

NPAFC

Doc. 1190

Rev. \_\_\_\_\_

Rev. Date:

## Proposed Otolith Marks for Brood Year 2009 Salmon in Russia

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Submitted to the

NORTH PACIFIC ANADROMOUS FISH COMMISSION

by

Russia

November 2009

**THIS PAPER MAY BE CITED IN THE FOLLOWING MANNER:**

Akinicheva, E., and V. Volobuev. 2009. Proposed otolith marks for brood year 2009 salmon in Russia. NPAFC Doc. 1190. 5 pp. Sakhalin Research Institute of Fisheries & Oceanography, and Magadan Scientific and Research Institute of Fisheries and Oceanography, Russia . (Available at [www.npafc.org](http://www.npafc.org)).

# **Proposed Otolith Marks for Brood Year 2009 Salmon in Russia**

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## **Abstract**

The main goal of salmon marking at Russian hatcheries is the assessment of Pacific salmon returns. Besides, differentiation of wild and hatchery-reared salmon is used for studies according to the regional programs. For instance, in Magadan region the wild and hatchery-reared juvenile chum salmon survival in the early sea life period is evaluated based on the otolith marks differentiation. A complex population structure of pink salmon returns is noted for Sakhalin-Kuril region where they spawn in great numbers. In this connection, the important trend of studies is to determine timing of pink approaches and abundance of their different populations and groupings. The straying assessment of the hatchery-reared pink spawners to the neighbour rivers is of great interest for fish culturists.

## **Proposed Otolith Marks for Brood Year 2009 Salmon in Russia.**

In recent years, salmon marking in the Far East has been performed in Magadan, Kamchatka, and Khabarovsk regions. Only a small number of otolith marks have been used and repeated from year to year.

The studies directed to apply otolith marking at Sakhalin hatcheries have been conducted since 2008. In this region, chum and pink salmon are the main hatchery-reared species. To achieve a goal, there is a need in much more marks because of the numerous hatcheries located there. To mark Sakhalin salmon of the 2008 brood, a total of 8 marks were required for 8 Sakhalin hatcheries: 4 for chum and 6 for pink salmon.

In 2009, the salmon-marking hatcheries will increase in number. A significant part of reared production will be marked at 8 hatcheries, and the experimental marking of small numbers of eggs and larvae will be conducted at individual hatcheries.

Marking at Sakhalin hatcheries is a complex process due to unstable temperature of water sources which supply nursery incubators and canals. Besides, at major hatcheries it is impossible to change water temperature for individual batches of eggs and juveniles, and sometimes for individual salmon species; this causes additional problems. At present, the otolith microstructure of salmon released from these hatcheries is studied as well as the temperature conditions during incubation and growing. Now it is difficult to choose hatcheries for experimental marking of the 2009 salmon brood; they will be distinguished during investigations.

Because of such situation, a three-year marking plan has been elaborated in Russia. In 2009, only part of marks will be used. The rest marks will be gradually used during the following period. We suggest the possibility of their operative exchange between hatcheries and yearly rotation. Besides, one and the same mark could be used at the embryonic stage and after hatching at some hatcheries.

The marking plan is presented in Table 1.

The thermal marking pattern is presented as the RBr notation (Munk and Geiger 1998; Hagen 1999) and Hatch code notation (Hagen et al. 2000).

### **References**

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Munk, K. M., and H. J. Geiger. 1998. Thermal marking of otoliths: the "RBr" coding structure of thermal marks. (NPAFC Doc. 367) 19 p. CWT & Otolith Processing Lab., Alaska Department of Fish and Game, Juneau, Alaska, USA.

Table1.Plan marks from Russia for 2009 brood year stocks of salmon

| Mark Type | BROOD YEAR | SPECIES | COUNTRY | STATE/<br>PROVINCE | FACILITY                | HATCH CODE | RAPHIC IMAGE    |             |
|-----------|------------|---------|---------|--------------------|-------------------------|------------|-----------------|-------------|
|           |            |         |         |                    |                         |            | PREHATCH        | POSTHATCH   |
| 1         | 2          | 3       | 4       | 5                  | 6                       | 7          | 8               | 9           |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Ado-Tymovsky Hatchery   | 1,3,1H     | I I I I I       |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Ado-Tymovsky Hatchery   | H1,3,1     |                 | I I I I I   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Pobedinsky Hatchery     | 1,2,2,1H   | I I I I I       |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Pobedinsky Hatchery     | H1,2,2,1   |                 | I I I I I   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Buyuklovsky Hatchery    | 1,2,4H     | I I I I I I     |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Buyuklovsky Hatchery    | H1,2,4     |                 | I I I I I I |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Sokolovsky Hatchery     | 5,2H       | I I I I I I     |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Sokolovsky Hatchery     | H5,2       |                 | I I I I I I |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Bereznyakovsky Hatchery | 4,2H       | I I I I I I     |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Bereznyakovsky Hatchery | H4,2       |                 | I I I I I I |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Anivsky Hatchery        | 3,2H       | I I I I I       |             |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Taranaysky Hatchery     | 1,5H       | I I I I I I     |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Taranaysky Hatchery     | H1,5       |                 | I I I I I I |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Sokolnikovsky Hatchery  | 3n,1,2H    | I I I I I       |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Sokolnikovsky Hatchery  | H3n,1,2    |                 | I I I I I   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Yasnomorsky Hatchery    | 5,1H       | I I I I I I     |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Yasnomorsky Hatchery    | H5,1       |                 | I I I I I I |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Urozhayny Hatchery      | 3n,3H      | I I I I I       |             |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Kalininsky Hatchery     | 3-3H       | I I I I I I     |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Kalininsky Hatchery     | H3-3       |                 | I I I I I I |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Lesnoy Hatchery         | 3,2n,2H    | I I I I I I     |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Lesnoy Hatchery         | H3,2n,2    |                 | I I I I I I |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Okhotsky Hatchery       | 3n,1,3H    | I I I I I I     |             |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Okhotsky Hatchery       | H3n,1,3    |                 | I I I I I I |
| DM        | 2009       | Chum    | Russia  | Iturup             | Kuril'sky Hatchery      | 3,2,2nH    | I I I I I I     |             |
| TM        | 2009       | Chum    | Russia  | Iturup             | Reydovyy Hatchery       | H1,2,2     |                 | I I I I I   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Hatchery on bay Olya    | 3,1,3nH    | I I I I I I     |             |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Zalom Hatchery          | 1,2,1H     | I I I I I       |             |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Monetka Hatchery        | 3,4H       | I I I I I I I   |             |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Pilenga Hatchery        | 9H         | I I I I I I I I |             |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Phirsovka Hatchery      | 3,5H       | I I I I I I I   |             |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Bakhura Hatchery        | 1,2,3,1H   | I I I I I I I   |             |

Table1 (continued). Plan marks from Russia for 2009 brood year stocks of salmon.

| Mark Type | BROOD YEAR | SPECIES | COUNTRY | STATE/<br>PROVINCE | FACILITY              | HATCH CODE | RAPHIC IMAGE      |                   |
|-----------|------------|---------|---------|--------------------|-----------------------|------------|-------------------|-------------------|
|           |            |         |         |                    |                       |            | PREHATCH          | POSTHATCH         |
| 1         | 2          | 3       | 4       | 5                  | 6                     | 7          | 8                 | 9                 |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Igrivaya Hatchery     | 4n,1,2H    | III I I I         |                   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Skal'nyy Hatchery     | 1,2,1,2,1H | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Ol'khovatka Hatchery  | 5,2nH      | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Krasnoyarka Hatchery  | 3,1,3H     | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Kuybyshevka Hatchery  | 4,1,2H     | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Osenny Hatchery       | 4,2,1H     | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Okeansky Hatchery     | 1,2,1-2H   | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Dolinka Hatchery      | 4n,3H      | III I I I         |                   |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Lazovoy Hatchery      | 3,2n,2H    | I I I I I I I     |                   |
| TM        | 2009       | Chum    | Russia  | Sakhalin           | Lazovoy Hatchery      | H3,2n,2    |                   | I I I I I I I     |
| DM        | 2009       | Chum    | Russia  | Sakhalin           | Ozero Hatchery        | 1,4,2H     | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Kamchatka          | Ozerkovsky Hatchery   | 3,3H       | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Kamchatka          | Ketkinsky Hatchery    | 3,2,2H     | I I I I I I I     |                   |
| TM        | 2009       | Chum    | Russia  | Kamchatka          | Paratunsky Hatchery   | H9         |                   | I I I I I I I I I |
| DM        | 2009       | Chum    | Russia  | Magadanskaya       | Armansky Hatchery     | 4,3H       | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Magadanskaya       | Olsky Hatchery        | 5H         | I I I I I         |                   |
| DM        | 2009       | Chum    | Russia  | Magadanskaya       | Olsky Hatchery        | 1,6H       | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Magadanskaya       | Olsky Hatchery        | 4,3nH      | I I I I I I I     |                   |
| DM        | 2009       | Chum    | Russia  | Magadanskaya       | Tauysky Hatchery      | 3n-3nH     | III III           |                   |
| DM        | 2009       | Chum    | Russia  | Magadanskaya       | Yansky Hatchery       | 7H         | I I I I I I I     |                   |
| TM        | 2009       | Chum    | Russia  | Khabarovskaya      | Kometa Hatchery       | 3n,4H      | III I I I I       |                   |
| DM        | 2009       | Sockeye | Russia  | Kamchatka          | Ozerkovsky Hatchery   | 3,3H       | I I I I I I I     |                   |
| TM        | 2009       | Sockeye | Russia  | Kamchatka          | Malkinsky Hatchery    | 3,1,2H     | I I I I I I I     |                   |
| DM        | 2009       | Sockeye | Russia  | Magadanskaya       | Olsky Hatchery        | 7H         | I I I I I I I     |                   |
| DM        | 2009       | Sockeye | Russia  | Magadanskaya       | Armansky Hatchery     | 3,4H       | I I I I I I I     |                   |
| TM        | 2009       | Coho    | Russia  | Kamchatka          | Paratunsky Hatchery   | H9         |                   | I I I I I I I I I |
| DM        | 2009       | Coho    | Russia  | Kamchatka          | Viluysky Hatchery     | 3,5H       | I I I I I I I I I |                   |
| DM        | 2009       | Coho    | Russia  | Magadanskaya       | Armansky Hatchery     | 4,3H       | I I I I I I I I I |                   |
| DM        | 2009       | Coho    | Russia  | Magadanskaya       | Olsky Hatchery        | 5H         | I I I I I I I     |                   |
| DM        | 2009       | Coho    | Russia  | Magadanskaya       | Tauysky Hatchery      | 7H         | I I I I I I I I I |                   |
| DM        | 2009       | Coho    | Russia  | Magadanskaya       | Yansky Hatchery       | 3n,3nH     | III III           |                   |
| DM        | 2009       | Coho    | Russia  | Sakhalin           | Ado-Tymovsky Hatchery | 1,3,1H     | I I I I I I I     |                   |
| DM        | 2009       | Coho    | Russia  | Sakhalin           | Buyuklovsky Hatchery  | 1,2,4H     | I I I I I I I I I |                   |

Table1 (continued). Plan marks from Russia for 2009 brood year stocks of salmon.

| Mark Type | BROOD YEAR | SPECIES | COUNTRY | STATE/<br>PROVINCE | FACILITY              | HATCH CODE | RAPHIC IMAGE  |               |
|-----------|------------|---------|---------|--------------------|-----------------------|------------|---------------|---------------|
|           |            |         |         |                    |                       |            | PREHATCH      | POSTHATCH     |
| 1         | 2          | 3       | 4       | 5                  | 6                     | 7          | 8             | 9             |
| TM        | 2009       | Coho    | Russia  | Sakhalin           | Buyuklovsky Hatchery  | H1,2,4     |               | 1,2,4         |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Sokolovsky Hatchery   | 5,2H       | I I I I I I I |               |
| TM        | 2009       | Pink    | Russia  | Sakhalin           | Sokolovsky Hatchery   | H5,2       |               | I I I I I I I |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Anivsky Hatchery      | 3,2H       | I I I I I     |               |
| TM        | 2009       | Pink    | Russia  | Sakhalin           | Taranaysky Hatchery   | H1,5       |               | I I I I I I I |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Taranaysky Hatchery   | 1,5H       | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Pugachyevsky Hatchery | 3,3,1H     | I I I I I I I |               |
| TM        | 2009       | Pink    | Russia  | Sakhalin           | Pugachyevsky Hatchery | H 3,3,1    |               | I I I I I I I |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Lesnoy Hatchery       | 4,2,1H     | I I I I I I I |               |
| TM        | 2009       | Pink    | Russia  | Sakhalin           | Lesnoy Hatchery       | H4,2,1     |               | I I I I I I I |
| DM        | 2009       | Pink    | Russia  | Iturup             | Kuril'sky Hatchery    | 3,2,2nH    | I I I I I I I |               |
| TM        | 2009       | Pink    | Russia  | Iturup             | Reydovyy Hatchery     | H1,2,2     |               | I I I I I     |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Monetka Hatchery      | 3,4H       | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Phirsovka Hatchery    | 3,5H       | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Bakhura Hatchery      | 1,2,3,1H   | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Igrivaya Hatchery     | 4n,1,2H    | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Skal'nyy Hatchery     | 1,2,1,2,1H | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Ol'khovatka Hatchery  | 5,2nH      | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Tikhaya Hatchery      | 1,6H       | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Ay Hatchery           | 3,1H       | I I I I I     |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Krasnoyarka Hatchery  | 3,1,3H     | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Kuybyshevka Hatchery  | 4,1,2H     | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Dolinka Hatchery      | 4n,3H      | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Manuy Hatchery        | 5,1H       | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Nituy Hatchery        | 6,1H       | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Sakhalin           | Urozhayny Hatchery    | 3n,3H      | I I I I I I I |               |
| DM        | 2009       | Pink    | Russia  | Magadanskaya       | Yansky Hatchery       | 4,3H       | I I I I I I I |               |
| DM        | 2009       | Masu    | Russia  | Sakhalin           | Sokolovsky Hatchery   | 5,2H       | I I I I I I I |               |
| DM        | 2009       | Masu    | Russia  | Sakhalin           | Anivsky Hatchery      | 3,2H       | I I I I I I I |               |
| DM        | 2009       | Masu    | Russia  | Sakhalin           | Urozhayny Hatchery    | 3n,2H      | I I I I I I I |               |
| TM        | 2009       | Chinook | Russia  | Kamchatka          | Malkinsky Hatchery    | H3,1,2     |               | I I I I I I I |