Ministerio de Agricultura, Lima, Peru. The drawings were executed by A. M. Musser, and the photograph in Figure 4 was taken by L. Trueb.

Literature Cited

CEI, J. M. 1977. Serological relationships of the Patagonian toad *Bufo variegatus* (Gunther). Serol. Mus. Bull. 52:2.

DUELLMAN, W. E. 1987. Two new species of marsupial frogs (Anura: Hylidae) from Peru. Copeia 1987:903–909.

———, AND T. H. FRITTS. 1972. A taxonomic review of the southern Andean marsupial frogs. Occas. Pap. Mus. Nat. Hist., Univ. Kansas 9:1–37.

———, AND L. TRUEB. 1988. Cryptic species of hylid marsupial frogs in Peru. J. Herpetol. 22:159–179.

FORMAS, J. R. 1979. La herpetofauna de los bosques temperados de Sudamérica, p. 341–369. *In:* The South American herpetofauna: its origin, evolution, and dispersal. W. E. Duellman (ed.). Monogr. Mus. Nat. Hist., Univ. Kansas 7:1–485.

LYNCH, J. D. 1975. A revision of the Andean leptodactylid frog genus *Phrynopus.* Occas. Pap. Mus. Nat. Hist., Univ. Kansas 35:1–51.

STEBBINS, R. C. 1954. Amphibians and reptiles of western North America. McGraw-Hill Book Co., Inc., New York, New York.

TOSI, J. A., JR. 1960. Zonas de vida natural en el Peru. Bol. Tecn. Inst. Interamer. Cien. Agric. 5: 1–271.

TROLL, K. 1959. Die tropischen Giberge. Bonn. Geogr. Abhandl. 25:1–93.

(WED) MUSEUM OF NATURAL HISTORY AND DEPARTMENT OF SYSTEMATICS AND ECOLOGY, THE UNIVERSITY OF KANSAS, LAWRENCE, KANSAS 66045 AND (OOM) DEPARTAMENTO DE BIOLOGIA, UNIVERSIDAD NACIONAL DE SAN ANTONIO ABAD DEL CUZCO, APARTADO 921, CUZCO, PERU. Accepted 9 April 1990.

Copeia, 1991(1), pp. 141–147

Description of a Facultative Cleanerfish (Teleostei: Cichlidae) from Lake Malawi, Africa

J. R. STAUFFER, JR.

A new species of the cichlid fish genus *Pseudotropheus* from Lake Malawi, Africa, is described. The new species superficially resembles *Pseudotropheus lanisticola* and *P. livingstonii,* but is clearly distinguished by head shape. The behavior pattern of cleaning ectoparasites from other cichlids is unique among all known species of *Pseudotropheus.*

THE cichlid fishes of Lake Malawi occupy a wide variety of habitats and exhibit diverse behavioral adaptations. Ribbink et al. (1983) published a survey of the rock-dwelling cichlids ("mbuna"), documented the distribution of many of the mbuna, and commented on their behavioral adaptations. Mbuna primarily inhabit the rocky shores and rock outcroppings of Lake Malawi; however, some representatives of this group occur over sand substrate or over the rock/sand interface. These species are *Pseudotropheus elegans* Trewavas, *P. livingstonii* (Boulenger), and *P. lanisticola* Burgess. The purpose of this paper is to describe a new species that superficially resembles *P. lanisticola* and *P. livingstonii,* and inhabits the rock/sand interface.

Methods and Materials

Fishes were collected by chasing them into a monofilament net (7 m × 1 m × 1.5 cm) while SCUBA diving. Standard length is used throughout. External counts and measurements follow Barel et al. (1977), except that the following distances were recorded: anterior insertion of dorsal fin to anterior insertion of anal fin, posterior insertion of dorsal fin to posterior insertion of anal fin, anterior insertion of dorsal fin to posterior insertion of anal fin, posterior insertion of dorsal fin to anterior insertion of anal fin, posterior insertion of dorsal fin to ventral origin of caudal fin, posterior insertion of anal fin to dorsal origin of caudal fin, anterior

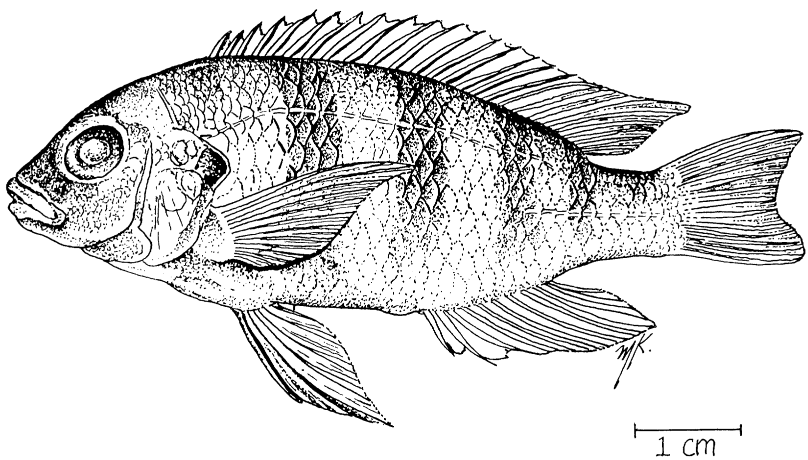

Fig. 1. *Pseudotropheus pursus,* holotype, USNM 307339, adult male, 60.6 mm.

insertion of dorsal fin to pelvic-fin origin, and posterior insertion of dorsal fin to pelvic-fin origin. These measurements were recorded so that a truss network could be completed, as described by Humphries et al. (1981). Except for gill-raker counts, which were recorded from the right side, all counts and measurements were made on the left side of the fish. Vertebral counts were made from radiographs.

The new species was compared with the holotype of *P. livingstonii* (BMNH 63.11.12.22) and the holotype (USNM 216266) and two paratypes (BMNH 1976.7.29:1–2) of *P. lanisticola.* Differences in body shape were analyzed using sheared principal components analysis (PCA) (Humphries et al., 1981; Bookstein et al., 1985). This technique, which quantifies shape differences among the populations independent of size (Reyment et al., 1984), was used by Stauffer and Boltz (1989) to distinguish between two sympatric species from Lake Malawi: *P. barlowi* McKaye and Stauffer and *P. xanstomachus* Stauffer and Boltz. All specimens were collected at either Songwe Hill (34°56′E, 14°00′S) or Kanchedza Is. (34°56′E, 13°58′S), Lake Malawi, Malawi, Africa. Institutional abbreviations follow Leviton et al. (1985), except where noted.

Pseudotropheus **pursus** n. sp.
Figs. 1–4

Holotype.—USNM 307339, adult male, 60.6 mm, Kanchedza Is., Lake Malawi, Africa, 2–3 m, 18 April 1989.

Paratypes.—USNM 307340, 12 (46.9–60.1 mm), BMNH 1990.2.14:2–6, 5 (42.1–57.1 mm), MFU 1 (Malawi Fisheries Unit, Monkey Bay, Malawi, Africa), 3 (43.7–48.2 mm); data as for holotype. MFU 2, 3 (31.9–49.6 mm); Songwe Hill, Lake Malawi, Africa.

Diagnosis.—A cichlid of the genus *Pseudotropheus* that superficially resembles *P. lanisticola* and *P. livingstonii* but differs in shape (Fig. 2). *Pseudotropheus pursus* generally has a smaller cheek depth and more scale rows on the cheek than either of the aforementioned species. Moreover, it differs behaviorally from these two species in that it is not associated with snail shells (*Lanistes nyassanus*) as are *P. lanisticola* and *P. livingstonii* (Burgess, 1976; Ribbink et al., 1983). It is distinct from all known *Pseudotropheus* in color pattern and in that it is a facultative cleaner.

Description.—Morphometric ratios and meristics are presented in Table 1. Jaws isognathous (Fig. 1); teeth on jaws in three rows (premaxilla of one paratype had two rows); most teeth in outer rows bicuspid, those in inner rows tricuspid; 15 teeth in outer row of left lower jaw of holotype, 12–17 in paratypes. Pectoral fins with 13 rays in holotype and 12 paratypes, 14 rays in 11 paratypes; anal fin with three spines and seven rays in holotype and 21 paratypes, three spines and eight rays in remaining paratypes; caudal fin emarginate (Fig. 1). Vertebrae of ho-

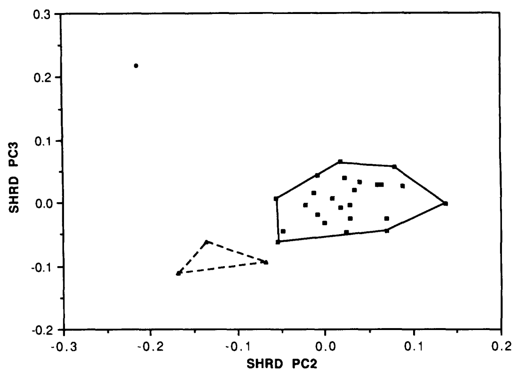

Fig. 2. Plot of individual principal component scores of *Pseudotropheus pursus* (squares), *P. lanisticola* (triangles), and *P. livingstonii* (circle) on the sheared second and third principal components.

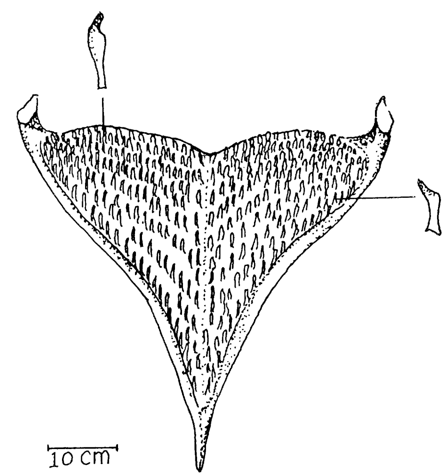

Fig. 3. Lower pharyngeal bone of *Pseudotropheus pursus*, holotype, USNM 307339, adult male, 60.6 mm.

lotype 13 + 16 (abdominal + caudal), seven paratypes with 13–14 + 15–16. Lower pharyngeal bone of holotype triangular in outline (Fig. 3); pharyngeal teeth in left posterior row 20, those in left median row 14. Scales along lateral side ctenoid; holotype with 29 pored lateral-line scales, paratypes with 31–32; pored scales posterior to hypural plate 0--3 (Table 1). Seventeen specimens, including holotype, with six scale rows on cheek, remaining paratypes with five. Gill rakers simple, first gill arch with 8–11 on ceratobranchial, 2–3 on epibranchial, one between epibranchial and ceratobranchial.

Sheared PCA of the three species demonstrated that there was no overlap among species when the sheared second principal component was plotted against the sheared third principal component (Fig. 2). The first principal component is interpreted as a size component and the sheared components as shape, independent of size (Humphries et al., 1981; Bookstein et al., 1985). After size, which accounts for 85.7% of the total variance, is removed, the second and third principal components account for 36% and 23% of the remaining variance. Those variables that have the highest loadings on the sheared second principal component are cheek depth, snout length, and caudal peduncle length, while those that have the highest loadings on the sheared third principal component are pelvic-fin length, caudal-peduncle length, and preorbital depth (Table 2).

Lateral body coloration of males grey dorsally, white ventrally with 4–6 grey bars; scales outlined in blue; head grey with one interorbital blue stripe; preorbital blue; gular white with a yellow blotch on anterior portion; pectoral and pelvic fins with clear membranes and yellow rays; anal fin clear with two orange ocelli; caudal-fin rays and some membranes yellow, other membranes blue; dorsal fin clear with yellow lappets. Females similarly colored but not as intensely; ocelli absent on anal fin.

Etymology.—The name pursus, from the Latin meaning clean, was chosen to reflect the cleaning behavior of this species.

Distribution.—*Pseudotropheus pursus* appears to be restricted to the eastern side of the Nankumba Peninsula in Lake Malawi. Numerous collections and SCUBA observations by Ribbink et al. (1983), McKaye (pers. comm.), and myself throughout other portions of the lake did not record this species.

Life history.—*Pseudotropheus pursus* is a facultative cleaner. It has been observed to feed on periphyton and to clean parasites from *Lethrinops* cf. *lituris* (Cichlidae; Fig. 4). Additionally, it has been observed to clean parasites from *Cyrtocara* cf. *fenestrata* and *Cyrtocara* cf. *picta* (Cichlidae). The cleaning of the latter two species has been recorded on underwater video tapes cataloged at The Pennsylvania State University Fish Museum (PSU 2273). The host fish approaches *P. pursus* and positions itself with its dorsal fin oriented toward the cleaner, and per-

TABLE 1. MORPHOMETRIC AND MERISTIC CHARACTERS OF *Pseudotropheus pursus.* Range and mean include holotype and 23 paratypes.

	Holotype	Mean	SD	Range
Standard length, mm	60.6	49.8	6.4	31.9–60.6
Head length, mm	19.6	16.1	1.8	11.1–19.6
Percent standard length				
Head length	32.3	32.4	1.3	30.3–37.1
Snout to dorsal-fin origin	35.1	35.1	1.0	34.1–39.2
Snout to pelvic-fin origin	39.1	37.3	1.5	35.5–41.8
Greatest body depth	37.1	34.4	1.6	32.1–39.2
Caudal-peduncle length	14.9	15.7	1.0	13.8–18.5
Least caudal-peduncle depth	13.0	12.7	0.7	11.5–14.7
Pectoral-fin length	32.2	29.5	1.6	25.4–32.2
Pelvic-fin length	33.8	29.4	2.7	25.3–34.9
Dorsal-fin base length	59.6	59.8	1.9	57.1–67.2
Anterior dorsal to anterior anal	52.1	51.6	1.9	47.6–57.5
Posterior dorsal to posterior anal	16.3	16.3	0.5	15.4–17.5
Anterior dorsal to posterior anal	62.5	62.4	2.1	58.9–70.5
Posterior dorsal to anterior anal	33.3	31.3	1.3	28.8–33.5
Posterior dorsal to ventral caudal	19.1	19.8	1.0	18.5–22.8
Posterior anal to dorsal caudal	23.3	23.5	1.2	21.8–28.3
Anterior dorsal to pelvic-fin origin	36.0	34.9	1.5	32.0–37.5
Posterior dorsal to pelvic-fin origin	57.8	57.3	1.9	53.8–62.5
Percent head length				
Horizontal eye diameter	34.2	37.6	1.8	34.2–41.9
Vertical eye diameter	34.2	36.1	1.8	32.6–39.9
Snout length	32.1	27.2	2.3	24.0–32.1
Postorbital head length	39.8	40.5	1.8	37.1–44.2
Preorbital depth	15.3	15.6	1.0	14.3–18.2
Lower-jaw length	43.4	36.2	2.4	32.6–43.4
Cheek depth	21.9	19.6	1.9	14.9–22.9
Premaxillary pedicel	26.5	25.0	1.9	20.7–29.2
Head depth	90.8	88.9	5.0	76.6–98.3
Counts				
Lateral-line scales	29	31.1	0.6	29–32
Pored scales posterior to lateral line	1	1.5	0.8	0–3
Scale rows on cheek	6	5.7	0.5	5–6
Dorsal-fin spines	17	17.8	0.4	17–19
Dorsal-fin rays	9	8.1	0.7	7–9
Anal-fin rays	7	7.1	0.3	7–8
Pectoral-fin rays	13	13.5	0.5	13–14
Gill rakers on first ceratobranchial	9	9.3	0.6	8–11
Gill rakers on first epibranchial	3	2.6	0.5	2–3
Teeth in outer row of left lower jaw	15	13.7	1.3	12–17
Teeth rows on upper/lower jaw	3/3	2.9	0.2	3–2

mits *P. pursus* to remove ectoparasites from its fins and skin. French (1980) noted the orientation of the dorsal fin and interpreted this position to be "similar to the attitude of inferiority described by Miller (1963) except that the fins were erect." Abel (1971) reported that the initial stage in cleaning symbiosis is cessation of movement that is followed by the maintenance of an inflexible posture.

The parasites could not be identified by examining stomach contents; however, I have observed elongate parasites and what appear to be trophozoites of the holotrichous ciliate, *Ichthyophthirius multifiliis*, removed from the

TABLE 2. VARIABLE LOADINGS ON SIZE AND THE FIRST TWO SHEARED PRINCIPAL COMPONENTS (SHAPE FACTORS[1]) FOR *Pseudotropheus pursus* (n = 24), *Pseudotropheus lanisticola* (n = 3), AND *Pseudotropheus livingstonii* (n = 1).

		Sheared components	
	Size	PC2	PC3
Standard length	0.184	*	*
Head length	0.160	0.188	*
Snout length	0.175	−0.364	*
Postorbital head length	0.163	*	*
Horizontal eye diameter	0.147	0.195	*
Vertical eye diameter	0.139	0.258	*
Preorbital depth	0.200	−0.261	0.417
Cheek depth	0.200	−0.599	0.103
Premaxillary pedicel	0.213	*	*
Lower-jaw length	0.198	*	*
Head depth	0.203	*	*
Body depth	0.203	*	*
Snout to dorsal-fin origin	0.175	*	*
Snout to pelvic-fin origin	0.182	*	*
Dorsal-fin base length	0.204	0.188	0.110
Least caudal-peduncle depth	0.181	*	*
Caudal-peduncle length	0.203	0.279	0.435
Anterior dorsal to anterior anal	0.205	0.101	*
Posterior dorsal to posterior anal	0.187	*	*
Anterior dorsal to posterior anal	0.196	*	*
Posterior dorsal to anterior anal	0.192	−0.111	−0.143
Posterior dorsal to ventral caudal	0.194	0.142	0.175
Posterior anal to dorsal caudal	0.189	0.244	0.159
Anterior dorsal to pelvic-fin origin	0.201	*	*
Posterior dorsal to pelvic-fin origin	0.183	*	*
Pectoral-fin length	0.217	0.266	−0.373
Pelvic-fin length	0.262	−0.149	−0.589

* Signifies that the loading was $< \pm 0.1$.

hosts. That elongate parasites are being removed is supported by my observation that one *P. pursus* spent approx. 10 min attempting to remove a tag that I had inserted into the dorsal area of an individual of *L.* cf. *lituris*, as part of another study. French (1980) reported that sunfish cleaners (Centrarchidae) attempted to clean the point at which an identification tag was attached to a host.

Stomach analysis indicated that *P. pursus* feeds predominately on periphyton. Scales of other cichlids were found in the stomachs of *P. pursus*; however, it is thought that these were taken as part of the cleaning behavior rather than fed upon directly. In all cases observed, the host fish positioned itself as described above, and permitted *P. pursus* to clean it. At no time did I observe any direct attacks on the scales or fins by *P. pursus*, as observed with known cichlid lepidiophages that inhabit Lake Malawi (i.e., *Corematodos shiranus* Boulenger, *Docimodos evelynae* Eccles and Lewis, *Genyochromis mento* Trewavas). Furthermore, the host fish did not flee from *P. pursus* once cleaning commenced. Observations by Ribbink (1984) and me clearly indicate that fishes that are victims of attacts by lepidiophages flee immediately after an attack.

Pseudotropheus pursus is reproductively active during the spring of the year. Two females, which were collected on 18 March 1989, had 31 and 26 ripe eggs in their right ovaries; the left ovaries were reduced and contained three and five eggs. I observed a single spawning act over a sand substrate in April 1989; a single male was observed courting a female; there was no observable sand structure similar to those reported for many of the sand-dwelling cichlids (McKaye et al., 1990), and the male moved away after spawning with a single female. The lack of a breeding arena occupied by several males may have been because the height of the breeding season was over.

Fig. 4. *Pseudotropheus pursus* positioning itself to clean *Lethrinops* cf. *lituris* in Lake Malawi, Malawi, Africa.

Discussion

Pseudotropheus pursus is morphologically similar to the *P. zebra* complex in that it has a terminal mouth with three rows of teeth. The outer rows are bicuspid, with an occasional conical lateral tooth, and the inner rows are tricuspid (Ribbink et al., 1983). It superficially resembles *P. lanisticola* and *P. livingstonii* in color pattern and because it is found over both a sand substrate and the rock/sand interface. It differs from these two species in that it is not associated with snail shells of *Lanistes nyassanus* (Burgess, 1976; Ribbink et al., 1983).

Pseudotropheus pursus is distinguished from *P. lanisticola* by having a greater number of scale rows on the cheek (5–6 vs 4) and more teeth in the outer row of the lower jaw (12–17 vs 8–11). A comparison of *P. pursus* with the holotype of *P. livingstonii* shows that *P. pursus* has fewer teeth rows on the lower jaw and premaxilla (3 vs 5) and a greater number of scale rows on the cheek (5–6 vs 4).

It should be noted that Ribbink et al. (1983) considered *P. lanisticola* to be conspecific with *P. livingstonii*; however, the data depicted in Figure 2 show that there is a complete separation between these two species based on shape analysis. These data are based solely on the type material, and a more detailed analysis of these two species must be completed before the question of conspecificity of these two forms can be resolved.

Although cleaning behavior is relatively common among marine fishes, it is rare in freshwater environs. Losey (1987) reviewed cleaning symbioses in aquatic environments. Witte and Witte-Maas (1981) described two haplochromine cleanerfishes from Lake Victoria that fed on carplice and leeches attached to smooth-skinned fishes. French (1980) observed cleaning behavior in sunfish hybrids (Centrarchidae) under laboratory conditions. Cleaning has been reported by the centrarchids *Lepomis macrochirus* Rafinesque and *Micropterus salmoides* (Lacepède) (Sulak, 1975; Powell, 1984). Cleaning behavior was reported for *Pimephales notatus* (Cyprinidae), *L. macrochirus, Lepomis cyanellus,* and *Pomoxis anularis* (Centrarchidae) based on gut contents and behavioral observations (Spall, 1970). Abel (1971) described facultative cleaning symbioses for several European freshwater fishes.

In Lake Malawi, cleaning behavior of *D. evelynae* was reported by Ribbink (1984). *Docimodus evelynae* is a lepidiophage and, as noted by Ribbink (1984), passes through several feeding phases: 1) feeding on fungi from other fishes; 2) feeding on plankton, insects, and periphyton; and 3) feeding on scales, fins, and skin of other fishes. Ribbink and Lewis (1982) described *Melanochromis crabro* (Cichlidae) from Lake Malawi, which fed on: 1) *Argulus africanus*, a branchiuran parasite that occurs predominantly on siluroid catfishes (Fryer, 1956); and

2) on eggs of *Bagrus meridionalis* Günther (Bagridae). Itzkowitz (1979) noted that facultative cleanerfishes do not depend exclusively on ectoparasites for nutrition, and are usually carnivores.

As stated previously, *P. pursus* feeds predominately on periphyton. Sulak (1975) hypothesized that sunfish cleaning behavior may have developed as an adaptation of their benthic feeding mode. Hobson (1971) hypothesized that several marine benthic feeders were behaviorally and morphologically "preadapted" to clean. Thus, the opportunistic, faculative, cleaning behavior observed in *P. pursus* may have developed as an extension of their benthic grazing of periphyton.

Acknowledgments

I thank the government of Malawi for providing the permits to make this research possible. I benefited from discussions with K. R. McKaye and T. J. LoVullo. M. Gutowski and R. Raesly reviewed the manuscript. L. W. Knapp arranged for shipment of specimens from Malawi to the USNM. The original artwork was completed by M. Katz. This work was funded in part by the National Science Foundation (BNS86-06836).

Literature Cited

ABEL, E. F. 1971. Zur Ethologie von Putzsymbiosen einheimisher Suffwasserfische im naturlichen Biotop. Oecologia 6:133–151.

BAREL, C. D. N., M. J. O. VAN OIJEN, F. WITTE AND E. L. M. WITTE-MASS. 1977. An introduction to the taxonomy and morphology of the haplochromine cichlidae from Lake Victoria. Part A. Text. Neth. J. Zool. 27:333–389.

BOOKSTEIN, F., B. CHERNOFF, R. ELDER, J. HUMPHRIES, G. SMITH AND R. STRAUSS. 1985. Morphometrics in evolutionary biology. The Academy of Natural Sciences of Philadelphia. Philadelphia, Pennsylvania. Spec. Publ. 15.

BURGESS, W. E. 1976. A new shell-dwelling cichlid from Lake Malawi and its inquiline catfish. Trop. Fish Hobby. 14:39–48.

FRENCH, D. P. 1980. Cleaning behavior in sunfish hybrids under laboratory conditions. Copeia 1980: 869–870.

FRYER, G. 1956. A report on the parasitic Copepoda and Branchiura of the fishes of Lake Nyasa. Proc. Zool. Soc. Lond. 127:293–344.

HOBSON, E. S. 1971. Cleaning symbiosis among California inshore fishes. Fish. Bull. 69:491–523.

HUMPHRIES, J. M., F. L. BOOKSTEIN, B. CHERNOFF, G. R. SMITH, R. L. ELDER AND S. G. POSS. 1981. Multivariate discrimination by shape in relation to size. Syst. Zool. 30:291–308.

ITZKOWITZ, M. 1979. The feeding strategies of a facultative cleanerfish, *Thalassoma bifasciatum* (Pisces: Labridae). J. Zool., Lond. 187:403–413.

LEVITON, A. E., R. H. GIBBS, JR., E. HEAL AND C. E. DAWSON. 1985. Standards in herpetology and ichthyology: part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. Copeia 1985:802–832.

LOSEY, G. S., JR. 1987. Cleaning symbiosis. Symbiosis 4:229–258.

MCKAYE, K. R., S. M. LOUDA AND J. R. STAUFFER, JR. 1990. A field test of the importance of bower size to male reproductive success in a cichlid fish lek. Amer. Nat. 135:597–613.

MILLER, H. C. 1963. The behaviour of the pumpkinseed sunfish, *Lepomis gibbosus* (L.) with notes on the behaviour of other species of *Lepomis* and the pigmy sunfish *Elassoma evergladei.* Behaviour 22:88–181.

POWELL, J. A. 1984. Observations of cleaning behavior in the bluegill (*Lepomis macrochirus*), a centrarchid. Copeia 1984:996–998.

REYMENT, R. A., R. E. BLACKITH AND N. A. CAMPELL. 1984. Multivariate morphometrics. Academic Press, New York, New York.

RIBBINK, A. J. 1984. The feeding behaviour of a cleaner and scale, skin and fin eater from Lake Malawi (*Docimodus evelynae*; Pisces, Cichlidae). Neth. J. Zool. 34:182–196.

———, AND D. S. C. LEWIS. 1982. *Melanochromis crabro,* sp. nov.: a cichlid fish from Lake Malawi which feeds on ectoparasites and catfish eggs. *Ibid.* 32:72–87.

———, B. A. MARSH, A. C. MARSH, A. C. RIBBINK AND B. J. SHARP. 1983. A preliminary survey of the cichlid fishes of the rock habitats in Lake Malawi. So. Afr. J. Zool. 18:149–310.

SPALL, R. D. 1970. Possible cases of cleaning symbiosis among freshwater fishes. Trans. Amer. Fish. Soc. 99:599–600.

STAUFFER, J. R., JR., AND J. M. BOLTZ. 1989. Description of a rock-dwelling cichlid (Teleostei: Cichlidae) from Lake Malawi, Africa. Proc. Biol. Soc. Wash. 102:8–13.

SULAK, K. J. 1975. Cleaning behavior in the centrarchid fishes, *Lepomis macrochirus* and *Micropterus salmoides.* Anim. Behav. 23:331–334.

WITTE, F., AND E. L. M. WITTE-MAAS. 1981. Haplochromine cleaner fishes: a taxonomic and ecomorphological description of two new species. Neth. J. Zool. 31:203–231.

SCHOOL OF FOREST RESOURCES, THE PENNSYLVANIA STATE UNIVERSITY, UNIVERSITY PARK, PENNSYLVANIA 16802. Accepted 8 March 1990.