

## AFSC/ABL: 1996 Brood year Steelhead growth and early life-history transitions

**Theme keywords:** 002, Biota, growth, heritability, maturation, *Oncorhynchus mykiss*, precocious, smolting, steelhead

**Abstract:** Heritabilities of growth, precocious maturation and smolting were measured in 75 families of juvenile steelhead or rainbow trout *Oncorhynchus mykiss*, progeny of within and between line matings (crosses) of wild, anadromous steelhead and wild, resident (lake) rainbow trout originally derived from the same anadromous stock 70 years earlier. The tagged yearling progeny were combined by line in common freshwater rearing containers and graded into three categories: mature, smolt or rearing (undifferentiated) at age 2 years. Heritabilities of precocious male maturity, smolting and growth were moderate to high, and the genetic correlation between growth and smolting was low. Smolting and precocious male maturity were highly variable among families within lines and significantly different between lines. Each of the four lines produced significant numbers of smolts at age two. Smolting and maturation were negatively genetically correlated, which may explain the persistence of smolting in the lake population despite strong selection against lake smolts; balancing selection on male maturation age may help to maintain variation for smolting. The high heritability of smolting, coupled with the inability of smolts that leave the lake to return to it indicates that the genetic potential for smolting can lie dormant or be maintained through a dynamic interaction between smolting and early maturation for decades despite complete selection against the phenotype. The results have significant implications for the preservation of threatened anadromous stocks in fresh water and the inclusion of resident fish of formerly anadromous populations, currently trapped behind long-standing barriers to migration, as one component of the same population.

### FGDC, ESRI, and Biological Profile Metadata:

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Metadata elements shown with **blue** text are defined in the Federal Geographic Data Committee's (FGDC) [Content Standard for Digital Geospatial Metadata \(CSDGM\)](#). Elements shown with **green** text are defined in the [ESRI Profile of the CSDGM](#). Elements shown with **brown** text are defined in the [NBII Biological Profile of the CSDGM](#). Elements shown with a green asterisk (\*) will be automatically updated by ArcCatalog. ArcCatalog adds hints indicating which FGDC elements are mandatory; these are shown with gray text.

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### Identification Information:

#### Citation:

**Citation information:**

**Originators:** Thrower, Frank P., Hard, J. J., Joyce, John E., AFSC

**Title:**

AFSC/ABL: 1996 Brood year Steelhead growth and early life-history transitions

**Publication date:** 2004

**Geospatial data presentation form:** database

**Other citation details:**

Thrower, FP; Hard, JJ; Joyce, JE. 2004. Genetic architecture of growth and early life-history transitions in anadromous and derived freshwater populations of steelhead. *Journal of Fish Biology* 65 (suppl. 1):286-307.

**Description:****Abstract:**

Heritabilities of growth, precocious maturation and smolting were measured in 75 families of juvenile steelhead or rainbow trout *Oncorhynchus mykiss*, progeny of within and between line matings (crosses) of wild, anadromous steelhead and wild, resident (lake) rainbow trout originally derived from the same anadromous stock 70 years earlier. The tagged yearling progeny were combined by line in common freshwater rearing containers and graded into three categories: mature, smolt or rearing (undifferentiated) at age 2 years. Heritabilities of precocious male maturity, smolting and growth were moderate to high, and the genetic correlation between growth and smolting was low. Smolting and precocious male maturity were highly variable among families within lines and significantly different between lines. Each of the four lines produced significant numbers of smolts at age two. Smolting and maturation were negatively genetically correlated, which may explain the persistence of smolting in the lake population despite strong selection against lake smolts; balancing selection on male maturation age may help to maintain variation for smolting. The high heritability of smolting, coupled with the inability of smolts that leave the lake to return to it indicates that the genetic potential for smolting can lie dormant or be maintained through a dynamic interaction between smolting and early maturation for decades despite complete selection against the phenotype. The results have significant implications for the preservation of threatened anadromous stocks in fresh water and the inclusion of resident fish of formerly anadromous populations, currently trapped behind long-standing barriers to migration, as one component of the same population.

**Purpose:**

This dataset contains information for each fish including parental cross type, lifestage at age 2, length and weight, and growth rates. The results have significant implications for the preservation of threatened anadromous stocks in fresh water and the inclusion of resident fish of formerly anadromous populations, currently trapped behind long-standing barriers to migration, as one component of the same population.

**Time period of content:****Time period information:****Range of dates/times:**

**Beginning date:** 1996

**Ending date:** 1998

**Currentness reference:**

observed

**Status:**

**Progress:** Complete

**Maintenance and update frequency:** None planned

**Spatial domain:**

**Description of geographic extent:**

Little Port Walter, Alaska

**Bounding coordinates:**

**West bounding coordinate:** -134.64330

**East bounding coordinate:** -134.64330

**North bounding coordinate:** 56.38417

**South bounding coordinate:** 56.38417

**Keywords:**

**Theme:**

**Theme keywords:** 002, Biota

**Theme keyword thesaurus:** ISO 19115 Topic Categories

**Theme:**

**Theme keywords:** growth, heritability, maturation, Oncorhynchus mykiss, precocious, smolting, steelhead

**Theme keyword thesaurus:** None

**Place:**

**Place keywords:** Alaska, AK, Little Port Walter

**Place keyword thesaurus:** Geographic Names Information System

**Taxonomy:**

**Keywords/taxon:**

**Taxonomic keywords:** single species, vertebrates

**Taxonomic keyword thesaurus:** None

**Taxonomic classification:**

**Taxon rank name:** Empire

**Taxon rank value:** Biovitae

**Applicable common names:** Carbon-based lifeforms

**Taxonomic classification:**

**Taxon rank name:** Kingdom

**Taxon rank value:** Animalia

**Taxonomic classification:**

**Taxon rank name:** Phylum

**Taxon rank value:** Chordata

**Taxonomic classification:**

**Taxon rank name:** Subphylum

**Taxon rank value:** Vertebrata

**Taxonomic classification:**

**Taxon rank name:** Superclass

**Taxon rank value:** Osteichthyes

**Taxonomic classification:**

**Taxon rank name:** Class

**Taxon rank value:** Actinopterygii

**Taxonomic classification:**

**Taxon rank name:** Subclass

**Taxon rank value:** Neopterygii

**Taxonomic classification:**

**Taxon rank name:** Infraclass

**Taxon rank value:** Teleostei

**Taxonomic classification:**

**Taxon rank name:** Superorder

**Taxon rank value:** Protacanthopterygii

**Taxonomic classification:**

**Taxon rank name:** Order

**Taxon rank value:** Salmoniformes

**Taxonomic classification:**

**Taxon rank name:** Family

**Taxon rank value:** Salmonidae

**Taxonomic classification:**

**Taxon rank name:** Subfamily  
**Taxon rank value:** Salmoninae

**Taxonomic classification:**

**Taxon rank name:** Genus  
**Taxon rank value:** Oncorhynchus

**Taxonomic classification:**

**Taxon rank name:** Species  
**Taxon rank value:** mykiss  
**Applicable common names:**  
steelhead

**Access constraints:** Contact the Point of Contact for data request form. The Data set is still being analyzed and will not be available for distribution until it has been finalized and all QA/QC practices have been performed. Contact the Data Point of Contact for estimated time of release.

**Use constraints:**

User must read and fully comprehend the metadata prior to use. Data should not be used beyond the limits of the source scale. Acknowledgement of NOAA, as the source from which these data were obtained, in any publications and/or other representations of these data is suggested.

**Point of contact:****Contact information:****Contact person primary:**

**Contact person:** Frank Thrower

**Contact organization:** National Oceanic and Atmospheric Administration (NOAA) Alaska Fisheries Science Center (AFSC) Auke Bay Laboratories (ABL)

**Contact address:**

**Address type:** mailing and physical

**Address:**

17109 Point Lena Loop Road

**City:** Juneau

**State or province:** AK

**Postal code:** 99801

**Country:** USA

**Contact voice telephone:** 907-789-6000

**Contact facsimile telephone:** 907-789-6094

**Contact electronic mail address:** frank.thrower@noaa.gov

**Contact instructions:**

The e-mail address directs you to the person most knowledgeable about this data. If an alternative contact person becomes necessary, use the voice phone number for referral.

**Native data set environment:**

Microsoft Excel spreadsheet

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**Data Quality Information:**

**Logical consistency report:**

None

**Completeness report:**

None

**Lineage:**

**Process step:**

**Process description:**

No process steps have been described for htis data set.

**Process date:** Unknown

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**Entity and Attribute Information:**

**Detailed description:**

**Entity type:**

**Entity type label:** 96growth97-98

**Entity type definition:**

Table containing data on steelhead crosstypes done in 96

**Entity type definition source:**

Database developer

**Attribute:**

**Attribute label:** crosstype

**Attribute definition:**

type of parental cross

**Attribute definition source:**

Database developer

**Attribute domain values:**

**Enumerated domain:**

**Enumerated domain value:** 1

**Enumerated domain value definition:**

anadromous female with anadromous male

**Enumerated domain value definition source:**

Database developer

**Attribute domain values:**

**Enumerated domain:**

**Enumerated domain value:** 2

**Enumerated domain value definition:**

anadromous female with resident male

**Enumerated domain value definition source:**

Database developer

**Attribute domain values:**

**Enumerated domain:**

**Enumerated domain value:** 3

**Enumerated domain value definition:**

resident female with resident male

**Enumerated domain value definition source:**

Database developer

**Attribute domain values:**

**Enumerated domain:**

**Enumerated domain value:** 4

**Enumerated domain value definition:**

resident female with anadromous male

**Enumerated domain value definition source:**

Database developer

**Attribute:****Attribute label:** female**Attribute definition:**

unique fish number assigned to female parent

**Attribute definition source:**

Database developer

**Attribute domain values:****Unrepresentable domain:**

No domain defined.

**Attribute:****Attribute label:** male**Attribute definition:**

unique fish number of male parent

**Attribute definition source:**

Database developer

**Attribute domain values:****Unrepresentable domain:**

No domain defined.

**Attribute:****Attribute label:** tagcode**Attribute definition:**

unique tag number assigned to each fish

**Attribute definition source:**

Database developer

**Attribute domain values:****Unrepresentable domain:**

No domain defined.

**Attribute:****Attribute label:** 6/98 lth**Attribute definition:**

length of fish in mm at age 2

**Attribute definition source:**

Database developer

**Attribute domain values:**



**Unrepresentable domain:**

No domain defined.

**Attribute:****Attribute label:** 6/98 wt**Attribute definition:**

weight in grams of fish at age 2

**Attribute definition source:**

Database developer

**Attribute domain values:****Unrepresentable domain:**

No domain defined.

**Attribute:****Attribute label:** LIFESTAGE**Attribute definition:**

lifestage of fish at age 2

**Attribute definition source:**

Database developer

**Attribute domain values:****Enumerated domain:****Enumerated domain value:** resident**Enumerated domain value definition:**

lifestage of fish at age 2

**Enumerated domain value definition source:**

Database developer

**Attribute domain values:****Enumerated domain:****Enumerated domain value:** Mature**Enumerated domain value definition:**

lifestage of fish at age 2

**Enumerated domain value definition source:**

Database developer

**Attribute domain values:****Enumerated domain:****Enumerated domain value:** smolt**Enumerated domain value definition:**

lifestage of fish at age 2  
**Enumerated domain value definition source:**  
Database developer

**Attribute:**

**Attribute label:** 10/97 lth

**Attribute definition:**

length in mm of fish in October of 97 used to calculate growth rate

**Attribute definition source:**

Database developer

**Attribute domain values:**

**Unrepresentable domain:**

No domain defined.

**Attribute:**

**Attribute label:** 10/97 wt

**Attribute definition:**

weight of fish in grams in October 97 used to calculate growth rate

**Attribute definition source:**

Database developer

**Attribute domain values:**

**Unrepresentable domain:**

No domain defined.

**Attribute:**

**Attribute label:** 6/97 lth

**Attribute definition:**

Length of fish in mm in June of 97, used to calculate growth rate

**Attribute definition source:**

Database developer

**Attribute domain values:**

**Unrepresentable domain:**

No domain defined.

**Attribute:**

**Attribute label:** 6/97 wt

**Attribute definition:**

Weight of fish in grams in June of 97, used to calculate growth rate

**Attribute definition source:**

Database developer

**Attribute domain values:****Unrepresentable domain:**

No domain defined.

**Attribute:****Attribute label:** gth6/97-10/97**Attribute definition:**

calculated growth rate from June to October of 97

**Attribute definition source:**

Database developer

**Attribute domain values:****Unrepresentable domain:**

No domain defined.

**Attribute:****Attribute label:** gth 10/97-6/98**Attribute definition:**

calculated growth rate from October 97 to June 98

**Attribute definition source:**

Database developer

**Attribute domain values:****Unrepresentable domain:**

No domain defined.

**Attribute:****Attribute label:** gth 6/97-6/98**Attribute definition:**

calculated growth rate from June 97 to June 98

**Attribute definition source:**

Database developer

**Attribute domain values:****Unrepresentable domain:**

No domain defined.

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## Distribution Information:

### Distributor:

#### Contact information:

##### Contact person primary:

**Contact person:** Frank Thrower

**Contact organization:** National Oceanic and Atmospheric Administration (NOAA) Alaska Fisheries Science Center (AFSC) Auke Bay Laboratories (ABL)

##### Contact address:

**Address type:** mailing and physical

##### Address:

17109 Point Lena Loop Road

**City:** Juneau

**State or province:** AK

**Postal code:** 99801

**Country:** USA

**Contact voice telephone:** 907-789-6000

**Contact facsimile telephone:** 907-789-6094

**Contact electronic mail address:** frank.thrower@noaa.gov

##### Contact instructions:

The e-mail address directs you to the person most knowledgeable about this data. If an alternative contact person becomes necessary, use the voice phone number for referral.

**Resource description:** offline data

##### Distribution liability:

The user is responsible for the results of any application of this data for other than its intended purpose.

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## Metadata Reference Information:

**Metadata date:** 20080624

**Metadata review date:** 20100202

**Metadata contact:**

**Contact information:**

**Contact person primary:**

**Contact person:** Emily Fergusson

**Contact organization:** National Oceanic and Atmospheric Administration (NOAA) Alaska Fisheries Science Center (AFSC) Auke Bay Laboratories (ABL)

**Contact position:** Metadata coordinator

**Contact address:**

**Address type:** mailing and physical

**Address:**

17109 Point Lena Loop Road

**City:** Juneau

**State or province:** AK

**Postal code:** 99801

**Country:** USA

**Contact voice telephone:** Use e-mail to contact the metadata coordinator.

**Contact facsimile telephone:** 907-789-6094

**Contact electronic mail address:** AFSC.metadata@noaa.gov

**Metadata standard name:** FGDC Biological Data Profile of the Content Standard for Digital Geospatial Metadata

**Metadata standard version:** FGDC-STD-001.1-1999

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