

# Trigger fish (*Balistes capriscus*). 2. Studies on brine salting

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## SUMMARY

Brine salting of Trigger fish has been studied. Using Cambodian standard for salted and dried fish, in the absence of local standards, it has been shown that the salting time can be reduced to 2.75-6.25 h depending upon the brine concentration. It is hoped that this method will be applied to replace eventually, the traditional dry-salting method, which is not only tedious, but takes 24-72 h to attain the same salt content.

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## Introduction

In Ghana, salting as a means of fish preservation has been known for a considerable length of time. However, a survey of the traditional fish handling industry revealed that dry-salting was the only method in use even though brine salting is practised as a normal process in other West African countries such as Sierra Leone (Watts, 1965).

With these two methods of salting, namely dry-salting which involves the use of salt crystals and brine salting which involves the use of brine (salt solution), the latter provides a faster rate of salt penetration. Cutting (1965) in his work on brining of fish showed that eel of 0.22-0.33 kg attain a salt content of 4-6 per cent without change in weight after one hour's immersion in a nearly saturated brine, while in dry-salting the same salt content is reached after 12-18 h with about 20-30 per cent weight loss. Del Valle & Gonzale-Inigo (1968) found out that, depending upon the type of product desired, dry salting time may range from a few

## RÉSUMÉ

NERQUAYE-TETTEH, GLADYS: *Le poisson trigger* (*Balistes capriscus*). 2. *Etude sur la salaison dans la saumure*. L'auteur a étudié la salaison dans la saumure du poisson trigger. En l'absence de données locales, le standard Cambodgien (Ernest Hess, 1953) a été adopté. Il est apparu que le temps de salage peut être réduit, par cette méthode, de 2,75 à 6,25 heures, suivant la concentration de la saumure. L'auteur espère que cette technique pourra être pratiquée, car le salage traditionnel au gros sel est pénible et prend 24-72 heures pour produire le degré de salaison désiré.

days to months.

This long period of salting is not desirable because Del Valle & Gonzale-Inigo (1968) pointed out that for larger quantities of the product, the production rates are usually inversely related to the processing time and hence all attempts to decrease salting time should be explored. Moreover, it has been observed that under warm climatic conditions such as prevails in Ghana, spoilage sometimes sets in before the fish is completely salted.

On this basis, this work was carried out to investigate whether Trigger fish can be brine salted and also to determine the minimum time for achieving the permissible salt level in the finished product using the Cambodian standard as a base.

## Materials and methods

Two experiments were carried out. The first experiment was aimed at studying the salt levels in the Trigger fish when it is brine-salted for a period of 60 h. The second experiment was to de-

termine the minimum time for achieving the permissible salt level in the finished product.

The fresh Trigger fish was purchased from Elmina beach immediately on landing. It was immediately gutted, washed and transported on ice to Food Research Institute, Accra. The whole lot was stored in the cold room (from - 24 to 28 °C) for about 18 h till the next day when it was used for the work.

### Experiment 1

Three dm<sup>3</sup> each of 100, 80, 60 and 40 per cent saturated brine were used for the brine salting. A stock of 100 per cent w/v saturated brine was prepared by adding 9 kg crude solar salt to 20 dm<sup>3</sup> water at room temperature (28-30 °C) until no more salt dissolved. The other concentrations were then made from this stock by weight. Into each concentration of the brine in plastic bowl, 25 thawed, gutted and washed, whole Trigger fish with weight ranging 85-100 g/piece and length 14-16 cm, were put and kept at room temperature (28-30 °C) for 60 h. The ratio of fish to brine was in all cases 1 : 1. Five fish were randomly taken from each of the bowls at 12 h intervals up to 60 h. Some brine was removed at the same time as the fish in order to keep the fish: brine ratio constant. The samples were allowed to drain for 30 min before they were minced for analyses.

### Experiment 2

In this experiment dry-salting was included for purposes of comparison. The fish used was of the same size as stated in Experiment 1.

In groups 1, 2, 3 and 4, sixty gutted Trigger fish were brine-salted in 100, 80, 60 and 40 per cent saturated brine respectively at a ratio of 1:1 (w/v) fish to brine.

In group 5, sixty gutted Trigger fish were salted using solar salt at a ratio of 5 parts fish to 1 part salt (w/v). The salting was done by filling the belly of each fish with salt and the rest of the salt was sprinkled on the packed fish in a plastic bowl.

Five fish were taken from each of the five groups at hourly intervals for 12 h and analysed for salt and moisture levels.

### Chemical analyses

The Trigger fish was first skinned manually, and

the flesh removed from the bones with a knife before it was minced with a Hobart mincer (CE-100 Mixer, 10 QT Model) for analysis. All the five whole fish picked at each time interval were minced together for the following analyses.

Moisture was determined on a 5 g well minced sample in a ventilated drying oven at 105 ± 1°C to a constant weight following the method described in AOAC (1970).

Salt was determined according to the method described by Schonherz (1955) and salt content on dry weight basis (sdwb) obtained from:

$$\text{sdwb} = \frac{100 m}{100 - m}$$

where m = moisture content.

### Results and discussion

Fig. 1 shows the results of Experiment 1 where the fish was brine-salted and samples taken at 12 h intervals for 60 h. There was a steady increase

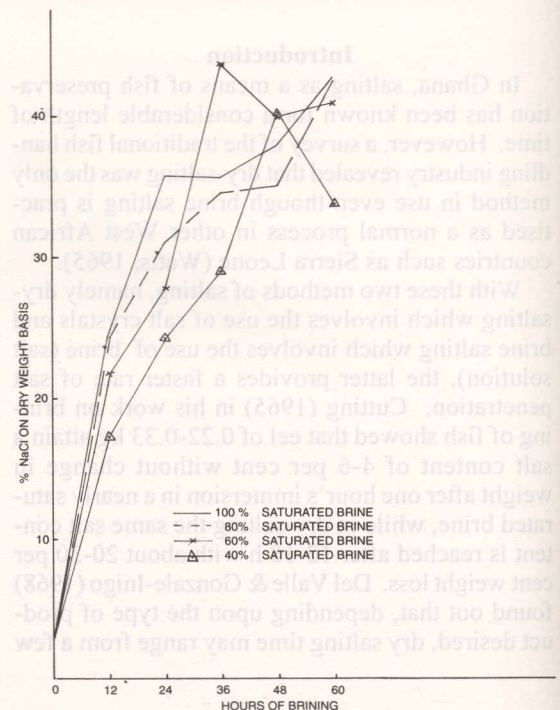


Fig. 1. Changes in sodium chloride content of Trigger fish flesh during the course of brine salting at different concentrations for 60 h.

of salt content in the fish with time in all the four concentrations. In all the salt concentrations, the highest amount of salt uptake occurred within the first 12 h of the brining process after which there was only slight increase. The behaviour of the graph in Fig. 1 between 26-60 h showing a decrease in salt content and subsequent increase in all the concentrations of brine are probably the result of random variation.

The results of Experiment 2 are shown in Fig. 2. The Cambodian standard (Hess, 1953) for salted and dried fish recommends 10 per cent salt at 40 per cent moisture. This means that the salt content on dry weight basis is  $\frac{10 \times 100}{60} = 16.7$  per cent.

Using this in the absence of local standards, the following rates of salting were observed for brine salting of Trigger fish at the five different levels of salt concentration:

- Group 1 100 per cent saturated brine - 2.75 h
- 2 80 per cent " " - 3 h
- 3 60 per cent " " - 3.5 h
- 4 40 per cent " " - 6.25 h

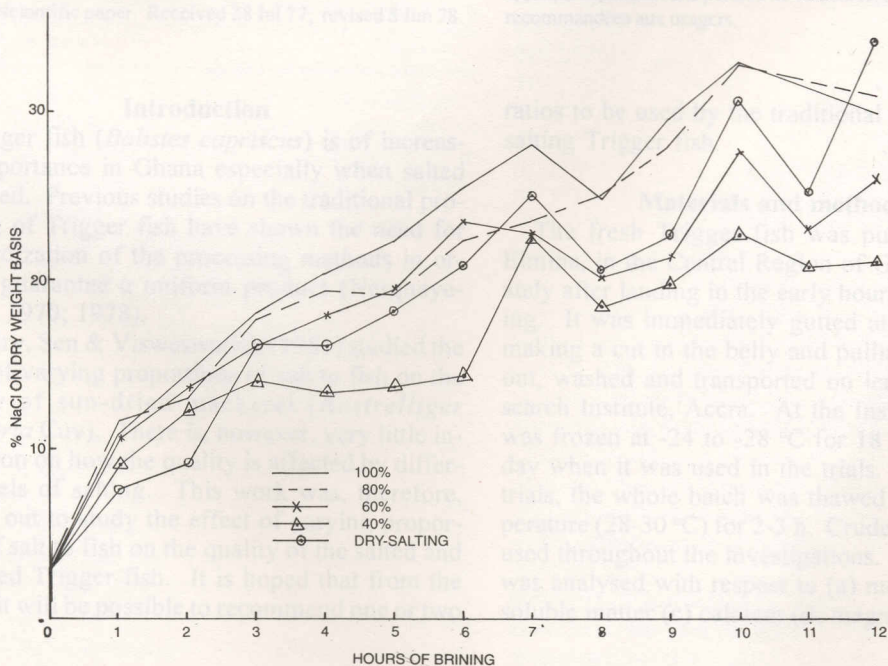


Fig. 2. Changes in sodium chloride content of Trigger fish flesh during the course of brine salting with different concentrations of brine for 12 h.

5 Dry salting - 4.5 h

Although brine salting is considered to be faster than dry-salting (Cutting, 1965), there are both disadvantages and advantages in the use of brine salting. The advantages are the possibly more rapid and probably more uniform salt content attainable under controlled conditions. Some of the disadvantages are that to ensure salt uptake similar to those in the laboratory, the brine strength will have to be maintained during brining which will require a brineometer. Alternatively the fish/brine ratio will have to be the same each time, so weighing equipment may be needed. In order to cut down cost, there will be a tendency to re-use the brine. This may lead to increased risk of bacterial spoilage of the product. Dry-salting, as indicated by Cutting (1965), has a moisture reducing effect, while brining, unless 100 per cent saturated throughout, may lead to an increase in moisture content and the need for longer drying.

Conclusion

It has been shown that Trigger fish can be brine-

salted as a method of preservation. The advantage of this method is that it reduces the traditional processing time from 1-3 days to 2.75-6.25 h. The reduction in processing time may allow a bigger volume of fish to be salted. There is also an indication of saving of labour due to the elimination of handling of individual fish during packing in wooden barrels as is done in the traditional dry-salting process.

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*Experiment 2*

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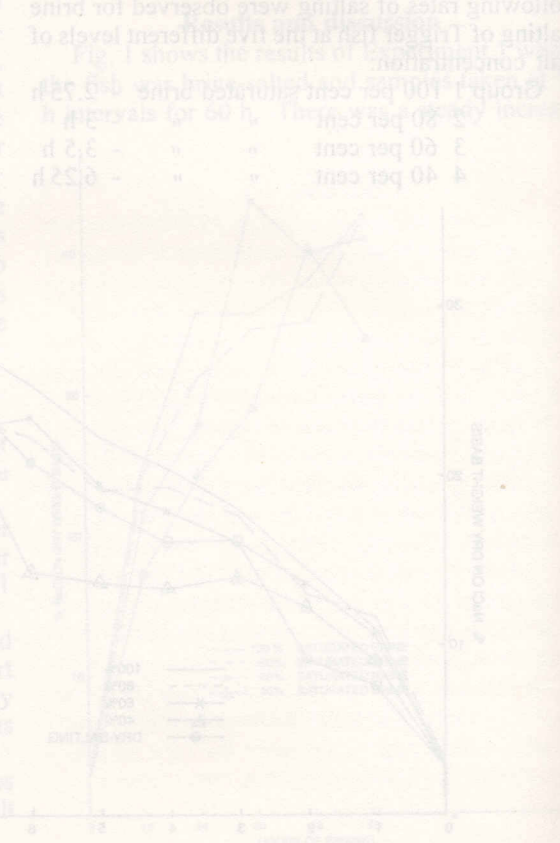


Fig. 3. Changes in sodium chloride content of Trigger fish over 12 h. 12 h intervals for dry salting and sodium chloride levels.