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ANALYSIS OF HOOKING DEPTH OF ATLANTIC BLUE MARLIN CAUGHT BY LONGLINE DURING THE 2000-2001 CRUISE BY THE R/V SHOYO-MARU

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SUMMARY

A research cruise in the central Atlantic by the Japanese research vessel SHOYO-maru was conducted in 2000-2001 as a part of ICCAT Bigeye Tuna Year Program (Matsumoto et. al., 2001). For a total of 24 deep longline operations (11 or more hooks per basket), 13 Atlantic blue marlins were caught, and hooking time and depth were successfully estimated for 11 blue marlin by using time-temperature and depth recorders (TDR) that were attached to the hook line. Catch rates of blue marlin were estimated by depth layer, by using hooking data and total hook resting time of each operation by depth layer, which were also estimated by TDR. The estimated catch rates of blue marlin were higher in the shallower layers than in the deeper layers.

RÉSUMÉ

Une campagne de pêche exploratoire a été menée dans l'Atlantique central par le navire de recherche japonais Shoyo-Maru en 2000-2001 dans le cadre du Programme d'Année Thon obèse de l'ICCAT (Matsumoto et al., 2001). A l'issue de 24 opérations à la palangre de profondeur (au moins 11 hameçons par élément), 13 makaire bleus de l'Atlantique ont été pris et la durée du mouillage et la profondeur des hameçons ont été estimées avec succès pour 11 makaires bleus à l'aide d'enregistreurs de temps-température et de profondeur (TDR) qui étaient fixés à la ligne de l'hameçon. Les taux de capture du makaire bleu ont été estimés par couche de profondeur, à l'aide des données relatives aux hameçons et de la durée totale de mouillage des hameçons de chaque opération par couche de profondeur, qui ont également été estimées par TDR. Les taux de capture estimés du makaire bleu étaient plus élevés dans les couches peu profondes que dans les couches profondes.

RESUMEN

El barco de investigación japonés Shoyo-Maru realizó un crucero de investigación en el Atlántico central en 2000-2001, como parte del Programa Año del Patudo de ICCAT (Matsumoto et. al., 2001). En un total de 24 operaciones de palangre de profundidad (11 o más anzuelos por cesta), se capturaron 13 agujas azules del Atlántico, y se estimó con éxito el tiempo de calado y profundidad de los anzuelos para 11 agujas azules utilizando grabadoras de tiempo-temperatura y profundidad (TDR) colocados en la línea del anzuelo. Se estimaron las tasas de captura de la aguja azul por capa de profundidad, utilizando los datos relacionados con los anzuelos y el tiempo total de calado de los mismos en cada operación y por cada capa de profundidad, lo que se estimó también mediante TDR. Se estimaron unas mayores tasas de captura de aguja azul en las capas superficiales en comparación con las capas más profundas.

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1. MATERIALS AND METHODS

The SHOYO-maru conducted 23 deep longline operations in the tropical and subtropical areas of the central Atlantic in the 2000-2001 research cruise, and all these operations targeted bigeye tuna (Matsumoto *et. al.*, 2001). Monofilament nylon lines were used and configuration of gear was more of less same as the one used by Japanese longliners operating in the Atlantic. During operations, TDR was attached to two or more branch lines per basket to record hooking time, depth and temperature of fish caught. TDR was attached to hook line in the position not far from hook. In every operation, TDR was attached to all branch line of single basket to estimate the movement of each branch line **(Figure 1)**. TDR was set to collect depth and temperature data in every 4 or 10 seconds.

Time and depth of hooking of blue marlin was estimated based on the movement of hook. **Figure 2** shows the example of movement of hook when blue marlin was caught. In most of case, apparent irregular movement of hook was observed when blue marlin was hooked. In this study, starting time of irregular hook movement was assumed to be hook time.

In case that blue marlin was caught by branch line with no TDR, hooking time was estimated by the TDR attached to the nearest or second nearest branch line, and hooking depth was estimated by assuming that the under water movement of hooks in all basket was same as hooks of the basket of which TDR was attached to all blanch line.

Total hook resting time by depth layer in one operation was estimated by using data of TDR attached to all branch line of single basket, under assumption that the under water movement of hooks in all basket was same as hooks of that basket.

By using these hooking time, hooking depth, and total hook resting time be depth layer obtained by the method mentioned above, CPUE (n / hook resting time) of blue marlin by depth layer was calculated. Because former studies indicated that blue marlin mainly distributed in the surface mixed layer (Block *et. al.*, 1992; Holland *et. al.*, 1990), base line of depth was set at the bottom of surface mixed layer in this study and all depth layers were expressed as the relative depth of this base line. Depth of surface mixed layer was determined by TDR data used in estimation of hooking depth.

2. RESULTS AND DISCUSSIONS

Within total of 13 catches of blue marlin, hooking time and depth could be estimated for 11 fishes. Analysis of CPUE was conducted by using data of these 11 catches.

Figure 3 shows CPUE of blue marlin by depth layer. CPUE in depth layer of 25.0 m-49.9 m was 7-12 times higher than CPUE in layers deeper than 100 m. No catch was observed in layers deeper than 200 m. In layer of 25.0 m-49.9 m, blue marlin was caught by moving hook, while in layer of deeper than 100 m, blue marlin was caught by settled hook.

Figure 4 shows CPUE of blue marlin by depth layer relative to the bottom of surface mixed layer. Decreasing trend of CPUE was also observed by relative depth. CPUE in layer just above the bottom of the mixed layer was about 60% higher than CPUE in layer just below the mixed layer.

The pattern of CPUE by depth obtained in this study with Atlantic blue marlin was very similar to the one with Pacific striped marlin reported by Boggs (1992). Thus such pattern is seemed to be general one for shallow swimming marlins. Higher CPUE of blue marlin in shallower supposed to be reflected the vertical distribution pattern of blue marlin, even if higher gear efficiency of moving hook than settled one was accounted Boggs (1992) reported that moving hooks was about 40% more effective than settled hooks for striped marlin.

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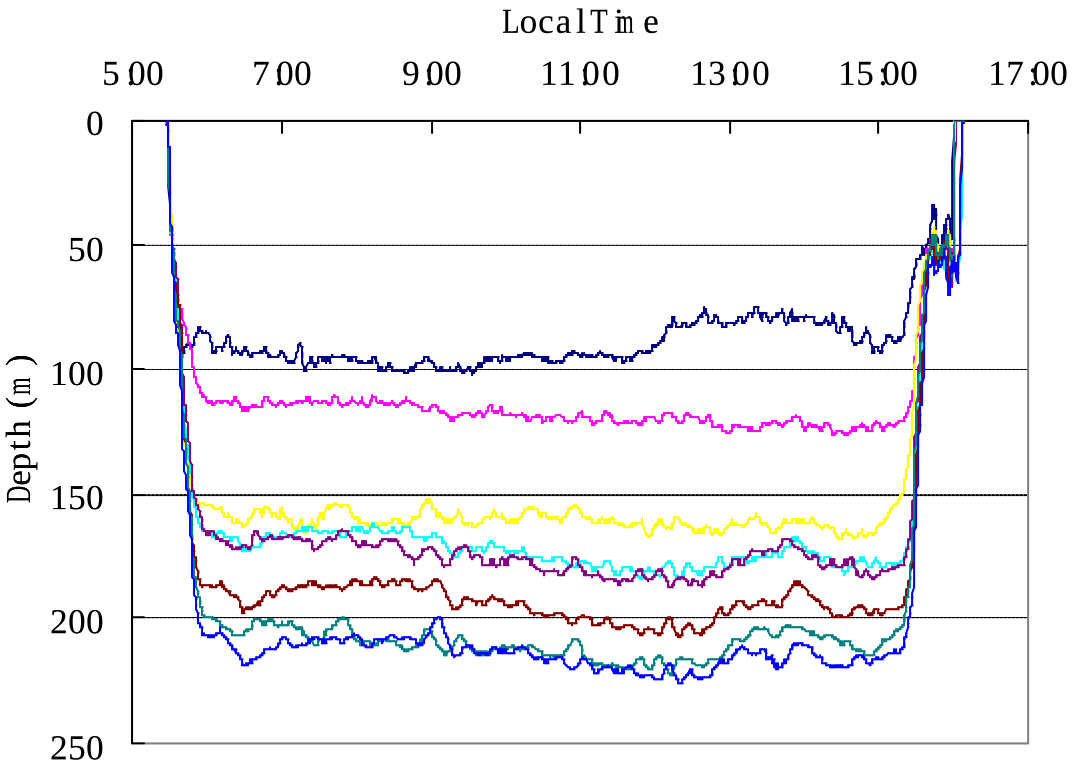

Fig. 1. Example of movement of hook of #1 - #7 line in one basket recorded by TDRs. Number of branch line per basket was 15.

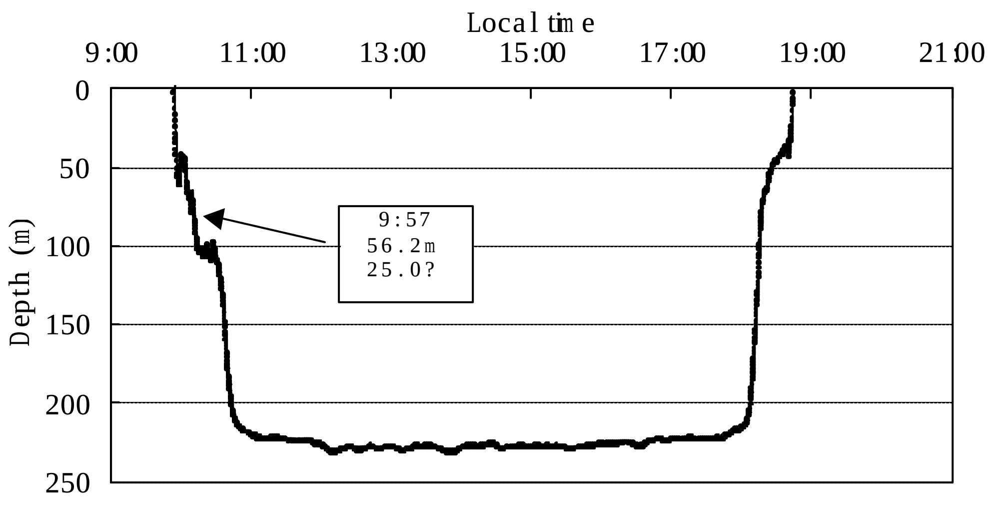

Fig. 2. Example of time-depth data of longline hook when Atlantic blue marlin was caught by a next deeper branch line with TDR. Data collected in 4th of November 2000 in position in 4.6 S and 17.6 W.

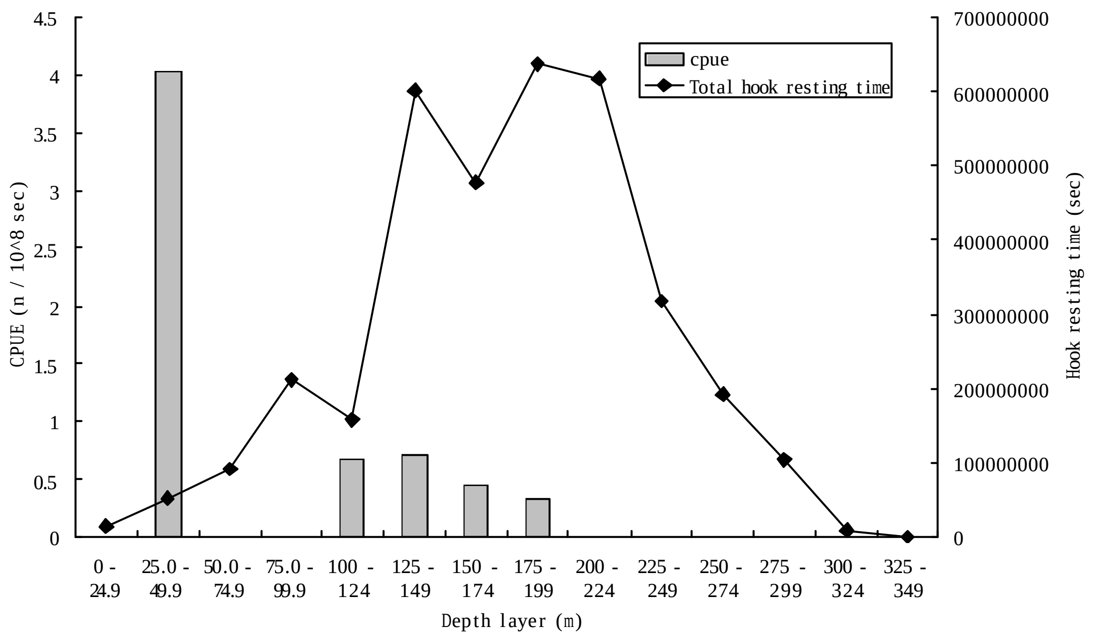

Fig. 3. CPUE of Atlantic blue marlin by depth layer, and total hook resting time of operations during the SHOYO-maru 2000-2001 research cruise.

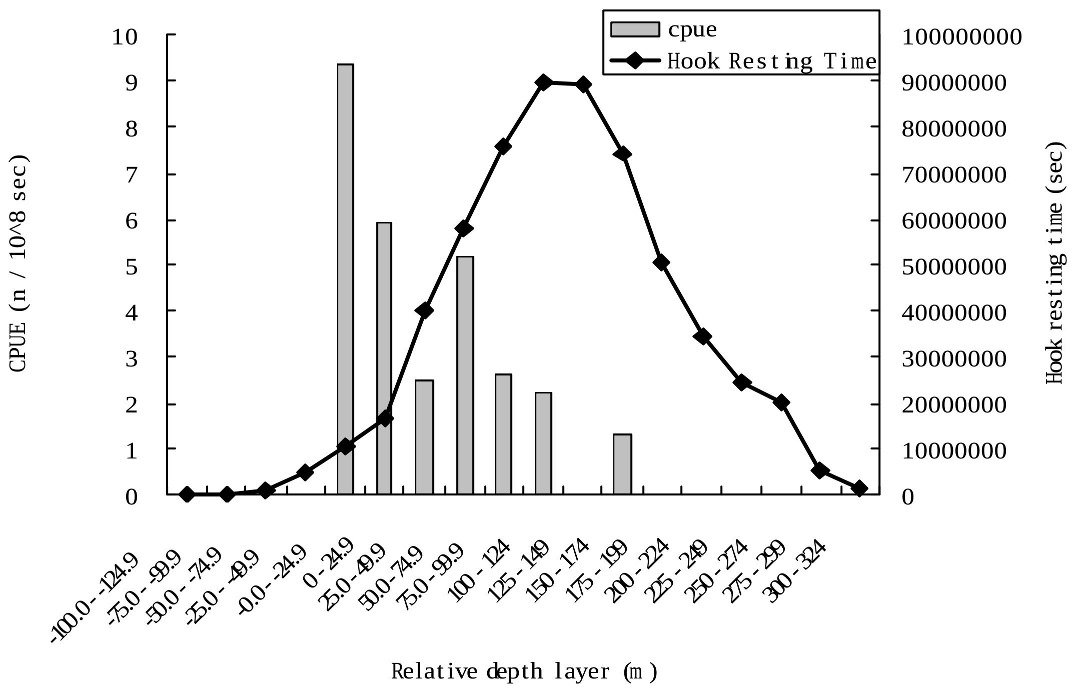

Fig. 4. CPUE of Atlantic blue marlin by depth layer relative to the bottom of the surface mixed layer, and total hook resting time of operations during the SHOYO-maru 2000-2001 research cruise.