THE RIVER LAKSH

OF THE TANA WATER SYSTEM

IN NORTHERNMOST NORWAY

AS SALMON RIVER

A WORKING REPORT

BY

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IN ABO OF FINLAND ON THE 1ST APRIL 1995

FOR

FYLKESMANNEN I FINNMARK, NORWAY

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I dedicate this minory working report to the Fishing Consultant **Kjell Moen** of "The Provincial Board of Finnmark County / Dep of Environmental Protection" (the principal was, however, in Finland). I hope that my literary English with many figures now is some more intelligible than my mysterious Finnish - I have had and have further comfortable cooperating with him for years. It began when his canoe slided out in 1985 in River Goržžejohka, near northern boundary of *Øvre Anarjåkka nasjonal park*, remote North-Norway. I sat then on a bank and cooked coffee

SUMMARY

Mattsson, Jorma 1995: **The River Laksh of the Tana water system in northernmost Norway**. A working report, River Tenojoki Fisheries Research Station (Finnish Game and Fisheries Research Institute) & ´Dep. of Environmental Protection (´The Provincial Board of Finnmark County, Norway´)´. Åbo 1995, 32 p.

River Laksh (Lákshjohka) is a tributary of Tana, the most noticeable salmon river in western Europe, in northern Norway. R. Laksh drainage itself consists of three the bigger tributaries: R. Garbbe, R. Gurtte and R. Deavkehan. Whole drainage area is 356 km^2 and the longest length is 64.5 km. There is 50.0 km as total salmon reaches from total lengths of 109.9 km of the main rivers. There are near 1500 lakes and ponds (over 5000 m^2 minimum area) in R. Laksh drainage. The biggest lake Gurttejávri is 85 ha (hectare: 100 x 100 m) and very shallow one.

Whole fell area is nowadays unpopulated vast and bare highlands. Ancient originated glacifluvial terraces, eskers, sandurs and other paleo landforms visually dominate this large area.

The River Laksh is a fairy good salmon (*Salmo salar*) river. Downstream located big waterfall is passed by fishladders in 1972-73. Other fish species are grayling (*Thymallus thymallus*), charr (*Salvelinus alpinus*) and brown trout (*Salmo trutta*). Burbot (*Lota lota*) is possible candidate of ichthyofauna, perhaps also pike (*Esox lucius*). Whitefish (*Coregonus* sp.) is absent.

Monitored salmon reaches resulted eight spawning sites 600-950 m^2 total, in upper sectors of the tributaries probably much more. There are rapids and riffles 65.3 ha total and pools 360.7 ha, only in the salmon reaches of I-III class (I versatile salmon river with spawning sites, II spawning possible, III solitary salmons as wanderers).

It were ten electro fishing sites in the lowerest river course: ten km from the rivermouth. Mean salmon parr density was in 71.2 parrs / 100 m^2 in August 1994. Four sites consisted of 0+ fries. The latest spawning sites were near them.

The River Laksh is ordinary fishing river of local Sámi people in River Tana valley. Others cannot fish there.

Key words: salmon, River Tana, fishladders, spawning site, hiding pool, nursery area, natal river.

CONTENTS

PREFACE

This piloting work has done under control of the *River Tenojoki Fisheries Research Station* (by Finnish Game and Fisheries Research Institute) stationed in Utsjok, northernmost Finland. The monitorer hiked up in River Laksh valley in August 1994. Some days after three electro fishers came after and fished pointed sites.

Fishing permission was been admitted by *Fylkesmannen i Finnmark, Miljövernavdelingen*, and signed by **Kjell Moen** i Vadsö. River Laksh water system is granted into high category of salmon tributaries in River Tana drainage. It tooks the lead in their river preference list of Tana drainage.

There were little information about fish biotope situation in far Laksefjordvidda, now ~~less~~ MORE. The piloting work belongs to new scoping idea of northernmost lotic salmon waters. The needs of re-evaluation the habitat conditions are ever increasing relevant demand. The UNCED conference in 1992 in Rio de Janeiro labelling more and more a biodiversity of the living world, also in water systems. River Tana with many salmon populations and other salmonids maintains unique ichthyofauna in modern European conditions.

River Laksh (Lákshjohka) with tributaries of its´ own also are good salmon rivers. It is likely to have own specialized salmon population(s). Water system itself has lot of many-sided water biotopes. This Tana´s tributarial river drainage is worth of monitoring also in future.

RIVER LAKSH AND A LOCAL LANDSCAPE ECOLOGY

WATER SYSTEM

River Laksh (*Lákshjohka*) is situated near Finnish border in Norwegian Finnmark. It is belonged to the drainage network of the greatest salmon river in western world: River Tana (in Sámish *Deatnu*, Norw. *Tana*, Finn. *Teno*). River Tana is bordering stream between Norway and Finland. 59 km from rivermouth to upstream is, however, amongs Norwegian properties only.

The watersheds of River Laksh are far north in bare and windy *Laksefjordvidda*: willowed fjell plateau between R. Tana and the ends of the fjords. Nobody resides in this vast area nowadays. It is a real fjell wilderness.

The drainage area of River Laksh is 356 km^2. The longest trip from rivermouth to the tributary takes 64.5 km. Salmon swims about 50 km of that. The greatest tributary rivers of the River Laksh are (with the main course, too):

river:	*as salmon river:*	*total length:*	*drainage area:*
Lákshjohka	13.5 km	13.5 km*	65 km^2
Garbbejohka	5.1	15.6	36
Gurttejohka	17.6	51.0 *	136
Deavkehanjohka	13.8	29.8	119
total	*50.0 km*	*(109.9 km)*	*356 km^2*

Table 1

** the greatest total length of w.s. is 64.5 km*

The all rivers Garbbe, Gurtte and Deavkehan meet at the junction of the upper end of River Laksh. It is the upper beginning site of Lákshjohka. The River Tana itself is 16 136 km^2. 69 % of it (11 103 km^2) is situated in Norwegian side and rest 31 % (5033 km^2) in Finland.

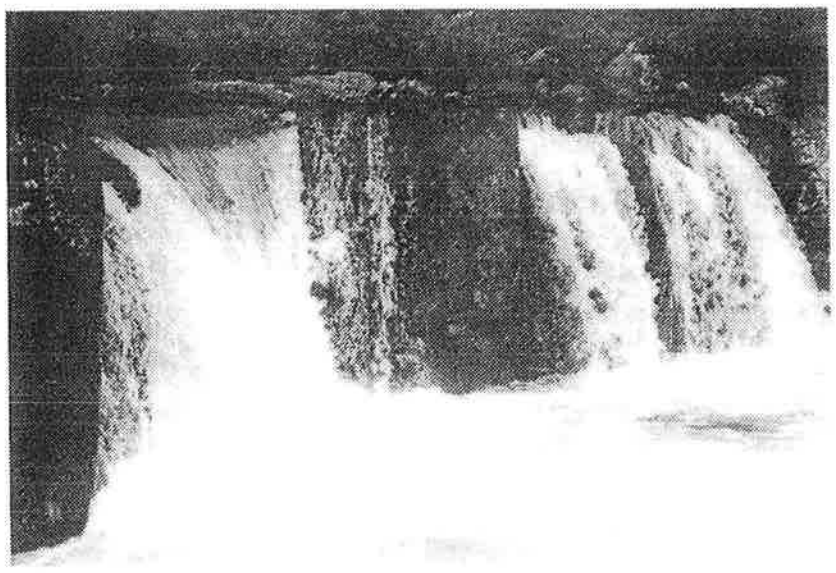


Fig. 1

The Falls (*Lakshjokgordshi*) is 5.1 meter-high vertical waterfall. It is a serious immigration obstruction to Salmonids.

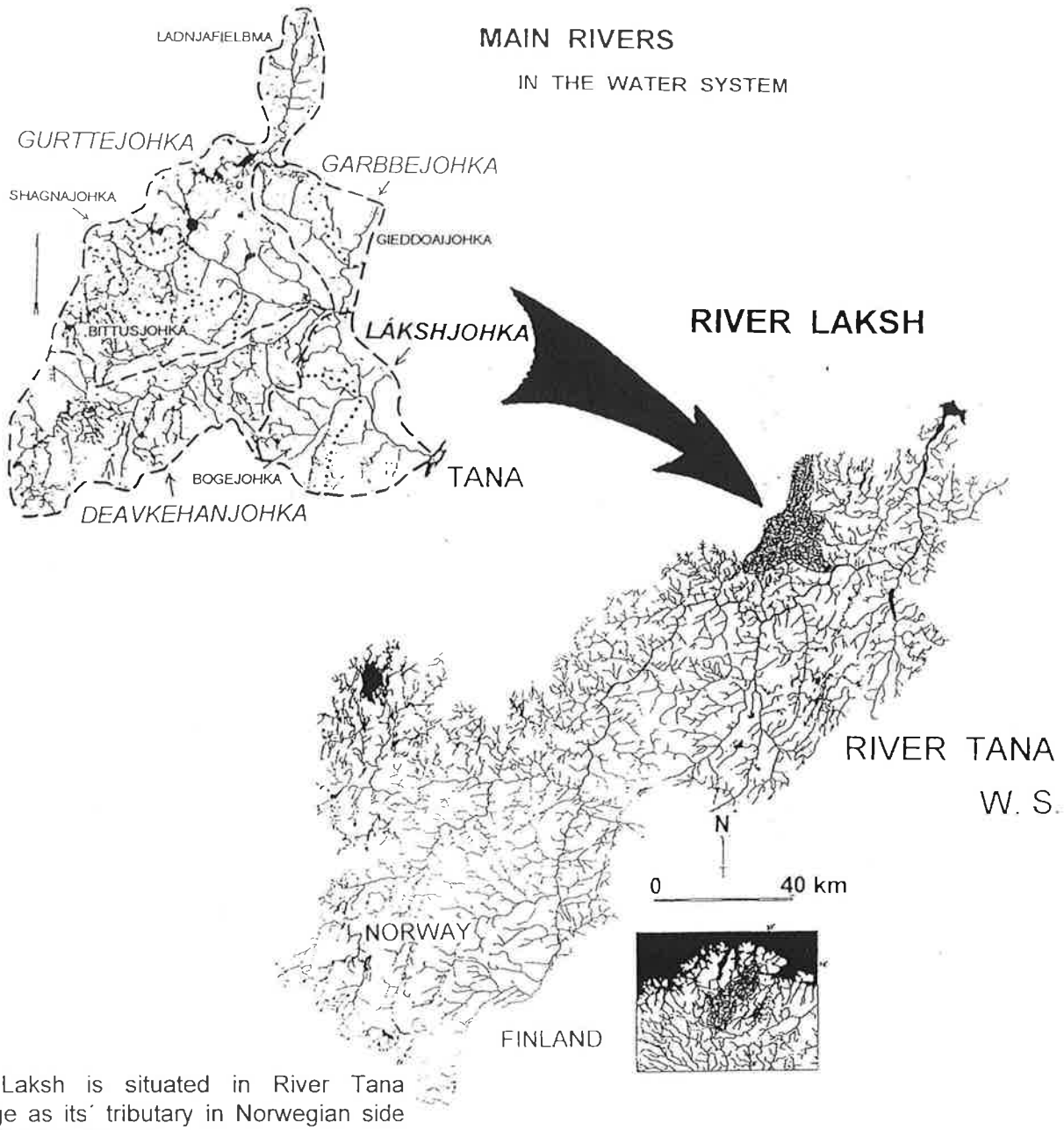


Fig. 2

River Laksh is situated in River Tana drainage as its´ tributary in Norwegian side of the frontier river Tana.

The gradients of the rivers are heterogenous. **R. Laksh** falls 11.5 m/km (from 195 m to 40 m between 13,5 km). Whole R. Laksh is, of course, as salmon river. The fishes swim to the tributaries of this main river. **R. Garbbe** has only 2.2 m/km in its´ salmon course 5.1 km from the level of 205 m to 194 m and whole tributary 6.2 m/km (290 >>> 194 m). **R. Gurtte** has between salmon course of the 17.6 km 5.1 m/km (285 >>> 195 m) and whole river only 2.2 m/km. There are large lakes and riverlakes (Saam. *luobbal*). **R. Deavkehan** salmon course is 7.7 m/km (301 >>> 195 m) and whole tributary 6.9 m/km (400 >>> 195 m).

Whole the drainage area of the River Laksh consists of about 1500 lakes over minimum size 5000 m^2 (five Norwegian *dekar*). Relevant size indicators here are m^2, *hectare* (*ha*, 100 x 100 m) and km^2. Lákshjohka only has (as a pilot investigation) 63 lakes, Garbbejohka 267 lakes, Deavkehanjohka 434 lakes and Gurttejohka 732 lakes and so total 1496 lakes: just 1500.

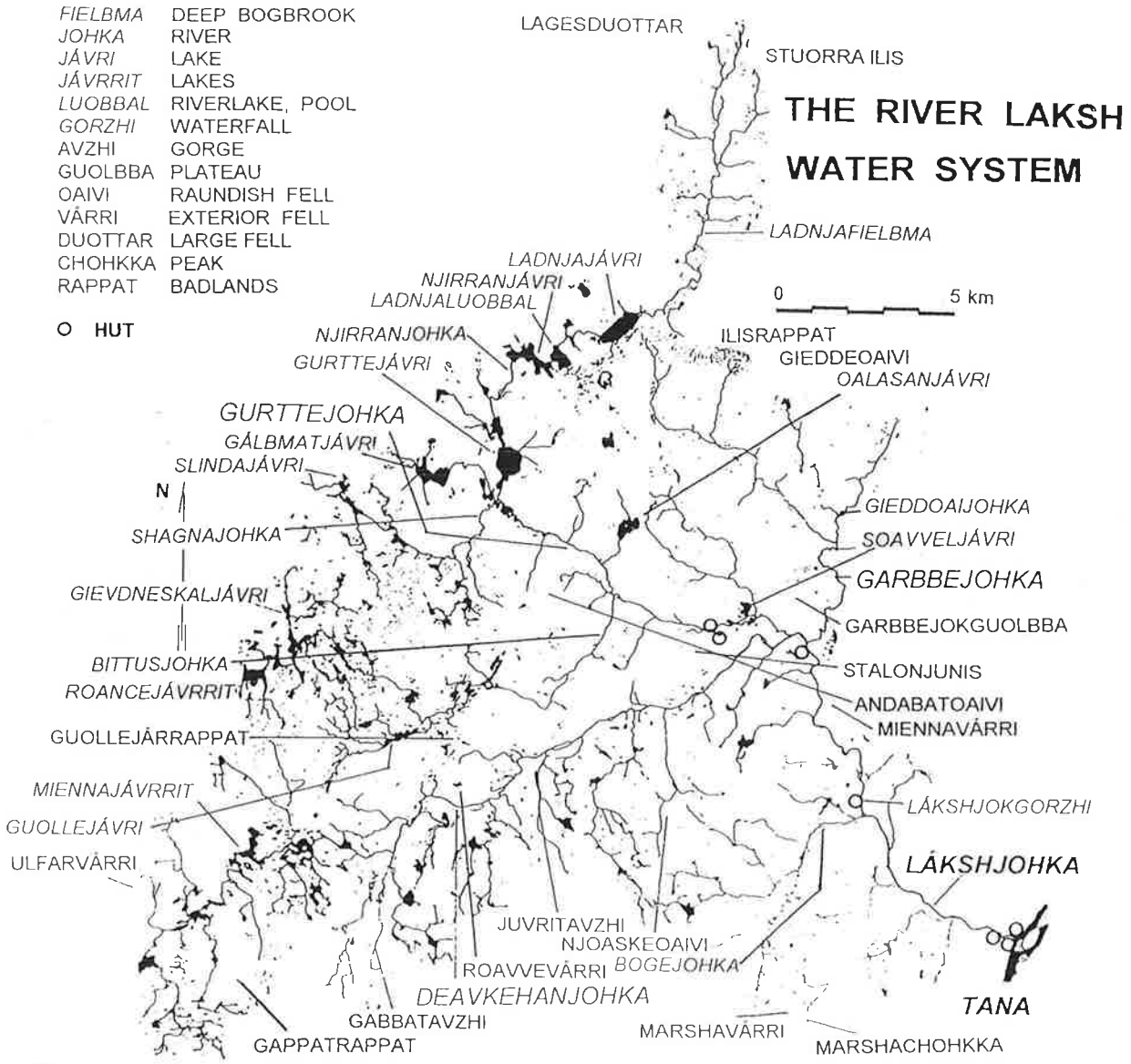


Fig. 3

The water system of the River Laksh consists of 1500 lakes and ponds, vide fell plateaus and the kings of waters: salmon at the main rivers and charr in the main lakes.

The seventeen largest lakes are (Sám. *jávri*, plur. *jávrrit* is in Engl. lake/lakes, Sám. *luobbal*, Engl. riverlake, big pool):

1. Gurttejávri	82 ha	7. Gievdneskalj. 351 m	40 ha	13. Slindarjávri	21 ha
2. Miennajávri 306 m	55	8. Roancejávri 362 m	29	14. Guollejávri	20
3. Ladnjajávri	52	9. Ladnjaluobbal	25	15. Gurtteluobbal	19
4. Miennajávri 307 m	51	10. Bittusjávri	25	16. Roancejávri 356 m	17
5. Njirranjávri	46	11. Oalasanjávri	24	17. Gievdneskalj. 344 m	15
6. Galbmajávri	43	12. Soavviljávrrit	21	total	585 ha

Table 2

GEOMORPHOLOGY

Northern cold Barents Sea is very near. Periglacial processes has be seen everywhere. Long winter dominates and freeze-thaw fenomens are very frequent ones. In *palsa* bogs there is permafrost as ice lenses lasting over summertimes. Also structured ground in polygons is seen many places. On slopes there is irregularly distributed solifluction lobes, stone stripes and terracettes (Rohdenburg 1989).

Fig. 4
The paleoterraces of and river sediments of continental ice is seen very well fron this aerial photos.

Glacifluvial landforms determined the qualities of the lakes and rivers´ leading even today. The marks of continental ice like been reading the book about deglacial times. Landscapes consists of long eskers, great glacifluvial mound and ridge areas, many-sided moraines, large alluvial fans, paleochannels, drumlins, flutings *etc.* (Sollid *et al.*1973). Some very large and far away visible erratics are located in fell tops. They are all named (*staalu*) and as ancient sacred sites well-known for local Sáme people even today. Very famous *staalu* is in the top of *Staalonjunis* (*njunis*: far reached fell projection: spur) near the junction of the rivers Gurtte and Deavkehan.

Ancient glacifluvial and alluvial sands, gravels and pebbles favour salmonid fishes. Such kind of material treats mosaic rhitral biotope compositions: spawning sites, juvenile pebbles and cobbles and fine material even for water macrophytes. All depends on water velocities which vary according to floods.

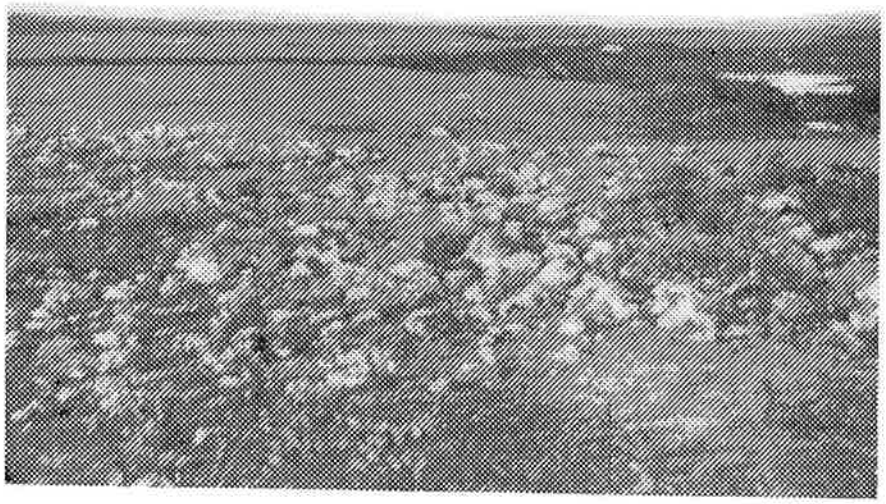


Fig. 5 Tableflat glacifluvial sandur and terrace plateaus are visible between the lower reaches of the rivers Gurtte and Deavkehan. No trees and bushes are in those water penetrating into dry moorlands.

Fig. 6 Old sand dunes with their dried ponds and lakes is seen in vide dune zone round the Falls.

Very visible and large (7 km^2) glacifluvial terraces and paleodelta both sandur-like landforms are located in upper end of River Laksh. Eastern part of it is named as *Garbbejokguolbba* (*guolbba*: moor). Sand dunes of 3 km^2 are around the scenic waterfall *Lákshejokgordshi*. In watershed areas of all tributaries there are large morainic badlands (*rappat*). Narrow canyons of *Gabbatavzhi* and *Juvritavzhi* are 9000 - 10 000-year-old paleochannels of smelting waters of withdrawing continental ice mass.

SEASONAL CHANGES

Local winters are cold and long lasting. So the summers are short and cool. Mostly clouds overlays landscapes. Often it also rains. Some day of july can be even hot but after midnights a summerfrost comes again in breezeless nights. Then frost converted into so called *the lakes of cold air* in fell valleys. In the bottom of valley can be even ten (Celsius)degrees lower temperature than only some fifty metres upper in the slopes.

Strong **springflood** time is in June. Torrential rains cause in some hours swift **rainfloods**. There also is a **hot weather´s flood**. Then the snow patches of 1000-meter-high fells (in Sámish *gaisá*) melt and the downstream rivers flood (see Mattsson 1989).

Every autumn fishes suffer shock when waters in rapids cool even into *minus* 1 Celsiusdegree but not freeze. Bluish **bottom ice** grows then upstream and icy water floats down the rivers. Even hardened charrs (*Salvelinus alpinus*) must wander to refuge of the nearest riverlake or lake. -- There are many lakes in upper courses of River Laksh water system and many more riverlakes at main rivers.

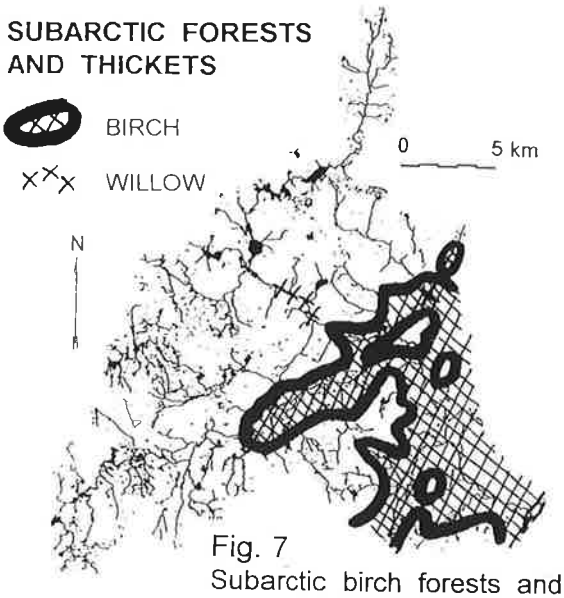


Fig. 7
Subarctic birch forests and riparian willow gallery forests are only wood types in those bare northern areas.

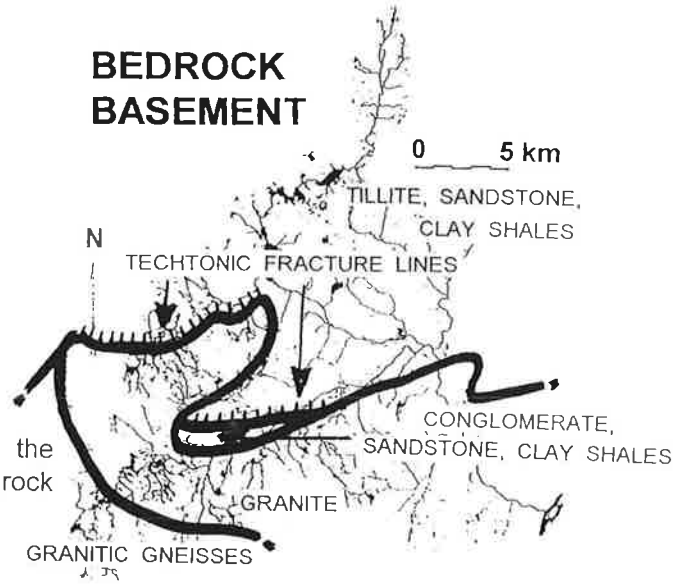
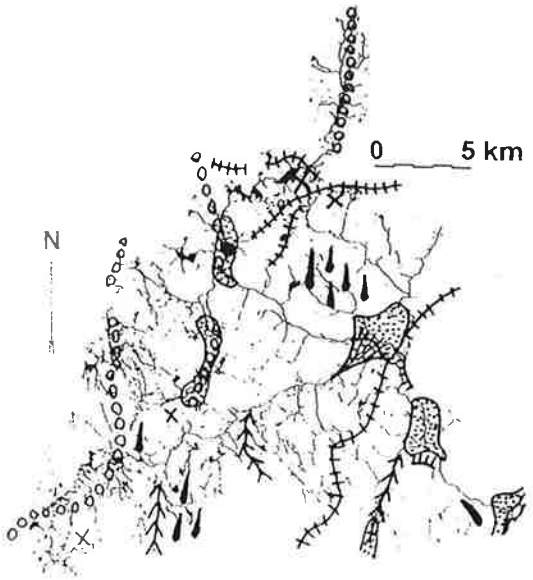


Fig. 8
River Deavkehan is situated alongside the fracture zone of different kind of bedrock material



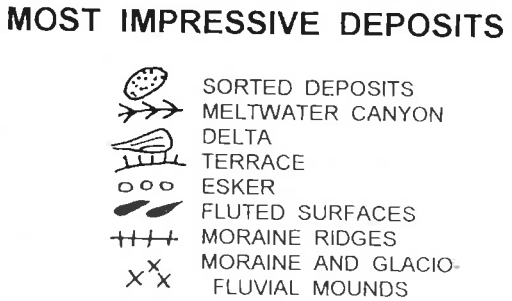


Fig. 9
Mighty continental ice lefts much marks of its´ working everywhere

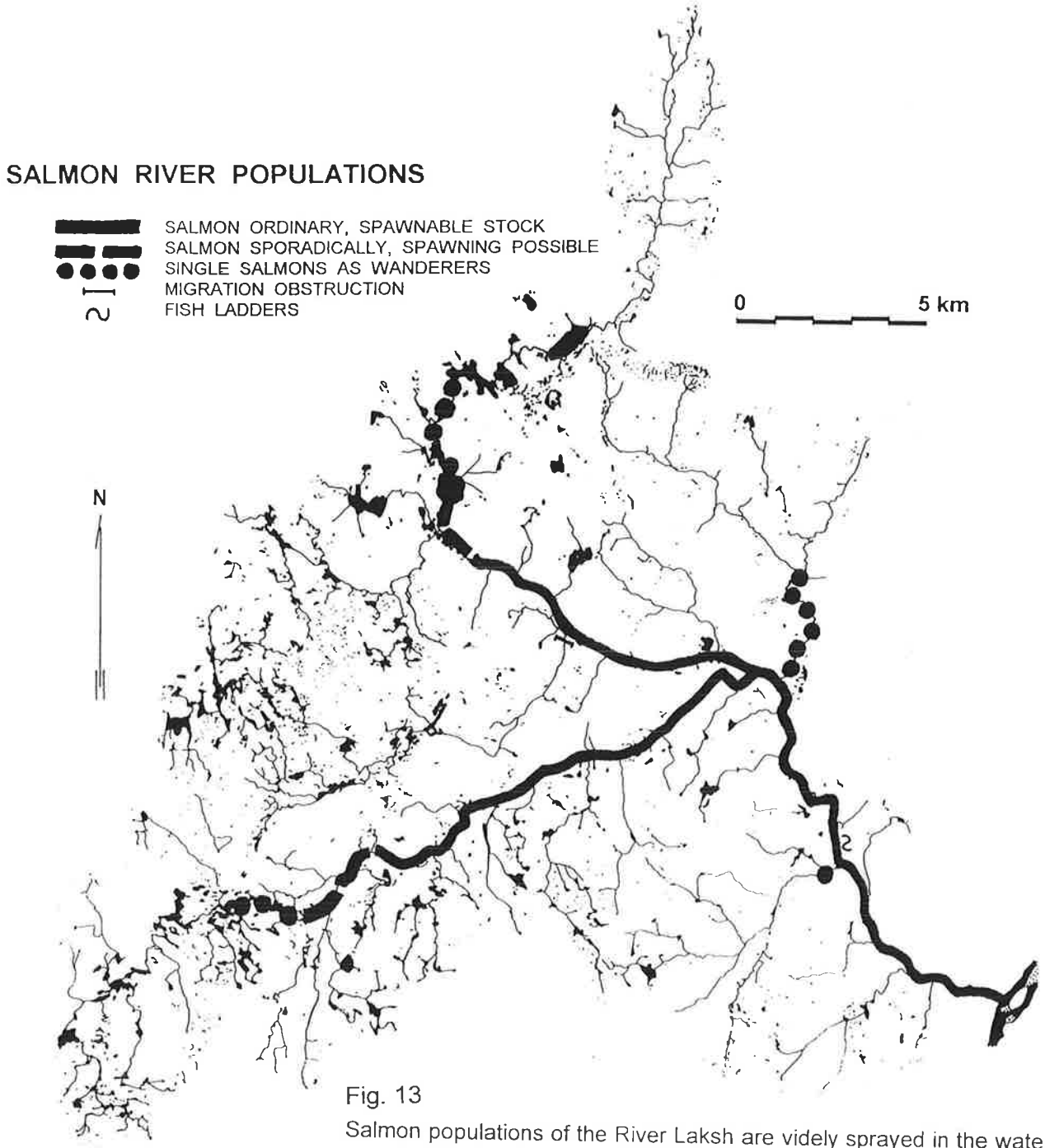


Fig. 13
Salmon populations of the River Laksh are videly sprayed in the water system.

Salmon 0+ parrs in above table mean the fries of about 40 mm long (36-45 mm). The fishing time was at the end of August. Total salmon parrs mean 0+, 1+, 2+ etc., precocious and male parrs and some becoming into smolt and were smolts. Trout parrs consist of some dwarf but adult brown trouts, too.

The River Laksh is without a doubt a good salmon river. Near the site No. 4 there is the Visitors´ Book at an info board for local fishers. A fisher wrote on the 7th July 1994 that he had catched eight salmons: five about one kg each, 2.1 kg, 3.1 kg and 6.7 kg.

There are salmons also above the fish ladders. Some good spawning areas is situated near upper end of River Laksh. The River Garbbe is *fielbma*-type brown trout river. It is possible that some lonely salmons can swim 2.2 km upstream to the mouth of Gieddoaijohka. The River Deavkehan can have good spawning sites near Miennajávrrit. The river is stony and consists of many riverlakes and pools. The best salmon tributary perhaps is the River Gurtte. Above the mouth of Bittusjohka there are alluvial plateau with gravel riffles and flats. Vast inpenetrable riparian willows prevent a checking of possible spawning sites in this area. The tributary of R Gurtte: Bittusjohka has an absolute migration obstruction at the mouth. It is too stony and vertical one.

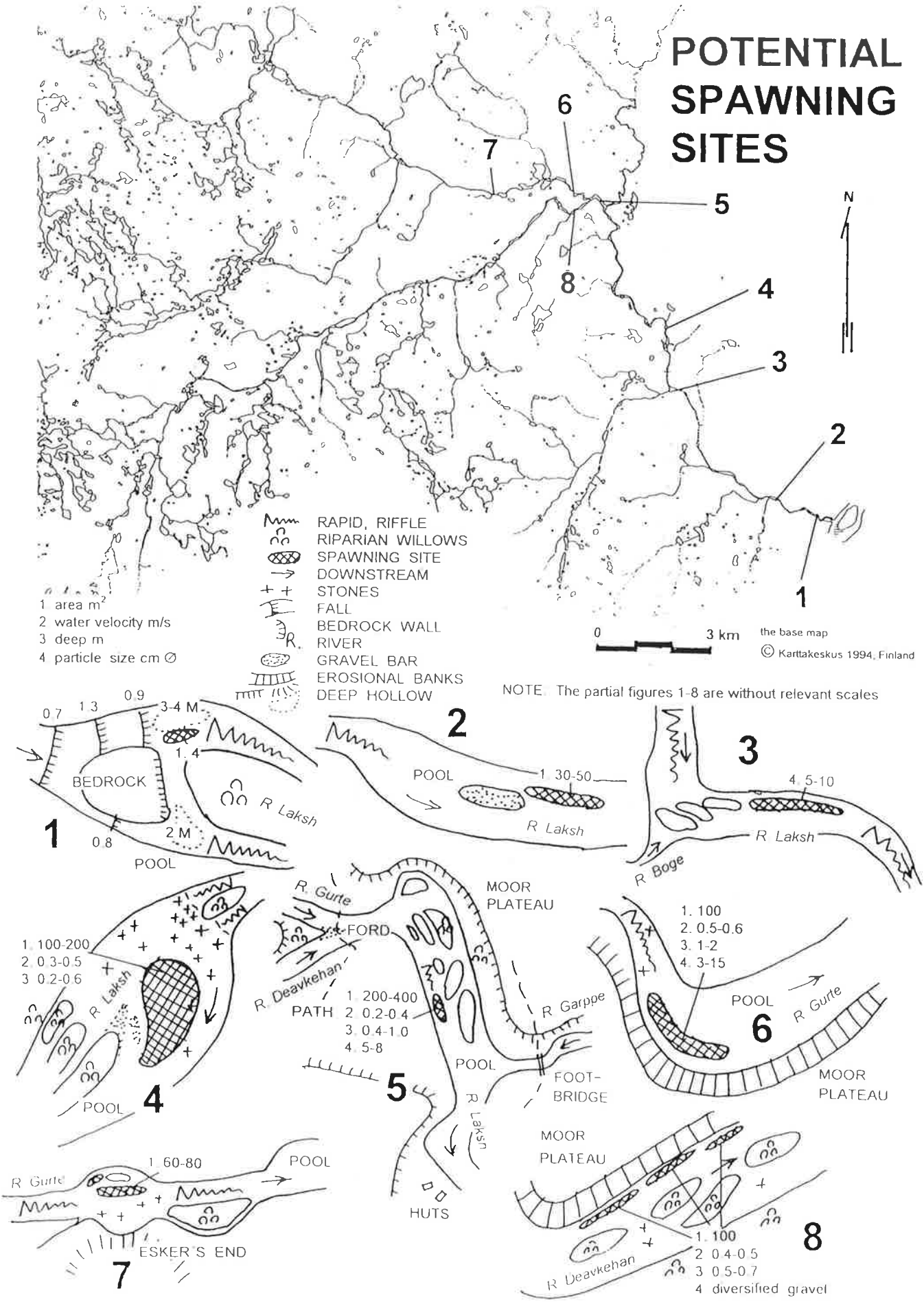


Fig. 14

The lowest spawning sites of the main reaches are tiny and it has been finding only some of them. There are more them nearer in the watersheds?

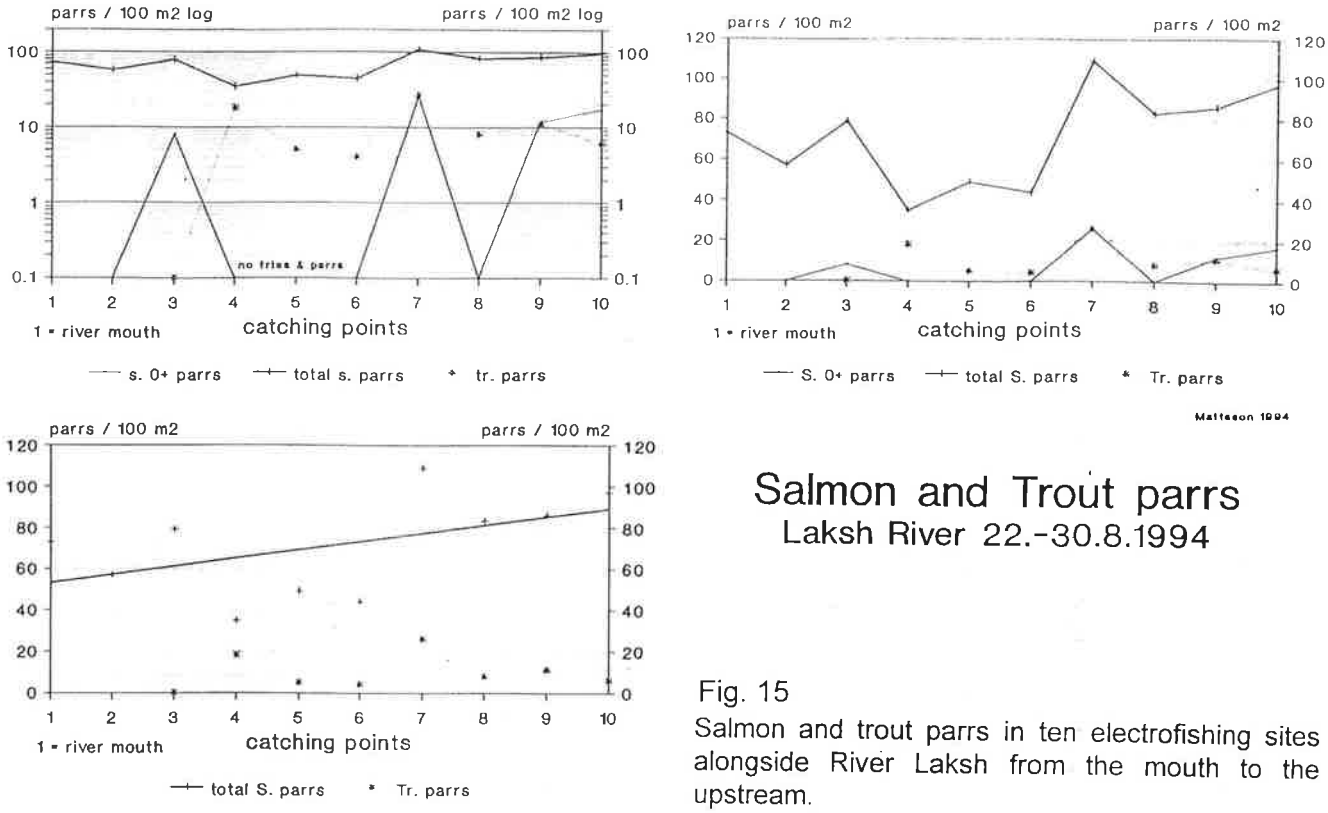


Fig. 15
Salmon and trout parrs in ten electrofishing sites alongside River Laksh from the mouth to the upstream.

OTHER SALMONIDS

There is hardly nothing information about other Salmonids as Atlantic **salmon** (*Salmo salar*). Some **brown trouts** (*Salmo trutta*) has been seen in lower part of River Garbbe. Just in lower end of River Gurtte there is the riverlake named as Soavveljávri. Sámish *soavvil* means **grayling** (*Thymallus thymallus*). Nobody hesitate that also **charr** (*Salvelinus alpinus*) belonging to the ichthyofauna of the area. So it is obvious, that of Salmonids there are salmon, trout, grayling and charr present in Lákshjohka w.s.

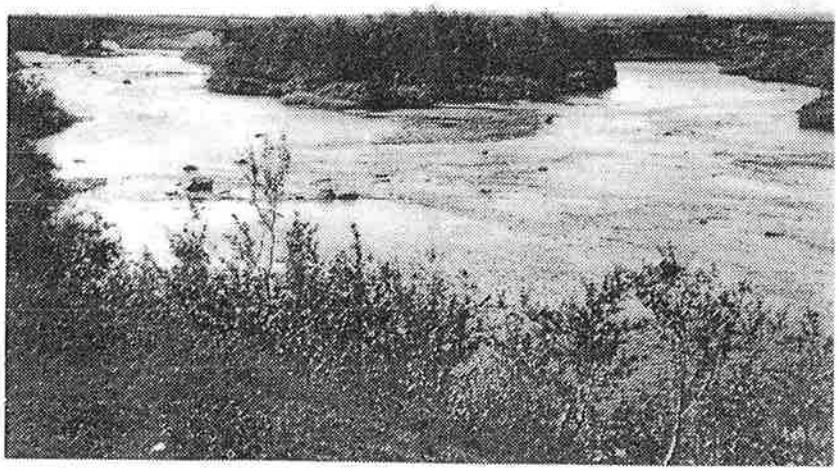


Fig. 16
The junction of the rivers Deavkehan and Gurtte is the beginning of the River Laksh This also is a ford

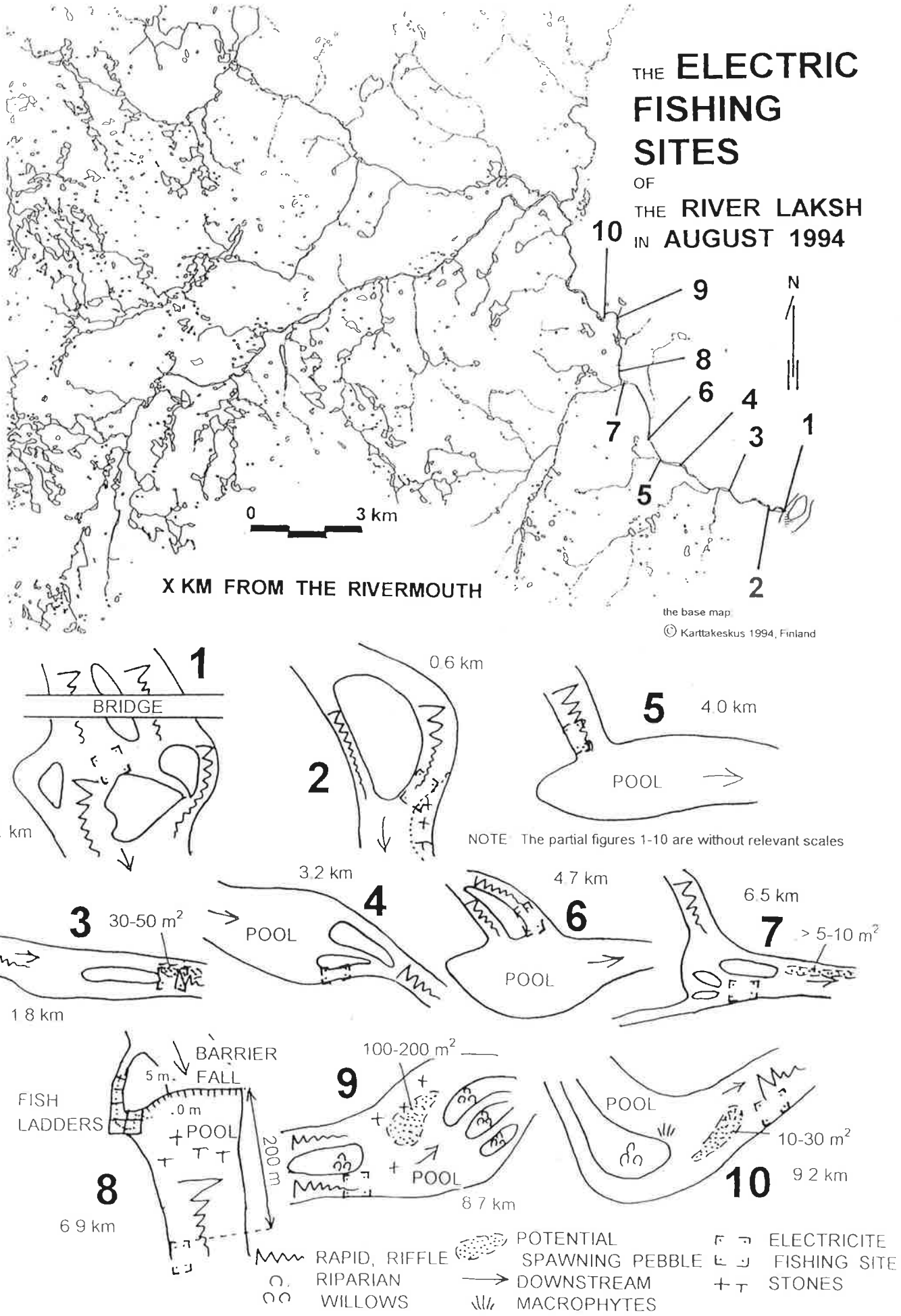


Fig. 17
There were ten electrofishing sites in Lákshjohka river system in August 1994

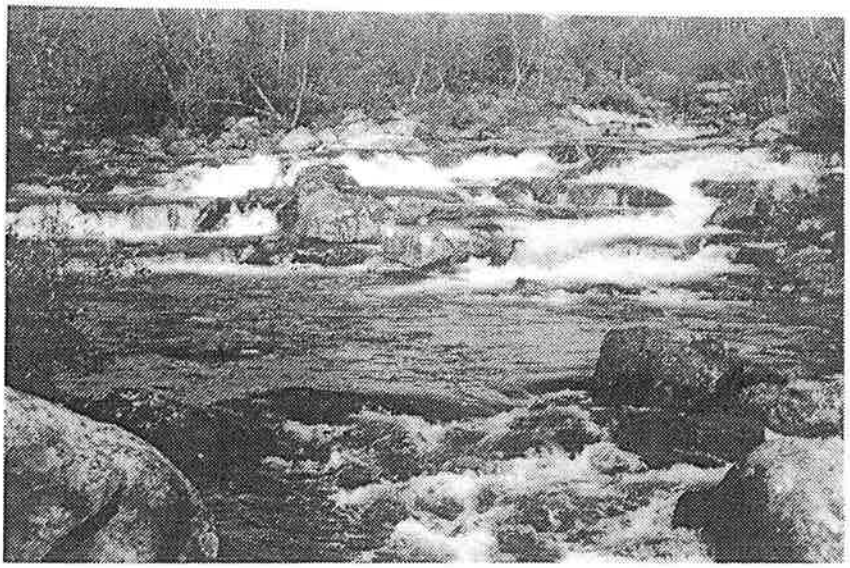


Fig. 18
Near the rivermouth of the River Laksh there are noticeable cataracts with over one meter´s steps.

OTHER FISHES

We know nothing about other fish species. It is quite possible, that burbot (*Lota lota*) and perhaps also pike (*Esox lucius*) can be in local waters. Sticklebacks (*Gasterosteus aculeatus, Pungitius pungitius*), minnow (*Phoxinus phoxinus*) and whitefishes (*Coregonus* sp.) are absent. The vertical waterfall and big cascades of lower R. Laksh have allways obstructed immigrations of other fishes. Norwegians have never had cultivation campaigns for whitefishes like it has had in Finnish side of R. Tana (Salojärvi 1992, Karlsen & Reiestad 1994).

HABITAT ASSEMBLAGE

Spawning gravels

Only eight potential spawning sites has been noticed in lower part of Láksjohka r.s. The sizes of those is very tiny. A situation is just same everywhere amongs northern salmon rivers. Perhaps only some percent of river´s watered area is passable for spawning. This is enough for salmons.

site No.	*area as m²*	*water velocity m/s*	*deep as m*	*particle size cm ∅*
1.	3 - 4	0.4 - 0.6	0.2 - 1.0	3 - 10
2.	30 - 50	0.2 - 0.4	0.2 - 0.6	2 - 10
3.	5 - 20	0.1 - 0.3	0.3 - 1.1	1 - 10
4.	100 - 200	0.3 - 0.5	0.2 - 0.6	1 - 5
5.	200 - 400	0.2 - 0.4	0.4 - 1.0	5 - 8
6.	100	0.5 - 0.6	1.0 - 2.0	3 - 15
7.	60 - 80	0.3 - 0.5	0.2 - 0.5	?
8.	100	0.4 - 0.5	0.5 - 0.7	diversified gravel
total	*598 - 954*	*mean 0.3 - 0.5*	*mean 0.4 - 0.9*	*mean 3 - 10*

Table 4

NOTES:
1. no glacifluvial landforms near or in upstream (R. Tana´s paleoterraces?)
2. gravel bar very near and sandy terrace with erosional bank near
3. high and very large alluvial terrace (delta) upstream
4. like before, but now mostly downstream
5. the glacifluvial delta of 7 km² and terraces around, much sorted gravel and stones
6. like before
7. esker´s erosional end as river bank near
8. high erosional gravelbank as right riverbank

Fig. 19
A perifyton (algae) covers bottom stones in reaches which it has much light, some eutrophic water from near swamp and ices do not clean them yearly. There are very much all kind of bottom invertebrates. Lot of food, many salmonid fries and parrs, too.

As before noticed salmons´ spawning sites have near contact from some gravel source. If a river is enough large, its´ erosional bank, esker near, old delta or sandur, alluvial landscape and glasifluvial terraces signify that passable material is to supply for sorting of flowing waters. Then it is also possible to find potential spawning sites, even redds in autumn.

Both R. Gurtte and R. Deavkehan have in their upper watersheds large alluvial areas. If river is not too small and there is not migration obstructions it can find more salmonious areas. It is not impossible assuming that there are adult salmons enough many in water system.

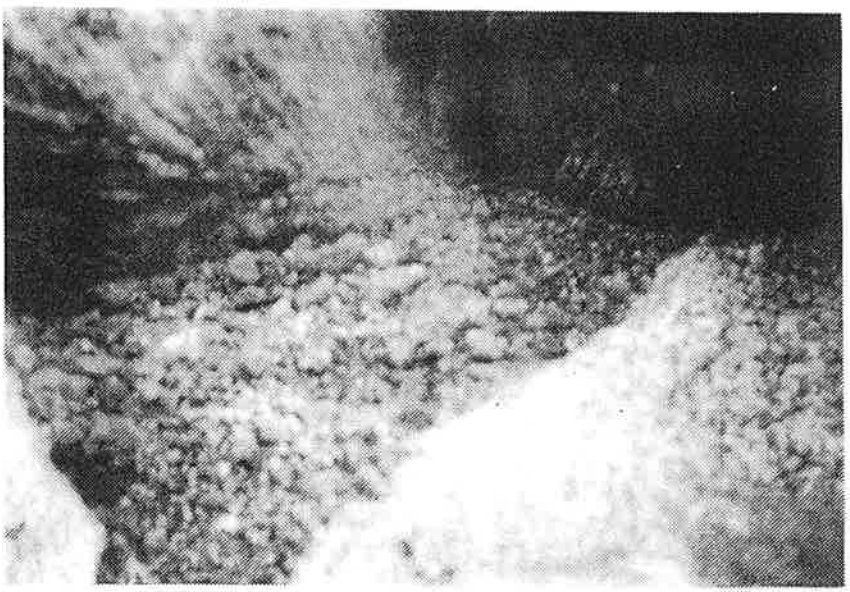


Fig. 20
Little gravel patch can be as redd site for local dwarf brown trout. Those kind of mosaic structures is everywhere in the waters.

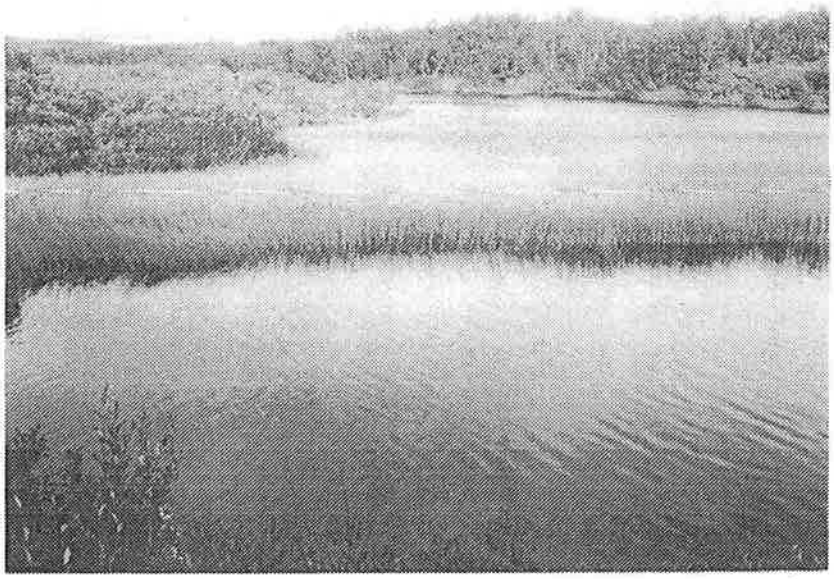


Fig. 21
Vide areas of the water macrophytes (*Carex* sp.) and unpenetrable riparian willows (*Salix* sp.) dominates in some reaches on subarctic rivers. This is taken just above the Falls.

Nursery rubble bottoms

As before mentioned, there are quite enough stony riffles and rapids in northernmost hemisphere. The rivers are mostly very stony. Fries and parrs can spread effectively to waters. Only the greatest streams are more sandbottomed: Upper and Lower Tana, River Lutto in Finnish - Russian borderland *etc.* Also some catches of bog brooks in fell plateau can be so slow-flowing and sandy both also meandering that salmons avoid them. Local Sáme people has own appellative for such kind of river: *fielbma*.

Pool: riffle ratio is the first primeval inventory object of the rivers. It is easy do even by videotaping from aeroplanes. Rapids and riffles are white, pools black. Only few ones are border-line cases. Such kind of silent but swift **runs** are in Sámish *njávvi*, in Finnish *niva*. After this operation there can focuse other characteristics of the rivers.

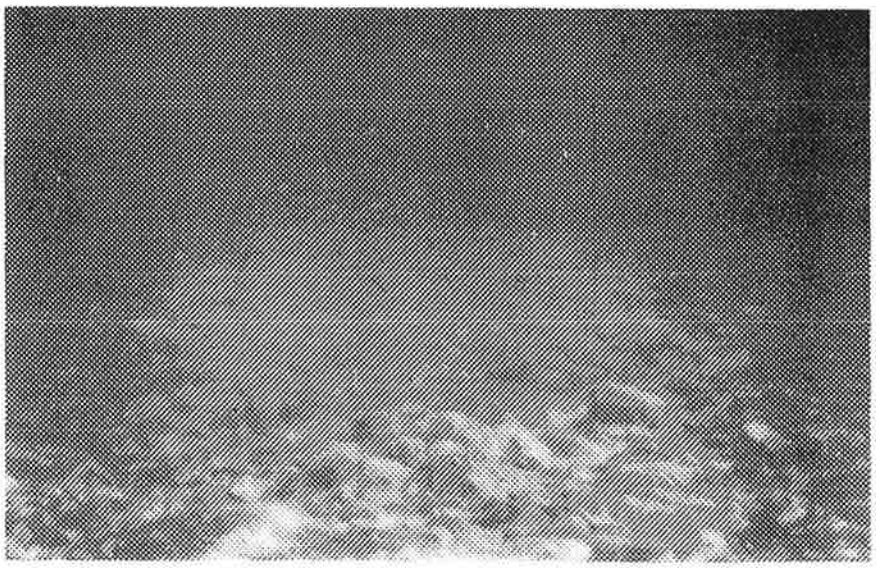


Fig. 22
Monotonic bottom area consists of small stones filled sand around them. Visible distance is over in this two-metre-deep almost 7-8 metres.

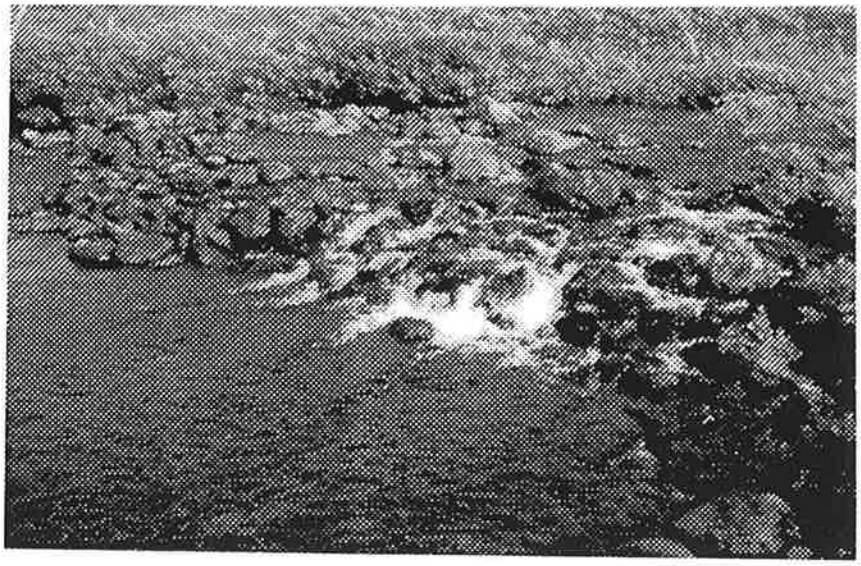


Fig. 23
The mouth of River Bittus is inpenetrable for salmonid immigrants. Too many stones and too less water in summertime.

River Laksh water system has salmon assemblage courses 50 km and watered area 426.0 ha total. Other facts are (I - III cl. salmon strips only):

	R. Laksh	*R. Garppe*	*R. Gurtte*	*R. Deavkehan*	*total*
number of riffles & rapids	16	3	11	23	53
riffles & rapids as total ha	25.2	0.6	11.9	27.6	65.3
number of pools	15	4	12	24	55
pools as total ha	25.0	9.0	278.8	47.9	360.7
total watered area as ha	*50.2*	*9.6*	*290.7*	*75.5*	*426.0*

Table 5

'Pools' above can be **riverlakes**, **pools** or smooth and voiceless **flats** of rivers. **Rapids** are noisy: they rush even roar in big streams. **Riffles** give gurgling and babling. They are shallow and bottom substrate are tiny stones. Rapid's stones can be boulders and slabs. Such kind of swift waters are very fast white water. There can also be bedrock outcrops (pits, slabs, fractures, projections and depressions).

Fig. 24
There is sand round the big stones in about two-metre-deep. Some graylings swim nearby carefully following activities of the photographer.

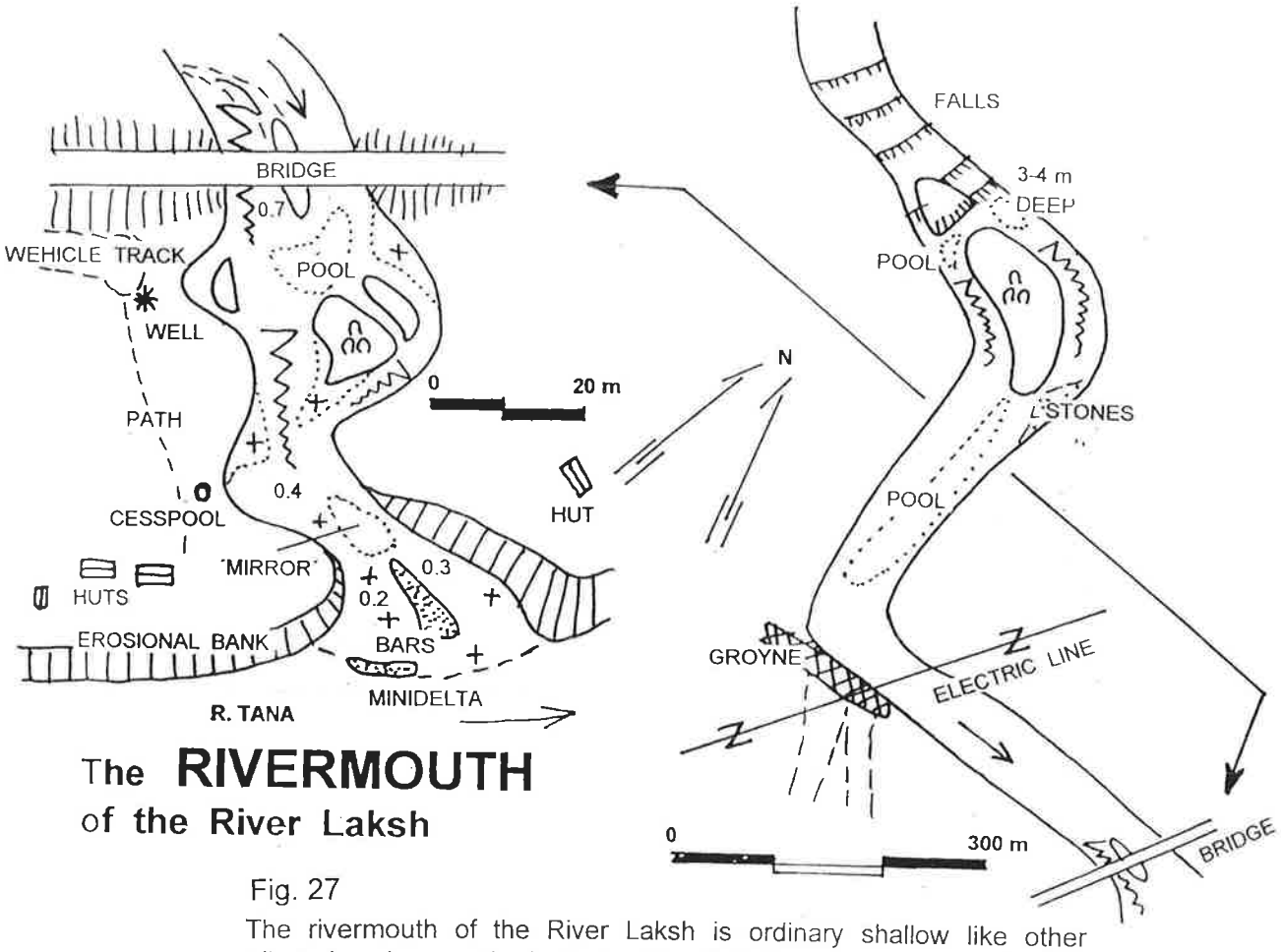


Fig. 27

The rivermouth of the River Laksh is ordinary shallow like other tributarian rivermouths in Tana area. It is one *groyne* here collecting water to the main riverbed only.

There are hundreds of tiny fell ponds around uppermost reaches and among the more large lakes of the tributaries everywhere. Every watersheds of the bigger tributaries of R. Laksh are such kind of labyrinths of waters. Also some central large lake can be noticeable shallow (visibling even from aerial photos). Sediments loading by swift lotic waters have filled them in Holocene period. Gurttejávri is this type of a lake. If this is a through flowing riverlake, it also consists of enough oxygen in late winters.

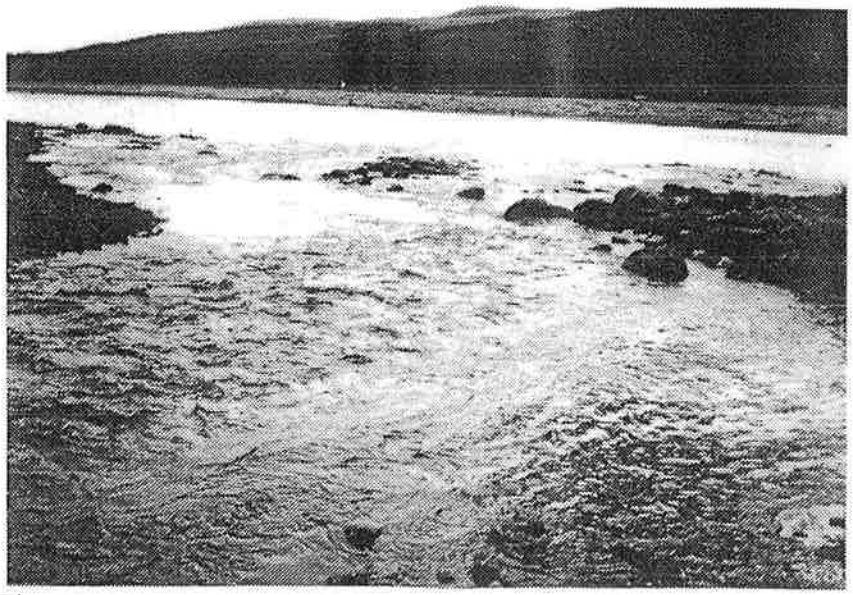


Fig. 28

The rivermouth of the River Laksh against the River Tana is shallow like generally other rivermouths in Tana area.

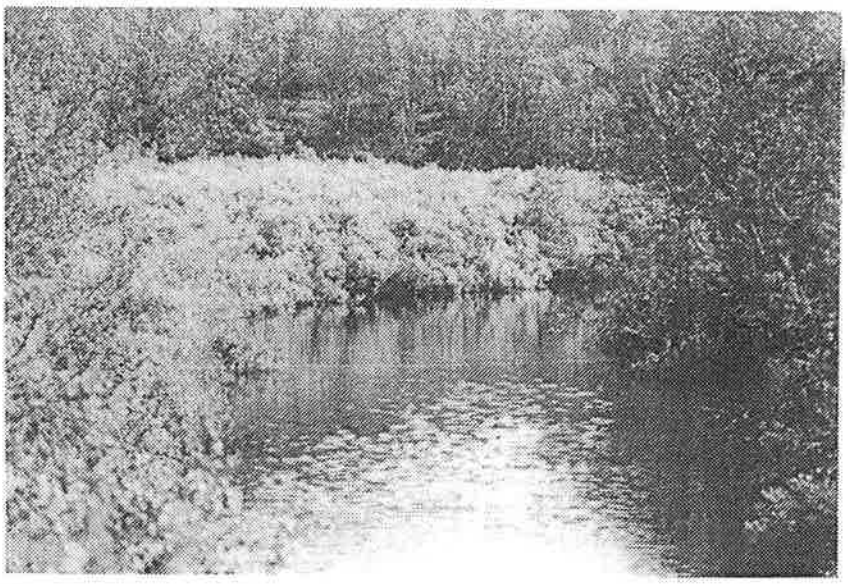


Fig. 29
River Garbbe is typical fielbma. It is very deep flat and riverbanks are almost unpenetrable willowed. There are videly both moor and swamps, even fens.

Many large lakes in morainic sources of the tributaries have varied deep: the Mienna Lakes in R. Deavkehan w.s., the Roance Lakes and Lake Gievdneskal in R. Bittus of R. Gurtte w.s. and some big riverlakes in upper R. Gurtte area. R. Laksh itself consists of some very deep flats in middle reach: perhaps 4-5 m. The mirrow below the Falls is ordinary deep and very well oxygened.

Then there is some strange lakes, too. These lakes have almost dried in late summers. They typically are situated in areas of sorted dune material. They are ombrotrophic and suspended from rain water only. They are, of course, often fishless ones. There are this kind lakes and ponds in dune area near the Falls and to the east from the mouth of R. Garppe.

So it is noticed that hiding pools can be both a sector of river and a lake, but deep only or as shallow riverlake in subarctic conditions of River Laksh catchment.

Fig. 30
Short run opens between two riverlakes near the site of the Visitor's Book. This is optimal grayling residence.

HUMAN INTERVENTIONS

River Laksh with the tributaries and whole vast backround fell plateau (in Norwegian: *Laksfjordvidda*) is unpopulated nowadays. For that there is less real human interventions. This is only partly as a truth. Whole those large fell wildernesses are traditional areas for Sámish home economics (Miljöverndepartementet 1978).

Lákshjohka catchment belonged to Utsjok (*Ohcejohka*) Sáme village until the year 1739. Local reindeer herdsmen wandered in springtimes (to the coastal peninsulas) and back in autumns (to the Tana winter residences and holdings). Just the uppermost source of R. Gurtte (in its´ tributary *Ladnjafielbma*) was famous crossing junction of the routes: *Stuorra Ilis* fell ridge. This seasonal wandering stopped by the Russian emperor in the year 1852. Finland belonged in that time to Russia.

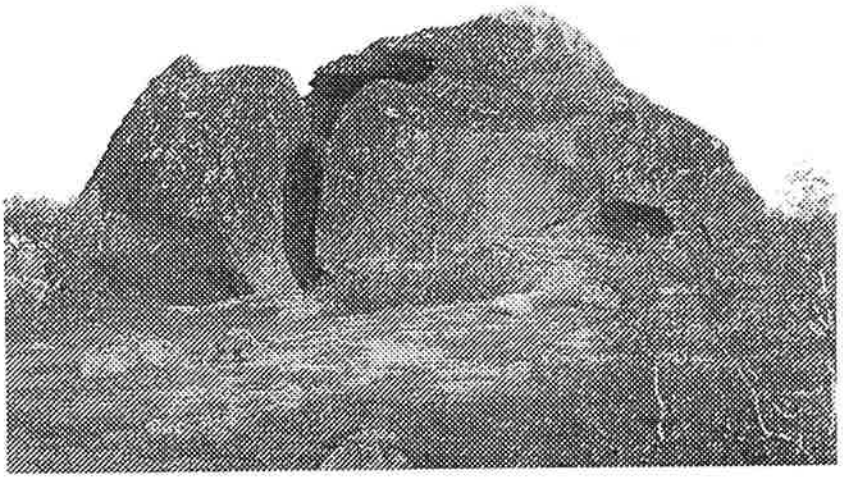


Fig. 31
Ancient holy *staalu* is seen as huge erratic in almost bare fell top of Staalunjunis.

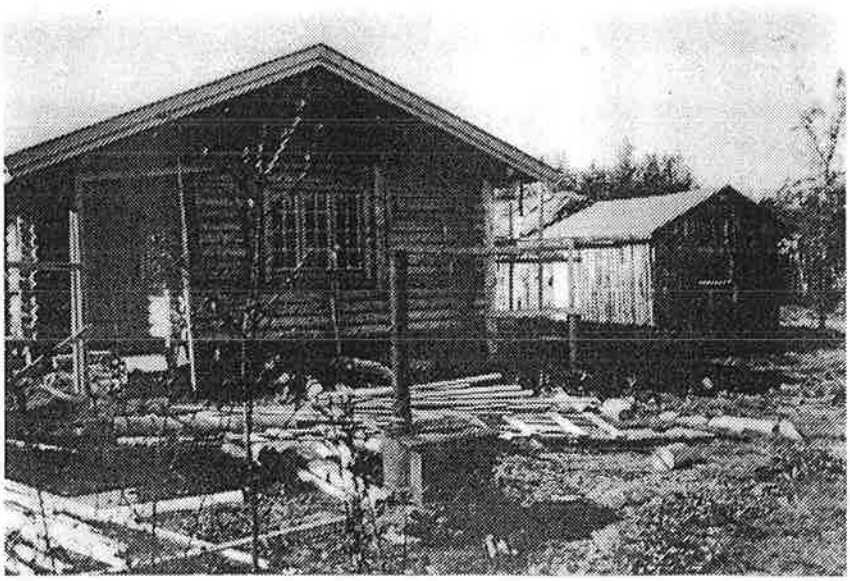


Fig. 32
Local reindeer herdsmen´s hut under construction in August 1994. Old hut is visible behind the newest wall logs. The location is near the junction the R. Garbbe and R. Laksh.

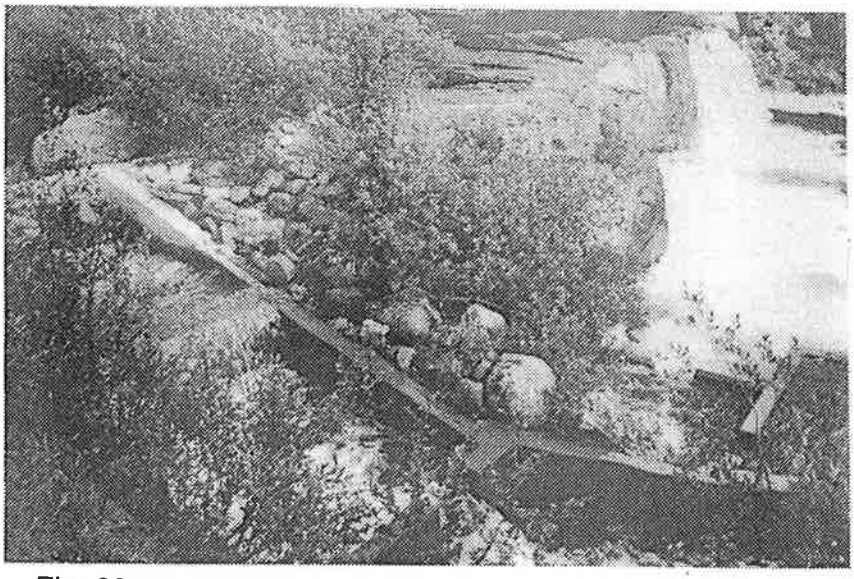


Fig. 33
The fishladders of the Lakshjokgordshi is constructed in 1972-73.

FISH LADDERS OF THE FALL

River Laksh allways has been an important salmon river. There is, however, big vertical waterfall in the lower part of the reach. There is 7.2 km from the rivermouth to the upstream. The Fall (*Lákshjokgordshi*) is 5.1 meter-high. Only very few and the strongest salmon individuals could jump up beyond the Fall. The pool below the fall is good, namely deep ´runway´ for the jumpers.

The fish ladders have been built in 1972-73 (Halvorsen 1987). It consists of four pools with internal jumpings of 0.7 m. Today there is good salmon populations above the Fall. Nobody knows anything about migrations of sea trouts. Those are only surely acting fish ladders in River Tana area.

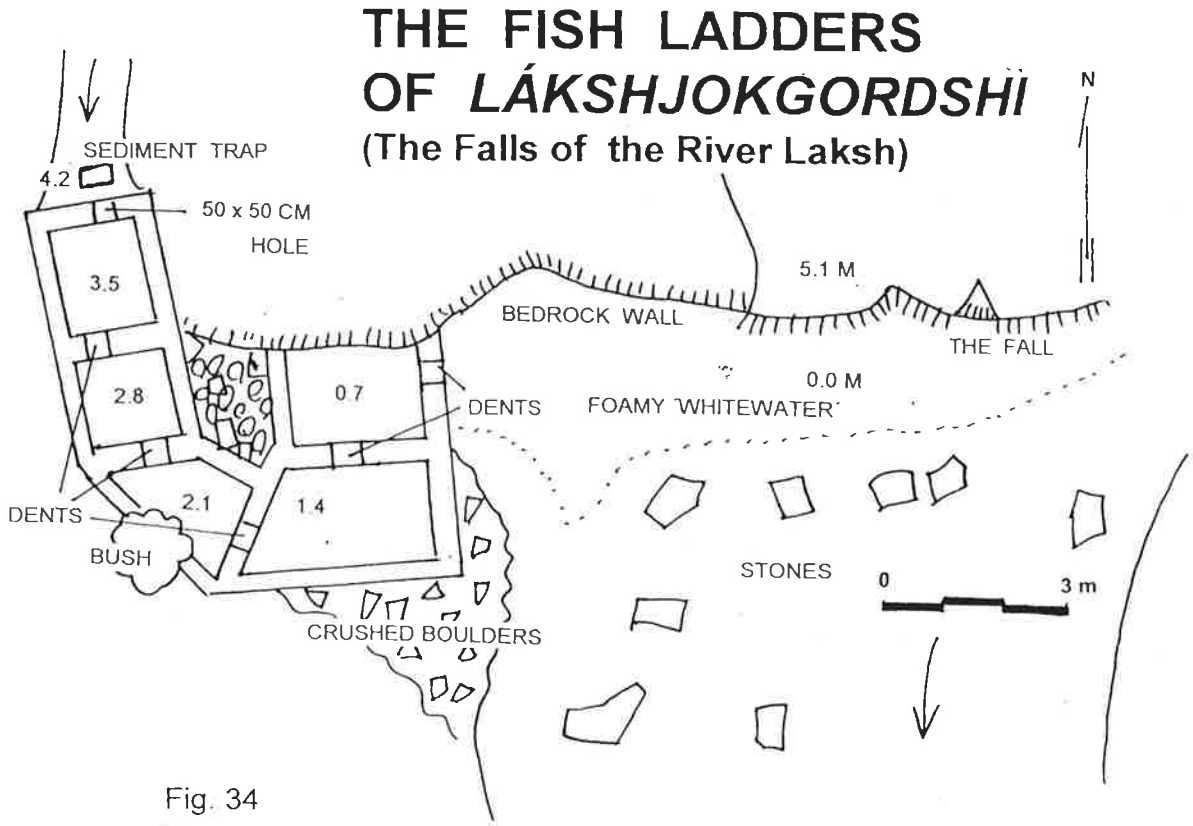


Fig. 34
The fishladders of *Lákshjokgordshi* are active aid for migrating salmons.

Fig. 40
The middle reach of the River Gurtte is just at the frontier of birch coppices.

FUTURE THREATS

Some national and international visions about relevant threats are seeing now. Human impact consists of overexploitation of salmons of Tana (the share of 40-60 per cent´s catch in whole River Tana area?). Hatchery reared and sea ranched fish swim also to the upstream of the main course of River Tana (but how many fishes?).

Some serious diseases (furunculosis *etc.*) and parasites (*Gyrodactylus salaris etc.*) spread alongside the Norwegian coast to the north (Jonsson & Fleming 1993, Mattsson 1995). Also whole Finnish and Russian sides also are as potential threats because fish farming extends quickly.

Also acidification of waters spreads slowly but definitely. The puffering capacities of local waters have been used provided that general trend changes not during next two decades.

Those all are our modern noticeable problems. Single local man cannot does any more against these threats. He can only waits? – Monitoring the threats is beyond this pilotage work´s scope.

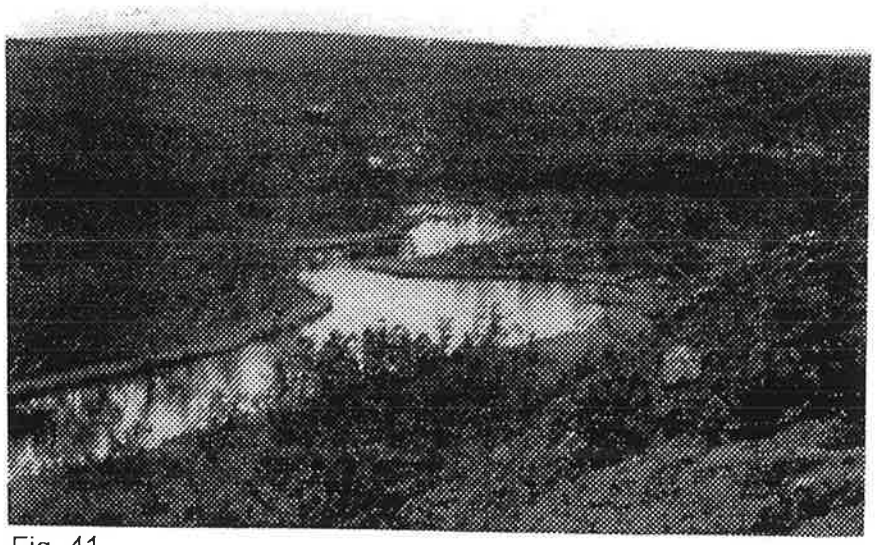


Fig. 41
The flats, pools and riverlakes of the River Deavkehan is many-sided lotic and lentic surroundings for Salmonids.

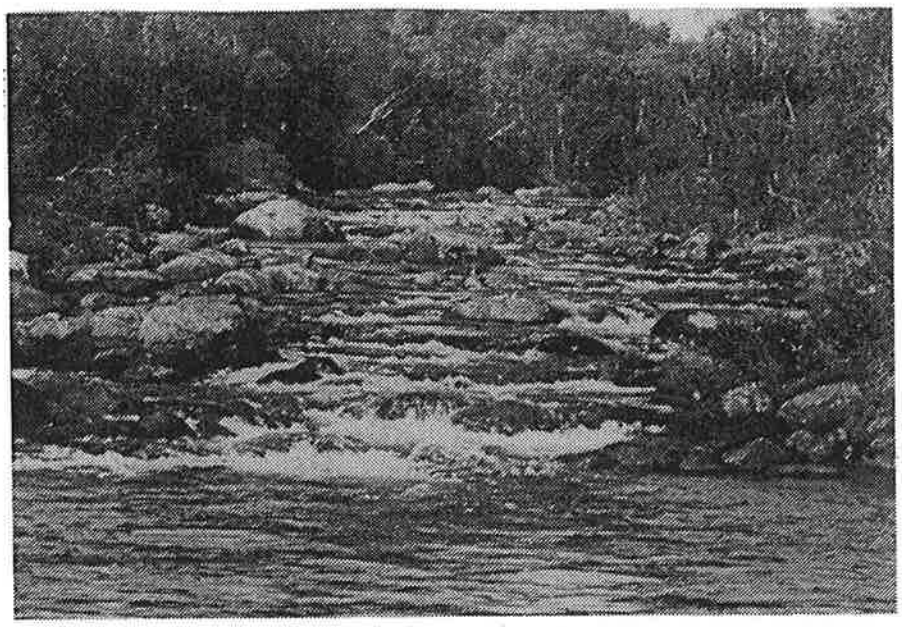


Fig. 42

This is not a riffle but noise rapid. There are lot of parr biotopes round the stones.

RIVER LAKSH IN TANA WATER SYSTEM

River Laksh is a tiny tributary in large River Tana drainage. Also its´ salmon population probably is not major one, noticeable certainly. River Tana has 15-25 other salmon populations (Mattsson 1989). All of them are, however, unique and irreplaceable fishes in our modern Europe. They are self-recruiting populations and very well passed their conditions. Majority of the salmons in our continent are originally farmed (and escaped?) or expressly hatched under human control.

The grilses and salmons of R. Laksh have come back from deep waters of northern Atlantic, just homing. Some has gone into neighbouring tributaries, some of those rivers´ fishes has come into R. Laksh, just straying. So whole Tana salmon population also is a big ´fish clan´. Whole the genetic chain is at least ten thousand years old, probably much older by some circumstances. This community is on our hands precisely – also the salmons of the River Laksh (*Lákshjohka*).

according to
field pilotage monitoring by

Jorma Mattsson

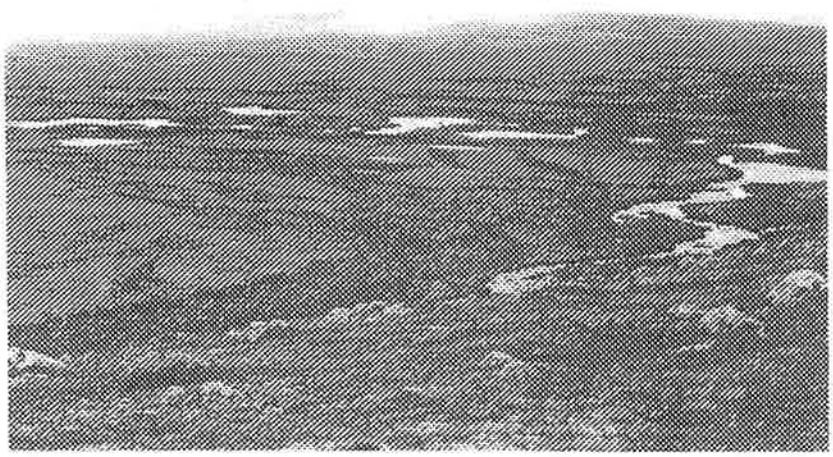


Fig. 43

Bare landscape opens from the fell Roavvevárri to the west towards the Lakes Mienna. There is videly morainic badlands here.

Fig. 44 © NLF
The complecity of the fell grounds in vast Laksfjordvidda is seen. Partly this area is so called badlands.

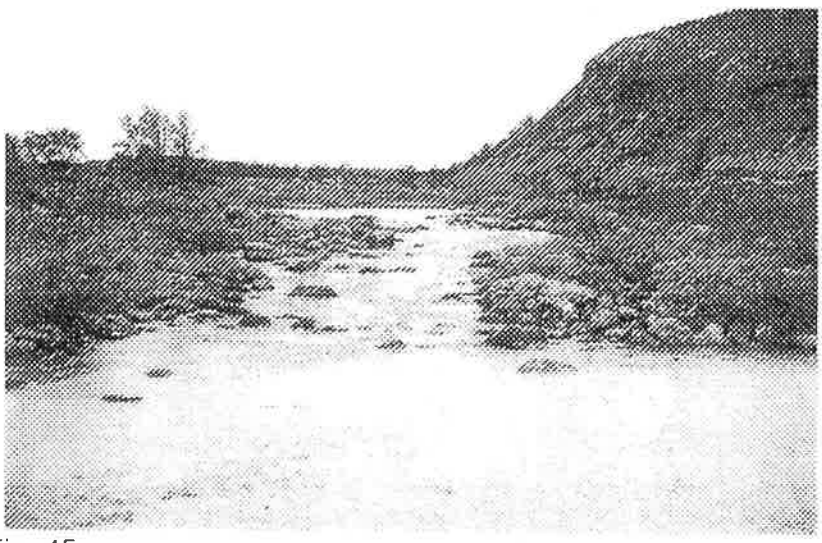


Fig. 45
River Deavkehan consists of its upper reach many pools and short runs and rapids between them. In the backround there is steep southern precipice of the fell Roavvevárri.

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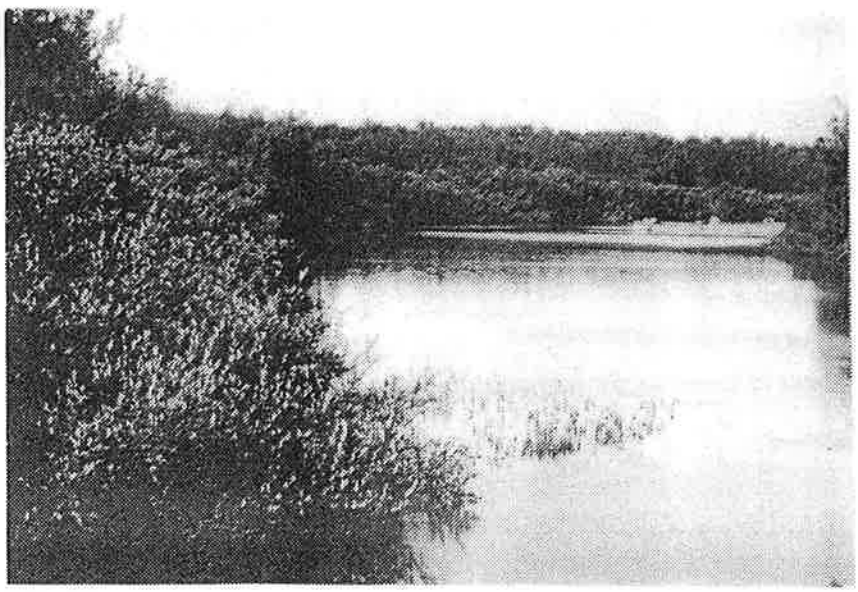

Fig. 46
Silent flat of the River Laksh: large riparian willows and water macrophytes: here *Hippuris vulgaris*.

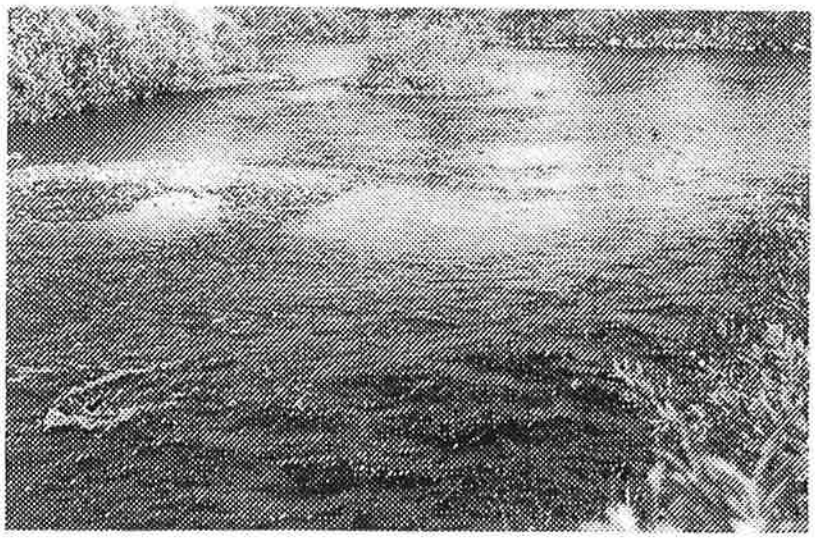

Fig. 47
Typical riffle is gurggling only and shallow. There are videly gravel.

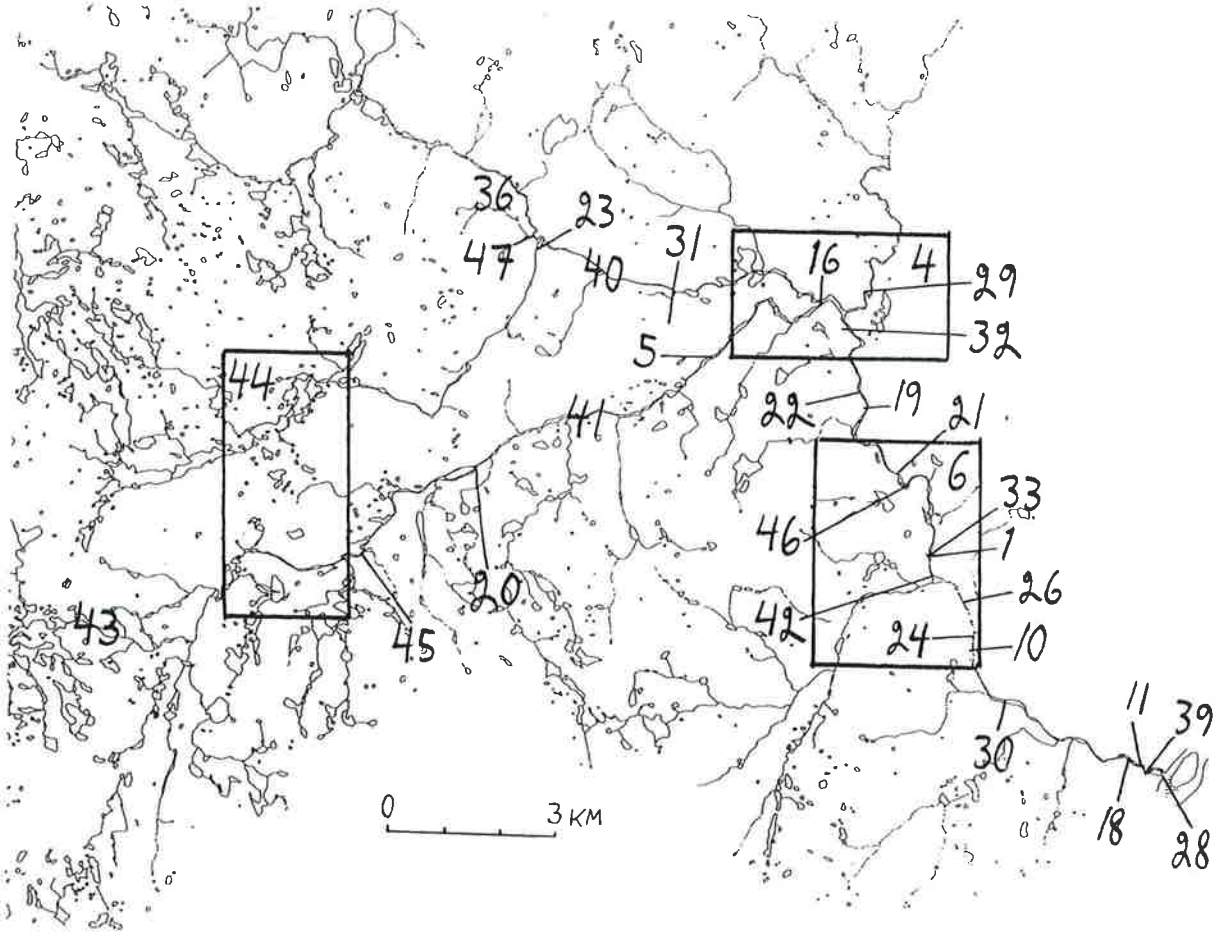

Fig. 48
The photos (1-3, 5, 7-43 and 45-47) and air photos (the rectangles 4, 6 and 44) of the investigated area. The base map: © Karttakeskus, Finland.