Northeast Gulf Science

Volume 8
Number 1 *Number 1*

Article 7

3-1986

Submersible Avoidance by Yellowfin Bass, *Anthias nicholsi*

E.J. Gutherz
Southeast Fishery Center

R.S. Jones
Harbor Branch Foundation, Inc.

DOI: 10.18785/negs.0801.07

Northeast Gulf Science Vol. 8, No. 1, March 1986 91

Short Papers and Notes:

SUBMERSIBLE AVOIDANCE BY YELLOWFIN BASS, *Anthias nicholsi*[1]

Assessment of fish populations by visual counting techniques and observations of fish behavior can be conducted from a submersible at depths greater than the limits of SCUBA (Uzmann *et al.*, 1977; Shipp and Hopkins, 1978; Lissner, 1979; Parker and Ross, 1985). Enumeration techniques are continually being refined. Methods of determining the field of vision (Zaferman, 1981) from submersibles have been developed, and comparisons of count techniques (Shipp, 1983) have been conducted. Although submersibles have not been reported to cause noticable changes in fish behavior (e.g., Barham *et al.*, 1967; Grassle *et al.*, 1975; and Shipp and Hopkins, 1978), attraction or avoidance responses of fishes should be documented, where possible, for incorporation as a density "adjustment factor" in the estimate of population density/size. This note reports the avoidance of a submersible, especially the artificial lights, by the yellowfin bass, *Anthias nicholsi*.

METHODS

During a cooperative cruise between National Marine Fisheries Service, Harbor Branch Foundation and South Carolina Marine Resources Division in August 1982, habitat descriptions, counts of near-bottom fishes and evaluations of fishing gear were conducted from the research submersible JOHNSON-SEA-LINK II. Several rocky mounds on the sea floor with local relief of about 18 m were studied approximately 148 km due east of Charleston (32°43.9'N, 78°05.9'W), South Carolina in 188 to 207 m of water. Approximately 3900 watts of incandescent lighting (Table 1) were used throughout the 2.5-3 h dives to enhance vision and illuminate the bottom and the community for video taping. Illumination for periodic still photography was provided by 500 watt strobe lights. Near-bottom visibility was about 12 to 18 m. Bathymetric charts and locations of fish aggregations were obtained by acoustical transects from the R/V OREGON using an EPSCO Chromascope CVS 8803 and recorded by a Color Video File CVF081[2]. The submersible's position on the bottom was determined by tracking a pinger on the vehicle with a Honeywell RS-7 short baseline acoustic navigation system from the R/V JOHNSON; relocation by the R/V OREGON was facilitated by a small air bubble leakage by the submersible which was used to confirm its location on the chromascope.

RESULTS

Chromascope recordings repeatedly indicated aggregations of small fishes distributed in the water column from the top of the ridge to a height of 24 m (Fig. 1, left). Similar aggregations were not confirmed visually by observers in the submersible. When the submersible was operating normally with lights on, we found *Anthias nicholsi* very near the bottom or in rocky rubble. Chromascope recordings in the proximity of the submersible at the ridge edge did not indicate dense fish aggregations in the water column (Fig. 1, middle).

After the submersible lights were extinguished, fish were observed above

[1]Contr. No. 460, Harbor Branch Foundation, Ft. Pierce, FL 33450, and S.C. Marine Resources Center Contr. No. 194.

[2]Reference to trade names does not imply endorsement.

Table 1. Lighting used on the *Johnson-Sea-Link II* during dives in August, 1982.

Light	Number	Position	Wattage/Lt.	Lumens/Lt.
Birns Snooperetts	4	upper or equipment bar	375	7,000
Birns Snooperetts	3	on TV camera	200	3,600
Birns Snooperetts	4	aft compartment	200	3,600
Zenon short-arc	1	upper equipment bar	1000	30,000

the bottom both visually and with the Chromascope. Within 5 to 10 min. after the lights were turned off, small *A. nicholsi* were observed slowly rising from the rocky rubble to various heights above the submersible. Aggregations of small fish were seen with the Chromascope up in the water column near the submersible when the vehicle lights were off (Fig. 1, right). Once the fish had risen from the bottom, turning the submersible lights on caused them to rapidly return to a near-bottom or completely hidden position in the rubble. If the lights in the aft section of the submersible were out and forward lights were on, aft compartment observer, Mike Russell, noted that most *A. nicholsi* near the bottom remained just outside the "edge" of the field of light forward and beyond the view of the forward observers.

Anthias nicholsi was positively identified as the fish species avoiding the submersible's lights. Identifications were made by comparing notes on color patterns of specimens observed near the bottom with five specimens (14 to 16 cm SL) obtained from the stomach of a greater amberjack, *Seriola dumerili* (129 cm FL), caught by bottom long-line in the vicinity of the observations.

DISCUSSION

The behavioral response of yellowfin bass to the normally operating submersible (lights on) suggests that this species, and possibly others, from this deep-water habitat, might be better enumerated visually under ambient light conditions. The species of commercial interest in this habitat are the snowy grouper, *Epinephelus niveatus*, the blueline tilefish, *Caulolatilus microps*, and the tilefish, *Lopholatilus chamaeleonticeps*. Counts of these species should include an evaluation of the effects of the normally operating submersible on their behavior. Observations of fish behavior suggest that, in general, *A. nicholsi*, *L. chamaoleonticeps* and *Gephyroberyx darwini* (slimeheads) avoided the submersible by hiding in the rocks and burrows, although occasionally individuals of each species did not hide (or only slowly proceeded to a hiding place) allowing photography under full light. The groupers and blueline tilefish did not noticeably avoid the submersible. Parker and Ross (1985), who conducted diver observations of the response of fishes to a submersible, reported that greater amberjack, *S. dumerili*, and gag, *Mycteroperca microlepis*, were sometimes attracted and other times repelled by the submersible, while other species did not seem affected.

Fishes over shallow reefs have been reported to react to diving lights at night in different ways. Luckhurst and

Luckhurst (1978) reported that several species avoided strong lights, but neglected to name the species. Stark and Davis (1966) noted that most shallow reef species were immobilized by 30-watt diving lights in a proportion to light intensity (probably due to proximity of the light); rapid avoidance of the light beam occurred occasionally but was not consistent for a given species. This variability in behavior may account for the fact that *A. nicholsi* were occasionally photographed near the bottom, completely in the open when the submersible lights were on. Although some individuals remained in the open, within the area of light from the submersible, (1) they represented only a very small percentage of those in the area, (2) they were much closer to the substrate than previously, and (3) they would hide completely when approached closely.

Visual techniques have great potential for enumerating groundfish populations, but their limitations must be understood prior to correct interpretation of the resulting fish counts (Sale and Douglas, 1981). Each technique should be validated by comparison of the results with those from a completely different method prior to incorporation into a standardized population assessment program. In the near future, it may be possible to measure the reaction of fishes to submersible operations during count transects by quantifying changes in distributional patterns with remote underwater television or high resolution acoustics. In the meantime, more quantitative comparisons between submersible observations and counts from video cameras (Lissner, 1979), trawl catches (Uzmann *et al.*, 1977) and SCUBA divers (Parker and Ross, 1986) would help to evaluate the relationship between fish behavior and variability of counts. Even during the limited dive time of a research submersible, valuable insight may be gained from repeatedly directing a small proportion of each dive to validation of the technique and behavioral objectives.

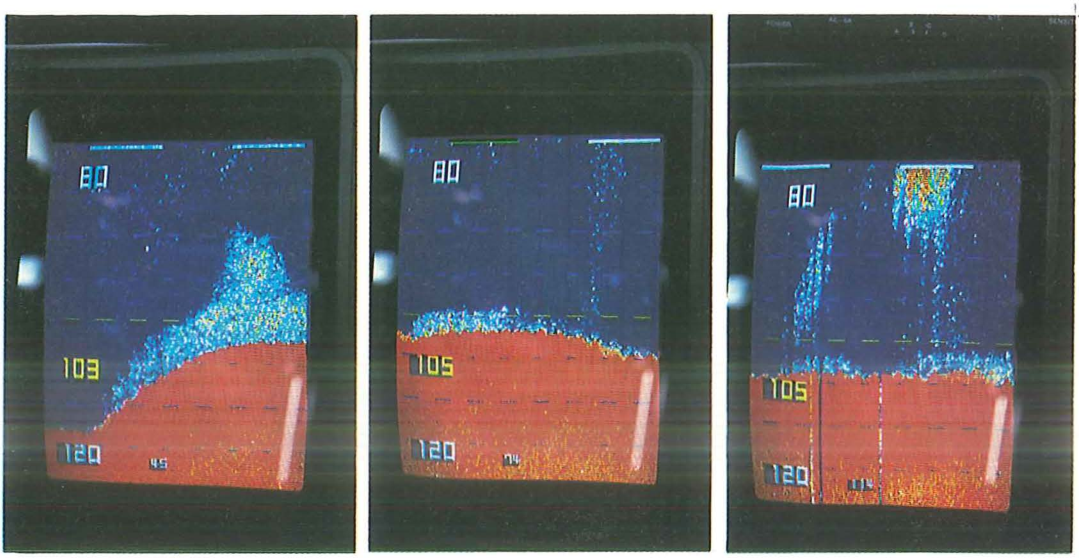

Figure 1. Chromascope video screen showing: left) common aggregation of *A. nicholsi* (light colors) in water column (dark blue) at top of mound (dark red bottom); middle) position of submersible with lights on, under rising air bubbles and absence of *A. nicholsi* any distance above bottom; and right) position of submersible with lights off, air bubbles (to the right) and *A. nicholsi,* and possibly other spp., up in water column.

ACKNOWLEDGMENTS

We thank all members of the joint effort from Harbor Branch Foundation, Inc., National Marine Fisheries Service, Mississippi Laboratories and the South Carolina Wildlife and Marine Resources Department who contributed to the success of the overall study. We especially thank the pilots and support staff of the JOHNSON-SEA-LINK II and the captains of the R/V JOHNSON and the R/V OREGON. The following persons contributed critiques of this note: W.R. Nelson, G.M. Russell, B.W. Stender and C.A. Wenner. Fisheries research was sponsored by the National Marine Fisheries Service (Southeast Fisheries Center) under Contract No. 6-35147.

LITERATURE CITED

Barham, E.G., N.J. Ayer, Jr. and R.E. Boyce. 1967. Macrobenthos of the San Diego trough: photographic census and observations from bathyscaphe, *Trieste.* Deep-Sea Res. 14:773-784.

Grassle, J.F., H.L. Sanders, R.R. Hessler, G.T. Rowe and T. McLellan. 1975. Pattern and zonation: a study of the bathyal megafauna using the research submersible *Alvin.* Deep-Sea Res. 22:457-481.

Lissner, A.L. 1979. Use of submersibles in marine biological surveys. Oceans '79. IEEE Conf. Engineering Ocean Environ. 15th Ann. Meeting Mar. Tech Soc. 788-789.

Luckhurst, B.E. and K. Luckhurst. 1978. Nocturnal observations of coral reef fishes along depth gradients. Can. J. Zool. 56:155-158.

Parker, R.O., Jr. and S.W. Ross. (1986). Observing Reef Fishes from submersibles off North Carolina. Northeast Gulf Sci. 8(1):31-49.

Sale, P.F. and W.A. Douglas. 1981. Precision and accuracy of visual census techniques for fish assemblages on coral patch reefs. Environ. Biol. Fish 6(3/4): 333-339.

Shipp, R.L. 1983. Methods of estimating populations of diminutive deep water reef fish species by use of a research submersible p. 4. Abstract *In*: C.A. Barans and S.A. Bortone eds. The visual assessment of fish populations in the southeastern United States: 1982 Workshop. S.C. Sea Grant Consortium Tech. Rept. SC-SG-TR—01-83. 52 p.

_________, and T.S. Hopkins. 1978. Physical and biological observations of the northern rim of the DeSoto Canyon made from a research submersible. Northeast Gulf Sci. 2(2)113-121.

Stark, W.A., II and W.P. Davis. 1966. Night habits of fishes of Alligator Reef, Florida. Ichthyol. Aquarium J. 38:313-356.

Uzmann, J.R., R.A. Cooper, R.B. Theroux, and R.L. Wigley. 1977. Synoptic comparison of three sampling techniques for estimating abundance and distribution of selected megafauna: Submersible vs. camera sled vs. otter trawl. U.S. Natl. Mar. Fish. Serv. Mar. Fish. Rev. 39(12):11-19.

Zaferman, M.L. 1981. Methods of instrumental assessment of the bottom fish abundance p. 895-906. *In*: J.B. Suomala, ed. Meeting on hydroacoustical methods for the estimation of marine fish populations, 25-29 June 1979. II Contributed papers, discussion, and comments. The Charles Stark Draper Lab., Inc., Cambridge, Mass. USA, 964 p.

C.A. Barans, *South Carolina Wildlife and Marine Resources Dept., P.O. Box 12559, Charleston, SC 29412.*

DOI: 10.18785/negs.0801.07

E.J. Gutherz, *Southeast Fishery Center, Mississippi Laboratories, P.O. Drawer 1207, Pascagoula, MS 39567.*
R.S. Jones, *Harbor Branch Foundation, Inc., P.O. Box 196, Fort Pierce, FL 33450. Present Address: Univ. of Texas, Marine Science Institute, Port Arkansas, TX 78373.*