To Doc Hiram

Energetic factors influencing foraging tactics of juvenile steelhead trout, *Salmo gairdneri*

Jerry J. Smith[1] & Hiram W. Li[2]
[1] *Department of Biology, San Jose State University, San Jose, California 95192, U.S.A.*
[2] *Oregon Cooperative Fishery Research Unit, Oregon State University, Corvallis, Oregon 97331, U.S.A.*

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Synopsis

Increases in water temperature and fish size should increase standard metabolism and food demand. Stream-dwelling trout may then, despite the increased cost of swimming, seek faster water where food is more abundant. We tested these predictions with juvenile steelhead trout, *Salmo gairdneri*, in a California stream and found that increased fish size and water temperatures did result in the increased selection of microhabitats with high water velocities. Faster water provided proportionally larger amounts of drifting invertebrate food. Higher velocity, shallower, and coarser substrate microhabitats also enabled fish to capture prey from portions of the water column substantially faster and more productive than at their resting positions. Velocities selected in this stream were similar to those which would result in a doubling of metabolic rate. Models evaluating trout habitat and effects of modifications should take energetic factors into account.

Introduction

Recently, efforts have been made to use microhabitat preferences to model the impacts of flow regimes on trout, especially in regulated streams (Stalnaker 1979). Habitat quality models, based on structural features (velocity, depth and substrate), have been developed (Main 1978) that assume microhabitat choice to be relatively fixed. However, microhabitat choice may vary in different environments. For example, Smith (1982) found trout density within sections of several small, cool streams (13–17° C) to be unrelated to water velocity, but in warmer streams (19–23°) density was strongly dependent on velocity. Even within the warm streams the patterns were different: density increased exponentially with velocity in two of the streams but was highest at intermediate velocities in a third, more productive, stream.

Water velocity is an important factor determining trout distribution in streams (Baldes & Vincent 1969, Lewis 1969), because trout generally maintain feeding stations within or beneath fast water where they are able to prey on drifting invertebrates (Chapman &Bjornn 1969, Jenkins et al. 1970, Waters 1972, Elliot 1973). Since foraging behavior is related to velocity, velocities utilized should vary in different environments or at different times just as prey choice, time and effort foraging, and other components of foraging behavior do. In particular, velocity choice should vary in response to several energetic factors: (1) water temperature, which affects standard metabolic rate (Beamish 1964) and thus food demand; (2) fish size,

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which also affects standard metabolic rate; (3) abundance and availability of drift organisms; and (4) cost of swimming. We report results of a study undertaken to determine the effects of water temperature and fish size on velocity preferences of juvenile steelhead trout, *Salmo gairdneri*, and to assess the relative benefits (drift availability) and costs (swimming energy) of using feeding stations of different water velocities.

Study area

Uvas Creek is a tributary of the Pajaro River, which empties into Monterey Bay in central California (approximate latitude 37° N, longitude 122° W). The stream is small, with width ranging from 4 to 12 m. Summer unregulated base flows average less than 0.05 $m^3 sec^{-1}$. The stream is moderately basic (pH 8.2), hard (140 mg l^{-1} as $CaC0_3$) and conductive (310 μohms). Flows in the lower portion of the stream are regulated by Uvas Reservoir. Water stored there is released for instream percolation, and downstream flows are relatively stable throughout the summer (0.2 to 0.3 $m^3 sec^{-1}$ in 1978). Releases are from the bottom of the reservoir, but because the reservoir is nearly drained in most years, water temperatures below the reservoir are about equal to those above the reservoir by August and remain warm until November.

The study area is located between 2 and 7 km downstream from the reservoir. Gradient within the study area is about 0.2%, and pool to riffle ratios vary between 3 to 1 and 8 to 1, resulting in relatively low invertebrate drift rates (Waters 1972). In the upper portion of the study area average mid-day shade is about 60%, but it decreases to less than 5% at the lower boundary. Average water temperature increases downstream. Water temperatures within the study area reach a maximum of 23 to 25° C in summer, and can still reach 18 to 22° C as late as October. Releases from the reservoir are moderately turbid, especially in late summer, but clarity increases downstream as silt settles or is trapped by epibenthic algae.

The creek supports highly variable numbers of juvenile steelhead. None were present in 1976 or 1977 because drought prevented access by sea-run adults, but the 1978 stock was the highest recorded from 1972 to 1980. No resident (nonanadromous) trout are present in the study area, and since Uvas Creek steelhead become smolts in one year (Smith 1982), only a single year class is present in any given year. The stream also supports abundant Sacramento suckers, *Catostomus occidentalis*, riffle sculpins, *Cottus gulosus*, and several species of minnows, including Sacramento squawfish, *Ptychocheilus grandis*. No direct interactions between the steelhead and other species were noted, although other species may affect overall drift rates (Smith in preparation).

Methods

Velocity preferences

Trout within the study area, especially the larger ones, were usually associated with riffle (surface broken) or run (fast water with most of surface smooth) areas, where surface turbulence or vegetation provided overhead cover and blocked visibility from above. Therefore, we made over 90% of the microhabitat preference determinations by using an underwater viewer while wading or crawling along the bottom. We used a mirror attachment to obtain a periscopic view in the shallow riffles, but because of difficulties in approaching feeding trout in very shallow riffles, no determinations were made with the viewer at depths less than 25 cm. Most of the sampling took place from September through December 1978, although additional work was done during late April and early May 1980 to collect data on small fish (<6 cm).

We checked microhabitat positions by working upstream through all pool, run and riffle habitats at each of three sites within the study area. When a fish was located, its focal point, or relatively fixed swimming position, was determined by observing its movements for at least 3 minutes. We used a thin calibrated pole for reference to measure or estimate depth of water at the focal point, distance of the fish from the substrate and fish size. Bottom type, degree of shading, and overhead cover were also recorded. Velocity was measured with a Marsh McBirney flowmeter, and readings were taken at the focal point, and (for about half of the fish) at feeding loci. Feeding loci were the points to which fish moved to intercept drifting prey. These points were upstream from, and usually higher in the water column than, the focal point. Sometimes we did not measure velocity at the time the fish was encountered, but instead marked the focal point with a numbered metal washer and determined velocity later (usually during the same day and always at the same flow rate, as determined by a water height marker).

Cross-sectional transects were run at the three sites to determine relative availability of microhabitat for comparison with fish choices. Thirty-three transects were made at each site and data were recorded every 0.5 m. Velocity readings in these transects were taken at 5 cm above the bottom, since that was the most frequent focal point distance. We sampled the study area by electrofishing (Smith-Root type V and VIII) to provide data on general habitat (riffle, run and pool) distributions and size composition of trout for comparisons with visual results.

Water temperatures during observations were recorded and 24 h mean temperatures were calculated by using these records and data from maximum-minimum thermometers at the sites. Comparisons of velocities chosen at different temperatures are based upon data from different sites and/or sampling dates. The average temperatures at the downstream end of the study area were 3–4° C higher than those at the other two sites. Lower temperature values at all sites also came with the cooling of water in fall. Any increase in fish size during this cooling period would slightly counteract any temperature effect, but mean size of fish observed did not significantly change during the period of cooling. In spring 1980, data for fish less than 6 cm were recorded within a three week period when mean water temperature was stable; these data were used only to compare focal points of different sized fish.

Invertebrate drift

At each of the three sites drift nets were used to determine the relationship of drift volume to velocity and to see if the three sites had substantially different drift rates. At each site twelve drift nets (18 × 36 cm mouth, 70 cm long with 0.3 mm mesh) were placed within a single riffle and associated downstream pool and run, and widely distributed to represent a considerable range of velocities. Placement was checked with dye releases and adjusted to insure that no net interfered with the drift of another. All nets were placed 2.5 cm off the bottom, and none extended above the water surface; consequently surface drift and benthic movements were not sampled. Velocity was measured at a point 10 cm off the bottom and 20 cm forward from the center of the net mouth.

Sampling was conducted on three overcast days (November 8, 11, 12, 1978) and at approximately the same starting time (1000 h) at each site. During sampling, nets were in place for two 1 h periods, separated by about two hours. Even with the short sampling periods, nets in faster water tended to clog with fine particulate organic matter, possibly reducing their effectiveness. Sorting was done in the field, because the live invertebrates could be seen more easily than preserved invertebrates among the leaves and other detritus. Invertebrates were counted and their relative volume in each sample was estimated by using a mayfly 0.5 cm long as a volume reference unit [similar to the point system of Windell (1971)].

Metabolic costs

The models of Weihs (1973) and Ware (1978) suggested that a swimming effort which doubles metabolic rate is energetically optimal for covering distance. Winberg (1956) has also suggested that routine or field metabolism is about twice the standard (resting) metabolic rate. We calculated swimming velocities which would double metabolic rate according to Weihs' model, using the cost of swimming data of Brett & Glass (1973). We used their data for sockeye salmon, *Oncorhynchus nerka*, rather than available data for rainbow trout because they studied small fish similar to those we encountered. These estimates were then compared with focal point velocities to determine whether effort by Uvas Creek fish was compatible with energetically efficient swimming.

Metabolism increases with fish size, and both metabolism and digestion rate increase with temperature (Elliot 1975, 1979, Windell et al. 1976). Elliot (1975, 1979) used data for brown trout, *Salmo trutta*, and combined these effects for various fish sizes and temperatures to estimate satiation requirements (amount of food demand or minutes feeding per meal) and maximum daily food demand for trout. We used his models to estimate satiation requirements for Uvas Creek trout and compared them with trout focal point velocity choices.

Results

Focal point velocities

Young steelhead selected focal points where water velocities were higher than those typically available in Uvas Creek (Fig. 1). Most fish for which focal points were determined were in deeper riffles and runs or at the heads of pools (mean depth was 59 cm). However, our results probably underestimated mean water velocities at focal points, since most of the faster water (velocities greater than 30 cm sec^{-1}) was in riffles less than 30 cm deep. These areas were not adequately observed with the underwater viewer, but were heavily used; over 40% of all fish and over 60% of those longer than 12 cm (standard length) taken by sampling with an electrofisher came from shallow water.

When fish size was checked against focal point water velocity preferences (Fig. 2) the expected increase in mean velocity with fish size was found for fish to a length of 10 cm. The general equivalence of water velocity choices for still larger fish is possibly due to selective sampling. Most of the larger fish were in shallow, unsampled riffles.

We found that focal point velocities also increased at higher temperatures (Fig. 3). Although the study was conducted over a period of over 4 months, fish sizes did not significantly change within sites for different dates and temperatures. However, fish from the lowermost site consistently averaged about 15% larger than those at other sites. At the lower site a 10° C increase (from 10.5 to 20.5° C) in mean temperature resulted in a 64% increase in mean water velocities at focal points. At the other 2 sites a 9° C increase (from 8 to 17° C) resulted in a 180% increase in focal point velocity.

Of focal points examined, 93% were within 10 cm of the substrate, and 72% were within 5 cm. Fish moved forward, and usually upward, to intercept drifting prey moving at velocities equal to, or

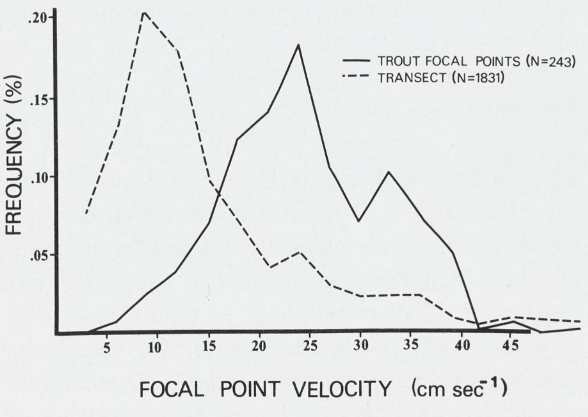

Fig. 1. Focal point velocity choices for trout at three sites in Uvas Creek, compared with results of transects of available habitat.

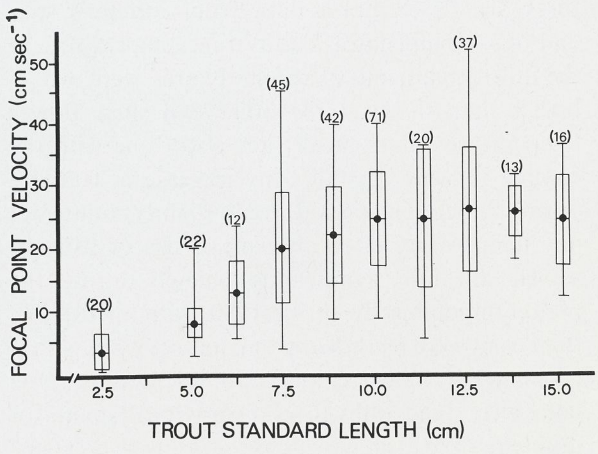

Fig. 2. Means, ranges, and 95% confidence intervals for water velocities at focal points for Uvas Creek trout of different standard lengths. Numbers in parentheses are sample sizes.

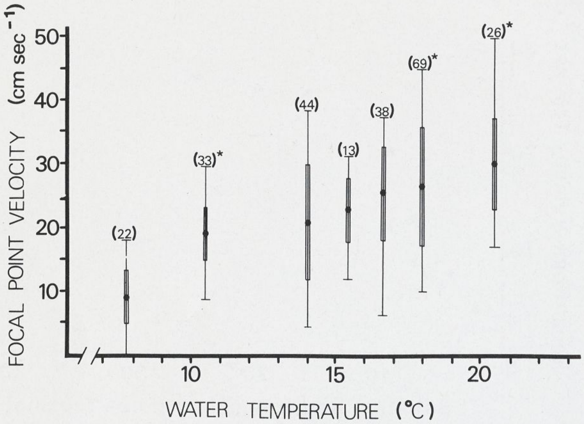

Fig. 3. Means, ranges, and 95% confidence intervals for water velocities at focal points of Uvas Creek trout at different 24 h mean water temperatures. Data with * is from lowermost study site.

greater than, the velocity at their focal point (Fig. 4). No trout were observed feeding on the bottom. At low velocities (8–20 cm sec^{-1}) the difference between velocities at the focal and feeding points was usually small, but at higher velocities (above 30 cm sec^{-1}) it averaged 31%. One reason for this difference was that slower focal points were usually in deeper water, where velocity changed less with small increases in height in the water column. A second reason was that focal points in slower water were usually associated with finer substrates of sand and small gravel. In faster water, focal points were more often associated with coarse gravel and rubble, which produced small, slow-water pockets near the substrate.

Invertebrate drift

Among the three sites sampled for invertebrate drift we found the same pattern of response to velocity (Fig. 5). Volume of drifting invertebrates captured by the nets increased in a manner compatible with either a linear or slightly curvilinear response to velocity. If a linear relation is assumed, there was a threshold, near 10 cm sec^{-1}, below which drift was negligible. If these drift net results accurately represent food available to feeding trout, a fish should be able to more than double food intake by feeding in water moving at 30 cm sec^{-1} rather than

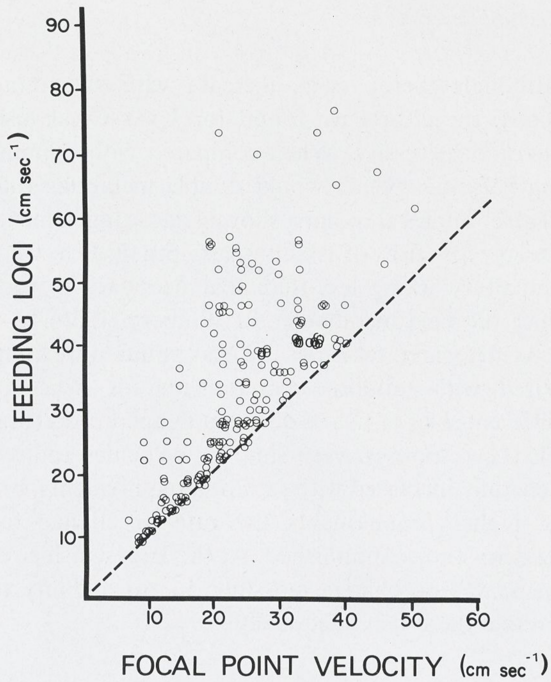

Fig. 4. Feeding loci water velocities for Uvas Creek trout having different focal point water velocities.

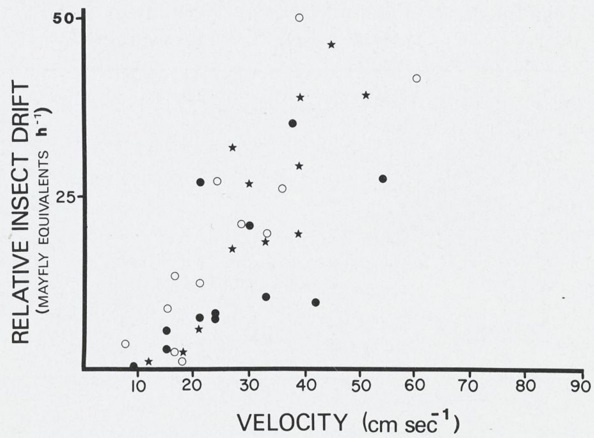

Fig. 5. Relative insect drift at different water velocities at three sites in Uvas Creek.

at 20 cm sec^{-1}. A further shift to 40 cm sec^{-1} water would gain the fish an additional 60% in available food. The apparent lack of drift at velocities below 10 cm sec^{-1} in Uvas Creek may account for the near absence of feeding trout at such low velocities (Fig. 1).

Metabolic costs

Although energy costs increase with swimming speed, the efforts we found for Uvas Creek fish were not excessive. When compared with swimming velocities which would double metabolic rate (Table 1), focal points showed close agreement, except for fish of small sizes. Small fish were actually working less than that necessary to produce the field metabolism of Winberg (1956).

When water velocities at focal points were compared with satiation requirements for fishes of different sizes or fish at different temperatures (Fig. 6), the responses were similar. Velocities utilized generally increased with satiation requirements, but at higher requirements the rate of change for velocity choice diminished. At the largest fish sizes there was no change, possibly due to inability to sample these fish adequately.

Table 1. Water velocities (body lengths sec^{-1}) at focal points for Uvas Creek trout versus swimming velocity at which swimming cost would double metabolic rate. Metabolic cost is from Brett & Glass (1973) for sockeye salmon at 16°C.

Total length (cm)	Focal velocity (Mean ± SD)	Velocity to double metabolism
3.3	1.3 ± 0.6	2.9
6.7	1.3 ± 0.5	2.5
8.1	1.6 ± 0.6	2.2
9.5	2.1 ± 1.0	2.1
10.9	2.1 ± 0.7	1.9
12.2	2.1 ± 0.7	1.8
13.6	1.8 ± 0.8	1.8
15.0	1.8 ± 0.7	1.7
16.4	1.6. ± 0.3	1.6
17.7	1.4 ± 0.4	1.5

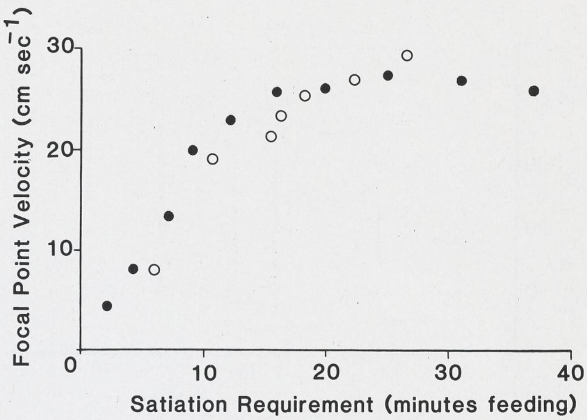

Fig. 6. Focal point water velocity choices of Uvas Creek trout at estimated satiation requirements (from Elliot 1975, 1979) for different fish sizes (●) and water temperatures (○).

Discussion

Uvas Creek, like most streams, is a complex environment of varying depths, substrates, pool and riffle sizes, velocities and amounts of overhead cover. Despite the importance of these structural features, the energetic role in trout microhabitat choice is clear and substantial. The drifting invertebrates upon which all the trout fed were more abundant in fast water, and as food demand increased with increasing fish size or water temperature, the fish responded by feeding in faster water. Juvenile atlantic salmon, *Salmo salar*, have also been shown to have distributions which are both size dependent and related to drift abundance (Wankowski & Thorpe 1979). For faster water and for larger fish our data are limited and uncertain because of our inability to sample fast, shallow riffles. However, Alley (1977), working on a large, warm California stream, found that larger rainbow trout (mean = 18.9 cm total length) chose focal velocities nearly twice as fast (45 cm sec^{-1} in 1976) as those we found. Size-dependent velocity responses for steelhead and chinook salmon, *O. tshawytscha*, were also found by Everest & Chapman (1972).

The possible benefits of feeding in faster water are substantial; in Uvas Creek a shift from 20 to 30 cm sec^{-1} would more than double drifting invertebrates. However, feeding fish in Uvas Creek, or elsewhere, are not all in the fastest water for several reasons:

1) Swimming cost may increase faster than food benefits. The effort of Uvas Creek trout did not generally exceed that which would double their resting metabolic rate (Table 1), and exponential cost increases of swimming may restrict effort to a point near or below this level. At higher tempera-

tures the relative metabolic cost of swimming decreases because swimming costs are relatively constant, but standard metabolism increases with temperature. Fish in warmer water can more profitably increase their activity.

2) Ability to react to and capture prey may restrict feeding efficiency at high velocities. In a moderately turbid stream Tippets & Moyle (1978) found that trout juveniles, with low metabolic rates and presumably in slow water, fed on drift, but adults fed on epibenthos. For adults the turbid conditions probably prevented their reacting to, and feeding on, fast-water drift; consequently drift-feeding had to be abandoned. Similar conditions can operate in heavily shaded streams; in Uvas Creek most focal points, even in generally shaded stream sections, were sunlit. At higher velocities, turbulence may also hinder prey capture.

3) Satiation can be achieved without hard work if prey are abundant, or if metabolic rate or digestive rate are low. Elliot (1975) found that for brown trout at low temperatures, a single short meal during the peak drift period was sufficient for satiation. At higher temperatures more rapid digestion allowed two meals per day. In Uvas Creek, due to high temperatures and low drift rates, fish apparently were feeding continuously. Because size differences in satiation requirements are great (Elliot 1979), small fish may rapidly become satiated, even at low drift rates. Comparisons of high and low drift streams should find large differences in fish focal points.

4) Fish may be able to reduce effort by maintaining a focal point in slow water, near the bottom or near obstructions, and still feed on fast-water drift. In this study we found that this differential averaged 31% at higher velocities; in faster water or with coarser substrate the difference should increase. Both Alley (1977) and Dettman (1978) found that trout focal points were often associated with slower pockets around boulders.

Because energetics can be so important in microhabitat choice, structural models of trout and salmon habitat (Main 1978) should consistently work well only among streams of similar productivity and temperature. Models in which temperature and productivity indices are used may prove to be more generally predictive (Binns & Eiserman 1979). Since metabolism varies with size, models must also account for size classes. Velocities suitable for supporting small, smolt-sized steelhead and salmon may be insufficient for spawning-sized fish necessary to sustain a resident trout stock.

Energetic models have obvious applications to maintaining and improving habitat quality. Not only do they show how quantity of flow may affect trout under various circumstances, but they also suggest that qualitative changes in flow, such as reducing temperature or turbidity or the addition of habitat structures, can improve habitat quality.

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cutthroat
Trout w/o adipose
Sheep Crk. - Ashley Nat. Forest

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A Trout with Two Dorsal Fins[1]

A rainbow trout (*Salmo g. gairdneri* Richardson) with two dorsal fins was obtained from the Washougal Hatchery of the Washington Game Department in September 1961. The fish was normal in appearance and was typical in meristic and morphometric characteristics except for a second dorsal fin located posterior to the first (Figure 1).

The two dorsal fins were similar in shape, but the first fin was larger. The first fin had 12 rays; there were 7 in the second. The length of the fin base from origin to insertion was 25 mm for the first dorsal fin, and 12 mm for the second. The longest ray was 20 mm from the base to the distal end in the first dorsal, and 17 mm in the second.

An X-ray photograph of the fish showed some unusual skeletal characteristics of the second dorsal fin. The pterygiophores of the second fin were bunched together and not aligned with the fin rays as they were in the typical first dorsal. Twelve rays and 12 pterygiophores were observable in the first dorsal fin, but only 7 rays and 6 pterygiophores could be observed in the second dorsal fin. The short, unbranched, anterior rays of the first dorsal fin (typical in this species) were absent in the second dorsal fin. The first ray of the second dorsal was long and had an abnormal appearance. It was not included in the fin ray count.

[1] Contribution No. 86, College of Fisheries, University of Washington, Seattle.

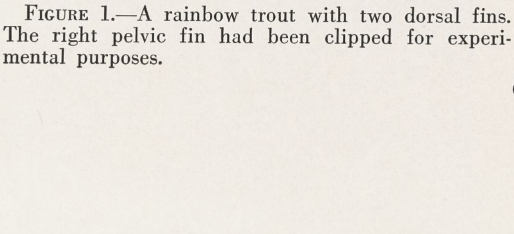

Figure 1.—A rainbow trout with two dorsal fins. The right pelvic fin had been clipped for experimental purposes.

We have found no report of fish in natural populations with more than the normal number of fins, but there are several reports on the absence of fins in fishes. Some carp (*Cyprinus carpio*) of an isolated population in Illinois had no pelvic fins, or just one pelvic fin, while others were normal (Thompson and Adams, 1936). A small proportion of an Atlantic salmon (*Salmo salar*) population in Sweden possessed no adipose fin (Svärdson, 1949). Cutthroat trout (*Salmo clarki*) lacking dorsal fins were found in Sheep Creek, Utah (Code, 1950). A perch population was found in which 20 percent possessed deformed fins, most of which were dorsal fins (Dyk, 1951). The abnormal cutthroat trout and Atlantic salmon were thought to be recessive mutants.

Interruptions in the development of fish embryos are known to have caused fin deformations. Welander[2] observed fin deformations in chinook salmon (*Oncorhynchus tshawytscha*) exposed to radiation. Eisler[3] observed reductions in the number of fin rays in chinooks exposed to visible radiation. Donaldson[4] induced various deformations in chinooks with high temperatures. Included was an additional dorsal fin which ran diagonal to the normal fin.

Whether the two dorsal fins in the fish described here were the result of genetic aberration or developmental deformation is impossible to determine. Only one specimen was found, making the genetic explanation least likely.

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EUGENE B. WELCH[5]
MARVIN HULL[6]
MAX KATZ[5]

[5] *College of Fisheries*
University of Washington
Seattle 5, Washington
[6] *Washougal Fish Hatchery*
State of Washington, Department of Game
Washougal, Washington

... Gairdneri (Richardson). Gairdner's Salmon
In: Fauna Boreali-Americana; or the Zoology of the Northern Parts of British America, pp. 221-222.
Fish from Ft. Vancouver on Columbia River - a barrel of them shipped to Sir John Richardson.

"This species ascends the river in the month of June, in much smaller numbers than the quinnat, in whose company it is taken. Its average weight is between six and seven pounds.

"Colour. - Back of head and body bluish-grey; sides ash-grey. Belly white. The only traces of variegated marking are a few faint spots at the root of the caudal. Form. - Profile of dorsal line nearly straight, tail terminating in a slightly semilunar outline. Ventrals correspond to commencement of dorsal and adipose to end of anal. Teeth. - Jaws fully armed with strong hooked teeth, except a small space in centre of upper jaw. Vomer armed with a double row for two-thirds of its anterior portion. Palate-bones also armed with strong teeth. Fins. - Br. 11-12; P.13; V.11; A.12.

"Dimensions.

	Inches	Lines		Inches	Lines
Extreme length	31	0	Length from end of snout to anal	21	0
Greatest height of body	5	9½	" " adipose*	21	0
Circumference of ditto	14	0	" of pectorals	3	4 2/3
Breadth between the eyes	2	0	" ventrals	3	0
" " nostrils	1	2 1/3	" attachment of dorsal	3	0
Length from end of snout to:			Height of dorsal	2	4 2/3
nostrils	1	2 1/3	" adipose	1	2 1/3
eyes	1	9½	Length of caudal	4	8 1/3
angle of opercule	5	2 1/3	Its greatest breadth	4	0
pectorals	6	3½	Length of attachment of anal	2	4 2/3"
dorsal	12	0			
ventrals	12	3½			

Gairdner, in lit.

(In this species the gill-cover resembles that of S. salar still more strongly than that of the quinnat does, the shape of the suboperculum in particular being precisely the same with that of salar. The teeth stand in bony sockets like those of the quinnat, but are scarcely so long. Those of the lower jaw and intermaxillaries are a little smaller than the linqual ones, and somewhat larger than the palatine or labial ones. The tongue contains six teeth on each side, the rows not parallel as in the quinnat, but diverging a little posteriorly. The pharyngeals are armed with small sharp teeth. The numbers of the teeth, excluding the small ones which fall off with the gums, are as follow: Intermax. 4-4; labials 21-21; lower jaw 11-11; palate-bones 12-12; vomer lost; tongue 6-6. When the soft parts are entirely removed, the projecting under edge of the articular piece of the lower jaw is acutely serrated, in which respect this species differs from all the others received from Dr. Gairdner. There are sixty-four vertebrae in the spine. - R.)

* Dr. Gairdner must have accidentally put down wrong figures here in transcribing his notes, as the adipose is not opposite to the commencement of the anal, but to its end. - R.

1855 - Salmo iridia. In Proceed. Calif. Academy of Sciences
Vol. I, 1854-57 (2nd Edition, Dec. 1873).

Dr. W. P. Gibbons presented the following description of a new Trout:

Salmo iridia, - Gibbons. Body elongated, sub-compressed; head about one-fourth of total length.

Eyes large, circular, horizontal diameter nearly one-third the length of the head. Facial outline eliptically rounded. Vertical line from the posterior extremity of the upper maxillary will graze the posterior edge of iris.

Teeth minute, numerous, regular, incurved. A series of from three to five incurved teeth in each margin of the tongue. Those on the edges of the palatines and on the vomer, numerous.

Length of body to its greatest depth, 9 to 2. First dorsal rises from a point midway between the extremity of the snout and the end of the lateral line. The adipose and anal terminate opposite to each other. Ventrals under the first fourth or half of the first dorsal. Caudal forked. First dorsal with five irregular, interrupted black horizontal bands. Other fins black punctate, ventrals tipped with orange, caudal and adipose with black margin.

Scales small. Back cineritious, with light purple tint. Sides along the lateral line light vermillion, interrupted by rounded dark patches, which become nearly or quite obsolete in older specimens. Sides and belly below these, silver-tinted, finely black punctate.

(P.37.) D.14; P.13; A.12; V.11; C.19, with accessories. Length five inches.

The three specimens from which this description was taken were obtained by Mr. Nevins from the San Leandro creek. They are evidently young fish.

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Persistence of the Native Rainbow Trout Type following Introduction of Hatchery Trout

RICHARD GARD AND DONALD W. SEEGRIST

Persistence of the Native Rainbow Trout Type following Introduction of Hatchery Trout

RICHARD GARD AND DONALD W. SEEGRIST

The Santa Ana River, California, originally contained native coast rainbow trout, but repeated introductions of hatchery-reared rainbow trout and Lahontan cutthroat trout have subsequently been made. Twenty-four morphological characters of samples of native coast rainbow trout, hatchery-reared rainbow trout, and cutthroat trout, and recent Santa Ana River rainbow trout were compared using the D^2 statistic to determine the extent that the native type was modified by introductions. The character mean of the recent Santa Ana sample was 10.8 D^2 units away from that of the cutthroat trout sample, 7.3 units from the hatchery-reared rainbow trout sample mean, but only 3.0 units from the native rainbow trout sample mean. Pure Lahontan cutthroat trout have disappeared from the Santa Ana River and trout recently occupying this river closely resemble the native coast rainbow trout.

INTRODUCTION

TAXONOMISTS and biologists are often confronted with the problem of assessing results of introduction of hatchery trout into waters containing native populations. Following introduction of hatchery trout into native trout waters, a heterogeneous population immediately results and character variability increases. Also, long-term modification of characters may occur through hybridization of native and introduced trouts or by complete replacement of the native form by the introduced form due to competition. The purpose of this study was to determine the extent to which the morphology of a native coast rainbow trout (*Salmo gairdnerii gairdnerii* Richardson) population was modified by genetic or competitive processes following introduction of hatchery-reared rainbow trout and Lahontan cutthroat trout (*Salmo clarkii henshawi* Gill and Jordan). Accordingly, a recent sample (21 fish) of rainbow trout from the upper Santa Ana River system of Mt. San Gorgonio in southern California (Fig. 1) was compared to samples of coast rainbow trout (30 fish) from San Pablo Creek (tributary of San Francisco Bay), rainbow trout (30 fish) from the Hot Creek Hatchery (east slope of the Sierra Nevada), and introduced Lahontan cutthroat trout (5 fish) from the South Fork of the Santa Ana River.

The authors are indebted to Dr. L. P. Schultz, Dr. G. S. Myers, the late Miss Margaret Storey, and Mr. W. A. Evans for loans of specimens. Mr. B. E. Gard, Sr. and Mr. B. E. Gard, Jr. assisted with collecting. Dr. W. F. Taylor and Mr. R. Fredrickson and staff at the Survey Research Center aided with statistical procedure and the late Dr. P. R. Needham, Dr. S. B. Benson, and Mr. R. J. Behnke read the manuscript and made constructive suggestions for its improvement.

HISTORY OF TROUT SAMPLES

Santa Ana rainbow trout.—Originally, the Santa Ana River contained coast rainbow trout which were derived from steelhead trout from the Pacific Ocean and probably occurred throughout the river system except where falls excluded them from headwater streams. Notable among these headwater streams formerly without trout is the upper South Fork which is separated from the lower river by a 9-ft falls (Fig. 1). During the past 70 years, hatchery-reared rainbow trout have been widely stocked in the Santa Ana River drainage. Our Santa Ana River rainbow trout sample, collected in 1951 and 1952, consisted of 21 specimens from 3 tributaries (South Fork, Forsee Creek, and Fish Creek) and probably represents a mixture of genes from native and hatchery trout. We do not have a sample from the original native population of the Santa Ana River.

Introduced cutthroat trout.—Before 1900, at least 45,000 Lahontan cutthroat trout were stocked in the Santa Ana River system (Anon. 1894, 1896); no subsequent plants are known. One lot was stocked above the falls on the South Fork where it evidently flourished. Five cutthroat trout collected from the upper South Fork in 1907 were described as a new

R. B.

Racial Characteristics and Migratory Habits in *Salmo gairdneri*

By Ferris Neave
Pacific Biological Station

(*Received for publication July 9, 1943*)

ABSTRACT

A significant difference exists between the average scale counts of anadromous and non-sea-going *Salmo gairdneri* of the Cowichan river system, B.C. Differences in scale number and in migratory habit are maintained in hatchery-raised offspring of the two types and are considered to be founded upon inherited characteristics.

The steelhead and rainbow trout of the coastal region of British Columbia are at the present time commonly regarded as constituting a single species, *Salmo gairdneri* Richardson. As is well known, certain individuals in the course of their life history migrate to and from the sea, while others remain permanently in fresh water.

Both these habits are found among the fish inhabiting the Cowichan river system, Vancouver island. In these waters the anadromous, or sea-going, type provides fishing at two stages of its life-history:—(1) the younger fish enter into the "trout" catch, especially during the period of their migration to salt water, and (2) older individuals provide "steelhead" fishing on their return from the sea. This anadromous type of fish occurs throughout the length of the Cowichan river, up to its source in Cowichan lake, and in certain tributaries of the latter. The "resident" fish are found mainly in the upper portion of the river and in the lake, where they constitute a large proportion of the trout taken by anglers.

The question as to whether the sea-going and resident habits are the result of mere individual variation, of differences in environment or of racial characteristics is of evident scientific interest and is, moreover, directly related to certain problems of propagation and conservation, both in these waters and elsewhere.

For convenience, the terms "steelhead" and "rainbow trout" are used in the present account to designate the anadromous and non-sea-going individuals respectively.

LIFE-HISTORY

The nature of the evidence may be better understood in the light of a brief statement regarding the life-history of the species in the upper part of the river system, where fish of both types are plentiful.

Young trout are numerous at all seasons in the upper reaches of the river. Recaptures of marked and tagged individuals have shown irregular local movements in and out of small tributaries and between lake and river. A definite

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migration of smolts down the river takes place in the spring, consisting of both one-year-old and two-year-old fish. At about the same time (April to June) other individuals, mainly two years of age and older, migrate upstream into the lake, where they spend the summer. In September or October trout from the lake reappear in the river, where they are to be found throughout the winter. Those which are mature spawn there, chiefly from January to March, often on the same grounds and at the same time as adult steelheads which have come up from the sea during the late autumn and winter.

SEPARATION OF TYPES

Scale Counts

Since 36 smolts captured at various times near the river mouth were all in their third spring (i.e. a little more than two years old) or younger, and since an examination of the scales of 555 adult steelheads indicated that less than one per cent had remained in fresh water for a longer period, it was assumed that fish which had definitely exceeded this age without going to sea could, as a group, be regarded as permanent dwellers in fresh water. A comparison is presented in the first half of table I between scale counts made on a series of such fish (approximately three to six years old), here called "rainbows", and on a series of steelheads of similar ages, but larger, taken from the same waters, and recognized as sea-run from examination of the scales as well as from size. Counts were made both on the lateral line and at a level about a third of the distance between the lateral line and the dorsum.

The difference of the means in both cases is highly significant, being about nine and eleven times the standard error respectively.

In order to obtain evidence as to whether these differences were due to environmental conditions, for example, temperature during early development, collections of steelhead eggs and of rainbow eggs were taken at the same time and place in February, 1940, and reared in the same water supply at the Cowichan lake hatchery until the following September, when counts were made on samples from each lot. The results are given in the second half of table I. In this instance again, the rainbow trout showed a significantly lower average scale count, the differences of the means being about six times and four and one-quarter times the standard errors.

It is reasonable to conclude from these data that the two types of fish represent different populations and that hereditary factors affect the number of scales.

Marking Experiments

Further evidence regarding migratory tendencies has been sought through the liberation of marked fingerlings of known parentage.

In 1938 and 1939 eggs were collected only from steelhead parents. These eggs were taken during January, February and March and the young fish were released, in lake and river, eight to twelve months later, after removal of the adipose and right ventral fins. Recoveries were as follows:

Brood year	Number liberated	Recoveries	
		Juvenile	Sea-run
1938	7,613	12	2
1939	35,445	28	9

Of the 40 fish which had not been to sea (juveniles), 38 were caught before the end of their third spring, i.e. within the period commonly spent in fresh water

TABLE I. Frequency distribution of scale counts made on Cowichan river rainbow trout and steelheads. d = standard deviation. d_M = standard error.

No. of scales	"Wild" fish				Hatchery fish			
	Lateral line		Above lateral line		Lateral line		Above lateral line	
	Rainbow	Steelhead	Rainbow	Steelhead	Rainbow	Steelhead	Rainbow	Steelhead
114	2	–	–	–	–	–	–	–
115	1	–	1	–	–	–	–	–
116	2	–	1	–	–	–	–	–
117	3	–	3	–	–	–	–	–
118	7	–	1	–	–	–	–	–
119	10	3	9	–	–	–	1	–
120	15	2	3	–	4	–	–	–
121	10	4	10	–	6	1	1	1
122	5	8	4	–	5	–	5	–
123	3	10	5	2	5	3	1	–
124	3	14	10	–	4	4	2	1
125	–	3	5	1	1	3	4	1
126	–	5	2	4	–	4	3	–
127	–	2	2	5	–	1	–	2
128	–	–	2	2	–	2	4	2
129	–	1	1	5	–	3	–	2
130	–	–	2	2	–	1	1	1
131	–	–	–	4	–	–	1	4
132	–	–	–	3	–	–	1	1
133	–	–	–	3	–	–	1	3
134	–	–	–	6	–	–	–	–
135	–	–	–	1	–	–	–	1
136	–	–	–	5	–	–	–	1
137	–	–	–	1	–	–	–	2
138	–	–	–	4	–	–	–	–
139	–	–	–	2	–	–	–	–
140	–	–	–	–	–	–	–	–
141	–	–	–	1	–	–	–	–
——								
159	–	–	–	1	–	–	–	–
No. of fish	61	52	61	52	25	22	25	22
Mean..	119.72	123.29	122.3	132.23	122.08	125.65	125.48	130.4
d......	2.196	2.077	3.23	5.81	0.415	2.343	3.52	4.06
d_M....	0.284	0.291	0.417	0.812	0.085	0.512	0.72	0.886

dif. = 3.57 dif. = 3.57

+2,36

by sea-going fish. The other 2 were taken on July 4 and August 3 of their third year, these dates being one to two months later than the close of the usual migratory period. One fish was recaptured twice, once on March 26, 1942, close to the point of liberation at the upper end of the river, and again one month later in brackish water at the river mouth.

The number of sea-run fish recovered cannot be regarded as an indication of the percentage which actually returned, as time and facilities for the capture of large steelheads were very limited. Indications are that marked sea-run steelheads of the 1939 brood year may have been quite numerous in 1943, since 9 were obtained in a total of only 19 fish caught by gill-net in the neighbourhood of the hatchery.

It is evident that these fish of steelhead parentage disappeared at an early age from the localities at which they were liberated and that at least some of them certainly went to sea.

In 1940 both rainbow and steelhead eggs were obtained from fish netted in the river. The resulting fingerlings were released in January, 1941. Details of these plantings and the number of subsequent recoveries are given in the following table.

Type of parent	Rainbow	Steelhead	Steelhead
Mark	Both ventrals	Dorsal and left ventral	Adipose and right ventral
Number released	2,976	2,976	34,800
Place released	River	River	Lake
Recoveries—			
In lake	8	0	1
In river and its tributaries	49	8	11
Total	57	8	12
Approximate no. of months after deposition of eggs	14-37	11½-26½	15-28

Particular interest attaches to the experiment involving the planting of equal numbers of fish from each type of parent. These were liberated at the same time and place. Both lots appeared quite healthy at the time of liberation, the mortality during the previous month having been less than 0.1% in both cases. The length range of the rainbow offspring was from 3 to 5 inches (7.6 to 12.7 cm.), the steelheads showing a slightly greater range, from 2½ to 5 inches (6.4 to 12.7 cm.). Of the very small number of steelheads recovered from this lot, none was taken after April 17, 1942. Recoveries of rainbows, on the other hand, have continued until March 1943, 28 having been taken subsequent to the last steelhead record. Moreover, 8 of these (recovered May to September 1942) had gone upstream into the lake, their presence there at that season being in accordance with the known habit of the non-sea-going type of fish (see p. 246). The recovery in the lake of these fish, survivors from a planting of less than 3,000 fingerlings in the river, may be contrasted with the results obtained from the 34,800 steelheads placed directly in the lake. None of the latter has been recaptured since June 6, 1942, and all but one of the 12 fish recovered had already moved down into the river.

Introduction of Kamloops Trout

While it is not proposed at the present time to enter into a discussion regarding the origin of the steelhead and rainbow types of this river system, it seems desirable to state that a non-indigenous member of the *Salmo gairdneri* series, the Kamloops trout of the interior of British Columbia, has been planted in these waters at various times between 1922 and 1934, and again between 1938 and 1942. The question naturally arises as to what influence, if any, these introductions have had on the existing populations of steelhead and rainbow trout.

The writer believes that neither of the two types discussed in the present paper owes its origin to, or has been markedly influenced by, the Kamloops trout. The following considerations may be cited:

(1) Both sea-run and resident fish were well known in the Cowichan before any Kamloops trout were introduced.

(2) All Kamloops trout introduced during the recent period have been marked distinctively and did not enter into the samples taken. Recoveries to date indicate a poor survival and no fish of breeding age have been found. A planting of 33,000 Kamloops trout of brood year 1939 was made in the lake and river at a considerably larger average size than the similar number of steelheads. These yielded only 20 returns, all within a period of one year from the time of liberation. While this figure compares fairly well with the recoveries of juvenile steelheads of the same year class, there has been no indication that the Kamloops trout avoided capture by going to sea. Recoveries from other plantings of Kamloops trout have been negligible.

(3) Kamloops trout reared from a late egg stage in the Cowichan lake hatchery show a much higher average scale count than even local steelheads (Neave 1943) and are still further removed in this respect from local rainbows, with which they might have been supposed to have a greater affinity.

DISCUSSION

Status of Types

It is concluded that the types of *Salmo gairdneri* found in the upper part of the Cowichan river system represent, in the main, two separate indigenous races, the tendency to go to sea or to remain in fresh water being largely controlled by hereditary factors. In this connection it may be pointed out that Landgrebe (1941) has recently suggested that the anadromous and non-sea-going types of brown trout (*S. trutta* L.) are genetically distinct, the difference between them being "associated with functional activity of the thyroid gland".

It is not contended that the offspring of sea-run fish never remain in fresh water until maturity. If they do, the situation would be analogous in some respects to that provided by the sockeye in Cultus lake (Ricker 1938, 1940), in which "residuals" from sea-run fish occur in addition to a self-maintaining stock of fresh-water kokanees. The present evidence from the Cowichan suggests that residual steelheads, if they occur, are very scarce.

Problems of Conservation and Propagation

From the standpoint of conservation it is evident that two self-perpetuating stocks of fish must be treated as if they were different species. If the conclusions reached in the present instance are correct, measures taken to protect or increase one type will not necessarily benefit the other. For example, the eight-inch (20.3 cm.) size limit at present in force ensures the escape of a large percentage of steelheads to the sea, but the maintenance of the steelhead runs will not protect the rainbow trout in a corresponding manner and might, indeed, be detrimental to the latter, if the steelheads monopolized the spawning and nursery grounds. The rainbow undoubtedly has to withstand a relatively heavier fishing drain than the steelhead in these waters.

The possible value of the Cowichan river rainbow trout for introduction elsewhere can be mentioned briefly. The extensive migratory tendencies which have nullified the introduction of "rainbow trout" in many localities have evoked a frequent desire for a "non-migratory strain". The U.S. Bureau of Fisheries in 1936 and 1937 made two expeditions to a remote part of Mexico in order to obtain a strain of rainbow trout which, because of physical conditions, were unable to migrate for any great distance (Needham 1938). The Cowichan rainbow trout makes a very short migration and the evidence indicates that, in its native locality, this characteristic is hereditary. The present writer will not undertake to predict the result of introducing trout into other waters. It may be suggested, however, that a fish which does not go to sea even when it has the opportunity deserves as much consideration as one which has been prevented from so doing by physical barriers. Additional recommendations might be found in the facts that the Cowichan river rainbow exists naturally in relatively warm water and in the face of competition from several other species of salmonids.

SUMMARY

A significant difference has been found between the average scale counts of anadromous and non-sea-going *Salmo gairdneri* of the Cowichan river system. This difference was found to persist in fish raised under the same environmental conditions.

Experiments with marked fish have shown that the offspring of anadromous parents disappeared from the fresh-water localities in which they were planted before or during their third spring. Some of these fish subsequently reappeared in these localities as adult sea-run steelheads.

Marked offspring of non-sea-run parents have remained in fresh water until their fourth spring. At least some of these fish migrated upstream to Cowichan lake during or prior to their third summer, in contrast to migrating seaward.

It is concluded that in this river there are two distinct races of *S. gairdneri*, the migratory habits of which are largely dependent on inherited characteristics.

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Meristic and Lactate Dehydrogenase Genotype Differences in Stream Populations of Rainbow Trout Below and Above a Waterfall

T. G. Northcote

Fisheries Research Section, Fish and Wildlife Branch
Department of Recreation and Conservation, Vancouver, B.C.

AND

S. N. Williscroft and H. Tsuyuki

Fisheries Research Board of Canada
Vancouver Laboratory, Vancouver, B.C.

Northcote, T. G., S. N. Williscroft, and H. Tsuyuki. 1970. Meristic and lactate dehydrogenase genotype differences in stream populations of rainbow trout below and above a waterfall. J. Fish. Res. Bd. Canada 27: 1987–1995.

Rainbow trout (*Salmo gairdneri*) from above a waterfall on Kokanee Creek had significantly higher average number of parr marks and scale rows but lower number of vertebrae compared with those living below the falls. Three phenotypic forms of liver lactate dehydrogenase (LDH) were recognized in Kokanee Creek rainbow trout (two single-banded homozygous forms CC and C′C′ and a five-banded heterozygous form CC′), apparently under the control of a two allele system. Homozygote CC was predominant in trout from the above falls population and homozygote C′C′ was predominant in those from below the falls. Possible origins of meristic and LDH differences between above- and below-falls populations are discussed and their significance to differences in behaviour, particularly migratory, are considered.

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INTRODUCTION

The problem of explaining patterns and mechanisms in lakeward migration and residence of trout populations from streams below and above falls forming barriers impassible to upstream movement of fish was considered briefly by Northcote (1969). Data given therein for Kokanee Creek, a tributary to Kootenay Lake, B.C., suggested that there were marked differences in migratory behaviour of young between "headwater" (above falls) and "below falls" populations — the former showing little evidence of downstream movement, the latter exhibiting a lakeward migratory pattern characteristic of inlet stream spawners. Differences in migratory behaviour between the two populations did not seem to be controlled by obvious environmental factors (e.g. temperature), and it was suggested that innate differences in current response might be expected in small headwater populations being subjected to strong selective pressure for maintenance of position in streams. Such is apparently the case

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for a population of brown trout (*Salmo trutta*) living above falls on the Swedish river Verkeån (Svärdson and Anheden, 1963; Svärdson and Nilsson, 1964).

In addition to differences in migratory behaviour between headwater and below falls populations in Kokanee Creek, there were also external differences in colouration and appearance. Indeed, headwater forms in nearby streams have been recognized as a subspecies (*whitehousei*) of *Salmo gairdneri* by Dymond (1932) on such features, in combination with other characters, especially lateral line scale rows. Therefore it seemed pertinent to examine headwater and below falls rainbow trout of Kokanee Creek in more detail. The populations were compared by two diverse approaches: (*a*) meristically by counting parr marks, scale rows, vertebrae, and gill rakers; and (*b*) biochemically by using electrophoretically definable proteins as genetic markers.

The biochemical system chosen was lactate dehydrogenase (LDH) because this enzyme has been investigated on 30 species of teleost fishes (Markert and Faulhaber, 1965), and because the tetrameric structure (Appella and Markert, 1961; Markert, 1962) and the molecular bases (Markert, 1968) for isozyme forms are well understood. In salmonid species, some or all of the LDH systems have been described by several investigators (Goldberg, 1965, 1966; Morrison and Wright, 1966; Hochachka, 1966; Ohno et al., 1968; Klose et al., 1968; Bouck and Ball, 1968; Massaro and Markert, 1968; Williscroft and Tsuyuki, 1970), and different systems of nomenclature adopted. In a previous publication (Williscroft and Tsuyuki, 1970) describing the LDH systems of rainbow trout, the polymorphic liver subunits were designated C and C′ in accordance with the convention established by Markert (1962) for the A (skeletal muscle) and B (heart muscle) subunits and with that by Odense et al. (1969) for the C (liver tissue), D (eye tissue), and E (other nonspecific tissue) subunits. The designation C has been used for LDH from gonadal tissue (Zinkham et al., 1963) as well as that from retinal tissue (Morrison and Wright, 1966) and the need for preempting its usage for testicular tissue (Massaro and Markert, 1968) is not universally adopted.

Geographic frequency differences in LDH alleles were observed in *Clupea harengus harengus* (Odense et al., 1966), *Merluccius productus* (Utter and Hodgins, 1969), and *Oncorhynchus nerka* (Hodgins et al., 1969). Recently polymorphism in the LDH from the liver of rainbow trout, and hence of immediate value to this study, was reported for the first time (Williscroft and Tsuyuki, 1970).

GEOLOGICAL AND RECENT HISTORY OF KOKANEE CREEK

Virtually the whole drainage basin of Kokanee Creek is underlaid by a lower cretaceous formation (Nelson plutonic rocks) formed mainly of porphyritic granite (Little, 1960). The creek enters the West Arm of Kootenay Lake. This large lake, during glacial retreat in late Pleistocene, was dammed by a terminal moraine near the big bend of the Kootenay River in the United States, and drained south over the moraine (Schofield, 1946). The lake level was much higher than at present as evidenced by old deltas some hundreds of feet above those of today at mouths of tributary streams (Little, 1960; W. H. Mathews, personal communication) so that the present falls would not have been a barrier to upstream migration of fish if present in the lake then.

The Kokanee Creek system has been subject to a long and confused history of fish introductions through activities of several hatcheries operating in the region. It is probable that rainbow trout existed above the falls prior to introductions by man, since they do so in other nearby small headwater lakes and streams tributary to Kootenay Lake, such as in Six Mile Lake and in Duhamel Creek, 8 km southwest of Kokanee Creek. The first recorded introduction of rainbow trout to Kokanee Creek was made in 1914 when several thousand young Kootenay Lake rainbow (Lardeau River–Gerrard stock) were apparently planted in Kokanee Lake at the head of the system. However, these may not have survived, at least in the lake, as Weldon Reid, Superintendent of Nelson Hatchery recorded in his report of 1930 (Department of Fisheries, 1932) that "cutthroat introduced into Kokanee and Kaslo lakes have done well and specimens up to two pounds in weight have been reported from the former. These lakes ... were regarded as barren before they were stocked from this hatchery." Since 1914 eyed rainbow trout eggs of unrecorded origin were planted in the creek in 1931, 1942, and 1951; rainbow fingerlings were also stocked in the creek in 1950. Although the location of these plantings was not recorded, most, if not all, were probably made below the falls. Origin of the stocks also was not recorded.

Since the first introduction, which was noted above, of Yellowstone cutthroat trout (*Salmo clarki lewisi*) into the system, this species has been planted in Kokanee Lake in 1931, 1933, 1938, 1939, 1941, 1952, and 1968. It also occurs in Gibson Lake, about 4 km downstream from Kokanee Lake and was stocked there in 1968. Cutthroat trout may be found in Kokanee Creek for at least 5 km below Gibson Lake (Conservation Officier R. A. Rutherglen, personal communication).

METHODS

Rainbow trout were collected from below the falls by seining in the lowermost 0.7 km of the creek. Twenty-six specimens (90–200 mm fork length; largely yearlings) were taken there on September 9, 1969, 25 on September 12 (46–65 mm; young of the year), and 31 on November 14 (45–57 mm; young of the year). An additional 50 yearling or older fish were caught in the below-falls section of the creek on April 23–25, 1970, and used only for parr mark counts. On September 4, 1969, 38 rainbow trout (111–170 mm; yearlings or older) were angled from above the falls in a section 6.5–12.5 km from Kootenay Lake. Several cutthroat trout also were caught in the upper reaches of this section. Another 26 rainbow trout, but no cutthroat, were seined and angled in an above-falls section of the creek 5.5–6.5 km from the lake on September 9, 1969.

Most fish were frozen shortly after capture. Later they were thawed, measured, weighed, parr marks counted, and X-rayed before being preserved for 48 hr in a 10% formalin solution and then transferred to a 40% isopropyl alcohol solution.

All counts were made from the right side of the specimens. Parr marks were counted if they appeared to extend as a single mark above and below the lateral line, although slight "breaks" were occasionally evident in some marks where intersected by the lateral line. For counts of scale rows above the lateral line each specimen was blotted dry of isopropyl alcohol, pressed against a blue ink stamp pad, reblotted, and then scale rows were counted under a low-power binocular dissecting microscope, using a fine hair across one ocular. This procedure facilitated scale counting by making the rows stand out clearly, even on small fish. Total number of vertebrae (not including the hypural plate) was counted from X-ray photographic negative plates using a dissecting microscope with suitable back lighting. The right anterior gill arch was removed from each specimen, washed, dried briefly under a fine air jet, and rakers counted under a dissecting microscope.

Scale row counts for young-of-the-year fish were not included in the analysis. Although all appeared to have completed scale formation (many showed 3–5 circuli), counts averaged lower than those from the other below-falls collection of yearling and older fish and were not included as they may have biased the total sample in favour of showing a difference when compared with the above-falls collection (Fig. 1). Differences between average counts of each meristic character were compared for significance by *t*-tests, using appropriate adjustment for unequal sample size where necessary.

For electrophoresis, liver samples were excised from partially thawed fish. Liver extracts were prepared by homogenizing approximately 0.3 g of tissue with 4 volumes of chilled sodium phosphate buffer, ionic strength 0.05, *p*H 7.55. After centrifugation the supernatant was applied directly to the starch gel.

The starch gel was prepared as a 13% solution in a buffer (Clayton and Gee, 1969) consisting of 0.002 M citric acid brought to *p*H 8.0 with tris (hydroxymethyl) amino methane (Tris). The electrode buffer was made of 0.04 M citric acid brought to the same *p*H with Tris. Electrophoresis was carried out at 4 C at 200 v for $2\frac{1}{2}$ hr using an apparatus described previously (Tsuyuki et al., 1968).

The histochemical solution for visualizing the lactate dehydrogenase consisted of the following in 200 ml final volume: 40 ml of 0.1 M Tris brought to *p*H 8.0 with HCl, 1.92 g lithium lactate, 60.0 mg of nicotinamide adenine dinucleotide, 3.0 mg of phenazine methosulphate, and 40 mg of nitroblue tetrazolium. The gels were placed in suitable washing trays, incubated with this mixture for 30 min at room temperature, and then washed with water. The zymogram was photographed immediately and also reexamined after 24 hr for the development of any minor components.

RESULTS

Significant differences in several of the meristic characters examined were evident in below- and above-falls populations of rainbow trout (Fig. 1). Compared with those from below falls, the above-falls fish had higher average number of parr marks (12.36 cf. to 10.57), higher average number of oblique scale rows above the lateral line (145.98 cf. to 135.65), and lower average number of vertebrae (63.75 cf. to 64.44). Although the average number of gill rakers in above-falls fish were lower than those below falls in all collections, differences were significant ($P < 0.05$) only in some comparisons (September 9, November 14, below falls cf. to September 4, 9 above falls; September 9 below falls cf. to September 4 above falls). As it could not be definitely determined that full raker numbers were formed in small young of the year, all of this age class were eliminated from the final comparison made in Fig. 1 where the calculated t value (1.88) was below the $P = 0.05$ level (1.99).

The lactate dehydrogenase in the liver of rainbow trout from Kokanee Creek existed in three phenotypic forms (Fig. 2) consisting of two single banded homozygous forms CC and C′C′, and a five-banded heterozygous form CC′. The autotetramer involving the more negatively charged allelic subunit has been designated C'_4 and that involving the less negatively charged component

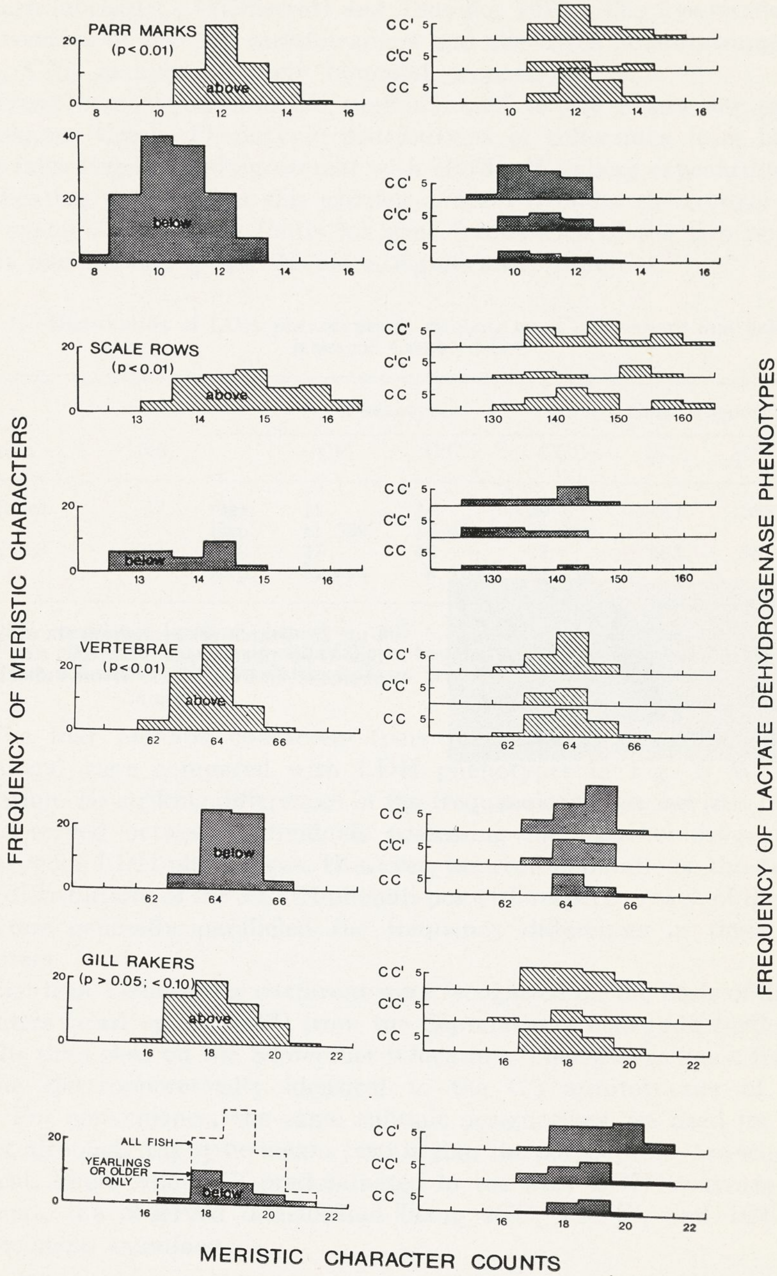

FIG. 1. Frequency distributions of four meristic characters in populations of rainbow trout below and above falls on Kokanee Creek; *P* values in parentheses give significance level of differences between populations. Histograms at right show distribution of CC, C'C', and CC' type liver LDH patterns for meristic characters in each population.

Fig. 2. Starch-gel zymogram showing rainbow trout phenotypes C'C', CC', and CC as expressed in liver LDH. Arrow indicates the origin.

has been labelled C_4 (Williscroft and Tsuyuki, 1970). The five-banded phenotype consists of the two autotetramers and the three heterotetramers, C'_3C, C'_2C_2, $C'C_3$ in approximately binomial proportions.

Trout homozygous for CC predominated in the headwater population of Kokanee Creek. Phenotypic distributions of collections from below and above falls were in good agreement with Hardy–Weinberg expectations (Table 1) indicating that in liver this isozyme protein is under the control of a two allele system. Confidence limits for gene frequencies of the two populations do not overlap and q^C is, therefore, significantly different.

TABLE 1. Distribution of LDH phenotypes in rainbow trout from above and below falls on Kokanee Creek, B.C.[a]

Location	No.		Phenotypes			Gene frequency		
			CC	C'C'	CC'	q^C	$q^{C'}$	χ^2
Below falls[b]	57	Obs.	11	17	29	.447	.553	.048
		Exp.	11.389	17.431	28.180			
Above falls[c]	64	Obs.	27	10	27	.633	.367	.544
		Exp.	25.644	8.620	29.736			

[a]95% confidence limits q^C below = .447 (.357–.537); q^C above = .633 (.549–.717).
[b]From collections made below the falls on September 9 and November 14, 1969.
[c]From collections made above the falls on September 4 and 9, 1969.

The four meristic characters (parr marks, scale rows, vertebrae, and gill rakers) were compared with LDH phenotypes in Fig. 1. Within each population, no striking differences in the frequencies of the meristic characters were observed between individuals possessing the two homozygous or the heterozygous LDH phenotypes. However, between populations, the differences in the distributions of the 3 LDH phenotypes with respect to each of the meristic characters generally paralleled the frequency differences in these meristic characters.

Eighteen Yellowstone cutthroat were recognized on the basis of diagnostic characters (Carl et al., 1967) from the September 4 collection further above the falls than that on the September 9 location. This species has a liver LDH isozyme electrophoretically identical to the C'_4 autotetramer of rainbow trout. For convenience, the same subunit designations are used for the two species, although it is by no means certain that the polypeptides are sequentially identical. Phenotype C'C' predominated in the liver LDH isozymes of these cutthroat, the observed distribution being 2CC, 15C'C', and 1CC' in the 18 specimens examined.

DISCUSSION

Meristic characters reported herein for the population of rainbow trout living above falls in Kokanee Creek are similar to those described originally for "mountain" Kamloops trout in the Kootenay area by Dymond (1932), Mottley (1936, 1937), Carl and Clemens (1948) and for "dwarf forms" from cold headwaters by Carl et al. (1967). In general they are characterized by high numbers of parr marks and scale rows but low vertebral and gill-raker counts (Table 2). On the other hand trout from below Kokanee Creek falls

TABLE 2. Comparison of some meristic counts (range, mean) in different forms of nonanadromous rainbow trout described in British Columbia.

Source	Location	Form	Parr marks	Scale rows	Vertebrae	Gill rakers
Kokanee Cr.	Above falls	Headwater stream resident	11–15 (12.36)	131–163 (145.98)	62–66 (63.75)	16–21 (18.23)
	Below falls	Lower stream resident or lake migratory	8–13 (10.57)	125–147 (135.65)	63–66 (64.44)	17–21 (18.73)
Kootenay area (Mottley, 1934, 1936, 1937)	Six Mile Lake	Headwater lake resident	– (–)	– (–)	62–66 (63.57)	– (–)
	Kootenay Lake	Lake migratory	– (–)	130–160[a] (144.84)	64[b] (64.00)	– (19.2)
			– (–)	125–146[c] (135.61)	63–66[c] (64.39)	– (–)
British Columbia (Dymond, 1932)	Six Mile, Bear, Fish lakes; W Kootenay area	Headwater lake resident	– (about 13)	140–164 (about 150)	– (–)	17–18 (–)
	Lower elevation inland lakes	Lake migratory	8–13 (usually 9 or 10)	130–160[d] (about 145)	– (–)	18–21 (–)
British Columbia (Carl & Clemens, 1948)	Six Mile, Cottonwood, Bear, Fish lakes; W Kootenay area	Headwater lake resident	– (about 13)	150–155 (–)	– (–)	– (–)
	Lower elevation inland lakes	Lake migratory	– (usually 9 or 10)	135–150 (–)	– (–)	– (–)
British Columbia (Carl et al., 1967)	High elevation lakes and streams	Headwater lake and stream resident	– (–)	"Highest for fish of cold headwater areas"	– (–)	– (–)
	Lower elevation inland lakes	Lake migratory	9–13 (–)	– (about 145)	– (–)	– (–)

[a]216 adult rainbow trout from Kootenay Lake and Lardeau River spawning area (Gerrard).
[b]12 adult Lardeau River (Gerrard) spawners.
[c]150 offspring from [b], reared at Nelson Hatchery.
[d]"Ninety percent, however, have from 135 to 153 scale rows."

(be they stream resident or juvenile lake migratory forms) have relatively low numbers of parr marks and scale rows but higher average vertebral and gill-raker counts, similar to rainbow found in Kootenay Lake itself or in other inland British Columbia lakes at lower elevations (Table 2). At least some of these meristic characters are subject to environmental modification (for example by temperature) as clearly shown by experiments of Mottley (1934, 1937). However, marked differences in environmental conditions, especially temperature, are not evident between above- and below-falls sections of Kokanee Creek (Northcote, 1969). Furthermore, some of the meristic differences, for example in vertebral number, are contradictory to those that would have been predicted on the basis of temperature-induced changes. Because of probable differences in spawning time between below- and above-falls populations (the former earlier than the latter), developing eggs may be subject to different thermal regimes and hence show meristic differences affected by temperature. However, the ultimate cause may be an innate difference in spawning period.

The observed frequency of the C allele in populations above the falls represents a minimum value as the elimination of the Yellowstone cutthroat trait from the gene pool would have the effect of lowering the number of the C′ allele that predominates in this species. Only those specimens that could definitely be recognized as Yellowstone cutthroat were excluded from the above-falls collections for LDH analyses. It is possible, therefore, that the above-falls rainbow trout population may have been at one time entirely the rare homozygous CC form. However, in the below-falls collections, the observed frequency of the C allele is probably a maximum value. Random escapement over the falls of trout with high C allele frequency would have the effect of increasing the number of C alleles relative to the C′ alleles. Furthermore, Yellowstone cutthroat were not recognized in the below-falls collection, nor were hybrid individuals apparent, thus minimizing the contribution of the C′ allele from this source. The possibility that the below-falls rainbow trout populations at one time could have been exclusively the common homozygous C′C′ form is not eliminated.

Although no obvious meristic differences were observed between homozygous phenotypes CC and C′C′, it is possible that some might be found if larger samples were used. A number of other protein systems could also be investigated, and if polymorphic, may show phenotypically linked morphological differences. One other protein system examined, the blood hemoglobins, was identical in the two populations. It is possible that the phenotypic differences in liver LDH could affect behavioural patterns such as the migratory differences observed by Northcote (1969) in the two populations of rainbow trout from this same stream. The directional response to water current of young from known above- and below-falls parents is being tested and some differences are evident. Furthermore the current responses and endurance of young from pure CC and C′C′ LDH selected strains will be compared to investigate the possibility of different LDH phenotypes being reflected in behavioural and physiological characteristics.

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To: Mr.Robert J. Behnke

Colorado State University

Department of Fishery and Wildlife Biology

Fort Collins

Colorado 80523

U.S.A.

Sjötunga — äkta tunga?

Av KENT ANDERSSON

GÖTEBORG: För några få dagar sedan informerade Fiskeristyrelsen att äkta tunga heter Solea sola på latin. Den världsberömde fiskexperten Kai Curry-Lindahl uppger att det rätta namnet är Solea vulgaris. Föreningen Svensk Fisk kallar fisken för sjötunga i handeln.

Sole: Solea vulgaris or Solea solea ?

Förvirringen blev stor hos allmänheten efter Fiskeristyrelsens uppträdande och många hörde av sig till Arbetets fiskeredaktion med undran vad som nu pågick i fiskvärlden. Vi ska här bena ut begreppen och räta frågetecken.

Bakgrunden lär vara ett TV-program en tidig lördagsmorgon när en välkänd konsumentkvinna framträdde med kritik mot fiskhandeln att de kallar sandskädda för sjötunga. Ett namn som Fiskeristyrelsen vill undvika.

Svenska fisknamn har i åratal vållat många diskussioner, motsättningar och förväxlingar som fått utländska forskare att gapskratta över våra namn.

Ordet sjötunga (= tunga i sjön) är ett gammalt handelsnamn för flera olika fiskarter hos tungor inom släktet Solea som betyder sjötunga enligt latinsk-svensk ordbok. Detta är ett samlingsnamn från romarnas tid. Används även av yrkesfiskare i Nordsjön där tungorna fångades till oss.

Sjötunga eller inte — det vill Fiskeristyrelsen reda ut begreppen på. Men meningarna är delade om deras information benat ut fisknamnen på rätt sätt, eller bara bidragit till större förvirring.

En liten sjötunga, ej fullvuxen och utvecklad, kan ibland vara svår att skilja från sandskädda och därför räknades på några lokala platser även sandskäddan till sjötungorna. Observera nu följande rader om några olika arter hos tungorna.

Linnés fisk Solea solea (= sjötunga sjötunga) heter både i utlandet och i Sverige **Dovertunga,** men föreningen Svensk Fisk namnger den som sjötunga hos sina medlemmar inom handeln. Föreningen håller sig fortfarande till det urgamla släktnamnet Solea som grupp i stället för korrekt artnamn.

Fiskexperten

Dovertungan finns normalt inte i svenska vatten utan vid engelska sydostkusten, därav namnet efter hamnstaden Dover. Även Fiskeristyrelsen har förväxlat arten.

Quensels beskrivning på Solea vulgaris (= vanlig stjötunga) som fiskexperten Kai Curry-Lindahl hänsyftar på heter enbart tunga på svenska. Denna tunga finns sparsamt vid svenska kusten men detta lär nog inte Svensk Fisk och Fiskeristyrelsen ha observerat — ännu.

"Äkta tunga" är inget fisknamn utan ett handelsnamn för den vanliga tungan Solea vulgaris i dag.

Gruppen "äkta (sjö-) tunga" omfattade tidigare även dovertunga, hundtunga, senegaltunga, sandtunga, bergskädda (= bergtunga, citrontunga), småtunga, strimmad tunga, rödtunga med flera. Plus gamla lokala populärnamn som sjötunga, såla, sula med flera, och för ovanlighetens skull — även sandskädda.

Inte lätt med fisknamn som synes, när vi slutligen berättar att ordet sjötunga kom från Trondheim till Sverige för över 100 år sedan.

Succé för svårfångat fiskekort

Av KENT ANDERSSON

GÖTEBORG: Vilket väljer du? Sportfiskarnas "Gula kortet" som gäller för 40 fiskevatten i Göteborgsregionen, eller Domänfiskekortet till cirka 1.500 fiskevatten över hela landet. Inklusive hälften av göteborgsområdets fiskevatten.

Årets val är inte svårt. På fjolårets turistmässa fick Domänverket kritik för att de inte kunde erbjuda allmänheten något fiskevatten i Göteborg.

Nu har företaget reparerat skadan och på turistmässan nästa vecka informeras besökarna att Domänfiskekortet gäller även för drygt 20 fiskevatten i Göteborg vilket glädjer många sportfiskeintresserade. Men det finns en hake.

Bakgrunden är att Domänverket har köpt in sig på "Gula kortets" fiskevatten från och med i år. Sportfiskeförbundet har 26 distrikt i Sverige men bara deras kontor i Surte ska sälja Domänfiskekortet enligt företagets återförsäljningslista. Trots påminnelse saknar fortfarande Surtekontoret kort till försäljning.

Andra återförsäljare finns i Trollhättan, Ulricehamn, Vargön och Vänersborg som närmaste plats för oss västsvenskar som där får punga ut med 100 kr för Domänfiskekortet, enligt listan.

Domänfiskekortet är en ny produkt som infördes 1988 efter provåret innan. Det gäller per kalenderår för hela familjen — så länge barnen är under 16 år — och kostar 80 kronor för medlemmar. Man kan sportfiska i cirka 1.500 sjöar, vattendrag och bäckar varav merparten finns i Bergslagen, Norrbotten och Västerbotten.

Kartkatalog

Har man lyckats köpa Domänfiskekortet översändes snart en 22-sidig kartkatalog i färg med vattenlista på 56 sidor. Dessutom lovar Domänverket en gratisprenumeration på Domänfisketidningen även om första numret fortfarande saknas efter tre månader på årets fiskesäsong.

Årets val är lätt, men Domänfiskekortet är svårfångat för allmänheten i syd- eller mellansverige. Trots barnsjukdomar och kritik ska Domänverket ha beröm för årets kortförsäljning. Förra året såldes totalt 40.000 fiskekort mot 49.000 hittills i dag efter första kvartalet i år.

Den 50.000:e Domänfiskekortsköparen koras nästa vecka på turistmässan. Troligen blir det en norrlänning eftersom huvudparten av kortköparna består av nordbor.

Domänverkets något skamfilade fasad har hyfsats till lite grann på färgglada prospekt över intressanta fiskevatten. Foto: KENT ANDERSSON

Fiskenytt för vårens alla napp!

April, april! Fiska bäst ni vill! Men innan nästa månad påbörjas i morgon skall vi i dag avsluta mars med några fiskenyheter i korthet.

Tranemo: Sportfiskarnas ungdomsråd i södra Älvsborg arrangerar ett kustfiskeläger vid Ljungskile den 22—23 april. Sista anmälningsdatum 31 mars. Info Kent Jacobsson tel 033-825 60 eller Mary-Anne Kroon 0325—760 68 bostad.

Varberg: EFSA's vårtävling 8—9 april har lockat nästan 50 deltagare ombord på två båtar. Än finns några få platser kvar. Info Hans Elmroth 046-12 55 25.

Göteborg: Sista inlämningsdatum är 1 april för Säveåns fiskeauktion den 29 april i Gamlestadens medborgarhus.

Göteborg: Säveåns Laxfiske till jonseredsvattnets fiskekort har sista anmälningsdag 1 april hos Sportfiskarnas göteborgskontor.

Mölndal: Den nybildade sportfiskeklubben Uppdraget inbjuder allmänheten till fritt fiske i Sisjön den 15 april. Info Bertil Andersson 031-29 25 52.

Angered: SFK Vapa är en nybildad fiskeklubb med drygt 50 medlemmar inklusive 30-talet juniorer. Info Olavi Mäki 031-31 27 96.

Stavanger: Den 1 april är sista anmälningsdatum till havsfiske-EM. Svensk info: Hans Elmroth, Skördevägen 5, 222 38 Lund, tel 046-12 55 25.

Finland: Resultat, nordiska mästerskapet i pimpel. Herr: 1) P-O Lindstrand, 2) P Tanttu, SF, 3) J Harju, SF. Dam: 1) M Säynevirta, SF, 2) Siv Hård, 3) Sylvia Kärrman. Junior: 1) T Tuskin, N, 2) Jonas Bergkvist, 3) Roger Wiik, S. Nationslag: 1) Sverige, 2) Finland, 3) Norge. Herrlag: 1) Finland, 2) Sverige, 3) Norge. Damlag: 1) Finland, 2) Sverige, 3) Norge. Juniorlag: 1) Sverige, 2) Norge, 3) Finland. Bäste individuelle deltagare: P-O Lindstrand, S, 4,8 kg.

G

Bagaregårdens Kulturhus: Månd—torsd 11—21, fred 14—22, lörd 11—22, sönd 11—18.
Blå Stället: Angered: Månd—fred 10—22, Lörd 10—22, sönd 12—22. Museihallen öppen tisd o fred 10—15, onsd o torsd 10—19, lörd o sönd 12—15.
Bokcaféet Arbetarkultur, Andra Långg 20: Månd—fred 10—18, lörd 10—14.
Bokcaféet Röda Rummet, Storgatan 15: Månd—fred 12—18, lörd 10—14.
Botaniska trädgården, Carl Skottsbergs gata 22: Parken öppen alla dagar från kl 9 till solnedgången, växthusen månd—fred 10—15, lörd—sönd 12—16.
Café Hängmattan, Karl Johansg 16: Månd—fred 10.30—22, lörd 12—18, sönd 12—22.
Cafe Måsen, Nordhemsgatan 68: Månd—fred 10—21, lörd—sönd 12—21.
Folkkampanjen mot kärnkraft, Viktoriahuset, Linnég 21 uppg A : torsd 18—21.
Forum Börsen, Gustav Adolfs torg 4: Månd—fred 12—18, lörd—sönd 12—16.
Fotohuset: Öppet tisd—onsd 12—18, torsd—sönd 12—16.

Långgatan 5. Öppet månd—fred 9—13.
Museerna har öppet tisd—lörd 12—16, sönd och helgd 11—17, onsd även 18—21. Undantag: Se Blå Stället, Medicinhistoriska- och Militärhistoriska-och Skolmuseet.
Militärhistoriska museet, Skansen Kronan: Lörd 13—15, sönd och helgd 12—15, onsd 19—21.
Offensivs bokcafé/redaktion, Nobelg 21: Månd—fred 10—16.
Palestinagruppens lokal, Viktoriahuset, Linnég 13—21: Öppet torsd 19—21.
Parkinsonsföreningens lokal, Karlag 23: Öppet tisd och torsd kl 10—14.
Riksförbundet för sexuellt likaberättigande, Esperantoplatsen 7: Café-och träfflokal tisd—torsd, lörd 23—04 och sönd 20—23, Rosa rummet onsd och sönd 20—22.
RFSL-U, Riksförbundet för sexuellt likaberättigande — ungdom, Esperantoplatsen 7: Cafe- och träfflokal öppet för homo- och bisexuella ungdomar under 26 år. Månd 19—22.
SKV, Svenska Kvinnors Vänsterförbund, Viktoriaskolan, linnég 21: Exp öppen månd—fred 10—14.
Skogssällskapets Naturrum, Stora Torp: Månd—torsd 10—12 och 13—15.
Skolmuseet, Engelbrektsg 1: Tisd och fred 11—13, sönd 13—15.
Stadsbiblioteket, Götaplatsen: Månd—torsd 10—21, fred—lörd 10—18, sönd 12—18.
Svensk-kubanska föreningens bokhandel, Linnég 13—21: Lörd 11—14.
Svenska Kvinnors Vänsterförbund, SKV, Linneg 21 A: Exp öppen månd—fred 10—14.
Syndikalistiskt Forum, Landsvägsg 38: Månd—torsd 17—20, fred 12—20, lörd 11—15.
Universitetsbiblioteket, Renströmsg 4: Månd—fred 8—21, låneexpeditionen 8.30—21, lörd 9—18 och sönd 13—17.

● Fokets Hus på skaftö inviger ikväll sin verksamhet med bl a Folkteaterns föreställning "Hjärtats saga".

Fredskommittén, Viktoriahuset, Linnég 13—21: Öppet onsd 18—21. Tel 14 64 57.
Frölunda kulturhus, Frölunda torg: månd-fred 8—22, lörd—sönd 10—18.
Författarbokhandeln Karl Gustavsgatan 10: Öppet tisd—fred 12—18.
Galleri 54: Öppet tisd—sönd 12—16.
Gunnareds Gård: Öppet mån—tis, tors—fre 10-16, ons 14-21.
Göteborgs Miljögrupp/Trädkramarna Andra Långgatan 5: Månd—fred 9—13.
Haga bokcafé, Södra Allégat 11: Månd—fred 12—18, lörd 11—14.
Holländaregården, Drottningg 13: Månd—fred 10—18, lörd 10—14.
Informationscentralen, Kungsportsplatsen: Månd—fred 9—17, lörd 10—14.
Internationella kvinnoförbundet för fred och frihet, Linneg 52: Månd-fred 13-18, lörd 11-14.
Konstgalleriet, Kronhusbodarna: Månd—fred 11—15, lörd 11—14.

...et i Studio 32, Uddevalla, när ...in ikväll.

Konsthantverkshuset, Slussg 1: Öppet tisd—fred 12—18, lörd—sönd 11—16.
Konst-kafeet, Klippans kulturreservat: Öppet dagl 12—17 utom fred då stängt.
Kronhuset, Kronhusg 1 D: Vard 12—16, sönd 11—17.
Lilla Änggården: Visas för grupper efter anmälan per tel 61 27 70.
Medicinhistoriska museet, Östra Hamng 11: Tisd—sönd 13—16.
Miljöförbundet Andra

Människor emellan

AA, Anonyma Alkoholister, Centrumgruppen. Du som tycker att du dricker för mycket alkohol är välkommen att ringa tel 11 43 13, månd—fred kl 19—21 samt lörd och sönd kl 17—19.
Al-Anon, hjälp för alkoholistens anhöriga: Möten tisd 19—21 på Andra Långg 11, tel 12 71 92 torsd 19—21 möten på Vasapl 3.
Alateen, en hjälp för barn och vänner (ca 12—20 år) till alkoholister. För information ring tisd 19—21 tel 12 71 92.
Cafe 35:an kristet jourkafé, Linnég 35. Öppet tisd—fred 10—20. Öppet hus onsd och lörd kl 19.30.
DKSN-RIA, Samtalsjour för kvinnor med alkoholproblem tisd och torsd kl 13—15, tel 51 53 51.
Frälsningsarméns gemenskapscenter, Kvilletorget 1: Öppet vard 9—15. Torsd sopplunch.
Föräldraföreningen Mot Knark, Härlandav 10: samtalsjour månd, tisd och torsd kl 13—15 på tel 20 28 29.
Föräldraföreningen Mot Narkotika, Nordhemsg 47: samtalsjour alla dagar tel 12 89 01.
Föreningen Söndagsförälder, Vävlagareg 4: kvällsjour onsd kl 19—21 på tel 19 40 85. Säkrast vard 10—12.
Hassela Solidaritet folkrörelsebyrån mot droger och utslagning. Stampgatan 8: öppet månd—fred 8—18. Tel 15 62 90.

Jourhavande kompis (Röda korsets ungdomsförbund samtalsjour) dagl kl 18—23 på tel 17 84 00.
Jourhavande medmänniska (Röda korsets samtalsjour): alla nätter kl 22—06 på tel 25 57 00. För finsktalande Puhelinystävä lörd och månd kl 18—22 på tel 11 30 22.
Kamratföreningen Länken, distriktsexp Allmänna vägen 40, tel 12 87 98 och 14 33 89. Sjukklinik Lotsg 7 månd och torsd kl 8—16, tisd, onsd, fred kl 8—14 på tel 24 90 42.
Kamratföreningen Länkens kvinnoförening, Storg 5: kl 8—15 på tel 11 10 50.
KF Länken Södra-föreningen, Stigbergsliden 10: dagl kl 8—21.
Kvinnohusets krisjour: Tisd, torsd och fred kl 18—21 på tel 84 25 11 och 84 25 87.
Kyrkans jourtjänst: kris- och samtalsjour dygnet runt på tel 84 80 15. Jourhavande präst på 90 000 kl 20—08.00.
Någon att tala med: Månd—torsd 10—22.30, fred 10—02.30, lörd—sönd 18.30—22.30 på tel 11 24 00 el 11 24 22.
RIA-Center, Halleg 6 (de kristna samfundens diakoni- och rådgivningscentral för människor med alkohol- och drogproblem): månd—fred kl 9—12, månd öppet hus kl 18—21, torsd gemenskaps- och allsångskväll kl 19—21. Telejour på 51 53 51. Hänvisning dygnet runt.
RFHL, Seminarieg 3: Månd—fred 8.30—16, tisd—torsd kvällsöppet till kl 20, tel 82 51 91 el 82 12 90.
RFSL, Esperantoplatsen 7: Gayjour för homo- och bisexuella. Tel 11 01 04. Rådgivning, professionellt stöd och information för homo- och bisexuella. Information om HIV och aids på tel 11 01 33.
RFSL—U, Esperantoplatsen 7: Telejour för och med homo- och bisexuella ungdomar. Sönd 9—21. Tel 11 56 49.
RMSÖ, Riksföreningen mot sexuella övergrepp på barn: Samtalsjour varje onsdag kl 18.30 — 22. Övriga dagar finns telefonsvarare. Tel 43 22 30
Rådgivning för narkotikamissbrukare och anhöriga: Alla dagar kl 8—17 på tel 13 71 16.
Samtalsjouren för män: Månd 19—23 på tel 40 37 23.
Vita bandets rådgivningsbyrå, Chapmansg 6 (för kvinnor med alkoholproblem): Månd 9—19, tisd—onsd 9—17, torsd 9—19 (ojämn vecka), 9—21 (jämn vecka), fred 9—15.

● "Det gäller livet"— en sorts revy mellan skratt och gråt, ges av Kattastroferna på café Måsen idag och imorgon.

Alingsås

Folkets Hus kl 15—18: Pensionärsdans med PRO Alingsås.
Nolhaga slott: Öppet tisd—lörd 12—16, sönd 12—17. "Ny sovjetisk fotografi".
Palladium: "Robert Persson" — målningar.
Alingsås museum: Öppet tisd—fred 12—16, onsd även 18—20, lörd 10—14, sönd 12—17. "Lön för mödan", utställning om metallarbetares liv i Alingsås på 1900-talet. Basutställningar om 1700-, 1800- och 1900-talens Alingsås.

Borås

Stadsteatern, Stora scenen kl 19: Hamlet.
Lilla scenen kl 19: Inte mer champagne.
Folkan kl 19: Riksteatern ger "På vinst och förlust".
Borås museum: Öppet alla dagar 12—16.
Tekomuseum: Öppet månd-fred 12—16, sönd 12—16, lörd stängt. "M &Y" — Maj-Britt Svensson och Yrjö Häkkinen, textil och lera, "Knyppling Jorden Runt".
Konstmuseet: Öppet tisd och torsd 12—20, onsd och fred 12—16, lörd 10—15, sönd 13—17. "Samlingsutställning" — Kerstin Bergh, Håkan Dahlén, Barbara Häggdahl m fl.

Halmstad

Figarosalen kl 19: Påsklovsrock med bl a Eros, Rubensson Combo, No Quarter.

● Ett av de märkligaste människoöden i vår tid — Elefantmannen — skildras i Riksteaterns föreställning med samma namn och som ges i Kungsbacka Teater ikväll.

Geting Medborgarhus kl 19: Påsklovsrock med I Roots och Kalle Kanin.
Halmkärven kl 20: Blues och 60-tals musik.
Stadsgalleriet kl 16—18: "Björn Olsén" — målningar. Vernissage.
Halmstads museum: Öppet månd—fred kl 10—16, onsd även kl 19—21, lörd—sönd kl 12—16. "Tecken 1946—89" — Björn Rosendahl, "Steninge glasbruk" — människor och glas. Basutställningar med bohusländska, stadshistoria, sjöfart och konst.
Café Österskans: Öppet vard 11—16, lörd 10—13, sönd 11—12.

Kungsbacka

Kungsbacka teater kl 19.30: Riksteatern ger "Elefantmannen".

Älvsåkersgården kl 19: Hembygdsfrågesport med Älvsåkers hembygdsgille.

Kungälv

Kungälvs stadsbibliotek: Öppet månd—fred 11—20, lörd 10—13.

Lerum

Ågården kl 14: Bingo med PRO Lerum.

Lilla Edet

Lödöse museum: Öppet månd—fred 11—16, tisd även 19—21, lörd 11—14, sönd 12—16. "Breven berättar" — släkhistoria i foton, broderi och applikation av konstnärinnan Solveig Kristiansson.

Lysekil

Folkets Hus, Skaftö kl 19: Programverksamheten invigs med musikteatern "Hjärtats saga" med Folkteatern besöker. Efter föreställningen knytkalas.

Mark

Rydals museum: Museet är öppet tisd—torsd och sönd 12—16. ""Examinerat" — examensarbete från Konstindustriskolan, "Barnens lek och arbete kring sekelskiftet", "All världens hobby". Permanenta utställningar: "Tråden som aldrig brast", "Land du välsignade" m fl. Visningar av Sjuhäradsbygdens äldsta spinneri.

Mölndal

Kvarnhuset kl 19: "Konst och posei" — uppläsning av Ragnar Strömberg.
Gunnebo slott visas kl 13 och 14.
Påsklov:
Lindome, tältet vid Lindevi parkering, kl 11—14: Pröva på att kasta Boule.
Almåshallen kl 12—16: Bordtennis.
Kvarnen, Kvarnbyns kultureservat: "9:e Grafiktriennalen" — Samtida grafik.
Mölndals museum, Forsåkersg 19: Museet är öppet kl 12—16. Utställningar: "Från istid till nutid" — kommunens historia med uppbyggda miljöer.
Mölndals hembygdsmuseum: Öppet lörd—sönd 13—16.
Kvinnojouren Frideborg: Telefonjour alla dagar 19—21 på tel 27 10 89, övrig tid telefonsvarare.

Skara

Skaraborgs Länsmuseum: Öppet vardagar 10—16, onsd även 18—21, lörd—sönd 12—16. ""Landsbygden genom linsen", "Rent till varje pris", "Bilder från sex decennier" — fotograf Stig Rehns bilder.

Skövde

Skövde museum: Öppet tis—fred 12—16, lörd 11—14, sönd 13—16.
Konsthallen sönd: "Svea Milton".

Stenungsund

Jordhammars herrgård, Ödsmål: Öppet kl 11—18. "Bohuslän" — temautställning.

Strömstad

Skee fritidsgård kl 19—24: Stor-disco. Musikgrupper från Strömstad uppträder.

Trollhättan

Stranna kl 12: Lunchlyrik med författaren Sandro Key-Åberg.
Folkets Park: Mogendans till Thor-Leifs.
Starkodderhallen : Öppet lörd—sönd 12—15, tisd—fred 12—16, torsd äv 18—20. "Rent till varje pris" — smuts och snusk genom tiderna, "Ferro" — ett bildreportage.
Trollhättans museum: Öppet tisd—fred 12—16, tisd även 18—20, lörd—sönd 12—15. "Forntid — Kanalhistoria — Industrihistoria — Stadshistoria — Emigrantrum", "Kungakort" — ur Berta Lundells vykortssamling.

Uddevalla

Studio 32, Kungsg 32, kl 19: "Salong Batong" — kabaré.
Hembygdsgården Forshälla kl 19: Forshälla Hembygdsförening har årsmöte. "Mattraditioner i Bohuslän" — föredrag av Barbro Östlund.
Bohusläns museum kl 10.30 och 13.30: För alla påsklovslediga visas en film om bl a lodjur.
Al—Anon, St Nygatan 1, hjälp och stöd för anhöriga till alkoholister. Möten onsdagar 19—21.
Bohusläns museum: Öppet tisd-fred 10—20, lörd-sönd 10—16. "De fyra stora" — våra stora rovdjurs situation idag, "Rena skiten" — om sopor och sophantering, resursslöseri och miljöproblem, "Kaffetåren".
Galleri Konst & Form, S Hamng 16: "Carl Folke Carlsson" — oljemålningar.

Varberg

Varbergs museum: Öppet vard 10—16, lörd och sönd 12—16. "Luffare i sägen och verklighet" och "Kartor för resor i tid, rum och fantasi".
Konstnärshuset, V Vallg 8: "9:e Grafiktriennalen".

Vänersborg

Vänersborgs museum: Öppet tisd—sönd 12—16. "Josefina Björnberg och Vera Haij" — keramik.
Museihallen: "Carl-Göran Hagberg" — konstutställning.

HELA SIDAN ÄR DIN!

Möten, föredrag, underhållning? Intresserar det en större allmänhet? Fyll då i kupongen och skicka den till: **Västsverige Idag, ARBETET, Box 66, 401 21 Göteborg.** Märk kuvertet "Västsverige Idag". Vi måste ha uppgifterna minst två dagar före publiceringsdagen. Informationen införs gratis i mån av utrymme.

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Rainbow trout like
best natural waters

Regnbågsöringen mår bäst i naturliga vatten

Arbetet presenterar dess bakgrund och historia

SKÅNE: Arbetet kan nu som första dagstidning publicera en komplett namnförteckning över regnbågsöringens olika arter och underarter. Tack vare ett seriöst samarbete med nordamerikanska vetenskapsmän som är experter på denna fisk i naturen.

Ja, dessa öringsspecialister på den vilda stammen av regnbågsöringen är i de flesta fall kraftiga motståndare till att "konstgjorda" öringar från fiskodlingar släpps fria ut i naturen. Man menar det är fullständigt fel att angripa problemet på detta sätt. Naturligt producerade fiskstammar har en stor genetisk bredd och är utan tvekan överlägsen fiskodlingarnas firrar som i många fall är sönderodlade genom inavel menar experterna i nordamerika. Det är också stor skillnad på fiskens köttkvalité.

Omväxlande föda

Den fisk som lever fritt i naturen har ofta stor variation i sin föda vilket fiskodlingen inte alltid kan åstadkomma till fullo. Om en fisk föds upp på endast en maträtt, vilket är ganska vanligt i fiskodlingar och akvarier, är det stor risk för bristsjukdomar, rubbningar i arvsmassan, dålig motståndskraft för sjukdomar och mycket annat.

Släpps en odlad fisk ut i naturen sätter man det naturliga urvalet på spel med stora risker för utrotning av den vilda stammen.

Därför bör varje land i stället inrätta naturskyddsområden där det råder året-runt-förbud mot all typ av fiske och varje form av utsläpp. Samtidigt skall man prioritera fiskevården i allra högsta grad, menar fiskeexperterna.

FISKA MED Arbetet

Kent Andersson

Regnbågsöringen

Som Arbetets fiskeredaktion tidigare publicerat, 30 december 1988, har regnbågsöringen fått ett helt nytt vetenskapligt huvudman — Oncorhynchus mykiss — från och med årets publikationer runt om i världen även om det nya namnet ännu inte slagit igenom i alla länder på grund av en viss övergångstid hos allmänheten.

Namnlistan intill upptar endast arter och underarter av regnbågsöringen från originalbeskrivningar och vi ska komplettera med geografiska orter.

De tre första namnen — mykiss, penshinensis, purpuratus — avser regnbågsöringen från ryska halvön Kamchatka i Stilla havet. Fjärde namnet gairdnerii(=synonymnamn) får tills vidare användas som underartsnamn vilket blir — Oncorhynchus mykiss gairdnerii — för att vara korrekt.

Kustvandrande

Denna fisk är stålhuvudsformen (kustvandrande) av regnbågsöringen lokaliserad i Columbiafloden vid Fort Vancouver, gränsen Kalifornien-Kanada.

Samma firre är "pappa" till inlandsformen av regnbågsöringen i Kamloopssjön har man senare konstaterat. Gibbons lade fram sin beskrivning år 1855 på irideus från San Francisco Bay som därefter namnändrades till irideus av Bean 1894. Ruvularis är fisken från Sacramentofloden.

År 1858 blev Girard först med beskrivning på den rödbandade regnbågsöringen — newberrii — vilken simmade i Klamathsjön, Oregon. Åttonde namnet — gibbsi — är också en rödbandad regnbågsöring, fångad i mitten av Columbiafloden. Masoni finns i Oregon och mendocino i Kalifornien.

År 1892 var Jordan först med att använda släktnamnet Oncorhynchus för insjöformen av regnbågsöringen i Kamloopssjön, British Columbia, västra Kanada. Gairdneri shasta och irideus stonei, Jordan 1892, finns båda i McCloud River och kallas allmänt för Sacramento River redbrand trout.

Bekymmer

Mykiss agua-bonita kommer från Kern och samtidigt använde Jordan ordet mykiss på en nordamerikansk strupsnittöring aguabonita vilket ställde till en del bekymmer för senare forskare. Regnbågsöringen gilberi jagar i Kern River. Gairdneri beardslei finns i Cresent Lake, Washington, och roosevelti har ibland populärnamnet "Golden Trout C K". Fisken whitei upptäcktes i Little Kern River och nelsoni i Baja California (Mexico). Regalis tillhör sjön Tahoe och smaragdus Pyramidsjön men de fanns inte från början naturligt i dessa två sjöar. Namnet rosei är grundad på närmaste hybrider av inplanterade regnbågsöringar.

Listans sista fisknamn — kamloops whitehousei — är den alpiska regnbågsöringen i sjövatten på Selkiska fjällbergen i British Columbia, Kanada, och staden Whitehouse finns där som fiskens namn fått.

Rasnamn

Utöver art- och underartsnamn finns rasnamn som en del forskare använt på regnbågsöringen men dessa har inte medtagits för att undvika missförstånd eftersom det har i flesta fall rört sig om introducerade regnbågsöringar som av misstag "beskrevs" som "nyupptäckta" arter eller underarter. Bland annat gjorde Bajkov 1927, Halkett 1913, Jordan Suckley 1874+1862a, Gunther 1866 (116-117), Girard 1859 — detta.

Avslutningsvis kan vi informera att regnbågsöringens hela systematik inte är fullt kartlagd än och listan intill kan ändras om några år men förteckningen ger ändå en god bild av fisken olika man vad man känner till i dag.

Övrigt

Nordiska mästerskapet i pimpel har nyligen avgjorts på Iso-Kisko sjön, Finland. Per-Olof Lindstrand, Sverige, vann herrseniorklassen med 4.800 gram före två finska pimpelfiskare. Damklassen vanns av Marja Säynevirta, Finland, med 4.750 gram före tvåan Siv Hård, Sverige, på 3,08 kg och bronset gick till Sylvia Kärrman, Sverige, med vikten 2,35 kg. Juniorklassens etta blev Tom Tuskin, Norge, med segervikten 4,54 kg för silvermedaljören Jonas Bergkvist, Sverige, på 4,21 kg. Bronset tog vår Roger Wiik efter 4,05 kg vikt. Både dam- och herrlaget från Sverige tog var sin silverplats före Norge eftersom Finland tog guldet.

Tog guld

Det svenska juniorlaget erövrade guld på 10,48 kg. Nationslagstävlingen vanns på 28,15 kg till Sverige, tvåa Finland på 27,53 kg medan Norge lyckades hiva upp 21.550 gram för sin tredjeplats.

Det svenska mästerskapet i pimpel, 1.779 deltagare föranmälda, har blivit framflyttad till november—december och då ska förhoppningsvis is finnas. Än finns det några få platser kvar till EFSA's vårtävling i havsfiske med Varberg som utgångshamn. Kontakta omgående Hans Elmroth, Skördevägen 5, 222 38 Lund, tel 046-12 55 25 bostad — som också meddelar att 1 april är sista anmälningsdatum för deltagande i havfiske-EM.

Namnförteckning - regnbågsöring

Salmo mykiss	Walbaum	1792
Salmo penshinensis	Pallas	1811
Salmo purpuratus	Pallas	1811
Salmo gairdnerii	Richardson	1836
Salmo iridea (irideus)	Gibbons	1855
Salmo rivularis	Ayres	1855
Salmo newberrii	Girard	1858
Salmo gibbsi	Suckley	1858
Salmo masoni	Suckley	1860
Salmo mendocino	Ayres	1876
Oncorhynchus kamloops	Jordan	1892
Salmo gairdneri shasta	Jordan	1892
Salmo irideus stonei	Jordan	1892
Salmo mykiss agua-bonita	Jordan	1892
Salmo gilberti	Jordan	1894
Salmo gairdneri beardslei	Jordan/Seale	1896
Salmo roosevelti	Evermann	1906
Salmo whitei	Evermann	1906
Salmo nelsoni	Evermann	1908
Salmo regalis	Snyder	1912
Salmo smaragdus	Snyder	1917
Salmo rosei	Jordan/McGregor	1924
Salmo kamloops whitehousei	Dymond	1931

● Synonymnamnlistan ovan är endast baserad på originalbeskrivningar av arter och underarter hos regnbågsöringen som från och med 1989 års publikationer går under det vetenskapliga huvudnamnet Oncorhynchus mykiss.

Källa: KENT ANDERSSON/Göteborg. Mars 1989.

Gaffeltruck blev vapen

MALMÖ: En 59-årig åkeriägare misshandlades med en gaffeltruck när skulle lämna varor till ett slakteri i Malmö.

Misshandeln ägde rum redan i januari, men inte förrän nu har åkeriägaren anmält händelsen eftersom han fått men av händelsen.

Åkeriägaren skulle lämna kött till ett slakteri i Fosie, och var medveten om att han inte fick gå in i slakteriet av hälsoskyddsskäl. Han ville ändå ställa sitt gods under tak eftersom det regnade, vilket en slakterianställd retade sig på.

Enligt åkeriägaren blev den anställde så irriterad att han med avsikt klämde honom mellan ena gaffeln och väggen. Det finns två vittnen till händelsen.

Värst skadad blev foten, som fick ett öppet sår, som nu har inflammerats.

Elevbrist på kurserna som ger jobb i industrin

Verkstadsjobb lockar inte — gott om platser hos AMU

□ Av GÖRAN JÖNSSON

MALMÖ: Verkstadsindustrin ropar efter folk, men AMU-skolan i Fosie i Malmö tvingas minska antalet utbildningsplatser i sina verkstadsmekaniska kurser på grund av elevbrist. Eftersom gymnasieskolans verkstadstekniska kurser befinner sig i samma situation kan man befara växande rekryteringsproblem för den svenska verkstadsindustrin.

Lennart Hansson, utbildningschef vid Fosie-skolan, beklagar det klena intresset för verkstadsyrkena:

— Dagens verkstadsindustri är bättre än sitt rykte, säger han. De som väl lärt ett verkstadsyrke får jobb direkt. Och de brukar trivas. Det är i varje fall min erfarenhet. Jag är själv gammal verkstadstekniker.

Av de 75 platserna inom området plåt och svets är för närvarande 23 vakanta. Och den verkstadstekniska utbildningen har 15 vakanta elevplatser.

Elevantalet i Fosie kan variera kraftigt från tid till annan.

Fler flickor

— Vi har tar in nya elever var fjortonde dag, säger Lennart Hansson. Männen dominerar i de verkstadstekniska kurserna, men andelen kvinnor ökar och ligger nu uppskattningsvis kring tio procent.

Ulf Persson, utbildare i verkstadsmekanik:

— Jag har goda erfarenheter av de kvinnliga kursdeltagarna. De brukar ofta bli duktigare än pojkarna.

Från nästa budgetår, som börjar 1 juli, minskas alltså platsantalet vid AMU-skolan i Fosie. Men i M-län som helhet är antalet utbildningsplatser stort sett oförändrat, enligt Lennart Hansson. AMU startar nämligen ny verkstadsmekanisk utbildning i Eslöv.

Nytt yrke

En tid med en oerhört snabb teknisk utveckling strävar AMU-skolan efter att ge en utbildning som är up to date. I det startar i Fosie en helt ny utbildning för ett nytt och kvalificerat yrke: elmekaniker. Utbildningen inriktas på underhåll, elmekanisk teknik och industrirobotar.

Kursen omfattar 51 veckor och ger teoretiska och praktiska kunskaper om datorer, robotar och styrsystem. Utbildningen i svarvning, fräsning, borrning och slipning i konventionella maskiner kompletteras med modern teknik i numeriskt styrda maskiner och robotar. Därtill kommer undervisning i elteknik, elektronik och datalära och slutligen en praktisk tillämpning i produktionsteknik med underhåll i flexibla tillverkningssystem (FMS).

— Elmekanikerna väntas bli mycket attraktiva hos industriföretagen, säger Lennart Hansson. De bör kunna spara både tid och pengar åt företagen genom att de kan utföra reparationer som den egna personalen inte klarar av i dag. Företagen behöver alltså inte i samma utsträckning som hittills anlita experter utifrån.

Robotisering

Tillverkningsprocessen ute i industrin blir mer och mer datastyrd och robotiserad. Därför får Fosie-eleverna förutom konventionell utbildning också lära sig arbeta med CNC-teknik, alltså numeriskt styrda maskiner och robotar.

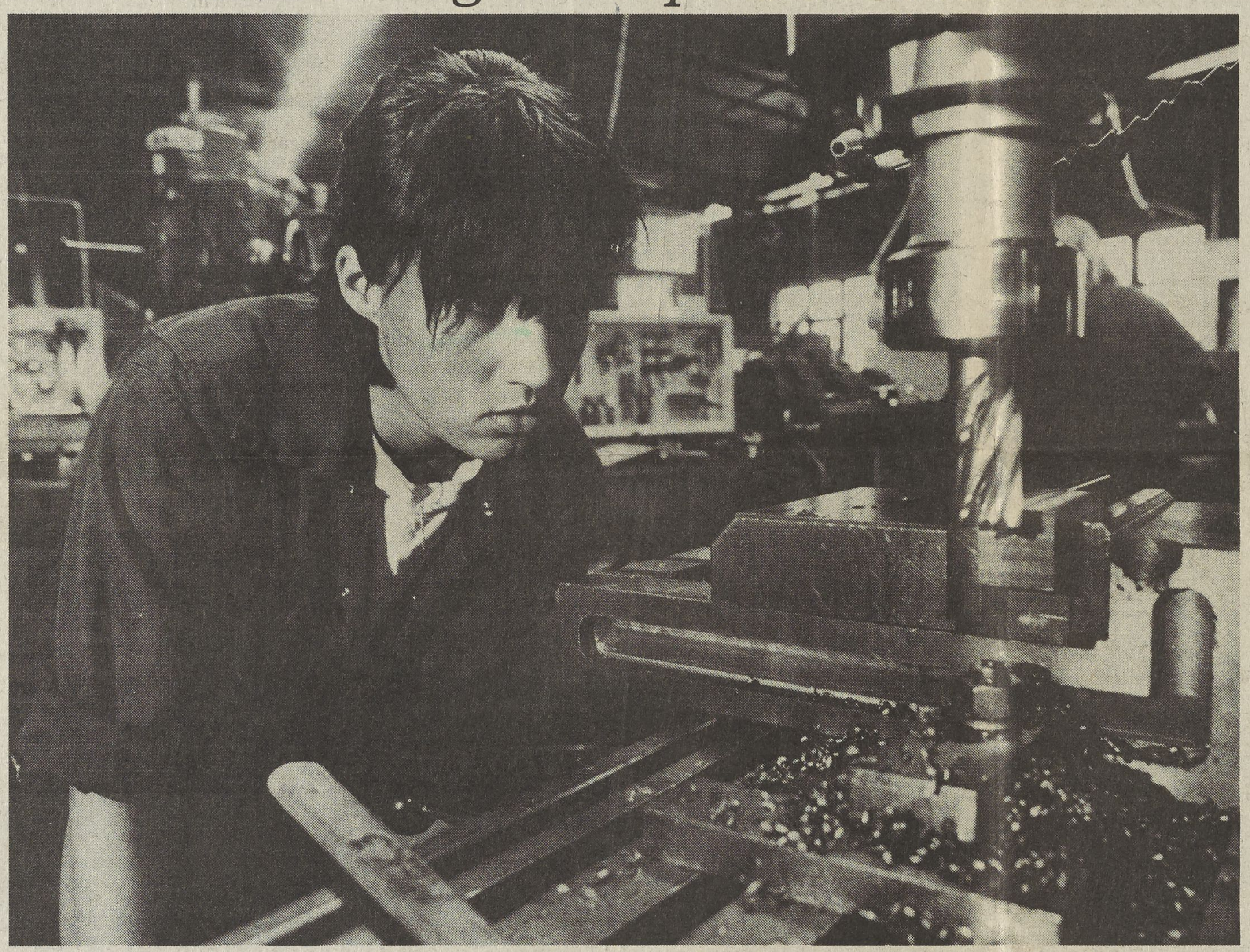
Efter den grundläggande utbildningen sker en specialinriktning. De blivande verkstygtillverkarna har den längsta utbildningstiden, 60 veckor.

— Här är en lektionstimme verkligen en timme, alltså 60 minuter och inte 40 minuter som i andra skolor, påpekar Lennart Hansson. Överhuvud taget har vi en stor "verklighetsinriktning".

CAD och CAM är ett par av de många engelska förkortningar som flitigt används bland människor som ägnar sig åt modern teknik. CAD betyder datorstyrd konstruktion, CAM datorstyrd produktion. Hur det går till i praktiken hör till de nymodigheter som AMU-skolan i Fosie lär ut.

En av de allra senaste nyheterna har beteckningen FMS (Flexible Machine System), alltså en flexibel maskinstyrning.

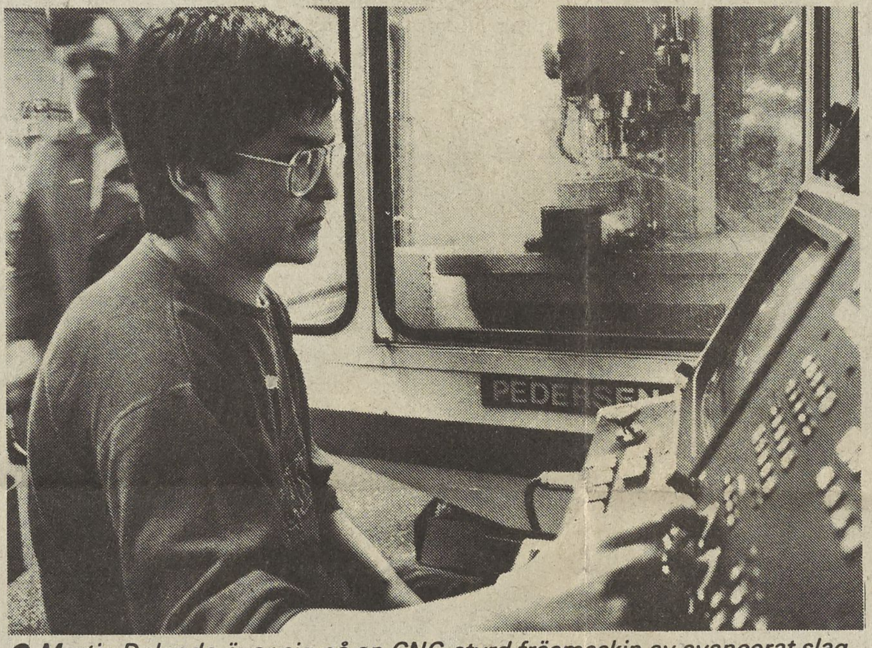
— Fullt utbyggd används FMS bara vid två företag i landet, men den hör framtiden till och vi ska in i den tekniken, säger Lennart Hansson. Därför krävs en investering på tio miljoner kronor.



● Elisabeth Nertzberg hanterar en fräsmaskin av traditionellt slag. Det måste alla elever i verkstadsteknik lära sig.

● Marie-Louise Nilsson lär sig programmera en CNC-maskin, alltså en numeriskt styrd svarv. — Det har jag längtat efter att få lära mig, säger hon.

● Åke Bergström från Samhall Pile får undervisning i CAD-tekniken (datorstyrd konstruktion) av utbildaren Erna Konnéus vid AMU-skolan i Fosie. Många företag köper hos AMU sådan utbildning av varierande omfattning.



● Martin Delgado övar sig på en CNC-styrd fräsmaskin av avancerat slag.

Knarkares familjer utan stöd

□ Av MARIA SEHLIN

MALMÖ: — Kommunerna tar inte sitt ansvar för narkotikamissbrukares familjer, det förlorar de själv på, kritiserar föräldraföreningen mot narkotika (FMN).

FMN i Malmöhus län har nu hamnat i en så dålig ekonomisk sits att de inte kan hjälpa fler familjer inom det närmaste halvåret.

— Det finns ingen allmän vård för anhöriga till narkotikamissbrukare, vi är de enda, säger Carina Gavlin på FMN.

Hon är kritisk till att kommunerna inte har förståelse för att föreningen behöver pengar för att bedriva sin vård. Ändå, menar hon, har inställning till dem blivit allt mer positiv. Socialsekreterare anlitar och rekommenderar dem, medan det inte anslås några pengar till dem.

— Vi blir behandlade som vilken idrottsförening som helst. Vi fungerar inte så, vi har stora utgifter. En enda familj kostar 20.000 kronor om året att behandla, berättar Carina Gavelin.

— Vi tycker inte att vi kan kräva familjerna på pengar. Deras psyke och ekonomi har urholkats under missbrukaråren, säger hon.

Just nu har de 65 familjer under behandling.

Nödvändigt

— Malmö kommun ger en klumpsumma, vissa kommuner ger ingenting alls. Vi vill att varje kommun, som har familjer här, betalar deras kostnader, säger hon.

Carina Gavelin menar att vård av familjen skulle löna sig för kommunerna.

— Missbrukarperioden skulle kortas avsevärt.

Det är mycket som en familj behöver hjälp med när de haft en missbrukande familjmedlem.

— Det kan ta flera år att komma tillrätta med deras problem.

— Man måste bygga upp relationer med släktingar och vänner som kanske brytits under en besvärlig tid. Ett yngre syskon har kanske hamnat i skymundan. Det är skönt att träffa andra familjer i samma situation och så vidare, säger Carina Gavelin.

— Det handlar inte bara om att bli av med drogen, det handlar också om att bli av med allt dåligt runt omkring, så att man kan bli en vanlig familj igen.

Allt fler söker sig till FMN för hjälp, men nu tvingas FMN säga nej eftersom det inte finns några pengar.

Fem års fängelse för narkotikabrott

Nordvästskånsk amfetaminliga dömd

KLIPPAN: Fängelse i fem år och sex månader. Det blev domen för en av ledarna i den nordvästskånska amfetaminligan. För en annan av de inblandade, som till vardags var ungdomsledare, blev straffet fem års fängelse för grovt narkotikabrott och häleri.

Polisen knäckte ligan, som bestod av sex män i åldern 29—43 år, efter en tids minutiös spaning i november i fjol. Under utredningen rullades en omfattande knark- och stöldhärva upp.

Ligan smugglade in amfetamin från Polen till sydsverige. Knarkaffärerna finansierades med mängder av inbrottsstölder. En av de dömda, 30 år, hade begått ett 30-tal inbrott, mest i skolor, under januari — november -88. Ibland var han ensam om inbrotten, andra gånger hade han hjälp av någon annan i ligan.

För stölderna av TV-apparater, videoutrustningar, symaskiner m m väntar nu ett digert skadestånd till företag och skånska kommuner vars skolor drabbats. Drygt en halv miljon ska 30-åringen sammanlagt betala i skadestånd till bl a Osby, Ängelholms, Hässleholms och Kristianstads kommuner.

Ett par av de andra dömda ska för en del av stölderna solidariskt dela skadeståndsersättningarna med kumpanen. Dessutom väntar utmätning och ersättning på tiotusentals kronor som förverkat värde och vinning av såld knark.

Klippans tingsrätt dömde 30-åringen till fängelse i 5,6 år för grovt narkotikabrott, grov stöld och stämpling till narkotikabrott.

En 29-åring dömdes till fängelse i fem år för häleri och grovt narkotikabrott. Fängelse i tre år och sex månader blev straffet för en annan av ligamedlemmarna, också det för grovt narkotikabrott. Två andra män i ligan fick vardera 10 månaders fängelse och ytterligare en annan fick fyra månaders fängelse.

Laglydiga lastbilar vid Trelleborgskoll

Farligt gods granskat av tullen

TRELLEBORG (TT): Under torsdagen genomfördes en specialkontrollerade lastbilar med farligt gods vid färjeterminalerna i Trelleborg. Ytterst få av det 15-tal lastbilar som hade kontrollerats vid 16-tiden fick anmärkningar.

— I samtliga fall stämde fraktsedlarna med innehållet i lastbilarna. De som fick anmärkningar saknade viss teknisk utrustning t ex brandsläckare, säger tullmästare Bengt Dahlvig till TT.

Sedan 1 juli förra året är Malmöhus och Värmlands län försöksområden när det gäller kontroll av farligt gods. Polis, tull, SJ och sprängämnesinspektionen arbetar tillsammans under ledning av en samordningsgrupp vid respektive länsstyrelser för att kontrollera farligt gods.

— Arbetet har blivit mycket effektivare. Nu kan vi både kontrollera vid införsel till Sverige och stoppa lastbilar ute på vägarna, säger Bengt Dahlvig.

Greenpeacekritik

På torsdagsmorgonen avsluta de miljöorganisationen Greenpeace sin riksomfattande kontroll av farligt gods. Efter ett dygns arbete konstaterar miljöorganisationen: många transporter av miljöfarliga ämnen är felmärkta eller saknar helt märkning.

— Vi befarar att en stor del av de här gifterna till sist hamnar ute i naturen. På sikt kommer de att ställa till nya miljökatastrofer, säger Joakim Bergman vid Greenpeace.

Hans kollega, kemisten Per Rosander, menar att kontrollen av kemikalier nästan är obefintlig och antalet ämnen liksom mängderna av dem ökar i rask takt.

Åtalas för smuggling av automatgevär och pistol

HELSINGBORG: Den 24-årige italienare som greps i tullen för ett par veckor sedan, misstänkt för att ha smugglat in ett automatgevär, en pistol samt ammunition, åtalas nu för varusmuggling och falsk urkund.

Hans kumpan, en fransman, lyckades ta sig igenom tullens garn men greps senare i Oslo.

24-åringen var på permission från ett fängelse i Danmark, där han avtjänar ett flerårigt fängelsestraff för ett bankrån, när han greps på tåget från Köpenhamn av tullarna i Helsingborg.

Tulltjänstemännen hittade ett AG-3 atuomatgevär samt 240 patroner under en passagerskorg på toaletten i en av tågvagnarna.

I nästa vagnstoalett hittade de en Neuhausen pistol 9 mm med 108 patroner.

När 24-åringens portfölj kontrollerades hittades rengöringsborstar till vapen och han greps.

Han har erkänt att han försökt smuggla vapnen och häktats.

Enligt 24-åringens berättelse träffade han fransmannen på stationen i Köpenhamn. Han erbjöd honom en resa till Oslo om han hjälpte till att smuggla vapnen.

24-åringen använde sig av ett falskt tanzaniskt pass med hans foto i.

I samband med att italienaren och fransmannen greps, spekulerades det i att de båda var på väg till Oslo för att göra ett attentat mot ANC-mötet där. Något som inte har gått att belägga.

En annan, troligare teori, var att vapnen skulle användas till ett rån.

Automatgeväret har stulits ur ett militärförråd på Bornholm och pistolen från en privatperson i Roskilde.

Halv miljard för kollektivtrafik som skonar miljön

LUND (TT): Det skulle kosta en halv miljard kronor för en utbyggnad av kollektivtrafiken i Malmöhus län om länsstyrelsens miljövårdsprogram skall kunna uppfyllas.

Det anser länstrafikbolaget som nu yttrat sig över programmet. Enligt detta skall biltrafiken minska till 1980 års nivå vilket innebär 20 procents mindre avgaser än för närvarande.

Enligt länstrafikbolaget kräver detta att det införs restriktioner mot biltrafik och en ordentlig satsning på kollektivtrafiken.

Kostnaden faller på kommunerna och landstinget som måste betala ytterligare mellan 400 och 500 miljoner om året till kollektivtrafiken.

Oklart om fallskärmsolycka ovanför Eslöv

STOCKHOLM (TT): Det har inte gått att fastställa varför en fallskärm vådautlöstes ombord på ett Cessnaplan ovanför Eslövs flygplats i höstas. Det förklarar statens haverikommission i sin undersökning, som nu är klar.

Hopparen, en 19-åring som gjorde sitt första fallskärmshopp, drogs ur flygplanet och fastnade med ena benet i dörrposten. Han ådrog sig en bäckensprängning.

Olyckan inträffade den 3 september. Ombord på planet, som startat från Eslövs flygfält, fanns förutom föraren en hoppmästare och fyra fallskärmshoppare. Det var under hoppmästarens försök att hjälpa 19-åringen att hoppa, som fallskärmen vådautlöstes.

Haverikommissionens undersökningar visar att 19-åringen varit rädd eller tveksam när han skulle ut på flygplanets hjul och göra sitt allra första fallskärmshopp på 2 500 meters höjd. Hoppmästaren misslyckades med att få honom att stå rätt och hålla händerna i sär. I stället kröp 19-åringen ihop och höll sig krampaktigt fast i planets vingstötta. Men innan hoppmästaren hann fram till honom för att föra upp honom till en riktig hoppställning, vådautlöstes fallskärmen. 19-åringen drogs då ur planet.

Haverikommissionen lanserar tre alternativa möjligheter. Den ena är att handtaget på fallskärmen hakat i eller pressats mot något föremål i dörröppningen.

En snabb tryckförändring genom att planet gjort en sväng kan också ha utlöst skärmen.

Som tredje möjliga alternativ anför haverikommissionen något slags tekniskt fel.

Haverikommissionen anser dock att 19-åringens hopp borde ha avbrytits, eftersom han visat sådan påtaglig tveksamhet inför det.

Sydsvenskan får ny redaktionschef

MALMÖ: Sydsvenska Dagbladet får en ny redaktionschef i september. Han heter Per Gunnar Holmgren, är 33 år, och kommer närmast från Östgöta Correspondenten i Linköping där han varit redaktionschef cirka ett år.

Han startade sin journalistiska karriär som redaktör för studenttidningen Lundagård i Lund 1982. Han har sedan varit på Expressens ledarredaktion samt varit redaktionssekreterare på Sydsvenska Dagbladet och allmänreporter på Östgöta Correspondenten.

SDS-koncernens styrelse har sagt ja till utnämningen av Per Gunnar Holmgren som ny redaktionschef. Även SDS journalistklubb står bakom utnämningen.

David Ingvar till Paris för hjärnkongress

En delegation av svenska forskare, med bland andra Lundaprofessorn David Ingvar, är på väg till Paris för att delta i en kongress om dyslexi — ett men i hjärnan som yttrar sig i läs- och skrivsvårigheter, men ofta också i stor kreativ begåvning. Dyslexi kallas i dagligt tal ordblindhet.

Dyslexi har klar övervikt hos pojkar. Kända dyslektiker är genier som Edison, Einstein och Churchill.

Barn med dyslexi blev förr ofta grymt behandlade i skolan.

KENT ANDERSSON
Norumshöjd 11, NB
417 45 GÖTEBORG
Sweden
Tel. (031) 55 36 99

MEDDELANDE MEMO MITTEILUNG

☐ Enligt önskemål / As requested / Auf Ihren Wunsch	☒ Handlingarna kan behållas / May be kept by you / Kann behalten werden	Utskrivningsdatum/Date/Datum: April 6, 1989
☐ Enligt överenskommelse / As agreed upon / Wie vereinbart	☐ Handlingarna önskas i retur / Please return / Bitte zurücksenden	Er referens/Your reference/Ihr Zeichen: Mr. Robert J.Behnke
☐ För kännedom / For your information / Zu Ihren Information	☒ V. g. kontakta avsändaren / Please contact sender / Bitte sich mit mir in Verbindung setzen	Till/To/An: Department of Fishery & Wildlife Biology, Colorado State University, Fort Collins, Colorado 80523, U.S.A.
☐ För yttrande / For your comments / Zu Ihrem Gutachten	☐ Handlingarna vidaresändes till: / Please pass on to: / Bitte weitersenden an:	
☐ För handläggning / For your action / Zur Erledigung		
☐ För granskning/godkännande / For Your perusal/approval / Zur Prüfung/Gutheissung		

Dear Mr. Behnke,

Many , many thanks for your two letters of March 14, 1989 and all information. You made me very happy and the readers are grateful too.
After my story, December 30, 1988, on name change from Salmo gairdnerii to Oncorhynchus mykiss I have got:
1)only positive response from anglers, a few fish-farms, two Swedish University.
2) " one negative responce - from a fish-editor who is very confused.
3) no response from any Swedish people in authority but a few have contact me and are wondering how I have got the information before them.They have not get the new names yet - from Drottningholm people.They do not know how to "face" the name change or the problem. Yet. Same people in authority are also confused and still are trying to check my story from December 30. I wondering how long time they need.

First of all I would point out that I always protect my information people so noboby can make personal attacks via my articles or create problems for any part. This means that I give informations - as correct as possible - without dupe readers. I also give people and readers chance to take decision themself and I respect you as you are like many others.
I am reporting news and informations of fishing and sometimes boating.Many readers and aglers are interested in historical,taxanomic and name information on fishes and I am trying to educate them so they more understand all problems you and your fellows have.
Sweden do not use the name "salmon-trout" any more.A salmon is a salmon and a trout is a trout.The word "salmon-trout" disappeared 10-20 years ago. A Salmo salar is a salmon and a Salmo trutta is a trout in Sweden.But some people say that the rainbow trout is a salmon and other it is a trout.What is your experience?

Many thanks for your copy of paper you wrote for Japanese charr symposium.It explain much, but I need - if possible - a nomenclature for Salvelinus(Salmo).Can you make one? So the Swedish readers can understand better?
I have read many Swedish and English new and old literature of fishes and I think Drottningholm people give a little confused information here in Sweden.

Looking forward to hear from you soon.

Sincerely
Kent A
Kent Andersson

PS. I will try to tell Drottningholm people to go to Wild Trout Symposium IV.

send Info on
— brook Trout
— lake trout
— Dolly Varden

Trulla

Tabell 12. Taxonomi, ekologiska särdrag, utbredning och esteras-2-frekvenser för tre syskonarter inom det arktiska rödingartkomplexet enligt Nyman, Hammar och Gydemo 1981.
Taxonomy, ecological characteristics, distribution and esterase-2-allele frequencies of three sibling species within the Arctic char species complex acording to Nyman, Hammar and Gydemo 1981.

?

N)	F)	S)
Storröding S. salvelinus (L.)	Större Fjällröding S. alpinus (L.)	Mindre Fjällröding S. stagnalis (Fabr.)
I låglandet och i sydsvenska sjöar	Högt belägna fjällsjöar	Västliga fjällsjöar inom vissa regioner
Sen invandring, ev. från syd och öst	Tidig invandring, ev. från öst	Rel. tidig invandr., ev. från sydväst
Plastiskt biotopval	Bentisk	Pelagisk
Plastiskt näringsval ofta fiskpredator	Bottendjur och fisk. Kannibal	Plankton
Maxvikt 10-12 kg	Maxvikt 6-7 kg	Maxvikt 1 kg
Leker grunt i stillastående vatten	Leker grunt, gärna i strömmande vatten	Leker grunt eller djupt i stillastående vatten
Konkurrenskraftigast	Konkurrenssvagast	Intermediär konkurrensstyrka
Genfrekvenser för den anodala allelen av Esteras-2:		
0.40 - 0.70	0.90 - 1.00	0.00 - 0.10

Av tabellen framgår att de båda rödingpopulationerna i Stora Rensjön både genetiskt och ekologiskt stämmer väl överens med karaktärerna för de bägge bentiska arterna Större Fjällröding och Storröding. Det är dessutom dessa båda arter som noterats i Anjan och Äsingen nedströms Stora Rensjön (Hammar et al 1983). De förekommer vidare som ensamma arter i många mindre sjöar söder om Stora Rensjön (Hammar 1984a). Mycket talar för att den konkurrenskraftiga rödingen med hög genfrekvens i Stora Rensjön dock tillhör den normalt mycket konkurrenskänsliga Större Fjällrödingen. En storvuxen röding med ett bentiskt närings- och habitatval överraskade redan 1947 med att fångas i rinnande vatten i de spärrar man byggt med avsikt att fånga öring i (Runnström 1957). Den större fjällrödingen påträffas strömlekande i många högfjällsvatten (Hammar 1984a),

Information from Drottningholm people no 13 December 1988

Sender: Kent Andersson
Norumshöjd 11 bv
417 45 Goteborg
Sweden

FLYGPOST · PAR AVION