

# ***Electrofishing***



[www.Aqua-Tech.eu](http://www.Aqua-Tech.eu)

# ***Electrofishing***

## **Electric fishing devices**

This save and powerful electric fish catching devices are successfully in use on all continents since over 30 years. Through the various and sometimes problematic areas of use, a wide range of electro-catchers was developed which will match nearly any requirement.

All our devices are built to EN 60335 standards, IEC and VDE-regulations, and can be TÜV-tested if preferred. The electric building corresponds to security class II. Therefore all power delivering parts are double isolated and guarantee the best possible security for persons. A "dead-man-switch" (required in the European Union) guarantees for additional security, so that all outlets of the device are without electric current if dangerous situations arise. The back-carry units, additionally have a tilt-switch, which switches off immediately if the unit is tilted to an angle over 45 degree. The permanent excited generator and the high quality magnet materials guarantee a continuous and reliable power. Each device will be tested mechanically and electrically completely and delivered with an user manual.

Direct current creates usually a better anodic reaction and lower deformations of fishes than pulse current would do. But at extreme conductivities or for electric barriers, with direct current soon the borders are reached. As result, powerful combined (Direct-/Pulse-Current) devices were created, where the pulse frequency and volts can be adjusted (via motor turns or switch). The backpack units are compact lightweight systems with high outgoing power. Impulse devices are a little larger and have a little more weight than direct current devices.

We deliver net-, battery- or motor-driven back-carry or stand-units with direct- and/or pulse-current with an outgoing power of 250-15.000 Watt (5-160 kw/pulse), and a voltage of 100-1000 Volt with a weight of 5-100 kg and for a water conductivity of 50-20.000  $\mu\text{S}/\text{cm}$ . As accessories are available: 30-60 cm  $\varnothing$  stainless steel anodes with RGP-electro handles up to 6 m in length, copper cathodes (3-6 m) with cable and connector, plastic cable drums for up to 100 m cable, hand or foot dead-man-switches, electro-rubber outfit (tested to 1000 Volt) as well as tanks and lights etc.

**EN**



**CE**

**Quality for reasonable prices!**

# ***AquaTech***

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# Electrocatcher

## Selection criteria

### To water specifications:

Region/Criterion	Substrate	Width	Depth	Power
Trout region	Pebble	1-5 m	0-1 m	<1 kW
Grayling region	Gravel	5-20 m	1-2 m	<3 kW
Barb region	Sand	20-50 m	2-4 m	<5 kW
Bream region	Mud	50-100 m	4-8 m	<7 kW
Brackish region	To electric conductivity		>10 kW	

### To electric conductivity:

Conductivity/Current	Direct Current	Pulse Current
To 600 µS	1 kW	
To 800 µS	3 kW	
To 1.000 µS	5 kW	
To 2.000 µS	7 kW	1 kW
To 4.000 µS	10 kW	5 kW
To 6.000 µS	-	10 kW
To 8.000 µS	-	30 kW
To 10.000 µS	-	50 kW
To 12.000 µS	-	80 kW
To 16.000 µS	-	120 kW
To 20.000 µS	-	160 kW
To 35.000 µS	-	400 kW

### To device properties:

Type	Power	Use	Direct Current <sup>(S)</sup>	Pulse Current	Voltage <sup>x</sup>	Anodes	Weight <sup>+</sup>
IGT201	B	T	-	5,0 kW	600 V	1	5 kg
IGT202	B	T	0,25 kW <sup>(3)</sup>	10,0 kW	150/600 V	1	5 kg
GIT600	B	T	0,65 kW <sup>(1)</sup>	1,2 kW	115-565 V	1	5 kg
GI1300	B	S	1,3 kW <sup>(1)</sup>	2,6 kW	80-470 V	1	8 kg
GI4000	B	S	4,0 kW <sup>(1)</sup>	8,0 kW	65-520 V	1	15 kg
ELT60	M	T	1,3 kW <sup>(2)</sup>	*32 kW	500/950 V	2	13 kg
ELT61	M	T	2,2 kW <sup>(2)</sup>	*32 kW	550/950 V	2	22 kg
ELT62	M	T	3,0 kW <sup>(2)</sup>	*32 kW	550/950 V	2	26 kg
EL62	M	S	3,0 kW <sup>(3*2)</sup>	*50 kW	550/600 V	2	37 kg
EL63	M	S	5,0 kW <sup>(3*2)</sup>	*80 kW	600/600 V	2	52 kg
EL64	M	S	7,0 kW <sup>(3*2)</sup>	*120 kW	600/600 V	2	68 kg
EL65	M	S	13,0 kW <sup>(3*2)</sup>	*160 kW	600/600 V	2	78 kg

Abbreviations: B = Battery, M = Motor, T = Back-carry-unit, S = Stand-unit;  
 S = DC-smoothing/ripples (1 = complete/non, 2 = well/low, 3 = medium/fair);  
 \* = Optionally, <sup>x</sup> = Standard (max. Direct/Pulse), <sup>+</sup> = without batteries or options.

# ***Electrocatcher***

## **Setting criteria**

**To device power:**

<b>Direct Current (kW)</b>	<b>&lt;1</b>	<b>1-5</b>	<b>5-10</b>	<b>&gt;10</b>
Anode diameter min. (cm)	30	40	50	60
Cathode length min. (m)	2-3	3-4	4-5	5-6
Total cable length max. (m)	200	150	100	50
Cable diameter min. (mm <sup>2</sup> )	1	2	3	4

**To water conductivity:**

<b>Conductivity (µS/cm)</b>	<b>&lt;100</b>	<b>100-500</b>	<b>500-1000</b>	<b>1000-5000</b>	<b>&gt;5000</b>
Direct current (Volt)	>400	300-400	200-300	100-200	<100
Pulse current (Volt)	>500	400-500	300-400	200-300	<200
Pulse durance (ms)	2-5	3-7	5-10	7-15	10-20
Pulse cycles (%)	<10	<20	<30	<40	<50

**To fish species:**

<b>Fish species (family)</b>	<b>Salmonidae</b>	<b>Esocidae</b>	<b>Cyprinidae</b>	<b>Percidae</b>	<b>Anguillidae</b>
Pulse frequency (Hertz)	40-70	30-60	30-50	20-50	10-40

Rain and snow water = No conductivity.

Humic water = Low conductivity (<150 µS).

Carbonate water = Medium conductivity (150-600 µS).

Lake and pond water = High conductivity (>600 µS).

Electrodes: Low conductivity = Large electrodes (and other way round).

Voltage: Low conductivity = High voltage (and other way round).

Frequency: Short pulse durance = High pulse frequency (and other way round).

Conformity: European Union = DIN EN 60335-2-86 (otherwise not allowed).

**DIN**

**TÜV**

**Best value for money!**

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# ***Electrocatcher***

## **Type overview**

### **Battery back-carry units:**



Type IGT  
200 (left)  
600 (right)



### **Battery stand units:**



Type GI  
1300 (left)  
4000 (right)



### **Motor back-carry units:**



Type ELT  
60 (left)  
62 (right)



### **Motor stand units:**



Type EL  
63 (left)  
64 (right)



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# ***Electrofishing***

Battery

## **Back-carry-devices**

Type IGT

For an easier catch of fishes in freshwater like smaller flowing or shallower standing waters (streams and ponds) to a depth of about 1-2 m and a conductivity up to 500  $\mu\text{S}/\text{cm}$  (direct current) resp. 5.000  $\mu\text{S}/\text{cm}$  (pulse current), this optimized and relatively strong electric fishing device is especially suitable, where the battery-pack is now carried on a back-frame. Other than simpler electrofish devices (from the east) this device conforms to all EU regulations and is CE certified, build after IEC 60335-2-86 and save against short-circuits and over-loads (protection class II, art IP55). The compact lightweight control-box (energy consumption max. 15/20/25 A) is connected with two eyes in front of the back-frame (WxDxH 38x28x58 cm, weight approx. 5 kg), and has several knob-switches and control-lights (Use, Battery, Current, Overload) and a tilt-switch (45 degree) with acoustic signal for safety reasons. The outgoing voltage with pulse current can be adjusted in 4 stages from 300/400/500/600 Volt (optionally from 400/600/800/1000 Volt), also the pulse frequency from 10-100 pulses/second. With direct current, the outgoing power is fixed to 150 Volt, but as special order can also be adjusted in 4 stages from 150/200/250/300 Volt (optionally from 200/300/400/500 Volt), and switched (PC/DC) in the anode handle. The outgoing power is 250 Watt direct current (with fairly smoothed current and some ripples) resp. 5.000 or 10.000 Watt pulse current (with fast increase and exponential decrease) and is switchable. Pulse current (PC) allows catching fish also at lower and higher conductivities than direct current (DC). As battery-packs (12 V) are either heavier but cheaper lead-gel batteries (stay and reach shorter times) or lighter but expensive lithium-iron batteries (stay and reach longer times) available, to enclose in the box of the backcarry-frame. Recommended are min. 2 battery-packs, so that the second one can be used and is fished with, when the first one is empty and must be charged. A battery-charger (12 V, 2 A) with control light is included in the delivery. Electrode-sets (anodes and cathodes) are available in different arrangements, e. g.: anode-handles with built-in deadman-switch and removable anode-rings from 30-50 cm  $\varnothing$ , as well as cathode-lengths of 3-5 m and special rubber cable in any length.



Type IGT  
201 (left)  
202 (right)



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Battery

## **Back-pack-devices**

Type GIT

For a simpler catch of fishes in freshwater like smaller flowing or shallower standing waters (streams and ponds) to a depth of about 1 m and a conductivity up to 1.000  $\mu\text{S}/\text{cm}$  (direct current) resp. 2.000  $\mu\text{S}/\text{cm}$  (pulse current), this reduced and relatively simple electric fishing device is especially suitable, as the battery-pack is now carried in a back-pack. Other than cheaper electrofish devices (from the east) this device conforms to the actual EU regulations and is CE certified, build after IEC 60335-2-86 and save against short-circuits and over-loads (protection class II, art IP65). The small (LxWxH 14x10x20 cm) and (approx. 1,8 kg) light-weight control-box (energy consumption max. 30 A) is connected with two eyes in front of the back-pack and has a voltage control with acoustic signal, a deadman-switch and a tilt-switch (45 degree) for safety reasons. The outgoing voltage can be adjusted by 3 coarse- and 11 fine-tuners from 115-565 Volt (optionally from 90-500 Volt), also the pulse frequency from 20-200 pulses/second and the pulse time from 1-10 ms. The outgoing power is 650 Watt (direct current with completely smoothed current and no ripples) resp. 1200 Watt (pulse current with fast increase and exponential decrease) and is switchable. Direct current (DC) creates a better galvanotaxis (catchability) and a less damaged fishes (mortality) than pulse current (PC). As battery-packs (24 V) are either heavier but cheaper lead-gel batteries (stay and reach shorter times) or lighter but expensive lithium-iron batteries (stay and reach longer times) available, each enclosed in a splash-proof casing with cable and plug. Recommended are min. 2 battery-packs, so that the second one can be used and is fished with, when the first one is empty and must be charged. A battery-charger (24 V, 1,5 A) with automatic regulator is included in the delivery and can be used for both battery types (lead-gel and lithium-iron). Also delivered is an extensive user manual. Electrode-sets (anodes and cathodes) are available in different arrangements, e. g.: anode-handles with built-in deadman-switch and removable anode-rings from 30-50 cm  $\varnothing$ , as well as cathode-lengths of 3-5 m and special rubber cable in any length. Optionally, this device is also available with a back-carry frame (instead back-pack), which has several advantages and is highly recommended.



Type GIT  
with backpack  
(left)  
with backframe  
(right)



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# ***Electrofishing***

## **Battery Stand-devices**

### **Type IG**

For a better catch of fishes in freshwater like larger flowing or shallower standing waters (rivers and lakes) to a depth of about 2-3 m and a conductivity up to 2.000 (or 5.000)  $\mu\text{S}/\text{cm}$  (direct current) resp. 4.000 (or 10.000)  $\mu\text{S}/\text{cm}$  (pulse current), these 2 compact electric fishing devices are especially suitable, as they can be placed and stand in a boat. This universal devices conform to the actual EU regulations and are CE certified, build after IEC 60335-2-86 and save against short-circuits and over-loads (protection class II, art IP54). The small LxWxH 36x20x15 cm, approx. 8 kg (or large LxWxH 36x40x15 cm, approx.. 15 kg) control-box (energy consumption max. 60 A) with 2 handles, several sockets (anode, cathode, deadman, battery(s)), with several switches and displays (Ready, Battery, Deadman, Overload) is mounted directly on top of the battery-pack(s) (LxWxH each 55x20x21 cm). The outgoing voltage can be adjusted by 5 (or 6) coarse-tuners and unlimited between them from 80-470 (or 65-520) Volt, but the pulse frequency is fixed to 70 pulses/second and the pulse time to 4-6 ms (similar to that of the electric eel). The outgoing power is 1300 (or 4000) Watt (direct current with completely smoothed current and no ripples) resp. 2600 (or 8000) Watt (pulse current with fast increase and exponential decrease) and is switchable. Direct current (DC) creates a better galvanotaxis (catchability) and a less damaged fishes (mortality) than pulse current (PC). Pulse current allows catching fish also at lower and higher conductivities than direct current. As battery-packs (24 V) are either heavier but cheaper lead-acid batteries (stay and reach shorter times) or lighter but expensive lithium-iron batteries (stay and reach longer times) available, each enclosed in a splash-proof casing with cable and plug. Required are min. 1-3 battery-packs, so that the needed input voltage (1 x 24 or 3 x 24 = 72 V) is reached. A battery-charger (24 V, 5 or 10 A) with automatic regulator is included in the delivery. Also delivered is an extensive user manual. Electrode-sets (anodes and cathodes) are available in different arrangements, e. g.: anode-handles with built-in deadman-switch and removable anode-rings from 40-60 cm  $\varnothing$ , as well as cathode-lengths of 4-6 m and special rubber cable in any length. For the larger unit, a transport trolley is available as accessory.



Type GI  
1300 (left)  
4000 (right)



# ***AquaTech***

# ***Electrofishing***

Motor

## **Back-carry-devices**

Type ELT

For an general catch of fishes in freshwater like smaller flowing or shallower standing waters (rivers and lakes) to a depth of about 1-2 m and a conductivity up to 600 (or 900)  $\mu\text{S}/\text{cm}$  (direct current) resp. 8.000  $\mu\text{S}/\text{cm}$  (pulse current), these universal electric fishing devices are especially suitable, as they can be carried on a back-frame or used from the shore. This devices conform to all EU regulations and are CE certified, build after IEC 60335-2-86 and save against short-circuits and over-loads (protection class II, art IP55). The compact and complete device is hung with two shoulder-belts and fixed with a belly-belt of the back-carry frame (WxDxH 38x36x58 or 38x42x78 cm, weight approx. 13 or 26 kg). The integrated control box has several sockets (2 anodes, 1 cathode, 1 deadman), displays (volt- and ampere-meter, operation-hours), switches (main and selection, deadman) and control-lights (use, error) and a tilt-switch (45 degree) with acoustic signal for safety reasons, which own small box with control light is mounted on the belly-belt. The air-cooled 1-cylinder, 4-stroke petrol motor (Honda) with 0,25 (or 1,0) l tank and manual start has, at a turning rate of 6800 (or 3600) RPM, a power of 1,8 (or 4,1) kW. The SD-generator is permanently excited and has, at a frequency of 680 (or 360) Hz, a power of 1,5 (or 3,0) kW. The outgoing voltage can be adjusted in 2 stages from 300/500 (or 300/550) Volt (optionally to 750 Volt) but can also be adjusted by motor turning rate or automatically by the device itself (only for devices without pulse current). Optionally, an impulse part (additional weight approx. 1 kg) can be integrated into the control box, where the pulse current is switchable 580/950 Volt and also the pulse frequency can be regulated from 25-100 pulses/second. Direct current (DC) creates a better galvanotaxis (catchability) and a less damaged fishes (mortality) than pulse current (PC). Pulse current allows catching fish also at lower and higher conductivities than direct current. The outgoing power is 1300 (or 3000) Watt (direct current with well smoothed current and low ripples) resp. 32.000 Watt (pulse current with fast increase and exponential decrease) and is switchable. Electrode-sets (anodes and cathodes) are available in different arrangements. Various deadman-switches are available as accessory.



Type ELT  
without Impuls  
(left)  
with Impuls  
(right)



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## **Motor Stand-devices**

### **Type EL**

For a qualified catch of fishes in fresh and brackish water like larger flowing or shallower standing waters (rivers and lakes) to a depth of about 2-3 m and a conductivity up to 1.000 (or 2.000)  $\mu\text{S}/\text{cm}$  (direct current) resp. 10.000 (or 15.000)  $\mu\text{S}/\text{cm}$  (pulse current), these professional electric fishing devices are especially suitable, as they can be used in a boat or from the shore. This devices conform to all EU regulations and are CE certified, build after IEC 60335-2-86 and save against short-circuits and over-loads (protection class II, art IP55). The solid and whole device is mounted in a stainless steel frame (LxWxH 63-89x48-50x48-50 cm, weight approx. 52 kg, or 67-91x50-53x48-50 cm, weight approx. 68 kg) with 4 flappable handles. The integrated control box has several sockets (2 anodes, 1 cathode, 1 deadman), displays (volt- and ampere-meter, operation-hours), switches (main and selection, deadman) and control-lights (use, over-temperature). The air-cooled 1-cylinder, 4-stroke petrol motor (Honda) with tank and manual start, oil-stand-warning and automatic-shutoff has, at a turning rate of 3600 RPM, a power of 6,6 (or 9,6) kW. The SD-generator is permanently excited and has, at a frequency of 360 Hz, a power of 5,0 (or 7,5) kW. The outgoing voltage can be adjusted in 2 stages from 300/600 Volt (optionally to 750 Volt) but can also be adjusted by the motor turning rate. Optionally, an impulse part (additional weight approx. 10 kg) with 2 additional anode sockets and switches can be integrated into the larger control box, where the pulse current is 600 Volt and the pulse frequency can be regulated from 10-100 pulses/second. Direct current (DC) creates a better galvanotaxis (catchability) and a less damaged fishes (mortality) than pulse current (PC). Pulse current allows catching fish also at lower and higher conductivities than direct current. The outgoing power is 5,0 (or 7,0) kW (with fairly smoothed current and some ripples) resp. 80 (or 120) kW (pulse current with fast increase and exponential decrease) and is switchable. Electrode-sets (anodes and cathodes) are available in different arrangements. As accessories, various deadman-switches, a cable drum (for up to 100 m cable) and transport-trolleys with 2 wheels and a handle are available. Larger/stronger electrofishing devices, on request.



Type EL  
without Impuls  
(left)  
with Impuls  
(right)



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# ***Electrofisher***

## **Accessories**

### **Anode-sets:**



Standard anode



Special anode



Standard handle (two-hand-use)



Special handle (one-hand-use)



Standard anode cable



Special cable drum

### **Consulting:**

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# ***Electrofisher***

## **Accessories**

### **Cathode-sets:**



Standard cathode



Floating cathode

### **Deadman-switches:**



Hand deadman switch



Foot deadman switch

### **Others:**



Transport trolleys



Rubber cloths

### **Consulting:**

# ***AquaTech***

# ***Electrofisher***

CE

## **Declaration of Conformity**

**to Low Voltage Guideline Directive (2014/35/EU)  
and Electromagnetic Compatibility (2014/30/EU)**

We: AquaTech, Unterbrunnweg 3, 6370 Kitzbühel, Austria

declare herewith under our sole responsibility,  
that the electric fishing devices of the types:

IG/IGT 200-202  
GI/GIT 600-650  
GI/IG 1300-4000  
EL/ELT 60-65

from building date 2020 onward

fulfil the requirements and regulations of the standards:

DIN EN 60335-1  
Safety of household and similar electrical appliances  
Part 1: General requirements

DIN EN 60335-2  
Safety of household and similar electrical appliances  
Part 2-86: Particular requirements for electric fishing machines

and therefore correspond with the regulations of the directives.

Kitzbühel, 01.07.2022

Martin Hochleithner  
(General Manager)

 **AquaTech**  
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**CE**

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Electrofishing with back-carry unit (above) and stand unit (below)



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# ***Electrofishing***

## **Introduction**

### **1. Applications**

With the help of the electrical fishery it is possible to preserve and maintain fish existence as carefully as possible. For the following purposes the electrical fishery is most frequently used:

- Fishing in smaller brooks on extra-large fish, in order to let the new generation arise better.
- The catch of spawn fish for stripping.
- Fishing of fish gotten sick, in order to prevent the propagation from fish diseases.
- Catching of fish in drying waters and rescue of the fish existence during building measures.
- Fishing in waters for stock-control.
- Determination of the circumference of fish dead, especially in waters damaged by sewages.
- Fishing for scientific purposes.

### **2. Determinations**

In order to be able to exercise the electro fishery, there are to be noted different legal measures that are differently regulated in the respective countries of the world.

Within Germany, following regulations are existing: The determinations of the VDE (association of German electrical engineers), the respective country fishery ordinances and the fishery law. In many states, each electro fisherman must lead following papers in execution of the electro fishery with itself:

- Operation certificate
- Permit certificate
- Allowance certificate (testimony)

The country institutes issue the operation certificate for fishery after a course was graduated for electro fisherman and the subsequent test was existed.

The responsible authorities (lower or waiter fishery authority) issue the permit. Prerequisite is for this that the operation certificate and the allowance certificate of the electric fishing device are produced.

The allowance certificates (test testimonies) for the electric fishing device becomes of an expert (i. e. TÜV) issued. In stationary electric fishing devices the allowance certificates applies to respectively one year, for place changeable three years.

### **3. Effects**

Because the effect of the electric current on the fishes depends of very many different factors, only some general points are supposed to be considered.

In the electric current field of the cathode (minus pole), the nerves of the fishes are excited. Therefore the fishes try to arrive to the area of the anode (plus pole), for there the nerve excitement is slighter. Therefore one speaks about the scare away cathode (scare away electrode) and the capture anode (capture electrode).

Each electrode possesses an electric field. This field may be compared to a spider network. Direct at the electrode the current field is very strong and becomes against its edge always weaker (the density and size of the electric current field dependents among other things also of the type of the related electrodes).

A fish that is located in the edge zone of a direct current field reacts with a flight trial. This first reaction is designated as a scare away effect. If the current field becomes denser, the electro taxis or only taxis steps as a second reaction on. At this point the fish swims to the anode. If the fish gets into the strongest current field directly at the anode, it falls in electro anaesthesia. It becomes unconscious and sinks to the waters ground or drives away with the water current. Especially the second reaction (electro taxis) is important for the electro fisherman because only in this current area a capture success enters.

Because of a large fish touches more volta-ge (shape voltage) in an electric current field than a little fish, it also reacts better to the current. On the other hand however a large fish has also more power in order to escape the electric field. Further the different fish types react differently to the electric current. Therefore i.e. eels, carp and tench are to catch comparatively badly. On the other hand pike, trout and graylings react well to the electric current.

## 4. Animal protection

Electric fishing counts as a protective method of the fishery if it properly is carried out. In pertinent use of the electric current, no damage of the fishes appears. Partially appearing discolouring are caused by pigment variations as a result of skin paralysis. They will disappear in relatively short time. Just as fish eggs, larvae and fish prey become not damaged in pertinent use.

### 4.1. Possible damages

At improper use, there will be damages and losses:

- Vertebral columns damage (jolt, postponement, breach).
- Internal bleedings by vessel injuries, usually within the area of the vertebral column.
- Fishbone break off at the vertebral column.

A cause for these injuries is tetanus during too strong current effect. They preferably arise with badly smoothed direct current as well as pulse of unsuitable form. In most cases these injuries heal completely again. Trout and pikeperch are particularly susceptible. Losses can occur through:

- Immediate mortality during extremely high current effect.
- Mortality by long lasting effect of weak pulsing current, typically for fish that are stored in a swimming container behind the boat with missing screen particularly when using surface anodes.
- Mortality through too late respiration in to long anaesthesia, the perch is especially susceptible.
- Secondary mortality by inappropriate handling of caught fish in the case of storage and transport, caused by oxygen deficiency and stress.

### 4.2. Countermeasures

As large as possible anodes should be used. Larger anodes have a larger range. Simultaneously the stress of the fishes is reduced because the current is not concentrated so strongly. Area anodes are particularly favourable.

- At direct current operation damages arise only at heavy output-power of the device or at using very small anodes.
- With pulse operation the devices have a clear power reserve (exception: very large conductivity and/or very large area anodes). You may not use the full power of the equipment in any case because of consideration of the fish.
- Switch the current on as briefly as possible, in particular with pulse! Switch off, as soon as the fish you want to catch are anaesthetized. Switch off anode at lifting out fish from water. When fishing with an area anode in continuous operation the induction time of the current is relatively high. Therefore and in the interest of brisk fishing you should drive not too slowly and compensate at too long anaesthesia times the long current reaction time by decreasing the voltage!
- When fishing with pulse a swimming container behind the boat should become shielded. With the use of area anodes this measure is absolutely necessary. The screen takes place via metal (alloy or steel) lattices or perforated plates inside the swimming container or a basket-like inlay made of metal. All metal parts must be bright and electrically leading connected. The fish may not show a reaction during operation of the dead man key.
- At storage and transport a sufficient oxygen supply should be provided!

The fish will show a so-called anodic effect. This means that it always swims away from the cathode and towards the anode (catcher). Due to the voltage field that is built between the cathode and the catcher pole the fish receives a certain voltage, which tempts it to swim towards the catcher. This physical fact is existing at direct current operation better than at pulse current operation. But if this voltage is too high, especially in the area nearest the pole, the fish will become insensible and drift away with the gush of the water. Therefore it is not always recommended to fish with the highest voltage and power. By adjusting the voltage level and therewith the delivered power output you decide substantially, whether fishing results are protective or damaging to fish. The voltage may be coarsely decreased by means of the voltage selector. If you want to reduce the voltage and the power just put back the hand throttle of the engine. If you are fishing with the catcher rod it is advantageous, when you switch on the dead man key after the catcher rod is dived down and you are pulling it in again (especially in fishing in deep zones of the water). Begin fishing with low voltages and increase as long as fish swim well to the anode. Voltage is well adjusted if there happens less or no narcotic to the fishes. After switching off the power output fishes should swim normally after a few seconds. Here the principle counts: „Start at low levels and stop on time“! Depend to the following criteria:

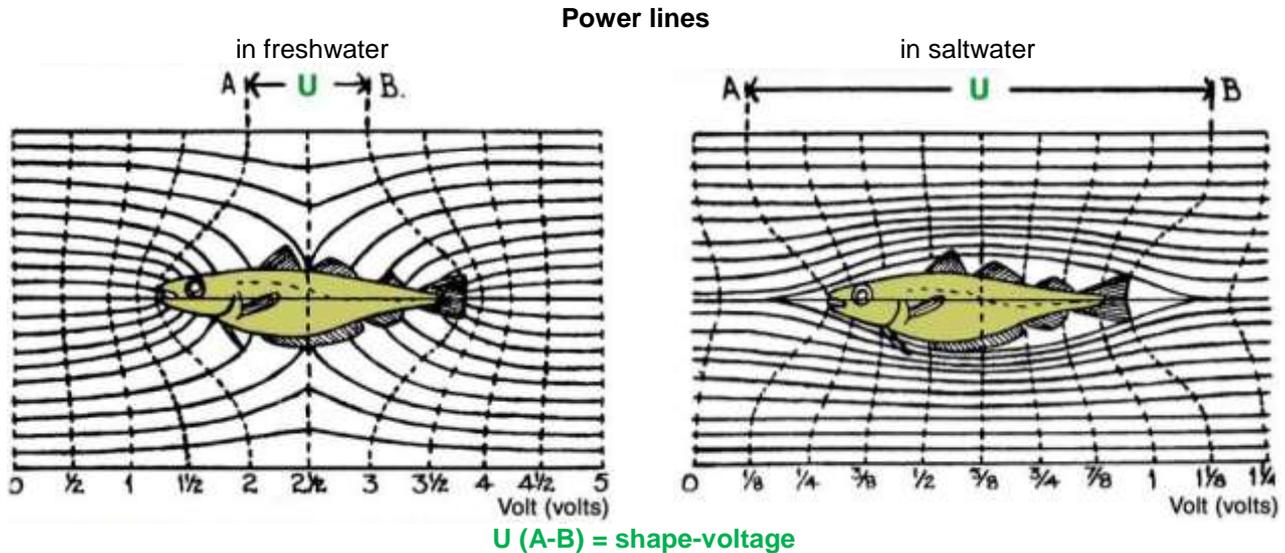
- You are fishing very carefully if the fishes are after-swimming the moved anode, immediately swim away or anaesthesia lasts only a few seconds after switching off the output.
- You are fishing still carefully, but you should not increase power if most fish remain up to approx. 1 min in anaesthesia (large white fish also longer) and all fish will awake from the anaesthesia. Control particularly Perch! However, only within the direct anode range most fish will be anaesthetized.
- You have to reduce power output, if most fish are anaesthetized over several minutes, individual fish don't awake from the anaesthesia any more or especially the Perch dies with spread gill. The anaesthesia begins already in larger distance to the anode and usually the fish don't reach the anode any longer.

## 5. Conditions

In order to fish in waters electrically, certain points must be considered. The electrical conductivity of the water, the electrical conductivity of the bottom and the kind of water (brook, river or lake) belong to it. The conductivity (measured in Siemens) respectively the electrical resistance (measured in Ohm) of the water does not change essentially in the course of one year. In the same water it depends mostly only on the water-temperature. Thus the conductivity of the water rises with the temperature and decreases, the cooler the water becomes. It is to be considered that in certain geographical regions the conductivity of the water has large differences. Mountain brooks have usually a lower conductivity (20 - 70  $\mu\text{S}/\text{cm}$ ) than waters in the flat country (70 - 3000  $\mu\text{S}/\text{cm}$  = MicroSiemens/Centimetre). The conductivity of the soil has some influence on the electrical fishery as the electrical field also spreads in the soil. Particularly clay, marl and mud possess a high conductivity, crystalline rocks such as porphyr, basalt and stones, conduct relatively badly. Also size and shape (morphology) of waters are to be considered, because even when using modern electrical fishery devices the anodic effect reaches only approx. up to 5 meters according to output voltage. Thus in narrow, flat waters may be better fished in than in wide ponds and lakes.

### 5.1. Voltage selection

In the next diagrams you will see different water conductivity situations. At low conductivity (fresh water) you need higher voltages to get the same shape-voltage of the fish as at a high conductivity (salt water).

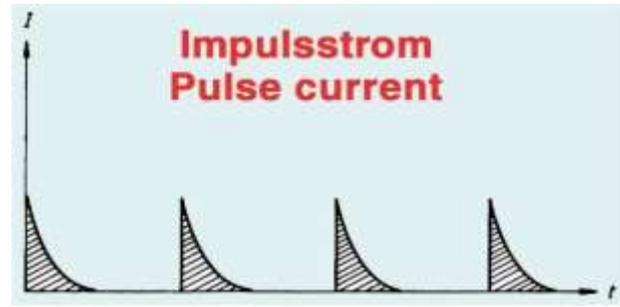
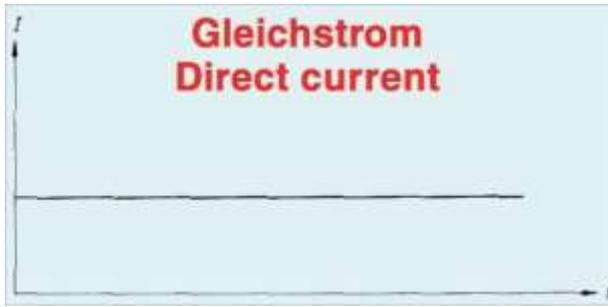


### 5.2. Equipment selection

In different water conditions different electrical fishing devices are needed. At the acquisition of electrical fishing equipment the following should be considered:

- The equipment should correspond to the conductivity of the water being fished in.
- The equipment should be as light-weight as possible.
- The operation should be simple.

To determinate the conductivity of a water a test should be sent to us. Thus we may decide what power and voltage is needed. If an operation of the equipment is intended in different waters, then the highest (and lowest) conductivity must be determined.



## 6. Electrode sizes

The size and shape of the electrodes have a substantial influence on fishing apart from the pure equipment power. Independently of power, type of current and conductivity applies:

- The larger an anode is, the current near to anode is concentrated the less. The power is better used (larger range at same power) and the fish will be more preserved.
- The output of the equipment is converted at anode and cathode. The power portion to the cathode is a loss, it contributes not to the catch effect. In the interest of a reasonable utilization of energy the cathode must have certain minimum dimensions at a given anode. By using too small cathodes the losses rise strongly. Accordingly larger anodes require larger cathodes.

Greater catching electrodes (anode) that have a better resistance and can therefore be used with less voltage but higher current, are using energy more efficient and have a better catchability. Because they distribute the current in a greater area they are more be easy on the fishes. However, the catching electrode must be tuned to the device's output power, the greatest catching electrode cannot be used with the smallest device. Our catching electrodes are obtainable with 30, 40 or 50 centimetre diameter. The power output of the device is transposed in one part at the catching electrode (anode) and the other part at the cathode. Last one is a loss and should be very small. Because of this the cathode must have a special relation to the circumference of the catching electrode. In most cases it is a good compromise if you choice for the length of the cathode 3 to 4 times of the circumference of the catching electrode (anode). The power loss is then 25%. If you are fishing in greater, troublesome water where working with a long cathode is no problem it may be useful if the length of the cathode is 6 to 8 times of the circumference of the catching electrode (anode). In this case power loss will be only 15%. More lengthening has no more appreciable use. In smaller, troublesome water you really don't need the full power of the device, but you may have problems at working with a long cathode. In this case a shortened cathode will be useful. In any case you should not shorten below 2 times of the circumference (power loss 35%). If more shortened power loss increases rapidly! The delivered standard length of 2 - 6 meters of the cathode is probably not the best solution in any case. You may order other lengths of the cathode. Above mentioned relations are independent from manufacturers, kind of current, power output and water conductivity. Disregarding this relations between cathode and anode is an often made mistake in electric fishing. Mostly catching electrodes are too small and cathodes too short. The supplied electrodes are co-ordinated. An enlargement of the electrodes entails also an increased power consumption, which means that the equipment is more loaded.

### 6.1. Handheld anodes

The anodes used for the steep-fishing are usually circular up to approx. 50 cm diameters. In principle electrical conditions are unfavourable because of the relatively small surface high current concentrations develop. They should be operated only with relatively small output power in order to avoid possible damage for the fish. A further disadvantage is the hard manual labour of the electro fisherman. The good mobility is favourable in difficult area conditions. Handheld anodes should be used if surface anodes are not applicable. This is the case in strongly structured waters with bent shore lines, constantly changing depth and numerous obstacles, e.g. driving wood and branches. Prefer anodes with as large as diameters as possible.

### 6.2. Area anodes

Area anodes presuppose a sufficient high equipment power output depending upon water conductivity. It concerns of large anodes (approx. 1 m x 1 m and more largely) from several parallel metal strips, also mentioned as strip anodes, which are usually installed at arms laterally at the boat. They are led with the movement of the boat, thus no operation is required. The work of the electrical fishing is limited to the pulling out of the fish and the equipment operation. Electrical conditions are really more favourable, in comparison to the handheld anode with same power a substantially larger water volume is "activated". There are no problems up to a depth of approx. 1 meter. A water strip of 2 - 3 meters broad constantly is fished in. In larger depths the operation is possible, if the anode is lowered (approx. 0.5 - 1.0 m).

The operation is particularly favourable:

- In shallow water areas, also with plants including sea-rose fields (parts of aquatic plants do not remain hanging, if the cross beam is led closely over the water surface and the easily down-hanging sheet metal slides over the surface.)
- Within bank areas with relatively smooth bank lines, for example stone pouring in rivers and channels or at narrow, sharp edged bank lines.

Under normal conditions this anode is used in continuous operation. The dead man key remains constantly switched on and the boat drives off the interesting areas. In shelter-poor waters with high escape readiness of the fish the scare away effect becomes unpleasantly noticeable with pulse operation mode. Then improving the catch by switching the anode on only briefly should be tried. The boat may be rowed as usual. The use of an engine results in a further clear facilitation of work. A condition is that the engine can be throttled far enough and the boat remains controllable. Direct current operation is recommended. The taxis is excellent, the fish swim the anode after and an anaesthesia hardly arises. Very large area anodes, as they are represented e.g. in electrified nets, must be operated with pulse if the direct current power output is not sufficient enough any longer.

### **6.3. Cathodes**

Cathodes may be made of copper or stainless-steel ropes or strips. Standard cathode: 2 - 6 meters long (depending on power of the device). But there are also floating cathodes available.

### **6.4. Adjustments**

The conductivity of the water is very variable and therefore the devices must be tuned to their highest load. This is primarily achieved by switching the voltage selector. According to the stage selected the current output (see the output current values on the name plate) should not be exceeded as this results in the device being switched off automatically. Should, however, the current increase, the power output can be adjusted by shortening the cathode. This can be achieved most simply by folding one part twice. In addition the anode should be made smaller at the same time. If no smaller anode catcher bow is available in such a way it is also possible to mask a part of it with insulating tape. It is also possible to achieve the same effect by putting back the hand throttle of the engine, but this results also in a power output reduction. Should, however, the maximum power output not be reached in any of the two stages, it would be possible to lengthen the cathode by means of a sufficiently thick copper strip (10 or 16 mm<sup>2</sup>) or stainless steel metal. Then it is possible to increase the anode, e.g. by a larger anode catcher bow.

## **7. Catching methods**

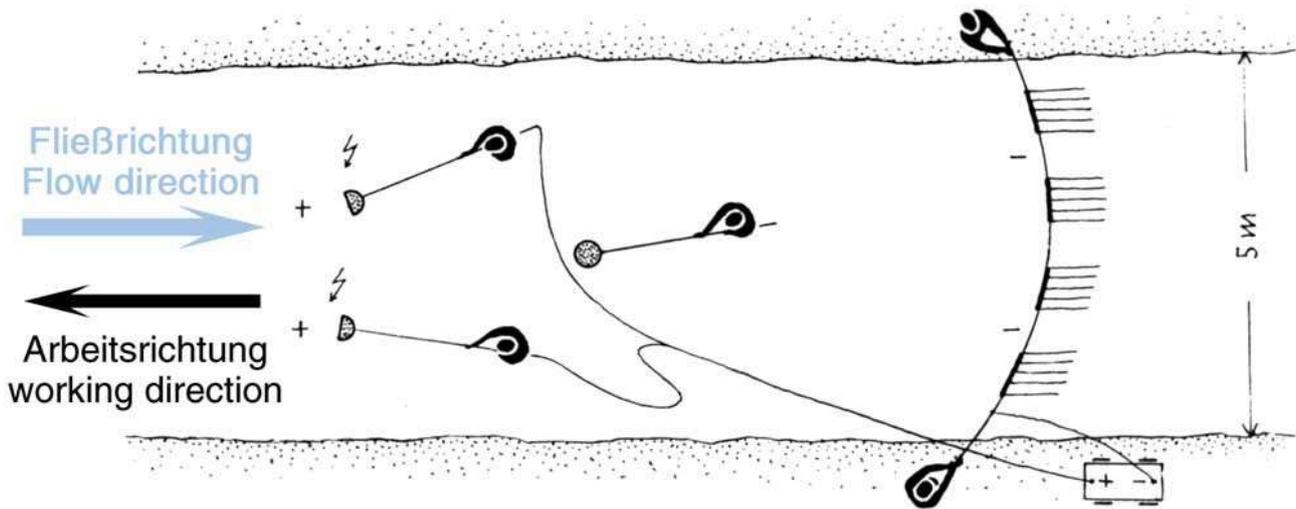
Before the working on a water, some general points should be considered. Fundamental a catching out of all fishes is to be differentiated from a catching out of some fishes. Catching out of all fishes is only possible in small, lock-offable waters. On the other hand catching out of some fishes is possible in nearly each waters. Particularly important is the fact that all cables and the equipment must be examined before the beginning of catching fishes, because the electrical fisherman has the entire responsibility for the catch action. To operate the electrical fishing device at least still another instructed assistant must be present except the electrical fisherman. All persons involved are to be informed and instructed about the special dangers. In addition isolated and waterproofed gloves, boots and/or wading trousers have to be used. If the electrical fishery is operated from the boat, life jackets are prescribed.

In order to preserve the equipment and particularly the fish, it is recommended at the electrical fishery to begin with the smallest output voltage that can be adjusted at the equipment. Only after that the output voltage needed for the catch must be regulated.

### **7.1. Electrofishing in streams**

Smaller brooks up to a width of approx. 5 meters, in which one can wade (wading fishery) are simplest for fishing. Therefore a battery equipment or equipment with petrol engine that the electrical fisherman carries on its back is used. As anode serves an electrified catcher bow with isolated rod. Most favourable the dead man key is inserted in the rear part of the rod. At the best one the cathode is constructed as a copper cable (without insulation) with approx. 16 mm<sup>2</sup> cross section. The length should be at least 2 meters long. The electrical fisherman pulls the cathode, which is connected with the equipment, in a distance from approx. 2 - 5 m behind itself (depending upon tract of land) and fishes thereby brook upward. The fish swimming to the anode will be caught out by the electrical fisherman or by the instructed assistants. Not out-caught fish try to escape brook upward.

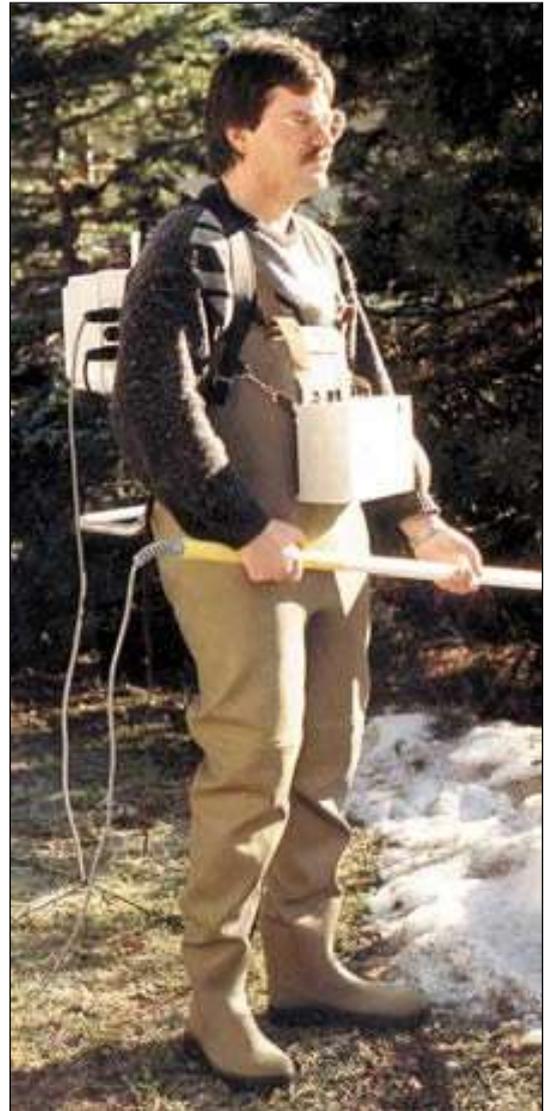
At obstacles, e.g. resoling thresholds, nevertheless these fish may still be caught out by the electrical fisherman. If the fish existence only is to be determined in a brook, then it is recommended not to take out the fish of the water. The kind of fish swimming to the anode should be named immediately by the electrical fisherman and their size estimated. An assistant registers these made data into a prepared list. However, with this method an electrical fisherman must have a good knowledge of the species.



If a brook must be fished out completely, the fishing-out distance is to be locked off with small mesh sized nets. Fishing direction is against the water flow. The fish swimming towards the anode will be taken out from the water by two assistants with normal, not electrified catcher bows. Because of a unique fishing session not all fish will be caught out, the distance must be fished out two or three times. Because of the fish, that were already one times in the current field, there should be a certain time interval between the individual fishing session, so that these animals may recover intermediate. In brooks being over 5 meters broad, it is more favourable to use two or three fishing devices at the same time with the wading fishery or using two anodes at one device, if the equipment power permits it. Electrical fisherman will work then next to each other in a line.

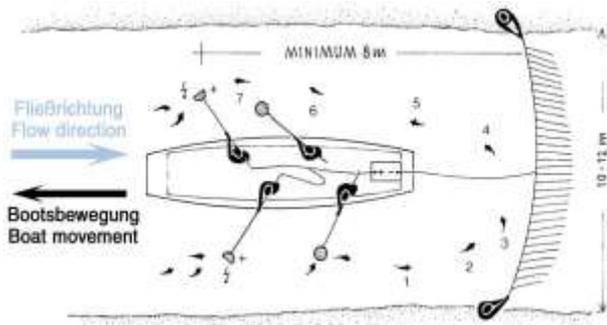
## 7.2. Electrofishing in rivers

In rivers either the wading fishery or the fishing from a boat may be exercised. With the wading fishery several portable devices or a freestanding device from the bank may be used. If a freestanding device is used, it should be fished with two or more electrified catcher bows. However, this depends on the power of the equipment and the width of water. If the water depth permits it, the operation from a boat with flat body is to be preferred. The electrical fishing equipment and the electrical fisherman are both situated in the boat. Thus the troublesome leading around of the long cables around bank obstacles is voided. As anode the electrified catcher bow is used. For better using of the scare away effect of the cathode in larger waters, a special adapted cathode should be used. Beside the standard pulled tight rope cathodes, following cathode forms promise a better success.

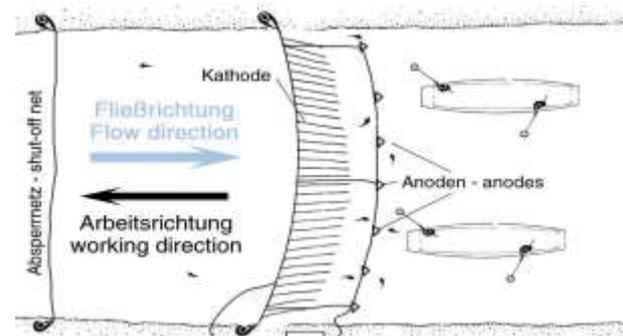


**Method A:**

One cathode form consists of an approx. 6 -8 millimetre strong steel cable, which is enough from one bank side to on the other. At this steel cable further steel cables are fastened in a distance of about 10 centimetres, which should reach up to the waters bottom. Thereby the scare away effect is used on the whole waters width. This cathode, which must be isolated at both ends, is adjusted by assistants on the bank upstream behind the electrical fisher-man.



Method A



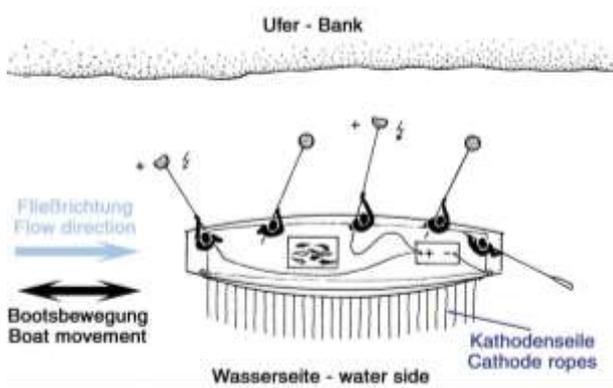
Method B

**Method B:**

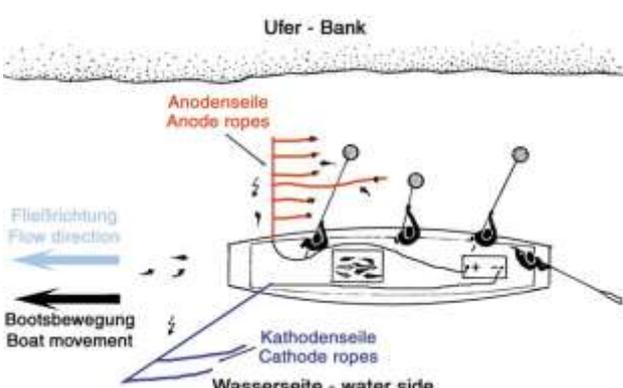
A further catch technology consists of a combined catch and scare away line. At a steel cable carried by floats in a distance of 25 centimetres are stainless steel tapes fastened with 30 millimetres broad. This tapes have a length of approx. 2.5 meters each and are used as the cathode. As the anode at a steel cable in the distance from 2.5 meters triangular timber frames will be additionally attached. The triangles are provided with narrow stainless steel strips. These anodes swim as far as behind the cathode (approx. 3 meters) that no contact between anode and cathode may happen. The chain is presented swimming on the water. They will come into the electrical field of the electrodes and collect themselves at the after-dragged anodes. There they will be caught out with simple catcher bows. Catch success with this method is very good, but very complex. Therefore the chain should not be build longer than approx. 25 meters, because of otherwise also the output power of the electrical fishing device may be not powerful enough.

**Method C:**

In broader rivers only a fishing at the banks is possible. A boat should always be used. Also here it may be more favourable to use special made anodes and cathodes. It is more favourable in any case to increase the cathode at fishing with the electrified catcher bow as anode. For this a rope cathode (e.g. a copper strip) is suitable. This is fastened to the long side of the boat, which is situated opposite the anode. By the electrical scare away field of the cathode is achieved that fish, which want to escape under the boat arrive again at the catch anode.



Method C



Method D

**Method D:**

Very good catch successes is also achieved by the following method. It is suitable particularly for the fishing at banks of larger waters from the boat. As anode is not an electrified catcher bow, but one at the boat fastened "strip anode" used. To a 1.5 meter isolated mounting plate are fastened in a distance of 10

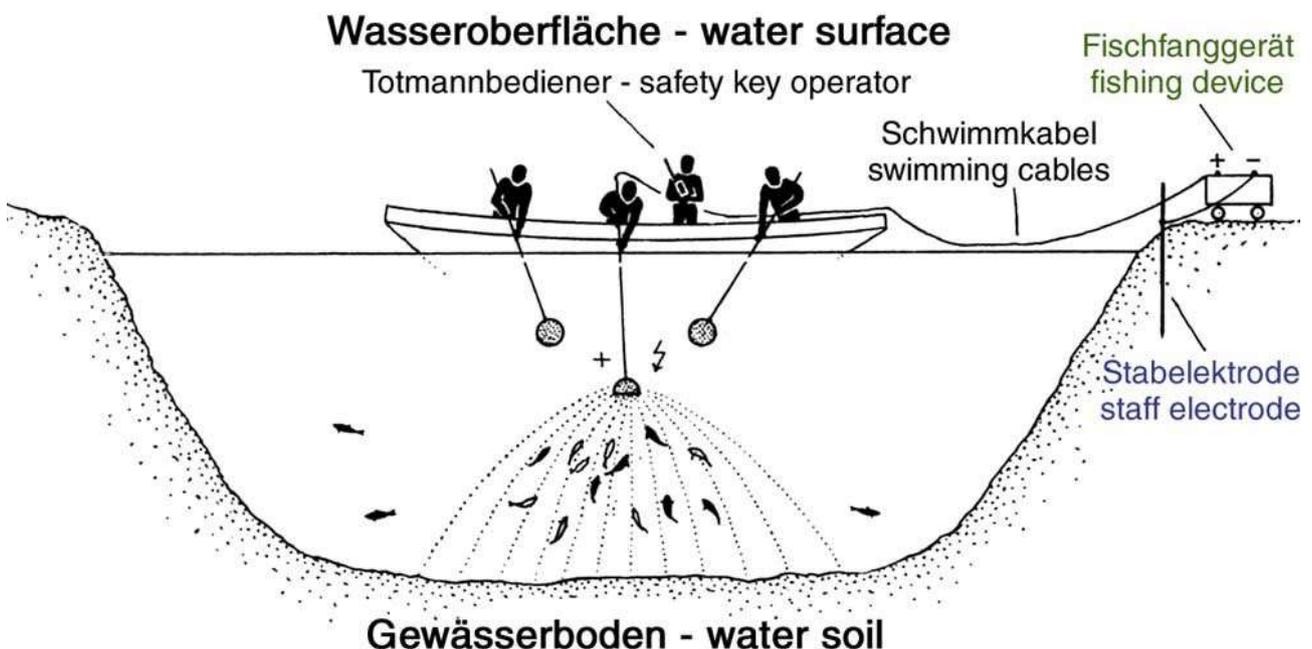
centimetres thin stainless steel strips, with a length of 1.4 meters and 30 millimetres broad. At the ends of these stainless steel strips plastic floats are attached, so that the anode swims on the water. In the centre of the plastic mounting plate, additionally one more with floats equipped strip of approx. 4 meters is fastened. The cathode consists of two 8 millimetre strong and 6 meter long steel ropes. They are fastened facing the side to the anode. They should dive in the water approx. 2 meters before the beginning of the anode even mounted on an isolated plate. Against the other methods the fishing direction is not approximately, but with the water flow. The strip anode is turned to the bank. Good alternatives are star-electrodes.

Because of the fishes are swimming against the water flow, they try to escape pending the effect of the scare away field of the ahead-standing cathode. They come with their whole body width into the capture range of the "strip anode". There, towards the anode swimming fish will be caught out with a normal catcher bow. The good catch success is justified in the fact that the long steel ropes of the cathode go down to the water ground, which leads mostly better than the water and that the anode possesses a larger surface than an electrified catcher bow. Thereby also the anodic capture range becomes larger.

### 7.3. Electrofishing in standing waters

The methods for running waters, described so far, may be used exactly the same with standing waters. However, most standing waters have a large surface, so that here only a fishing at the banks is worthwhile itself, otherwise parts of the water would have to be locked off with nets.

Here is a method for smaller, or locked off waters that may have a good success. The fishing device may be situated either in the boat or at the bank. The special cathode is formed as a staff that is rammed in the earth on the bank or into the soil. The soil must have a good conductivity.



If a water may be fished in with nets only, likewise the possibility exists of electrifying these. Accordingly a powerful pulse equipment is needed for it. Here as anode a steel rope is twisted to the upper line and as cathode a steel rope to the down line.

Because of each water is different, the electrical fisher-man has to find out again and again the optimal catch method and/or always again examine these.

If questions, please contact:

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