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CSRS Working Group on Salmon Marking Draft Report on the Development of Internet Accessible Otolith Mark Database

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by

CSRS Working Group on Salmon Marking

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Abstract

Otolith marking is an important tool to determine the hatchery origin of individual salmon in high seas and coastal waters. The number of otolith marked salmon released from hatcheries in the NPAFC countries has increased annually since 1994, reaching approximately one billion fish with nearly 150 marks in 2000. An easily accessible database and coordination of otolith mark releases are indispensable for the effective use of this technology. In cooperation with the Secretariat of the North Pacific Anadaromous Fish Commission (NPAFC), the Working Group on Salmon Marking (WGSM) recommends that a web accessible otolith mark database be developed with a computer expert hired by NPAFC. Under this plan, WGSM members will serve as mark coordinators for each country or region and will provide otolith mark data in a timely manner and uniform format for inclusion in the database. This report describes details and suggestions for the development and deployment of the database and web page. It is expected that this report may periodically be revised as necessary during the development stages.

Introduction

Otolith thermal marking (Volk et al., 1990; Volk and Hagen, 2001) is an effective tool to determine the hatchery origin of individual salmon in high seas and coastal waters. The North Pacific Rim countries are employing this mass marking technique, as well as other modified techniques such as dry (Rogatnykh et al., 2001), strontium (Schroder et al., 2001) or alizarin complexone otolith marks (Kawamura et al., 2001). The number of otolith marked salmon released from hatcheries has increased, annually, reaching approximately one billion fish (20% of total releases) with nearly 150 marks in 2000 (Urawa et al., 2001). Duplication of marks is not uncommon. With a steadily increasing use of otolith marks by salmon managers and biologists over a wide geographic region, an easily accessible database of otolith mark releases has become a priority for the most effective use of this technology.

At the 1999 NPAFC Annual Meeting, the CSRS recommended that the secretariat consider the development of an Internet-accessible otolith mark database on the NPAFC web site in cooperation with the Working Group on Salmon Marking (WGSM). The NPAFC Secretariat provided the WGSM a report on this matter in the summer of 2000, and the WGSM revised this report to develop NPAFC web pages for the otolith mark database and other information related to salmon otolith marking.

1. Web Page Contents

The web pages will be written by standard HTML code (http://www.w3.org/) to be accessible by any kind of browser (Internet Explorer, Netscape Navigator etc.) without extensions. To search the otolith mark database, a search program that works with the database and digital images (jpeg files) would be set on the web server. To develop well-designed and user-friendly web pages with an advanced search function, it is recommended that we hire the services of a web page design expert. There will be four major components to the web page.

(1) Introduction of Otolith Marking (History, Aims, Methods, References)
(2) Activities of Salmon Marking Working Group
(3) Reports and queries to view data contained in the Database
(4) A discussion forum including recurring pattern conflicts and a list of unsuccessful pattern searches

2. Otolith mark database

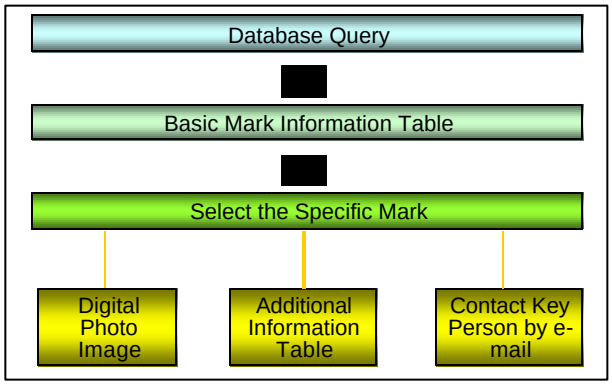
a) Application used for the database

A web accessible otolith mark database (NPAFC database) will be developed with a computer programmer hired by NPAFC. Members of the WGSM have agreed on a uniform format for the database and WGSM members will provide the Secretariat with data for each region or country.

b) Database structure

Bold items are basic information.
Asterisks* indicate "database search key"

1) **ID #** (initial of nation or state-brood year-# such as C99-01, J99-01, R99-01, A99-01, W00-01)
2) **Mark Type** * (TM, thermal mark; SM, strontium mark; DM, dry method mark; ALC, Alizarine complexone)
3) **Year Brood** *
4) **Year Released***
5) Date last released
6) **Species***
7) **Country***
8) State/Province*
9) Region released*
10) Agency*
11) Facility*
12) **Stock***
13) Release site
14) OM ID * (otolith mark ID; unique name, which may consist of facility, stock, or release site with brood year and species)
15) Stage at release
16) Mean size at release (mm)
17) Mean size at release (g)
18) Number of otolith mark released
19) **RBr code***
20) **Hatch code***
21) **Prehatch graphic**
22) **Posthatch graphic**
23) Digital image (jpeg file about 640*480 pixels, including scale)
24) Comments (such as mark quality)
25) **Contact person** linked with e-mail address



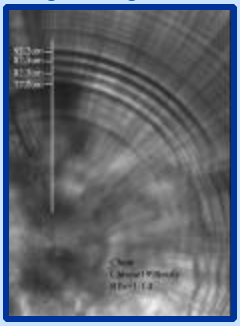
Search Result found **3 marks** for **Japan/brood year 1998**

ID #	J98-01	J98-02	J98-03
Mark Type	TM	TM	TM
Year Brood	1998	1998	1998
Year Released	1999	1999	1999
Species	CHUM	CHUM	CHUM
Country	JAPAN	JAPAN	JAPAN
Stock	Chitose River	Chitose River	Chitose River
RBr Code	1:1.4	1:1.4,2.2n	1:1.4,2.4n
Hatch Code	4H	4,2nH	4,4nH
Prehatch Graphic	I I I I	I I I I II	I I I I IIII
Posthatch Graphic			
Digital Photo Image	yes	yes	yes
Additional Information	yes	yes	yes
Contact Person	M. Kawana	M. Kawana	M. Kawana

Otolith Mark Basic Information

ID #	J98-01
Mark Type	TM
Year Brood	1998
Year Released	1999
Species	CHUM
Country	JAPAN
Stock	Chitose River
RBr Code	1:1.4
Hatch Code	4H
Prehatch Graphic	I I I I
Posthatch Graphic	
Digital Photo Image	yes
Additional Information	yes
Contact Person	M. Kawana

Digital Image J98-01



Otolith Mark Basic Information

ID #	J98-01
Mark Type	TM
Year Brood	1998
Year Released	1999
Species	CHUM
Country	JAPAN
Stock	Chitose River
RBr Code	1:1.4
Hatch Code	4H
Prehatch Graphic	I I I I
Posthatch Graphic	
Digital Photo Image	yes
Additional Information	yes
Contact Person	M. Kawana

Additional Information

ID #	J98-01
Date Last Released	4/18/99
State/ Province	Hokkaido
Region Released	Japan Sea coast
Agency	NASREC
Facility	Chitose Hatchery
Release Site	Chitose River
Stage	early fed fry
Weight (g)	1.04
Length (mm)	52.8
Total Released	1,227,500
OM ID	chitose98chum-e
Comments	excellent mark

kawana.morihiko@salmon.affrc.go. jp

c) Number of records and size of the database

Data records beginning from 1994 will be compiled in the NPAFC database. The number of records to be complied is shown in the table below. The size of the initial database would be less than 500 KB in Access® format, without images.

Number of records

Brood Year	Total	Canada	Japan	Russia	U.S.A.		
					Alaska	Washington	Others
1994	65	10	1	2	32	20	
1995	81	12	2	2	45	20	
1996	82	10	2	6	42	22	
1997	87	9	5	9	36	28	
1998	99	12	3	5	35	44	
1999	148	16	10	22	49	36	15
2000	181	19*	14	15*	61	69	3
Total	743	88	37	46	300	239	18

*Indicates estimate only.

Each record will be accompanied by a digital photo image of the otolith mark. Images should be saved in JPEG format. The size of an otolith mark JEPG file (640 x 480 pixels, gray scale) may be about 50 KB. Disk space to store files of all images from 1994 to 2000 would be about 35 MB.

d) Maintenance of database

The NPAFC database will be maintained and updated by WGSM members in cooperation with the Secretariat. At the NPAFC annual meetings, each party will report release information from the previous brood year and provide new data records to update the NPAFC database. The Secretariat or WGSM members will add the new data records to the NPAFC database.

3. Other contents in the web site

1) Introduction to Otolith Marking.

The introduction will provide a history of otolith marking as well as information on producing thermal marks and techniques for recovering the marks. This introduction will be prepared by working group members.

2) Activities of Working Group on Salmon Marking

The North Pacific Anadromous Fish Commission (NPAFC) established the Ad Hoc Working Group on Salmon Marking in 1998, and it became a permanent working group in 1999. The roles of working group are:

- Coordinate otolith mark patterns among countries to minimize the duplications
- Develop the Internet-accessible database of otolith marks released from Pacific rim countries
- Exchange information on the development and standardization of otolith mark techniques
- Exchange information on the applications of otolith mark for biology and management of salmon

3) Discussion pages

It may be desirable to include a feature that will allow users of this data to post questions or seek advice on particular mark patterns. This may including recurring pattern conflicts and a list of unsuccessful pattern searches and allow participants to post images for discussion.

4. Mark Code Notation

A) RBr code

The RBr is one way to codify the otolith thermal mark, defined by Munk and Geiger (1998). It stands for "**R**egion", "**B**and", "**r**ings". It is based on a mark approach that produces coherent groups of thermal rings and thermal bands; where ring intervals remain constant within a thermal band, and band intervals are minimum twice the width of ring intervals. It is written numerically as "Region:Band.rings", or "R:B.r".

R The uppercase "R" identifies the region where the base mark appears relative to the hatch mark. Three region codes – 1, 2, and 3 – identify whether the thermal mark appears prehatch, e.g. marked as eggs = region "1", or posthatch, marked as alevins = region "2". If both prehatch and posthatch stages are represented in the stock during marking, then the region code "3" is assigned.

B The uppercase letter "B" identifies the thermal **B**and number. A thermal band is a grouping of thermal rings which have sufficient spacing between the groups allow clear visual separation. There may be one, two, or more groups of rings. Precise and measured spacing between thermal bands is described by the use of a delimiter in the written RBr code. The simplest and most common delimiter is the comma ",". This indicates separation between thermal bands of 2 to 2.5 times the preceding ring interval (additional delimiters and band characteristics are described later).

r The lowercase "r" identifies the number of thermal rings within each thermal band. The number of thermal rings within each band are counted, and are written to the right of its band number, preceded by a period.

Delimiter The comma "," indicates spacing between bands of 2-2.5 times the preceding ring interval. This is the most common delimiter in separation of thermal bands. The hyphen "-" and slash "/" indicates spacing between bands by 3-3.5 and 4-4.5 times ,respectively, the preceding ring interval. Separating thermal bands by greater than 5 ring intervals is generally synonymous with the "accessory mark". The accessory mark is identified by plus sign, "+", and appears posthatch to a prehatch "basemark". It is unlikely to be used prehatch, however does sometimes follow a posthatch basemark.

Relative Spacing The concept of "relative spacing" of ring intervals of one band compared to later thermal bands increases the number of codes and still allows fast identification of these features. This feature is noted by "n" following a "band . ring-number" to indicate that it is a narrow spaced band (Hagen, 1999).

B) Hatch code

The Hatch notation is similar to the RBr code in that thermal rings are considered to be grouped into bands of rings that are evenly spaced. The primary difference is that the hatch event is denoted with a "H" and the position in the code indicates what rings are formed pre or post hatch (Hagen et al., 2000).

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