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## SUMMARY OF THE PORPOISE TAGGING WORKSHOP

*Cooperatively Sponsored by the  
National Marine Fisheries Service,  
Fish and Wildlife Service, and  
Marine Mammal Commission*

*May 4-5, 1977*

SOUTHWEST FISHERIES CENTER  
La Jolla, California

### BACKGROUND

A meeting was held in Laurel, Maryland in December 1976 to consider a proposal to establish a national center for storage and recovery of data on marine mammal marking and tagging. One of the principal recommendations of that meeting was that a workshop be held to review the state-of-the-art of tagging and marking of marine mammals. Such a workshop is currently being planned to immediately precede or follow the marine mammal conference being planned by Forest Wood of the Naval Ocean Systems Center (NOSC), which is scheduled for December 1977 in San Diego.

The Southwest Fisheries Center (SWFC) planned to initiate large-scale porpoise tagging in late 1977 prior to the proposed December workshop. To accommodate the SWFC, a special porpoise tagging workshop was held on May 4-5, 1977, in La Jolla, California. The primary objectives of the workshop were to review the state-of-the-art of tagging and marking small cetaceans, assemble design criteria for improved tags and marks,

and to identify specific areas of research needed for tag and mark evaluation and for experimental design. Among the participants were individuals representing all major U.S. porpoise tagging and marking efforts as well as veterinarians familiar with marine mammals, tag specialists, marine mammal research managers, an invertebrate specialist familiar with naturally attaching organisms, and a biostatistician responsible for the experimental design of the SWFC's tagging program (see list of participants).

#### Summary of Workshop

Brief presentations were made by Blair Irvine, Tom Dohl, Steve Leatherwood, Bill Perrin, and John Hall, who reviewed their respective programs and summarized results and problems. Several had experiences with mutilations caused by migrating tags or other injuries, difficulties in remotely applying tags, unsatisfactory recovery rates (including visual sightings), and uncertainties as to shedding rates. Results with the same type of tags and marks differed between programs. During the discussions it became apparent that available tags or marks were generally unsatisfactory or, at least, insufficiently tested on small cetaceans to evaluate their effectiveness and, their long- and short-term effects on the animals.

Ray Fields, a veterinarian cooperating with the NMFS National Fisheries Engineering Laboratory (NFEL), reviewed NFEL findings on some

experimental work performed for the SWFC. The "feathered" tip of the parasite, Penella, which occurs on cetaceans and fishes, was found to induce turbulence, causing the organism to flatten against the body of the porpoise. A zone of laminar flow of 3/4 inch was found to exist just posterior to the dorsal fin. Dr. Fields demonstrated some prototype tags developed by the NFEL; one of particular interest was a dorsal fin clip that can be easily attached to the trailing edge of the dorsal fin. On the basis of their studies, NFEL recommends that the dart-type tag be abandoned but, if continued, that (1) all metal parts be of the same metal (same batch); (2) no coating (e.g., teflon) be used on the metal; (3) the spaghetti tag rather than John Hall's experimental tag be used; (4) the flexibility of the near section of the tag be increased (e.g., by a hinge).

The advisability and desirability of penetrating through the blubber into the musculature was discussed by Ray Fields and Jay Sweeney. The blubber, as connective tissue, was thought to have more "holding power" and be more stable than muscle, especially if the muscle did not have time to form scar tissue. Blubber, however, realigns with stress. The blubber layer and muscle move separately causing any tag implanted in the muscle to move continuously in the wound. Tissue damage caused by this type of movement and drag on the tag is perhaps more important than infection. Fields and Sweeney generally agreed that it would be preferable not to implant a tag in the muscle.

Jackie Jennings briefly discussed the SWFC's findings on preliminary tag implant tests. The orientation of the standard spaghetti dart-type tag was found to be important for tag retention. For optimum retention, the dart has to be implanted approximately parallel to the body surface. To achieve the proper orientation, the dart is mounted on the insertion pin of the jab stick with the notched tail of the dart below and behind the pin and the spaghetti streamer rising from the dart. In this orientation, the dart "digs in" with drag on the tag or pull by other animals. In other orientations the tag was easily pulled out or would cut its way out gradually. The notching of the tail is for maximum utilization of metal in manufacturing the tag and is not designed to aid in tag retention. A blunt tail was thought to be preferable.

Bill Newman described the evolution and attaching mechanisms of several types of barnacles and copepods, including Xenobalanus and Penella which are parasites of porpoise. In general, barnacles use suction and cement to secure themselves and become incorporated to varying degrees into the surface of the host by pulling the skin up, around, and into the organism. Penella attaches as a larvae and "roots" into the skin. Some of these mechanisms might prove useful for temporarily immobilizing tags to allow scar tissue to form or to allow the flesh to grow through surgical material used for hold-fasts. At present no similar artificial cement is known although dental cement is a possibility.

Surgical mesh was considered as a possible hold-fast to be implanted, for example, with a small barb or incorporated in an expanding "parasol" but the tag would have to be inactive long enough to allow the tissue to grow through the hold-fast.

Rusty White reviewed his research on marking and tagging various marine mammals. Of particular interest was his work with freeze branding including investigation of optimum temperatures and pressures and development of a branding apparatus with changeable heads using a ratchet-socket connection. Continued evaluation of freeze branding and various types of tags are planned as well as an investigation of rejection of various materials by porpoise tissue.

Tom Dohl reported on the status of laser marking which is still very experimental yet promising if adequate safety precautions can be incorporated into the device. Bob DeLong discussed the necessity of verifying that tagging materials (plastics and dyes) are stable under ultraviolet light and other environmental conditions.

It became apparent that individual program needs and priorities varied considerably. For example, whereas the SWFC is particularly concerned with tag retention, rapid application, and visibility, Tom Dohl needs to maximize visibility, even if it is at the expense of other "desirable" criteria. The other most obvious difference between

programs is one of application technique--whether tagging or marking will be done remotely as by a crossbow or from the bow of a ship, or when handling the porpoise such as in the backdown area of a tuna purse seine net.

The SWFC's tentative plans for tagging were discussed and the magnitude of the undertaking explained. Briefly, the area to be considered is approximately 5 million square miles and one estimate of the number of porpoises to be tagged is 100,000. The method of recovery will probably be by observers placed aboard commercial tuna boats but most tags will probably be placed during chartered cruises. Vince Galluci, who is under contract to the SWFC, discussed the preliminary experimental design from a statistical and practical standpoint. The assumptions for using the standard mark-recapture analysis were discussed as were correction factors that would have to be developed to modify the standard equations because the field situation does not fit the assumptions. Certain "mini-experiments" which are necessary to develop these corrections were identified, such as studies of short- and long-term shedding rates and school size and integrity. These should be conducted prior to launching a large-scale tagging effort.

The different types of tags and marks were reviewed and recommendations assembled for submission to the Marine Mammal Commission for their use in evaluating related proposals.

Recommendations

## A. Captive Animal Tests

Establish a colony of animals to be used exclusively for tagging and long-term monitoring as follows:

1. A minimum of four dolphins are required.
2. It is preferable to work with the species which will be tagged in the wild.
3. Work should be started as soon as possible with any of the following species as available: Tursiops truncatus, Stenella longirostris, Delphinus delphis, and Lagenorhynchus obliquidens (recognizing that Stenella attenuata are not easily maintained in captivity).

## B. Tag Evaluation Criteria

All tags should be evaluated for the following:

1. Retention and shedding rates-
  - a. injury and infection
  - b. tissue rejection of materials (3 months)

- c. removal by conspecifics
- d. natural sloughing
- e. depth of penetration (through blubber?)
- f. holding strength

2. Migration of tags and reduction of drag

- a. placement according to hydrodynamics of porpoise body
- b. tag shape, size, and, when appropriate, bolt placement for minimal drag

3. Application technique -

- a. ease, speed, and accuracy
  - 1. remote application
  - 2. contact application
- b. Safety during field operation



#### 4. Durability of materials-

- a. deterioration
- b. fading

#### C. Recommended Research

Experiments should be supported on the following marking and tagging types:

##### 1. Branding-

- a. further investigation to refine freeze branding and secondarily hot branding
- b. evaluation of species-specific differences
- c. serial marking on the same animal for an evaluation of application times, pressures, plate temperature, sub-dermal temperatures, as well as a determination of tagging site for optimum tag life and quality

## 2. Dorsal fin attachments-

- a. appraisal of disc tags, roto tags, roto tags with streamers, sew-through streamers, hog rings, "paper clip tag," and small U-shaped tags to wrap around the base of dorsal fin
- b. investigation of anchor pin materials such as carbon bolts and surgical materials
- c. determination of the proper placement of radio packages on the dorsal fin and a possible "spoiler" modification of the package to reduce migration

## 3. Body attachments-

- a. evaluation of various streamers with emphasis on existing spaghetti-type tags and development of experimental tags including ribbon tags, spaghetti tags with swivels, and Penella-like tags
- b. evaluation of hold-fasts including the standard dart tip, multi-barbed dart, expanding parasol tip, eskimo toggle-head, cement and surgical materials

Support experiments on the following additional types of marking:

- a. fin notching
- b. laser branding
- c. paint
- d. dye-tattoo using air gun applicator

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May 4-5, 1977

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