

Northwest Atlantic



Fisheries Organization

Serial No. N406

NAFO SCR Doc. 81/IX/104

THIRD ANNUAL MEETING - SEPTEMBER 1981

Further Notes on Distribution of Young Short-finned Squid (*Illex illecebrosus*)
in Relation to Water Masses, February-March 1981

by

E. G. Dawe

Department of Fisheries and Oceans
Research and Resource Division
St. John's, Newfoundland, Canada

INTRODUCTION

It was first noted by Fedulov and Froerman (MS 1980) that young short-finned squid are found during winter within the Slope Water and that they are most abundant in a zone near the northern boundary of the Gulf Stream. Juvenile squid were generally not found within the Gulf Stream. These observations have been supported by more recent studies (Froerman *et al.* MS 1981, Dawe *et al.* MS 1981).

This paper describes the water masses in the area surveyed during the Gadus Atlantica cruise, February 20-March 11 1981. Squid catches are shown in relation to water masses as defined by characteristics of temperature profile toward suggesting possible transport mechanisms.

METHODS

Data presented in this paper resulted from a Canadian research survey aboard the Gadus Atlantica, February 20-March 11, 1981. Young squid of 1 to 3 cm in mantle length were captured using an Engel Midwater Trawl 80 (EMT 80). EMT 80 sets were conducted at 100, 300, 500 and 1000 m depths along Transect A (Fig. 1) and at 100 m and 300 m along other transects.

Water masses encountered along Transects A and B (Figs. 2 and 3 respectively) are described using temperature profiles which were drawn by hand from XBT casts to 750 m. Further details of methodology have been described by Dawe *et al.* (MS 1981).

RESULTS

Water Masses:

Along Transect A (Fig. 1) near-surface shelf water extended offshore to approximately 41°20'00" N. Temperature in the upper 100 m increased to a maximum of 18.5°C at the centre of this extension and

decreased thereafter to the south as Slope Water was again encountered. The Gulf Stream was encountered at approximately 39°50'00" N., as defined by temperature greater than 18.0°C in the upper 100 m as well as persistence of high near-surface temperature to greater depths in the north-south direction. The Gulf Stream extended to approximately 400 m depth at the southern extreme of this transect.

Along Transect B, Shelf Water occupied the upper 100 m as far south as approximately 41°40'00"N. (Fig. 3). Between approximately 39°10'00" N and 40°40'00" N this transect passed through the periphery of a warm core eddy. The Gulf Stream was first encountered near the surface at 38°40'00" N and its maximum depth was 400 m.

Along both transects and near the northern boundary of the Gulf Stream surface water was of North Atlantic Central Water origin ranging 14.0-18.0°C. North Atlantic Central Water was also seen at greater depths throughout the Slope Water mass.

Distribution in Relation to Water Masses:

Catches occurred throughout the Slope Water and at all depths (Figs. 2 and 3). Two exceptionally large catches occurred at 100 m. On Transect A 3462 squid were caught during a night-time set at 19.0°C on Station 12 (Fig. 2). Although this catch appears to have occurred within the Gulf Stream, it was in close proximity to underlying North Atlantic Central Water. On Transect B a very large daylight catch (2546) occurred at 100 m and 14.6°C on Station 15 (Fig. 3). This catch was also near the northern boundary of the Gulf Stream.

Squid were present in small numbers at the periphery of the warm core eddy (Fig. 3). Along both transects no catches were experienced within the Gulf Stream or underlying North Atlantic Central Water south of the two greatest catches. Also, no squid were captured within Gulf Stream Water during a 100 m night-time set at station 9 (Fig. 2).

DISCUSSION

Data presented in this paper support other studies which also found greatest concentrations of young squid in Slope Water near the northern boundary of the Gulf Stream and absence of squid in the Gulf Stream (Fedulov and Froerman MS 1980, Froerman *et al.* MS 1981). It has been suggested, based on an increase in mantle length of young squid to the north (Fedulov and Froerman MS 1980, Froerman *et al.* MS 1981) that spawning occurs in winter near the edge of the continental shelf, and larvae and juveniles are transported seaward to the northern boundary of the Gulf Stream. Although corresponding Canadian data are less extensive they do not support this progression in length to the south (Dawe *et al.* MS 1981). Also, transport mechanisms which could result in concentration of small juveniles at the northern boundary of the Gulf Stream are unclear.

The hypothesis of spawning in the vicinity of the Gulf Stream seems more likely. Isotherms of North Atlantic Central Water Origin ranging 14.0-18.0°C extend beneath the Gulf Stream to its northern boundary. Thus transport along these isotherms could result in such high concentrations of young squid in this zone, especially in the upper 100 m. Recently O'Dor et al. (MS 1981) noted that based on laboratory experiments embryological development occurs at a minimum temperature of 13°C. Such favourable conditions would more likely be found in the general vicinity of the Gulf Stream rather than near the continental shelf.

New insight into location of spawning will depend largely on gaining a better understanding of the dynamics of water transport in these complex water masses.

REFERENCES

- DAWE, E. G., P. C. BECK and H. J. DREW. MS 1981. Distribution and biological characteristics of young short-finned squid (*Illex illecebrosus*) in the Northwest Atlantic, February 20-March 11, 1981. NAFO SCR Doc. 81/VI/23, Serial No. N302, 20 p.
- FEDULOV, P. P. and Yu. M. FROERMAN. MS 1980. Effect of abiotic factors on distribution of young shortfin squid *Illex illecebrosus* (LeSueur, 1821). NAFO SCR Doc. 81/VI/98, Ser. No. N153, 22 p.
- FROERMAN, Yu. M., P. P. FEDULOV, V. V. KHALYUKOV, E. N. SHEVCHENKO and T. AMARATUNGA. MS 1981. Preliminary results of the R/V *Atlant* Research on short-finned squid, *Illex illecebrosus*, in NAFO Subarea 4 between 3 March and 4 May, 1981. NAFO SCR Doc. 81/VI/41. Ser. No. N323, 13 p.
- O'DOR, R. K., N. BALCH and T. AMARATUNGA. MS 1981. The embryonic development of the squid *Illex illecebrosus*, in the laboratory. NAFO SCR Doc. 81/VI/29, Ser. No. N308, 11 p.

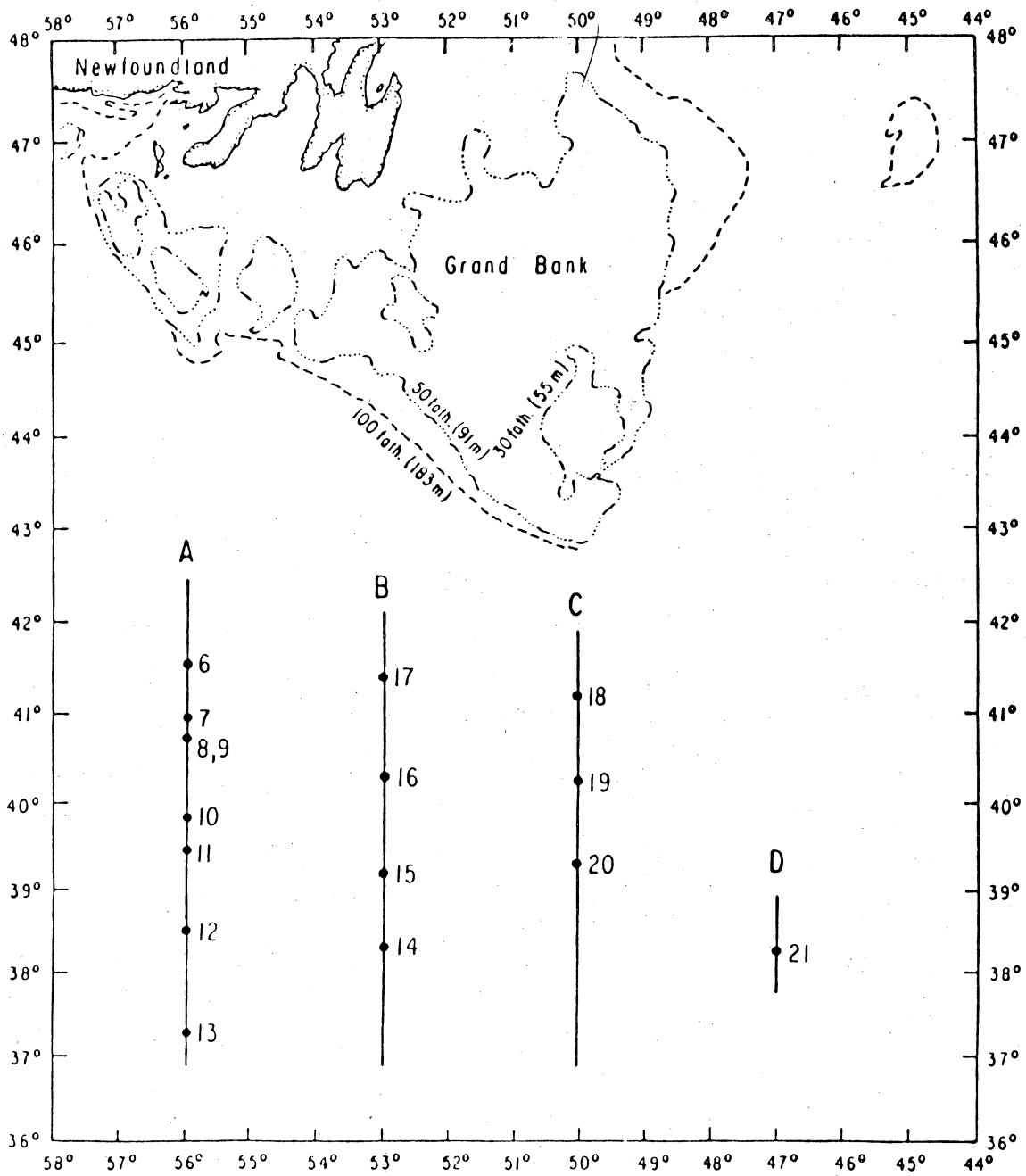


Fig. 1. Location of stations along transects in relation to latitude and longitude.

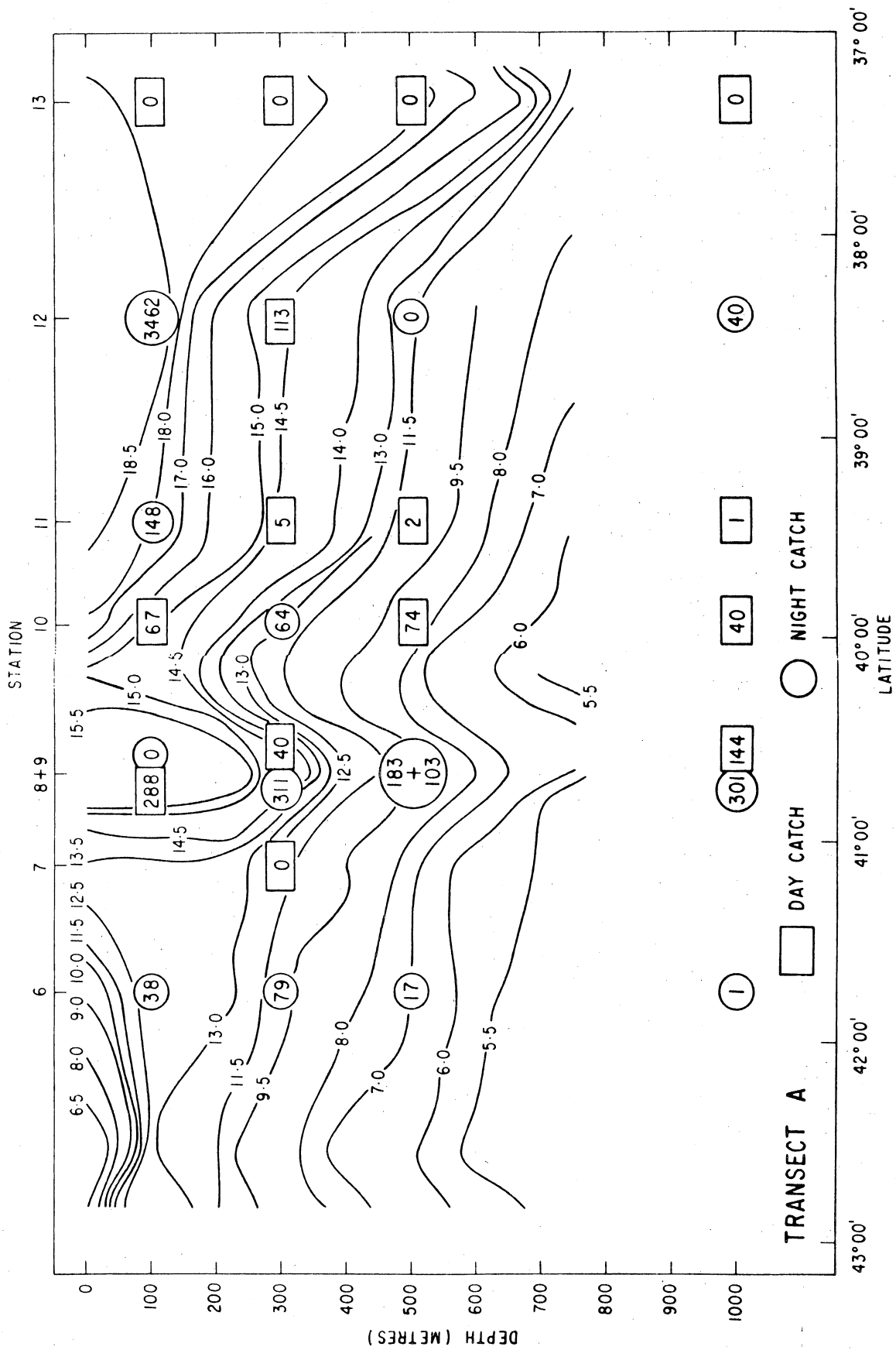


Figure 2. Catch at depth in relation to vertical temperature distribution along Transect A (56°00'00" W).

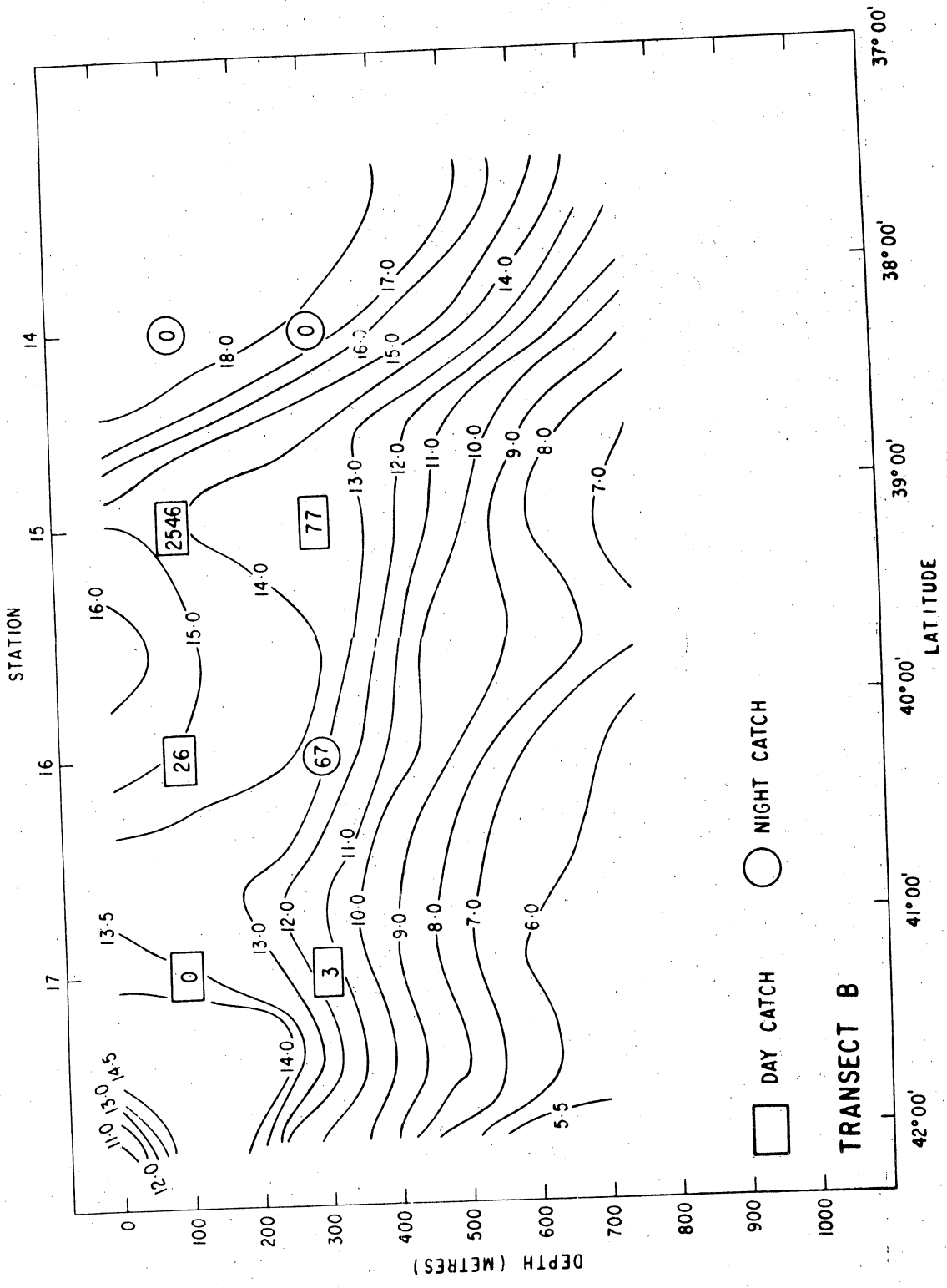


Figure 3. Catch at depth in relation to vertical temperature distribution along Transect B (53°00'00" W).