Acknowledgements

I thank A. Cockroft, W. Emmerson and H. Pienaar for assistance with the trawling and acknowledge the financial support of the South African National Committee for Oceanographic Research.

References

BADENHORST, A. & BOYD, A.J. 1980. Distributional ecology of the larvae and juveniles of the anchovy *Engraulis capensis* Gilchrist in relation to the hydrological environment off South West Africa, 1978/79. *Fish. Bull. S. Afr.* 13: 83–106.

BECKLEY, L.E. 1983a. The ichthyofauna associated with *Zostera capensis* Setchell in the Swartkops estuary, South Africa. *S. Afr. J. Zool.* 18: 15–24.

BECKLEY, L.E. 1983b. Community structure of ichthyoplankton off sandy beaches in Algoa Bay, South Africa. In: Sandy beaches as ecosystems, (eds.) McLachlan, A. & Erasmus, T. p.747. W. Junk, The Hague, Netherlands.

BECKLEY, L.E. (In press). The ichthyofauna of the Sundays estuary, South Africa, with particular reference to the juvenile marine component. *Estuaries.*

LASIAK, T.A. 1981. Nursery grounds of juvenile teleosts: evidence from the surf zone of King's Beach, Port Elizabeth. *S. Afr. J Sci.* 77: 388–390.

LASIAK, T.A. 1982. Structural and functional aspects of the surf-zone fish community in the Eastern Cape. Ph.D. thesis, University of Port Elizabeth, South Africa.

LASIAK, T.A. 1983. Recruitment and growth patterns of juvenile marine teleosts caught at King's Beach, Algoa Bay. *S. Afr. J. Zool.* 18: 25–30.

MARAIS, J.F.K. 1981. Seasonal abundance, distribution and catch per unit effort by gill nets of fishes in the Sundays estuary. *S. Afr. J. Zool.* 16: 144–150.

MARAIS, J.F.K. 1983. Seasonal abundance, distribution and catch per unit effort of fishes in the Krom estuary, South Africa. *S. Afr. J. Zool.* 18: 96–102.

MARAIS, J.F.K. & BAIRD, D. 1980. Seasonal abundance, distribution and catch per unit effort of fishes in the Swartkops estuary. *S. Afr. J. Zool.* 15: 66–71.

SMITH, J.L.B. 1965. The sea fishes of southern Africa, 5th edn. Central News Agency, South Africa.

VAN DER ELST, R. 1981. A guide to the common sea fishes of southern Africa. C. Struik, Cape Town, South Africa.

WALLACE, J.H. & KOK, H.M. 1983. Inshore small-mesh trawling survey on the Cape south coast. Paper at 5th National Oceanographic Symposium, Grahamstown, South Africa.

WINTER, P.E.D. 1979. Studies on the distribution, seasonal abundance and diversity of the Swartkops estuary ichthyofauna. M.Sc. thesis, University of Port Elizabeth, South Africa.

The reproductive biology of the moony, *Monodactylus falciformis*, in Algoa Bay

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Received 21 November 1983; accepted 12 January 1984

Gonadosomatic indices, macroscopic and microscopic examinations of gonads were used to establish the breeding cycle of *Monodactylus falciformis*. Spawning took place between October and February and evidence for serial spawning is presented.

Gonadosomatiese indekse, makroskopiese en mikroskopiese ondersoeke van die gonades is gebruik om die broeisiklus van *Monodactylus falciformis* te bepaal. Kuitskiet het tussen Oktober en Februarie plaasgevind en bewys van opeenvolgende kuitskiet word gegee.

The teleost, *Monodactylus falciformis* is widespread in the Indo-pacific region extending almost to the Cape (Smith 1965). It is the third most abundant species caught in the surf off King's Beach, Algoa Bay, accounting for 10% of the numbers landed (Lasiak, in press). Being of no commercial significance, little is known of its biology. Juveniles and sub-adults are fairly common in estuaries (Whitfield 1980; Marais & Baird 1980; Beckley 1983 and Marais 1983), whereas the moonies caught off King's Beach were all sexually mature.

Moonies were collected monthly between September 1978 and October 1980 by seine netting in the surf zone in Algoa Bay. Gonadosomatic indices were estimated and summarized monthly for the separate sexes. The maturation state of each

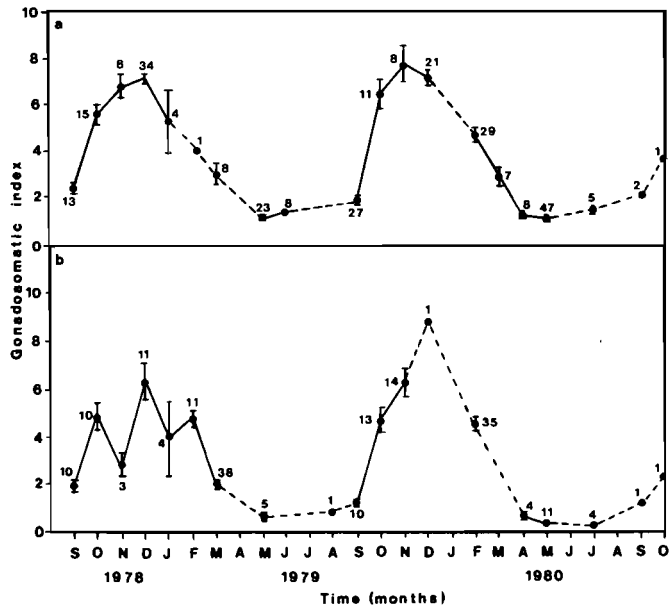

Figure 1 Seasonal variations in the gonadosomatic indices of (a) female and (b) male *M. falciformis*. Data are given as mean ± S.E.M. Numbers denote sample size.

fish was assessed visually from the macroscopic features of the gonads. These maturity stages were verified by histological studies as described in Lasiak (1983).

Gonadosomatic indices suggested that the period of greatest sexual development extended from October to February (Figure 1). Similar cyclic trends were evident for the two sexes. The ovary attained a slightly greater mass than the testis. Maximum values of 11,92 and 9,57 were recorded for females and males respectively. The lowest gonadosomatic indices, which reflect sexual inactivity, were recorded between May and September. The pre-spawning period, September – October, and the post-spawning period, February – May were of relatively short duration. Females bearing large translucent ova were caught in October and February.

The percentage of fish with gonads at different phases of maturity, as determined by visual inspection, is illustrated on a monthly basis in Figure 2. Comparison with the cyclic fluctuations in gonadosomatic indices (Figure 1) revealed that fish in the active state predominated during the pre-spawning period. The later stages of development were characterized by ripe females. The male fish showed greater variability with active or ripe individuals comprising the bulk of the population. Spent females were evident from March to June, and spent males from February to May. Between May and July both sexes were in the early recovery phase.

The maturation phases were distinguished histologically by the presence or absence of particular spermato- or oogenic cells, as described in Lasiak (1983). The mean percentage, standard error of the mean, and range of oocyte types present at each

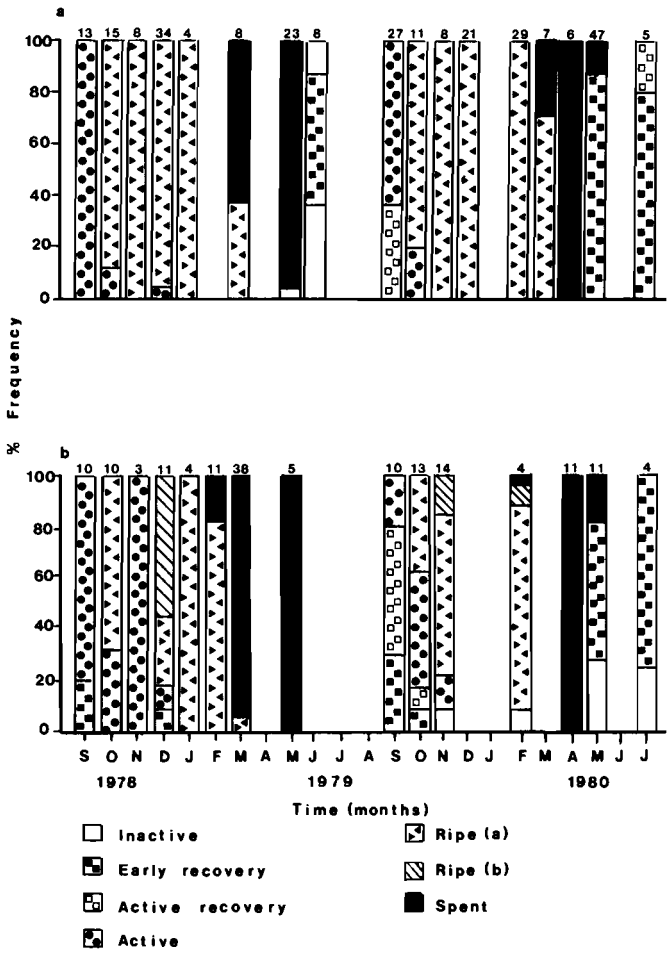

Figure 2 Percentage of fish with (a) ovaries and (b) testes corresponding to maturity stages based on visual assessment. Data are expressed as a percentage of the total number of fish examined monthly. The number of fish examined is given above each histogram.

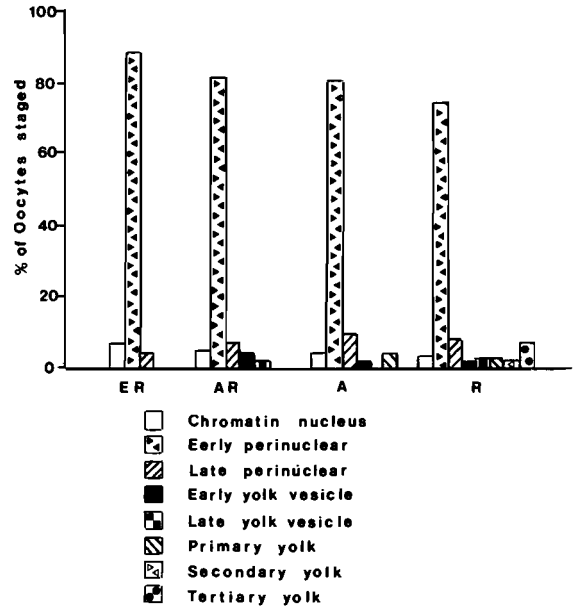

Figure 3 Variation in the distribution of eight oocyte types according to stage of maturity in *M. falciformis* (ER, early recovery; AR, active recovery; A, active; R, ripe).

Table 1 Variations in the proportions of eight oocyte developmental stages associated with the prominent ovarian maturity phases observed in *Monodactylus falciformis*[a]

		Oocyte developmental stage[b]								
Maturation phase	*N*	CNO	EPO	LPO	EYVO	LYVO	1°	2°	3°	Atretic
Early recovery	11	7,0 ± 1,0	88,3 ± 0,6	4,5 ± 0,8						0,2 ± 0,1
T = 3 475		(3,6 – 13,3)	(85,4 – 91,3)	(0,3 – 9,2)						(0,0 – 0,9)
Active recovery	3	5,5 ± 1,8	81,3 ± 4,6	7,2 ± 2,8	3,5 ± 1,2	2,4 ± 1,3				0,2 ± 0,2
T = 892		(2,8 – 9,0)	(73,5 – 89,5)	(1,8 – 11,2)	(1,4 – 5,5)	(0,0 – 4,4)				(0,0 – 0,5)
Active	1	4,2	80,7	9,7	1,6	0,0	3,9			
T = 311										
Ripe	10	3,5 ± 0,6	74,3 ± 2,0	8,1 ± 0,6	0,9 ± 0,2	2,2 ± 0,5	2,3 ± 0,3	1,7 ± 0,5	7,0 ± 1,9	
T = 3 159		(1,3 – 7,5)	(59,7 – 82,3)	(5,9 – 10,8)	(0,0 – 2,5)	(0,0 – 4,7)	(0,4 – 3,6)	(0,0 – 5,0)	(0,0 – 17,1)	

[a]Data is given as the mean percentage ± standard error, the range is given in brackets. *N* is the number of samples examined at each maturation phase and T is the number of oocytes staged.

[b]CNO, Chromatin nucleus; EPO, Early Perinuclear; LPO, Late Perinuclear; EYVO, Early Yolk Vesicle; LYVO, Late Yolk Vesicle; 1°, Primary; 2°, Secondary; 3°, Tertiary oocytes.

maturity phase are given in Table 1. Only four maturity stages were observed: early recovery, active recovery, active and ripe stages. Early perinuclear oocytes predominated throughout the breeding cycle. They accounted for 88% of the total oocytes present during the early recovery phase and declined to 74% of the total oocytes in ripe individuals (Figure 3). The proportion of yolky oocytes in ripe fish was surprisingly low (14%). No quantitative histological studies were performed on testicular tissue because of difficulties in counting the enormous number of cells present.

Ripe specimens of *M. falciformis* were recorded from Algoa Bay between October and February. Spawning probably takes place throughout the period since females with large translucent ova were caught at the beginning and at the end of this period. The prevalence of ripening individuals suggests that spawning may take place close inshore. However, no spent fish were caught during this study so the possibility that spawning takes place further off shore can not be discounted. Marais (1983) noted a reduction in the numbers of *M. falciformis* caught in the Krom estuary between October and February, which he attributed to a seaward spawning migration. Van der Elst (1981), however, suggests that spawning occurs in the vicinity of river mouths. The proportion of yolky oocytes in ripe moonies (14%) was low compared to that (33% to 49%) observed in the southern mullet, *Liza richardsoni* (Lasiak 1983). This could indicate serial spawning in *M. falciformis*.

Acknowledgements

The Department of Environmental Affairs is thanked for financial assistance. Prof. G. van der Horst and Dr A. McLachlan are thanked for their support during this project.

References

BECKLEY, L.E. 1983. The ichthyofauna association with *Zostera capensis* Setchell in the Swartkops estuary. *S. Afr. J. Zool.* 18: 15 – 24.

LASIAK, T.A. 1983. Aspects of the reproductive biology of the southern mullet, *Liza richardsoni*, from Algoa Bay, South Africa. *S. Afr. J. Zool.* 18. 89 – 95.

LASIAK, T.A. In press. Structural aspects of the surf zone fish assemblage at King's Beach, Algoa Bay, South Africa: long term fluctuations. *Estuar. Coast. Shelf Sci.*

MARAIS, J.F.K. 1983. Seasonal abundance, distribution and catch per unit effort of fishes in the Krom estuary, South Africa. *S. Afr. J. Zool.* 18: 96 – 102.

MARAIS, J.F.K. & BAIRD, D. 1980. Seasonal abundance, distribution and catch per unit effort of fishes in the Swartkops estuary. *S. Afr. J. Zool.* 15: 66 – 71.

SMITH, J.L.B. 1965. The sea fishes of Southern Africa. Central News Agency Ltd, South Africa. 580 pp.

VAN DER ELST, R. 1981. A guide to common sea fishes of Southern Africa. Struik, Cape Town, 367 pp.

WHITFIELD, A.K. 1980. A quantitative study of the trophic relationships within the fish community of the Mhlanga estuary, South Africa. *Estuar. Coast. Mar. Sci.* 10: 417 – 435.