



# Development of a Rapid Tagging Technique for Short Term Studies on Summer Flounder, *Paralichthys dentatus*

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## OVERVIEW

We tried several techniques to enhance development of fish tagging and sex determination for flatfishes. To do this we examined retention time of external transmitters attached to summer flounder, *Paralichthys dentatus*, with a single anchor, and used ultrasonography to assess the sex.

Transmitters are used to track fish, and are usually surgically implanted or double anchored (Bridger and Booth 2003). Intra-muscular single anchor attachment is needed as an alternative to surgery for short term studies requiring rapid tagging of numerous fish, but might bias behavior or fall out.

Two holding tanks each held 8 fish, 4 tagged and 4 untagged. Over a two-week period, tagged and untagged fish were compared for behavior and tag retention. 94% of experimental fish retained their dummy transmitter tags while still exhibiting natural characteristics. Summer flounder responded well to this tagging technique so it can be used for fast processing of numerous fish.

*Paralichthys dentatus*, are an economically and ecologically important flatfish abundant in the mid-Atlantic Bight from Cape Cod to North Carolina (Grosslein and Azaravitz 1982). Flatfish are not easily implanted because of their stomach, body cavity size and orientation.

External tagging, by means of intra-muscular t-bar attachment, has the benefit of being quick, easy and leads to sufficiently high retention times without negatively affecting normal fish physiology or behavior, which is key to any successful biotelemetry study.

## MATERIALS & METHODS

Transmitters were attached to 87.3 mm Floy "spaghetti" tags with a t-bar anchor using a combination of glue and shrink wrap. T-bars are commonly used to tag clothing with price tags and can be pushed through fabric or tissue using a stapler-like gun with a hollow slotted needle. Summer flounder (n=32, 273-454 mm TL) captured by hook and line were tagged by inserting the needle on the tagging gun posterior to the base of the first dorsal spine, in the flesh above the epaxial muscle just below the dorsal fin (Fig. 1). The needle was pushed towards the head at a shallow angle, until it penetrated between the dorsal fin rays, the tagging gun was held steady and triggered fully to eject the tag. Three different size transmitters were employed: 11x40 mm, 2.0 g N=1, 11X46 mm 4.2 g N=6; & 11X61 mm, 5.6 g N=1.

Each tag was attached to the experimental fish according to their size, to avoid transmitter weight exceeding 2% of their body weight (Bridger and Booth 2003). Smaller tags were used with smaller fish to minimize possible fish:tag mass ratio as an effect. The biggest tag was used on the biggest fish from each experiment (TL=454 mm; TL=440 mm), and the smallest tag on the smallest fish respectively (TL=273 mm; TL=309 mm). Sex was determined for trial 2 fish (n=16, 309-440 mm TL), as a side project using ultrasonography, than confirmed by dissection.

Two pilot studies were conducted with n=16 flounder, 8 of which were tagged, and were distributed evenly across two holding tanks (23.45 cm deep, 27.2°C, 29.96 ppt) with 4 tagged and 4 untagged flounder in each (Fig. 2).

Trials lasted two weeks. Fish were observed for 1 hr. twice daily. Individuals were scored on metrics of behavior; eating, fluttering, turning, growth, & tag retention (Table 1). All fish were fed killifish and shrimp every other day.

## Experiment 1:

- Transmitters with longer tag anchors (allowed easy swiveling).
- Tags were not attached to each other as a cartridge during tagging (Fig. 3).

## Experiment 2:

- Transmitters with shorter tag anchors (less swiveling).
- Tags were together as a cartridge (Fig. 3)

Floy "spaghetti" tag



Fig. 3: Aligned acoustic transmitters attached to a Floy tag with glue and shrink wrap. Windows were cut to see tag ID #.

Epaxial muscle



Fig. 1: Tagging summer flounder in the epaxial muscle below dorsal fin



Fig. 2: Tank A holding 4 tagged and 4 untagged summer flounder

Trial	Avg. Growth	Turns/min	Fluttering/hr.	Eating (Killifish/Shrimp)
Long anchor	10.60 mm	3/min.	3/hr.	35
Short anchor	10.30 mm	1/min.	1.5/hr.	50
Control	10.51 mm	1/min.	2/hr.	40

Table 1: Response of tagged and control summer flounder based on 20 hrs of observation of four metrics. Turning may indicated transmitter drag. Fluttering is a normal attempt to bury. Eating was measured by how many prey a summer flounder consumed.

## RESULTS

- Overall 94% tag retention
- Chafing of the tag between the point of insertion and dorsal fin, left an abrasion and indentation. The tag also drifted underneath the fish (Fig. 4), causing a split in the dorsal fin but did not seem to cause drag when observed swimming.
- Ultrasound to determine sex on experimental fish in trial 2 had a 73% success rate when confirmed by dissection.

### Trial 1 (Long anchors):

- Procedure speed: 8 fish tagged in 22 minutes (2.75 min./fish)
- Longer single stranded tags retained for the full two weeks.
- Tagged summer flounder behaved similar to control fish and actively pursued prey.
- Growth averaged 10.60 mm for tagged and 10.58 mm for untagged

### Trial 2 (Short anchors):

- Procedure speed: 8 fish tagged in 16 minutes (2 min./fish)
- Shorter aligned tags were retained except one, which was dropped by the biggest fish 7 days into trial.
- Tagged summer flounder behaved similar to control fish and actively pursued prey.
- Growth occurred averaging 10.30 mm for tagged and 10.45 mm for untagged.

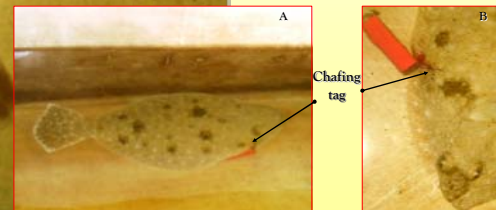


Fig. 4: (A) Tag splitting dorsal fin, and migrating to the blind side, (B) Chafing of epidermis on tagged fish

## ULTRASOUND

The quick tagging described here is beneficial to studies determining discard mortality, migration patterns, and diversity of habitat under natural conditions in the ocean. It needs to be complemented by a rapid sex assessment technique (Marrin-Robichaud Rommens 2001), especially in light of current fishing practices (Fig. 5).

A side project examined ultrasonography as a non-invasive method to assess sex and maturity of summer flounder. The ultrasound scanhead was positioned above the ventral surface to give a cross-section of the body cavity (Fig 6).

## Comparison of Sex & Length in Summer Flounder

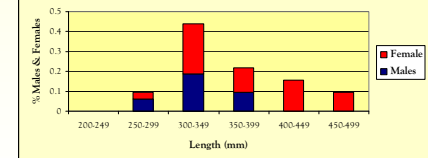


Fig. 5: As the length increases the number of males decreases. (n=32, Avg. for male length is 329.8 mm and avg. for female length is 374.9 mm).

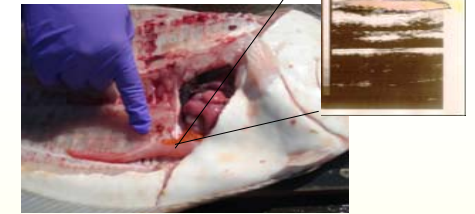


Fig. 6: Ultrasound of *Paralichthys dentatus*, Adult Female, TL= 440 mm. Possible ovarian lobe, ol, highlighted; confirmed by dissection.

## CONCLUSIONS

- Summer flounder retain single anchor tags for durations of two weeks or longer. This is a viable alternative to surgery for short-term studies.
- Tagging was fast, and had a 94% success rate, while not deterring normal fish behavior.
- The dropped tag was on the thickest fish and the needle did not fully penetrate to the blind side. This problem could be resolved, given a longer needle.
- Shorter tags eliminated some dorsal fin chafing but still left abrasions on three fish. A neoprene saddle might buffer this but adds to procedure time (Szedlmayer and Able 1993).
- Ultrasonography has potential to be a useful tool provided the technology be up to par. The technique, with practice, became simple inflicting minor stress on the fish.

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