from Durban Bay plankton samples which matched this egg and early larva have been reared to *Ambassis gymnocephalus* (A.D. Connell pers. obs.). The eggs also closely matched the description given by Nair (1957).

Pomadasys commersonnii (Family Haemulidae)

Eggs of *P. commersonnii* were 790–860 µm in diameter with a 190–200 µm oil globule. They characteristically developed four patches of yellow chromatophores on the newly hatched larva (Figure 1C). The oil globule was anteriorly positioned in the yolk sac, and the yolk was segmented, mainly on the edges. Owing to the occurrence of several other *Pomadasys* species in St Lucia (Whitfield 1980), it was necessary to attempt to rear this species. The rearing was very successful, and about 25 specimens ranging from 22–40 mm SL were preserved on 7 January 1994 when crowding caused anoxic conditions in the rearing tank.

The August and September 1994 samples from the Charters Creek area yielded fair numbers of *P. commersonnii* eggs (Table 2), with a single egg in the March sample.

Table 2 Eggs from 10 min plankton hauls at Charters Creek during 1994

	Sample date				
Species	4 Mar	13 Apr	8 Aug	1 Sept	26 Oct
Salinity ‰	25,4	33,0	34,5	33,0	31,0
Stolephorus holodon	3	2	–	4	–
Pomadasys commersonnii	1	–	77	25	–
Crenidens crenidens	–	–	98	1	–
Acanthopagrus berda	–	–	–	1	–
Mugilid	–	7	–	–	1
Solea bleekeri	–	3	233	130	1

Sillago sihama (Family Sillaginidae)

Although an attempt to rear these eggs was not successful, published illustrations of eggs and early larvae (Okiyama 1988) leave little doubt that this egg belonged to this species. The egg was 700–790 µm in diameter with a 190 µm oil globule, and a segmented yolk (Figure 1D).

The newly hatched larva was heavily marked with bright yellow chromatophores, and the oil globule was located posteriorly in the yolk sac (Figure 1E). The 1-day-old larva had a distinctive pattern of yellow chromatophores and a gut length of approximately 50% notochord length (Figure 1F).

Crenidens crenidens (Family Sparidae)

The eggs measured 720–770 µm with an oil globule of 170–190 µm. This was the only sparid egg found in the September 1993 samples from the estuary mouth. In view of the relative scarcity of records for the species in St Lucia (only recorded by van der Elst *et al.* 1976), rearing was attempted and three were reared to standard lengths of 9,5 mm (25 days), 22,7 mm and 23,9 mm (53 days). Although reported to spawn in tropical waters (Smith & Heemstra 1986), it has been found spawning in Durban Harbour (A.D. Connell pers. obs.).

?*Liza macrolepis* (Family Mugilidae)

Two specimens of a mugilid egg were found but not reared past initial confirmation that they were from this family. Mugilid eggs are easily identified by the very large oil globule (often a cluster of 6–8 smaller globules in fresh eggs, which later coalesce). These two measured 830 µm in diameter with an oil globule of 340 µm.

The Charters Creek samples yielded a few mullet eggs in April 1994 but the attempt to rear them failed. A single egg was also seen in October (Table 2).

Solea bleekeri (Family Soleidae)

Even when fresh, the eggs of *S. bleekeri* were easily identified. They measured 750–800 µm in diameter, and had a cluster of golden coloured oil globules, closely arranged like a bunch of grapes. These were located posteriorly in the newly hatched larva. The entire egg had a brownish tinge. The eggs hatched to the characteristic larvae, and the larvae settled in the rearing tanks in 12 days at 23°C.

The August and September 1994 Charters Creek samples contained many *S. bleekeri* eggs (Table 2).

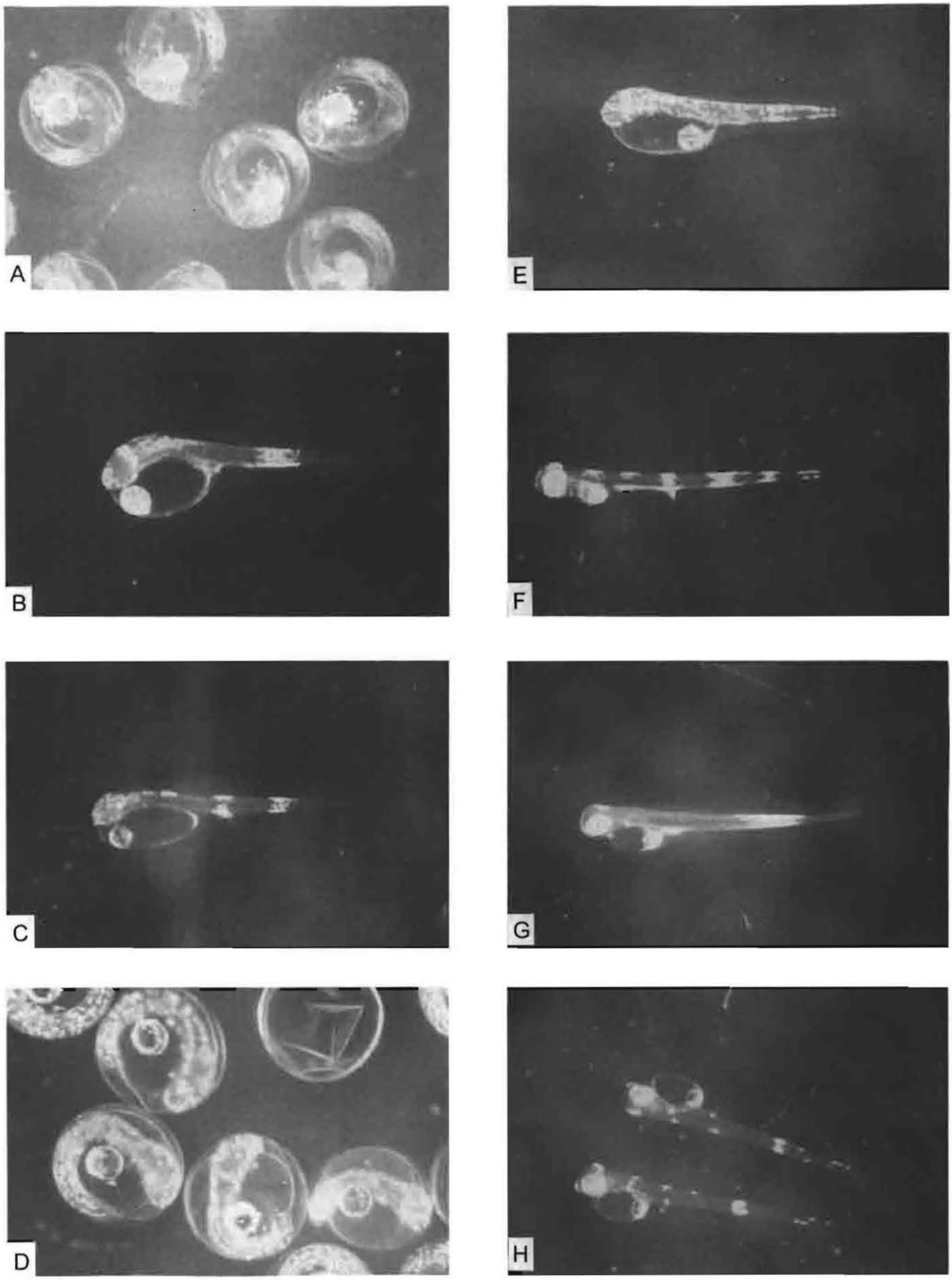

Figure 1 Eggs and early larvae from St Lucia estuary. Chromatophore patterns and oil globule position are illustrated. A. *Ambassis* sp. eggs. B. *Ambassis* sp. larva at 10 h. post-hatch. C. *Pomadasys commersonnii* larva at 24 h post-hatch. D. *Sillago sihama* eggs. E. *Sillago sihama* larva at 10 h post-hatch. F. *Sillago sihama* larva at 24 h post-hatch. G. *Acanthopagrus berda* larva at 24 h post-hatch. H. *Crenidens crenidens* larva at 1 0 h post-hatch.

Acanthopagrus berda (Family Sparidae)

Eggs of this species were not collected in the September 1993 samples. However a single egg was found in the September 1994 sample from Charters Creek (Table 2), and was hatched to the larva illustrated in Figure 1G. This egg and characteristic 1-day-old larva have been identified from eggs collected in Durban Bay and in the mouth of Kosi Bay, as *A. berda*, and confirmed by Garratt (1993).

Photographs have been included in the descriptions because the distinctive colour patterns are helpful in separating species of live fish eggs and early larvae. The eggs and early larvae of *P. commersonnii* are very similar to those of the striped grunt *Pomadasys striatum*, which are common in KwaZulu-Natal coastal waters (A.D. Connell pers. obs.). However, *P. striatum* has not been recorded in St Lucia (van der Elst *et al.* 1976; Whitfield 1980).

Crenidens crenidens eggs were separated from other known KwaZulu-Natal coast sparid's eggs by their small size, shared only by *Acanthopagrus berda* from the mouth of Durban Bay (720–770 µm egg with a 190–220 µm oil globule), and by the distinctive chromatophore patterns on the oil globule and larva in the egg (A.D. Connell pers. obs.). The newly hatched larvae were easily separated by their yellow chromatophore pattern, which in *A. berda* (Figure 1G) was conspicuous on the head, gut area and mid tail, but in *C. crenidens* was more discretely located (Figure 1H). Newly hatched *Diplodus sargus* larvae are similar to *C. crenidens* but their eggs are larger at 860–990 µm (Brownell 1979). Blacktail larvae of 1–2 days post-hatch (Brownell 1979) lack yellow chromatophores posterior to the midtail yellow blotch and on the brain that can be clearly seen on *C. crenidens* (Figure 1H). All sparids have a clear yolk and the oil globule is located in the posterior angle of the yolk sac in the newly hatched larva (Figures 1G and 1H).

The identity of the mugilid egg is uncertain as it was not reared. In Durban harbour numerous rearings have yielded only *Liza macrolepis*, while KwaZulu-Natal coastal waters have yielded only *L. dumerilii* (A.D. Connell pers. obs.). At Kosi Bay in June 1991 *L. macrolepis* was observed spawning *en masse* in the mouth of the estuary (Garratt 1993), and eggs from there yielded *L. macrolepis* when reared (A.D. Connell pers. obs.).

Whitfield (1990) listed *S. bleekeri* as one of 10 species of estuarine fishes that breed in South African estuaries, but later (Whitfield 1994) relegated it to his 'usually breed at sea' group. Cyrus (1991) while admitting that ... 'the evidence for (*S. bleekeri*) breeding in Lake St Lucia is not conclusive', provided a good deal of data in support of breeding taking place in Makakatana Bay, St Lucia, during periods of favourable salinity.

There is a substantial literature on the issue of estuarine dependence of fishes (e.g. Day, Blaber & Wallace 1981; Potter, Beckley, Whitfield & Lenanton 1990; Whitfield 1990) and the criterion regarded as paramount in establishing the status of a particular species is whether it remains in the estuary to breed. However, it remains feasible that many species of essentially marine fishes will spawn in an estuary (particularly the larger estuaries) given the correct environmental conditions of day length, temperature, salinity and water depth (among others). The data from Charters Creek support this contention.

In late September 1993 the salinity of the main lake at Charters Creek was 54‰, while it was only 38‰ at the mouth where the eggs were collected, although this is still a little above normal seawater (35‰). At the time the lake level was 0,61 m below chart datum (R. Taylor pers. comm.) owing to evaporation losses in the main lake, and the relatively lower salinity at the mouth might therefore have been at least partly due to intrusion of seawater through the sandbar (the sandbar was too wide to permit wave overtopping at high spring tide). While it is tempting to suggest that this triggered the spawning, the samples from the Charters Creek area have proved that some of these species were spawning in the main lake at the then (1994) prevailing salinity of about 34‰, despite the fact that the mouth was open to the sea. At future dates when salinity in the lake rises above seawater or falls below seawater, St Lucia will provide an interesting opportunity to study the spawning tolerance of these essentially marine species of fishes.

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INTERNATIONAL CONFERENCE ON SYSTEMATIC BIOLOGY

Willi Hennig Society 15th Annual Meeting

The 15th Annual meeting of the Willi Hennig Society (HENNIG-15) will be held from 15–20 Decenber 1996 at the University of Cape Town (UCT), South Africa. The first circular outlining the logistics of HENNIG-15 will be sent out during the first quarter of 1996. The local organizing committee includes Tim Crowe, Eric Harley and Peter Linder, all at UCT.

Steve Farris, Laboratory of Molecular Systematics, Swedish Museum of Natural Sciences, will assist them in the development of the HENNIG-15's scientific programme. This committee invites proposals for symposia for HENNIG-15 whichshould, ideally, include: (1) adescriptive title; (2) one to two paragraphs expaining the purpose of the symposium and its relevance to the theory and practice of systematics; and (3) a list of proposed speakers (including full contact information) and titles of presentations. The closing date for the receipt of proposals is 15 June 1996.

These proposals and all enquiries concerning contributed papers and/or attendance should be sent preferably via e-mail or fax to Tim Crowe:
e-mail = tmcrowe@botzoo.uct.ac.za: fax (021) 6503295; tel. (021) 6503292/7/1 at the FitzPatrick Institute, University of Cape Town, Rondebosch, 7700 Republic of South Africa.