Relationship between Tidal Range and Catch of Pound Net in Kasaoka Bay

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(Text-figs. 1-3; Table 1)

INTRODUCTION

The catch of the pound net (a kind of small set net called *masu-ami*) operated throughout the coastal regions of Kasaoka Bay to capture inhabitants of inshore waters is related to many environmental factors including presence of food organisms, water temperature, stage of tide, weather conditions, etc.. The species composition and the ecological aspects of fishes which had been captured by *masu-ami* were studied by some investigators.[1][2][3] But few studies have been concerned with the relationship between the environmental factors except weather conditions[3] and the catch of *masu-ami*. The respective catch of the two *masu-ami*, set close to each other in Kasaoka Bay, fluctuated in a very similar manner in weight and number of individuals, and the correlation coefficient between each catch of the two nets was highly significant.[1] This fact gives us an idea that there is an obvious relationship between the catch of the *masu-ami* set in the coastal regions and environmental factors. Stage of tide appears to be one of the most important factors; because moving with tide, shore fishes are trapped. As yet, no attention has been paid on the relationship between the stage of tide and the catch of *masu-ami*.

It is the purpose of this study to explore the relationship which may exist between the stage of tide and the catch of *masu-ami*. In this paper the daily catch per unit *masu-ami* and tidal range, a measure of stage of tide, were compared to determine if there was any relationship between the two. The correlation between them, moreover, was examined by computing the correlation coefficient.

MATERIALS AND METHODS

The materials of the present study is based on the daily commerical catch records of several regular *masu-ami* operated at Hikino water area of Kasaoka Bay, located along the northern middle part of the Seto Inland Sea, in the summer and autumn fishing season in 1957. Almost all of these *masu-ami* were of the same type in the shape. The structure of *masu-ami* has been detailed with its using in

previous paper.[1]

The tidal range in Kasaoka Bay is so great that it is effective and also that it is the only index in stage of tide available which cover the period of the data of *masu-ami* catch obtained.   The tidal range of the fishing ground,   therefore,   was used for
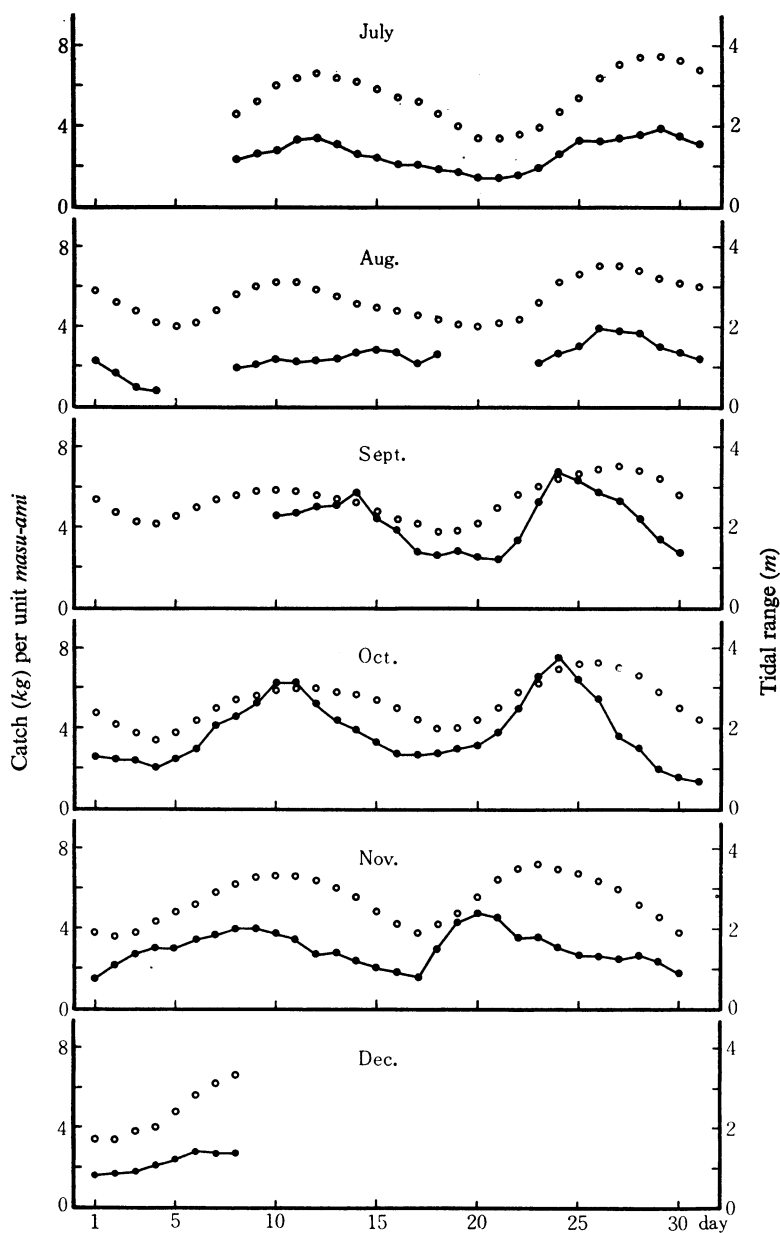

Text-fig. 1.   The curves of the daily catch per unit *masu-ami* (solid circle) compared with the tidal ranges (open circle) in Kasaoka Bay in 1957. (Curves smoothed by 3-day moving averages.)

the comparison of the catch of *masu-ami* fishing.   The range was estimated making necessary correction from the predicted value for Itozaki Port.[4]

RESULTS AND DISCUSSION

The estimated tidal ranges of the day when the fishes were trapped in the *masu-ami* is presented in Fig. 1, and the curves of three-day moving averages of the daily catch per unit *masu-ami* of the several regular nets during six months (from July to Dec. in 1957) have been drawn together to indicate the trends of the catch per unit-of-effort. In fig. 1, comparing the curves with the tidal ranges, it is clearly seen that the tidal range of the fishing ground and the daily catch per unit *masu-ami* are good agreement in trends and fluctuations in each month.   On the other hand, the relationship between the tidal range and the daily catch unit *masu-ami* is illustrated by months in Fig. 2.   The figure suggests that there may be some positive correla-
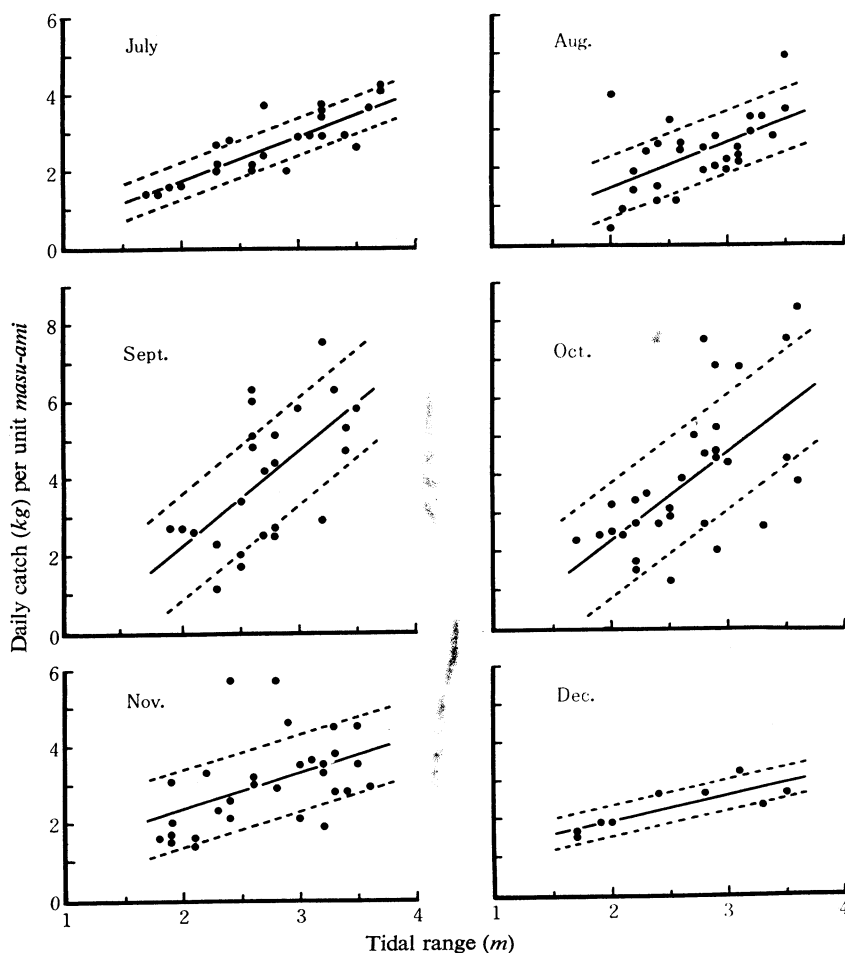
Text-fig. 2.   Relationship between the tidal ranges and the daily catches per unit *masu-ami* in each month in 1957.

tion between the two. The correlation coefficient, therefore, between the two in
each month has been calculated and it is tabulated respectively in Table 1, in which
it is highly significant in July, Aug., Sept., Oct. and Dec. and significant in only
Nov. In sum, it is 0.468 with 146 degrees of freedom, a highly significant result.

Table 1.   Correlation coefficients (r) between the tidal range and the
daily catch per unit *masu-ami*.

month	r	d. f.	t
July	0. 835	23	7. 277**
Aug.	0. 550	26	3. 358**
Sept.	0. 620	23	3. 789**
Oct.	0. 630	29	4. 368**
Nov.	0. 453	28	2. 437*
Dec.	0. 798	7	3. 503**
Sums	0. 468	146	6. 398**

** Highly significant (1% level).
* Significant (5% level).

The mean daily catches per unit *masu-ami* and its 95-percent confidence limits
during the six months from July to Dec. in 1957 are plotted against the correspond-
ing tidal ranges in Fig. 3. As might be reasonably expected, it is evident from this
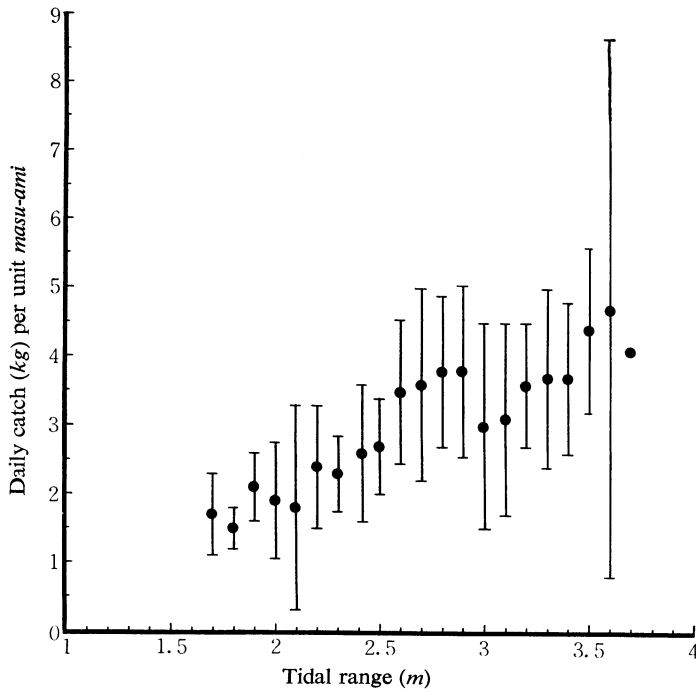
Text-fig. 3.   The mean daily catches per unit *masu-ami* and its 95% confidence limits plotted
against the corresponding tidal ranges. Date for all months of the 1957 fishing season com-
bined. The solid circles show the mean daily catches per unit *masu-ami* and the vertical lines
with terminal horizontal bars indicate the 95% confidence limits.

figure that in *masu-ami* fishing there is a linear relation between the tidal ranges and the mean daily catches per unit *masu-ami*, although obviously catches in Sept. and Oct. occurred at a considerably high level than in the other months as shown in Fig. 2. The regression coefficient, furthermore, amounted as much as 1.40 throughout the *masu-ami* fishing season in 1957 as the result of estimating.

These data are not quite good enough to predict with accuracy the daily catch of *masu-ami* from the tidal range of the fishing ground; however, the correlation is sufficiently high to conclude that the tidal range is a rough index of the general level of the catch of *masu-ami*. Although tidal range is not the only environmental factor determing the abundance of the catch of *masu-ami*, in Kasaoka Bay tidal range may in some instances be the limiting factor and have a direct effect on the abundance. In general, it may be said that the catch per unit *masu-ami* is more abundant in Kasaoka Bay on the day when tidal range is great than on the day with small tidal range.

SUMMARY

1)   Relationship between the tidal range of the fishing ground and the daily catch per unit *masu-ami* (a kind of pound net) was discussed by statistically analysing the data obtained from the several regular *masu-ami* of the commerical catch operated at Hikino water area of Kasaoka Bay, located along the northern middle part of the Seto Inland Sea, during six months from July to Dec. in 1957.

2)   The abundance of the daily catch per unit *masu-ami* had a highly significant correlation with the tidal range of the fishing ground as the result of calculating the correlation coefficient between the two in each month.

3)   In *masu-ami* fishing, although the catch per unit *masu-ami* fluctuated by fishing season, there was a linear relation between the tidal ranges and the mean daily catches per unit *masu-ami* against the corresponding tidal ranges, moreover, the regression coefficient amounted as much as 1.40 (kg/m) throughout the fishing season in 1957.

REFERENCES

1)   KAKUDA, S. & ONBE, T. 1962. Comparison of catches of two pound nets located at different distances from the shore. J. Fac. Fish. Anim. Husb., Hiroshima Univ., **4** (1/2): 7–20.

2)   ONBE, T. & KAKUDA, S. 1962. Ecology of fishes of Kasaoka Bay as observed from the catch of pound nets. J. Fac. Fish. Anim. Husb., Hiroshima Univ., **4** (1/2): 21–45.

3)   INOUE, A. 1963. Study on productivity of Kasaoka Bay. Bull. Naikai. Reg. Fish. Res. Lab., (20): 1–116. (In Japaneas with English summary).

4)   The Japan Meteological Agency. 1961. Tide tables for the year 1957., 223–228.

笠岡湾に於ける潮差と桝網漁獲量との関係

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　　内湾に設置された桝網について，その漁獲量と環境要因との関係を明らかにするために，1957年
7月から12月迄の6カ月間，笠岡湾の引野水域で操業された数統の桝網の1統当りの日別漁獲量と
漁場の潮差との相関々係について統計的な解析を試みた結果，両者の間には可成り高い正の相関が
認められた．即ち，月別ではその相関係数は7月に最高の0.835を，11月に最低の0.453を，6カ
月間の合計では0.468を示し，何れも統計学的に有意であった．又，両者間には直線関係が認めら
れ，その回帰係数は1.40（kg/m）で，潮差が桝網の漁獲量に可成り大きく影響することが判明し
た．