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RECENT RECORDS OF *CALLINECTES DANAE* AND *CALLINECTES MARGINATUS* (DECAPODA: PORTUNIDAE) FROM NORTH CAROLINA WITH ENVIRONMENTAL NOTES

Temperature and latitudinal distributions of the genus *Callinectes* are best known for *C. sapidus* Rathbun (Williams 1974; Norse 1977). The northern limits of *C. danae* Smith and *C. marginatus* A. Milne Edwards are listed as Bermuda and southern Florida, with one specimen of *C. marginatus* from North Carolina regarded as a temporary range extension (Williams 1974). We report the taking of two specimens of *C. danae* and six specimens of *C. marginatus* by 12.2-m (40-ft) otter trawl in and near the Cape Fear River estuary, N.C. All specimens have been deposited at the Institute of Marine Sciences, University of North Carolina, Morehead City, N.C. Measurements listed are of carapace width in millimeters including lateral spines.

Two specimens of *C. danae* (UNC 2766, ♂ 115; ♂ 113), 1 *C. marginatus* (UNC 2765, ♂ 97), 6 *C. ornatus* Ordway, and 7 *C. similis* Williams were captured by trawl in the Intracoastal Waterway on 19 September 1977, just south of the Carolina Beach Inlet, on a sand-shell bottom 4 m deep in water of 36‰ surface salinity and 26°C. Four *C. marginatus* (UNC 2763, ♀ 92; ♂ 103; ♂ 62; ♂ 81) were also caught at this location on 14 September 1977, along with 30 *C. ornatus*, 35 *C. similis*, and 10 *C. sapidus*. Bottom salinity was 20‰, and bottom temperature was 26.5°C. Several other small specimens of *C. marginatus* (40-60 mm) were observed, but not retained in this trawl. A sixth specimen of *C. marginatus* (UNC 2764, ♀ 91), 1 *C. ornatus*, 30 *C. similis*, and 20 *C. sapidus* were collected in the intake canal of the Carolina Power and Light Company generating plant in the Cape Fear River estuary west of buoy 19 on 11 October 1977. Bottom type was silty-sand at depth of 4 m. Surface salinity was 31‰ and surface water temperature was 17°C.

The present record of *C. danae* represents a northward range extension of 1,000 km, from Biscayne Bay, Fla., to the Cape Fear River. Williams (1974) noted that it occurs in a wide range of salinities and habitats. However, Norse (1977) believed *C. danae* prefers lower salinities, from studies in the Caribbean.

The six specimens of *C. marginatus* bring the total recorded in North Carolina and north of southern Florida to seven. Shallow environments over a wide range of substrates are preferred in a salinity range of 19-32‰ and temperature range of 22°-30°C (Williams 1974). Norse (1974) has inferred a preference for higher salinities by *C. marginatus*; note, we obtained four of the six specimens at 20‰ and a fifth was captured inside the Cape Fear estuary where salinities fluctuate widely.

Callinectes danae, *C. marginatus*, and *C. ornatus*, with the exception of two specimens of the latter from Charleston, S.C., are now recorded from Florida, North Carolina, and Bermuda. Another species which occurs in Florida and Bermuda, *C. exasperatus* Gerstaecker, has yet to be taken in

North Carolina. The northerly distribution for these species may be indicative of larval transport patterns via currents, i.e., Gulf Stream (Williams 1974). Another significant element, as proposed by Norse (1977), is the presence of summer temperatures in excess of 20°C required for the hatching of eggs and larval development.

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ANALYSIS OF CHLORINATED HYDROCARBON POLLUTANTS: A SIMPLIFIED EXTRACTION AND CLEANUP PROCEDURE FOR FISHERY PRODUCTS

Fishery scientists wishing to quantitate chlorinated hydrocarbons find a multitude of methods only marginally appropriate to the routine analysis of marine fishery products. This paper is a laboratory manual, delineating details of a simple, rapid, and reliable method for the extraction and cleanup of samples of fish, fishery products, and paper for analysis of chlorinated hydrocarbons, such as PCB,[1] dieldrin, and DDT and its metabolites TDE and DDE. The procedures can be adapted to a great variety of sample types. The method is economical since small amounts of solvents are used and the equipment and glassware are relatively inexpensive and readily available.

Chlorinated hydrocarbon analysis in marine fishery products is an extremely complex procedure requiring extensive knowledge and many years of experience to perfect. A number of specialized problems, uncommon in the preparation of foodstuffs and freshwater fish for analyses of chlorinated hydrocarbons by the established methods, occur during the isolation of such materials from marine fish and fishery products. For example, the official method of the Association of Official Analytical Chemists (Horowitz 1970; Porter et al. 1970) often requires 1½ days for the initial extraction of marine fish oil because of intractable emulsions. After purification, the final extracts still contain substances which cause the rapid loss of sensitivity of the electron-capture detector and decomposition of the column packing in the gas-liquid chromatographic system. The procedure described in this paper eliminates extraction of fish oil and provides final extracts freer of extraneous substances. In the course of analyzing over 2,000 samples we have found it suitable for routine analysis of marine fishery products.

The method was first developed by Robert Reinert (Reinert 1970; Snyder and Reinert 1971). We have refined it to maximize recovery of chlorinated hydrocarbons and have adapted it to new types of samples, such as fishmeal and carbonless carbon paper. We have described the procedure in detail because of the ultimate purity and freedom from unanticipated contaminants required of extracts for gas chromatography with an electron-capture detector. Data from samples of typical fishery products analyzed by us using the methods described in this paper were comparable to the data obtained by a number of other laboratories[2] following their usual procedures.

Preliminary Information

The accuracy and precision of analyses for chlorinated hydrocarbons are assured only if careful attention is given to the procedural details and the time factors involved in the various steps.

[1]Abbreviations used in this paper: DDE—*p, p'*-dichlorodiphenyldichloroethylene; DDMU—*p, p'*-dichlorodiphenylchloroethylene; DDT—*p, p'*-dichlorodiphenyltrichloroethane; IPA—isopropyl alcohol; PCB—polychlorinated biphenyls (Aroclor 1254 was used as the standard for PCB); and TDE—*p, p'*-dichlorodiphenyldichloroethane. The *o, p'*-isomers of DDT and its metabolites act similarly to the more common *p, p'*-isomers used here.

[2]See Acknowledgments for the list of laboratories.