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Bavarian State Research Center for Agriculture

Practical and legal aspects of transporting live fish

Information of the Bavarian State Research Center for Agriculture (LfL)

Imprint

Published by: Bavarian State Research Center for Agriculture (LfL)
Vöttinger Strasse 38, 85354 Freising-Weihenstephan, Germany
Internet: www.LfL.bayern.de

Editor: Institute of Fisheries
Weilheimer Strasse 8, 82319 Starnberg, Germany
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2nd edition: March 2018

Translation: Certrans GmbH, www.certrans.de

Nominal fee: €

Practical and legal aspects of transporting live fish

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1 Introduction

Fishermen, fish farmers, fishing associations and anybody else involved in fish transport are faced with numerous practical and legal demands concerning the transportation of live fish. There are a variety of legal obligations to be fulfilled in addition to the technical aspects and good management practice when handling fish.

In particular during the transport of life fish, the requirements of *Regulation (EC) No 1/2005 on the protection of animals during transport* that entered into force on 5 January 2007 and the requirements of the *German Decree on the protection of animals during transport* (*TierSchTrV*) must be complied with. Furthermore, there are the regulations to prevent the transfer of fish diseases (*German Fish Disease Prevention Ordinance - FischSeuchV*), the regulations for road traffic as well as in general the principles of the *German Animal Welfare Act (TierSchG*), which generally must also be observed when transporting live fish. Other relevant guidelines, regulations and laws can be found in Chapter 8 (Summary of the legal framework for the transportation of fish).

The accompanying information leaflet offers fishermen, fish farmers, fishing associations and anybody else involved in transporting fish an overview of the good management practice and the corresponding statutory regulations.

2 Practical aspects of transporting live fish

Basically, live fish transport must take place in such a way that the welfare of the animals is not compromised (KLEINGELD, 2015). Catching, sorting and transfer are incredibly stressful events for fish and only healthy fish are able to compensate for them. Additionally, as cold-blooded animals, fish are capable of tolerating a very wide range of water temperatures. Subject to their natural living conditions, our native fish species are able to tolerate an especially broad temperature range from just above 0 °C to 20 °C, and in some case higher. However, there are large species-specific differences in connection with this. Table 1 presents an overview of the physiological husbandry requirements of the important commercial fish species during culture, which are, in principle, also relevant to conditioning and transport. It must be noted that juvenile fish are more demanding with regard to both handling and water quality.

The water-quality parameters must be adjusted to the size and fish species, and must not be allowed to deteriorate to such an extent due to and during the transport that they are harmful to the fish. As every form of acclimatisation costs the fish energy, and ultimately negatively influences the condition and quality of the fish, abrupt changes in the environmental conditions must be avoided. Where there are large differences between the initial water and the water in the transport container or stocking water, the water must be slowly exchanged to allow continuous acclimatisation by the fish.

The transport of different fish species and sizes together should also be avoided, as they could injure each other, or it could lead to additional stress. Examples of such cases would be species with ctenoid (rough) and cycloid (round) scales, or transporting together predatory and non-predatory fish. The earlier common use of white fish as “buffer fish” between ctenoid-scaled fish (perch, zander) is

no longer considered to be in accordance with animal welfare practices, as this unavoidably leads to the white fish being injured.

Fundamentally, only healthy fish must be considered for transport. Moreover, sick fish should also not be transported or transferred in view of the associated spread of diseases. In this context, prospective liability claims by the consignee must be taken into consideration.

*Table 1: General physiological requirements of different fish species concerning the environmental conditions (SCHRECKENBACH, 2010, *modified)*

Environmental parameter	Unit	Critical lower range	Limited lower range	Optimal range	Limited upper range	Critical upper range
1. Trout and perciform species						
Oxygen (O_2)	mg/l	to 4.0	6.0 - 6.9	7.0 - 30	31 – 35	to 40
pH value		to 4.8*	5.2* - 6.0*	6.0* - 8.0	8.1 - 8.8	to 9.0
Carbon dioxide (CO_2)	mg/l	to 0.5	1 - 4	5 - 8	9 - 12	to 20 [2)]
Nitrogen (N_2)	% satur.	-	-	< 100	100 - 103	to 105
Ammonia (NH_3)	mg/l	-	-	< 0.01	0.01 - 0.07	to 0.1
Nitrous acid (HNO_2)	mg/l	-	-	< 0.0002	0.0002 - 0.0005	to 0.002 [1)]
Nitrite (NO_2)	mg/l	-	-	< 1.0	1.0 - 2.0	to 3.0 [1)]
Nitrate (NO_3)	mg/l	-	-	< 200	200 - 300	to 400
2. Carps, sturgeons, eels and catfish						
Oxygen (O_2)	mg/l	to 3.0 [K]	4.0 - 4.9	5.0 - 30	31 - 35	to 40
pH		to 5.5	6.0 - 6.9	7.0 - 8.3	8.4 - 10	to 10.5
Carbon dioxide (CO_2)	mg/l	to 0.5	1 - 6	7 - 18	19 - 20	to 25 [2)]
Nitrogen (N_2)	% satur.	-	-	< 100	100 - 103	to 105
Ammonia (NH_3)	mg/l	-	-	< 0.02	0.02 - 0.1	to 0.2
Nitrous acid (HNO_2)	mg/l	-	-	< 0.0004	0.0004 - 0.001	to 0.004 [1)]
Nitrite (NO_2)	mg/l	-	-	< 1.0	1.0 - 3.0	to 5.0 [1)]
Nitrate (NO_3)	mg/l	-	-	< 200	200 - 300	to 800

K = cyprinoid species to 2.0 mg/l oxygen

1) for Cl^-/NO_2-N –ratios > 8 (2) to > 17 (1) even higher HNO_2- and NO_2 concentrations will be tolerated (NaCl-, $CaCl_2$ baths)

2) higher CO_2 levels are also tolerated at high alkalinity and high oxygen saturation

2.1 Transportation in closed systems

Basically, transportation systems can be divided into open and closed systems. Closed systems are completely sealed containers, which must contain the necessary water and essential oxygen for the entire duration of the journey. Generally, the transport water and the remaining atmosphere are highly enriched with pure oxygen from a gas bottle in order to guarantee the survival of the fish throughout the entire duration of the journey. Transport bags are an example of this. In practice, 50 l plastic bags have become the established means of transporting fry and juvenile fish. When transporting fry in bags, the corners must be tied to prevent the fish collecting in the corners when seeking safety, which in turn can lead to them becoming trapped. Even more appropriate is the use of special fry and ornamental fish transport bags with ready-made, rounded-off sealed corners. For security, double-bagging is recommended. The bags are filled at a ratio of 1:3 or 2:3 (water : gas atmosphere) (Fig. 1).

Fig. 1: Filling the transport bags with oxygen (left: bag without gas with 1/3 water and fish; centre: after filling with oxygen; right: closing the transport bag filled with oxygen)

The transport bags should lie flat so that the water surface is as large as possible for effective gas exchange (solution of the gaseous oxygen in the water, outgassing of the carbon dioxide dissolved in the water) (Fig. 2). Furthermore, the transport bags should lie at right angles to the direction of travel. This reduces the stress to the animals from the water movements caused by the vehicle. It is recommended that a dark cover be placed over the transport bags lying in the transporting vehicle in order to reduce stress from light exposure. The fish are then calmer. When smaller transport bags are used, it is strongly recommended that they are packaged in polystyrene boxes, as these offer good insulation (preventing chilling or heating of the smaller packaging units).

Fig. 2: Horizontal transport of the transport bags

Agitation of the water surface is advantageous to ensure that there is always sufficient oxygen dissolved in the water during transport. The water movement during the journey generally guarantees optimum gas exchange. Stationary periods exceeding 20 minutes must be avoided with salmonids. They can be 30 to 60 minutes with cyprinids (BOHL, 1999). Tables 10 to 12 in the appendix provide reference values and recommendations for fish transport in plastic bags.

2.2 Transportation in open systems

Open systems are described as containers in which the water is supplied with the necessary oxygen from an external source (Fig. 3 and Fig. 4). In the simplest case, this is a container with an airstone, however usually specially made fish transport containers are used for live fish transport. They are square, have a water depth of around 1 m and a volume of around 1000 l to 2000 l. The general rule is, the taller the container or the higher the water level the more time the rising oxygen has to dissolve in the water column. Commercially available fish transport containers are made from fish-compatible material and insulated against temperature fluctuations. If transportation does not take place in insulated containers, then possible heating or chilling of the water must be taken into consideration.

Fig. 3: Trailer with transport containers with fish gates and installed oxygen supply

Fine-pored rubber or plastic tubing and ceramic stones, which produce particularly small oxygen bubbles, are used for optimum oxygen input. In this way, a large surface area is achieved, which guarantees maximum solution of the gaseous oxygen. However, according to RÜMMLER (1986), the degree of oxygen utilisation here is only in the range of 5 to 10%. Most commonly, the oxygen is introduced through a perforated tube in the container floor, keeping in mind that the effectiveness is related to the maximum height of the water column. Through the introduction of oxygen, a low volume of carbon dioxide and ammonia, which is harmful to the fish, is discharged. The containers must not be gastight when closed to allow the released gases to escape and prevent excess pressure forming. Furthermore, containers with fish gates allow the fish to be unloaded quickly and stress-free, e.g. by sliding out into the destination water. A discharge valve allows simple flow-through water exchange, as the container can be filled at the same time with fresh water from above while the valve is open. Disinfection is also easier as the disinfection solution can simply flow out after the contact time.

Oxygen input must be controlled primarily according to experience, as there are many factors determining the requirements of fish. If the fish demonstrate unusual behaviour, intervene by raising or lowering the oxygen input.

The weight of the fish that can be transported is dependent on the effectiveness of the oxygen supply, the water volume, the temperature, the transport duration, and the fish species and size. Some empirical values relating to this are presented in the appendix (Table 13 and Table 14).

Fig. 4: Oxygen control unit with pressure regulator and three control valves with flow meter for the container

Rules of thumb for the oxygen requirements of trout during transport:

- 100 kg rainbow trout require approx. 4 l oxygen per minute or 240 l/h;
- in summer 200 kg and in winter 250 kg plate-size trout can be transported for 6 to 8 hours in 1000 l water.

2.3 Oxygen, carbon dioxide, pH and ammonia

Essentially, the oxygen supply determines the amount of fish that can be transported and the duration of the journey. The use of or demand for oxygen (O_2) is dependent on a number of factors such as the fish species, age and weight of the fish, water temperature, stress effects, condition and time of last feed. Generally, an equal amount of fry in kg compared with adult animals requires a larger amount of oxygen, or, in other words, the same amount of oxygen can supply a larger number of adult fish in kg than juvenile fish (Table 2). For warm-water fish like carp, an oxygen level in the transport water exceeding 5 mg/l should be maintained. Cold-water fish have a higher demand, and for salmonids the dissolved oxygen level should be greater than 7 mg/l. Through the use of technically introduced oxygen, this ultimately stops being a limiting factor during fish transport in open systems. In comparison to the oxygen demand of carp, the requirement of trout is 2.83-times higher, in zander it is 1.76-times, in pike 1.10-times, and in eels and tenches 0.83-times (BERKA, 1986). As a rule, pure oxygen is used during transport and not pressurised air. In this way, on the one hand, a high oxygen level is achieved, and on the other hand, the risk of heating caused by the external temperature is reduced. At the same time, carbon dioxide and ammonia are released manyfold. The limits for excess oxygen are usually not reached and saturation values of up to 150% or a level of 35 mg/l are tolerated, for example by rainbow trout (HEINER, 1983).

In addition to oxygen, the parameters carbon dioxide (CO_2), pH and ammonia (NH_3) are also very important (SAMPAIO & FREIRE, 2016). They are closely interrelated. The optimum pH values for fish are 7–8 (7 being

neutral). Rapid changes beyond the optimal range mean stress resulting from disturbance of the acid-base balance (SHABANI et al., 2016). Around 0.9 ml carbon dioxide is produced by breathing 1 ml oxygen so that CO_2 becomes concentrated during the journey. Values above 20-30 mg/l can be exceeded easily if the water is not sufficiently oxygenated and the CO_2 is barely removed. High CO_2 levels in the water hinder the release of CO_2 from the blood of the fish, which then becomes acidified. Thus, the oxygen-binding capacity of the blood decreases (respiratory acidosis) so that the fish can suffocate although sufficient oxygen is available. The limits for CO_2 given in the literature vary greatly, as its harmfulness is dependent on the oxygen content and acid neutralising capacity (ACN). Trout appear to tolerate CO_2 values up to 15 mg/l well, but begin to show signs of stress at 25 mg/l (PIPER et al., 1982). Table 3 presents the upper limits for carbon dioxide. Problematic situations can arise in closed systems, whereas in open systems a lot of carbon dioxide is lost through oxygenation with pure oxygen. CO_2 is also largely insignificant in closed systems with low stocking densities.

Nitrogen, as a product of metabolism, is primarily excreted through the gills as ammonium (NH_4^+) and ammonia (NH_3). With increasing pH and temperature, the dissociation equilibrium shifts strongly towards the highly toxic ammonia (Table 4). At high levels of free ammonia in the water, fish are only able to release limited amounts of metabolic ammonia against the concentration gradient, which in turn leads to self-intoxication. The oxygen demand, heart rate and blood pressure increase and lead to metabolic disturbances, especially in the brain. The limits for NH_3 are very low (Table 5) and should not be exceeded over a prolonged period. However, sufficient starvation can greatly reduce the danger of a critical accumulation of NH_3 during journeys.

Table 2: Amount of rainbow trout with the same oxygen requirement (BERKA, 1986)

Stock weight and length	Number
25 kg rainbow trout (à 250 g)	100
20 kg fingerlings (12 cm)	1,100
17 kg fingerlings (8 cm)	3,200
12 kg fry (4 cm)	approx. 23,000

Table 3: Upper limits for carbon dioxide in closed systems (sources from BERKA, 1986)

Fish species	CO_2 [mg/l]	Authors
Warm-water fish	140	PECHA et al., 1983
Cold-water fish	40	PECHA et al., 1983
Salmonids	60-70	KRUZHALINA et al., 1970
Sturgeon adult	40	KRUZHALINA et al., 1970
Sturgeon fry	20	KRUZHALINA et al., 1970
Herbivorous fish (adult)	140-160	KRUZHALINA et al., 1970
Herbivorous fish fry	100	KRUZHALINA et al., 1970
Herbivorous fish larva	80	KRUZHALINA et al., 1970

Table 4: Percentage of ammonia [mg/l] subject to the pH and water temperature (SCHÄPERCLAUS & v. LUKOWICZ, 1998)

pH value	Water temperature				
	5 °C	10 °C	15 °C	20 °C	25 °C
6.5	0.04	0.06	0.09	0.13	0.18
7.0	0.12	0.19	0.27	0.40	0.55
7.5	0.39	0.59	0.85	1.24	1.73
8.0	1.22	0.83	2.65	3.83	5.28
8.5	3.77	5.55	7.98	11.18	14.97
9.0	11.02	15.68	21.42	28.47	35.76

Table 5: Limits for free ammonia in acclimated fish (SCHÄPERCLAUS & v. LUKOWICZ, 1998)

Fish species	NH_3 [mg/l]
Carp	0.02
Eel	0.01
Trout (feeding fry)	0.006
Trout (adult animals)	0.01

2.4 Starvation

The fish should be starved before handling and transport, i.e. feeding must be stopped in good time. Starvation prior to transport serves to empty the digestive tract of the fish in order to prevent pollution of the transport water through excrement, in turn causing oxygen depletion (KAMALAM et al., 2017). Fish that have not been starved require up to 100% more oxygen during the digestion phase, and are also more susceptible to stress. The possible journey time for improperly starved fish can be reduced by approximately fifty per cent (BERKA, 1986). However, the duration of starvation must always be adjusted to the fish species, fish size and temperature, and kept as short as possible, as the immune response of the fish already begins to deteriorate after a short starvation period (Table 6).

Table 6: Starvation times prior to transport (sources from BOHL, 1999)

Fish species	Stop feeding	Transport duration	Authors
Carp from grow out ponds	7 days	-	Gerstner
Fish from warm-water systems	1 day	-	Reichenbach-Klinke
Salmonids	2-5 days	-	Reichenbach-Klinke
Salmonids (200 g-1000 g) 10-12 °C	3-5 days	8-10 hours	Feldmann
Salmonid fry (2-3 g) in 10-12 °C	2 days	6-8 hours	Hofer
Salmonid fry (1 g) 10-12 °C	2 days	8-10 hours	Steinhart
Feeding rainbow trout fry (0.2 g) 10-12 °C	max. 6 hours	-	Steinhart

Complete emptying of the digestive tract can take two to seven days depending on the water temperature, as well as the fish species and size. Under warm-water conditions, a starvation period of one day can also be sufficient as the metabolism of the fish is accelerated at higher temperatures. Complete starvation should be avoided for fish larvae and young fry to maintain good condition, and as with adult fish, the journey time should be adjusted to the survival period without feed.

2.5 Water temperature and acclimatisation

Cool water temperatures must be aimed for during transport, as this reduces the metabolic activity and oxygen use of the fish. An additional beneficial effect is the high oxygen solubility in cold water. In general,

water temperatures above 18 °C and below 3 °C should be avoided when transporting native species. For cyprinid larvae and fry, the temperature must not drop below 15 °C, while this represents the maximum temperature for young salmonid fry (BOHL, 1999).

Various reference values are given in the literature for the temperature of the transport water for cold and warm-water fish (Table 7). Furthermore, during the journey the water temperature should not fluctuate by more than 1-2 °C, if possible. The influence of the surrounding air temperature can be reduced through the use of insulated containers or packing in polystyrene boxes. Liquid oxygen has a cooling effect on the transport water, whereas warming can be expected when using pressurised air at high outside temperatures.

Table 7: Reference values for the temperature of the transport water (BERKA, 1986; BOHL, 1999)

	Summer	Spring/Autumn	Winter
Cold-water fish	8-12 °C	5-10 °C	4-10 °C
Warm-water fish	15-20 °C	5-15 °C	1-5 °C

Where the temperatures of the source and transport waters differ by several degrees, depending on the age of the fish, acclimatisation is essential, especially as changes in temperature cause severe stress reactions (LÜBKE & WEDEKIND, 2016). The difference should not exceed ±1 °C for salmonid sac fry (BERKA, 1986). Older fry can tolerate differences from –3 °C to +5 °C. In larger trout, the difference should be a maximum of ±5 °C (BOHL, 1999).

Acclimatisation should take longer when there is a greater difference in the temperatures. For a temperature difference of 5 °C, the adjustment period should be at least one hour. Generally, acclimatisation at warmer temperatures is less problematic for the majority of fish species and is also faster. The acclimatisation can be performed by slowly mixing the water (transport and stocking water), which also has the advantage of aligning the chemical properties of the water.

When using plastic bags or smaller containers, these should initially be placed in the stocking water so that the temperature can adjust. Due to the lack of water movement, the duration of this adjustment must not exceed 20 minutes for salmonid fry, whereas the adjustment period for cyprinid and catfish fry may be extended to one hour (BOHL, 1999).

2.6 Stress and injury prevention

The unavoidable stress to the fish caused by catching and transport must be kept as low as possible, not just for animal welfare reasons, but also with regard to the fish quality and fish health. Handling the fish during catching, removing from the water, and overcrowding in transport containers is incredibly stressful and leads to severe physiological reactions (WEDEKIND & SCHRECKENBACH, 2004; HARMON, 2009). These processes can also be detected through the release of cortisol by the fish into the surrounding water immediately after catching and transfer. Studies show that fish can compensate relatively well for this kind of stress

if the subsequent conditioning or culture conditions meet their requirements. Thus, cortisol excretion due to acute stress has been shown to skyrocket in rainbow trout after transfer. This reaction then subsides again within a few hours (Fig. 5). However, every type of stress is associated with often enormous energy consumption, which can potentially lead to a long-term increase in disease susceptibility or can even lead to reduced quality of the stocking or fish as food (WEDEKIND, 2004a; WEDEKIND, 2012).

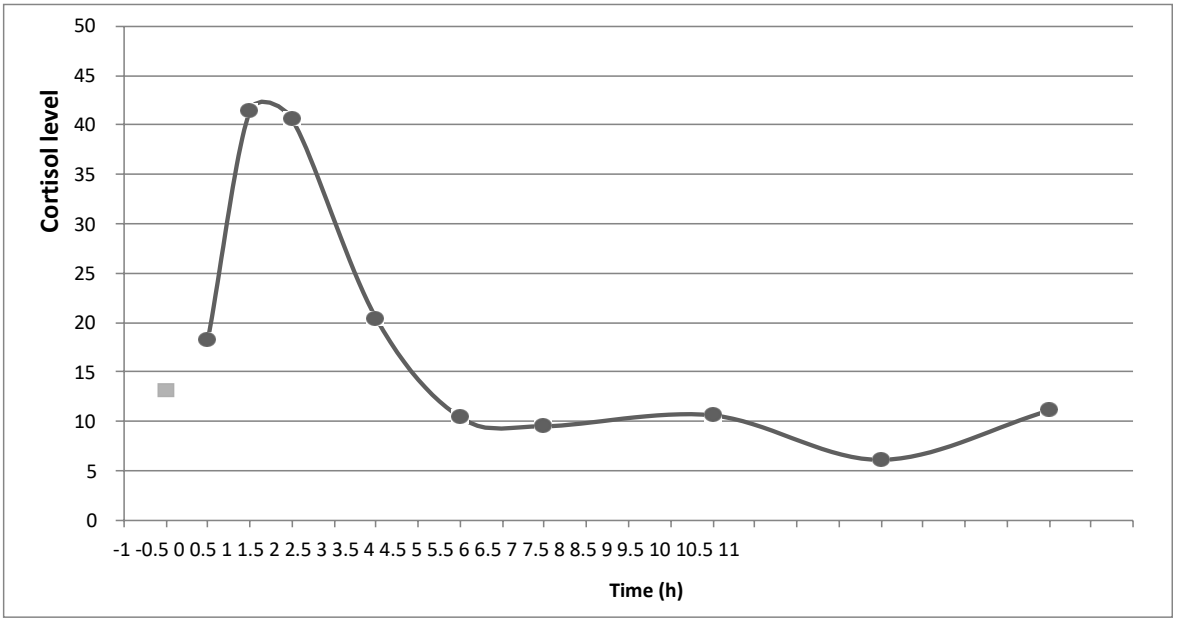

Fig. 5: Stress reaction curve for rainbow trout after transfer (WEDEKIND, 2015; LÜBKE & WEDEKIND, 2016)

The transport should therefore be as gentle as possible, as fish suffering from stress have a considerably higher oxygen demand. As a result, primarily the risk of suffocation increases, and critical levels of carbon dioxide can also be reached. Furthermore, the ion balance is negatively affected, and the excretion of ammonia rises. Loading is the greatest stress situation for the fish, and for this reason, the transport water must already have a high oxygen saturation level before stocking. Up to 50-60 % more oxygen can be supplied until the acute stress reaction begins to wear off after about one hour and the fish relax again. A high level of oxygen saturation of up to 150% does not present a problem for salmonids and cyprinids.

When harvesting fish crowded in a drag net from a pond or tank, a fish pump or fish lift is a particularly gentle means of removing them. At the same time, care should be taken to ensure that the drop height is as low as possible and the containers are designed in a fish-friendly manner. During netting, gentle handling involves the shortest possible period out of water, low fill quantity (not too many fish in the net!) and above all, for fish with hard dermal fin rays and ctenoid scales, the further transport in water-filled buckets is particularly important to prevent losses and subsequent damage (Fig. 6). Mechanical stresses should be kept as low as possible through the use of landing nets with knot-free netting. To keep fish injuries to a minimum resulting from contact with hard surfaces, these are best loaded “wet” (Fig. 7).

Fig. 6: Gentle handling during landing (left) and further transport in water-filled buckets (right)

Fig. 7: Fish-friendly "wet" stocking of a transport container

It is even recommended for especially sensitive fish that sodium chloride be added to the water during the journey. The fish demonstrate more relaxed behaviour after the increase in salinity and are therefore less susceptible to injuries. The recommended concentration is 0.5%. For grass carp, however, sodium chloride must only be added at temperatures up to 15 °C, as it can lead to increased mortality at warmer temperatures (BOHL, 1999). As well as this salt addition, the use of magnesium chloride (MgCl, concentration 0.35 %) and humins has also been successful in zander and other perciform species (WEDEKIND, 2004b). Doing so strengthens the electrolyte balance of the fish and stimulates mucus production.

2.7 Transport of selected fish species

2.7.1 Transport of zander

Zander are sensitive fish and should only be transported at low temperatures to reduce stress. Optimum temperatures are 10 °C-12 °C. Below 5 °C, the fish become lethargic and concentrate on the floor. Being so close to one another leads relatively quickly to mutual injuries of the mucus membranes and eyes caused by their ctenoid scales and their spiny fins. For this reason, the containers must be filled to a very high level so that water movement is kept to a minimum, and the fish can maintain their distance from each other. There are also special containers with a "dome", a pipe containing a swimming ball installed in the lid, which ensures pressure differences are compensated during the journey (Fig. 8). When transporting in plastic bags, it is recommended that the sacks are held upright to reduce movement. Furthermore, thick transport bags or double-bagging is recommended to prevent perforation of the bags and leakage of the water and oxygen. Additionally, it is sensible to add 0.5 % sodium chloride and to blackout the containers or bags. Furthermore, zander are sensitive to high levels of gassing with pure oxygen, and therefore pressurised air is better suited.

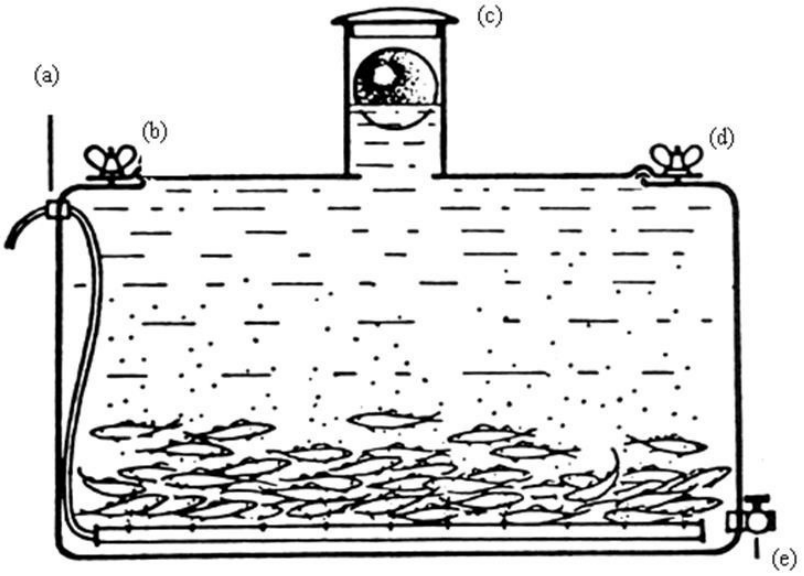

Fig. 8: Special containers for transporting zander with a "dome" and swimming ball to compensate for the water movement. (a) aeration device, (b) rubber joint, (c) removable cover, (d) tightening screw, (e) outlet valve (BERKA, 1986)

2.7.2 Transport of pike

Pike must only be removed from their source water at temperatures below 15 °C, as they only remain quiet at lower temperatures and therefore cause each other fewer injuries. Injuries to the mucus membranes in pike can quickly lead to fatal fungal infections, and for that reason they should never by weighed dry. The transport recommendations are similar to those for zander but they can be transported at higher densities (Table 8). Cannibalism can be suppressed by blacking out the containers.

Table 8: Recommendations for the transport of zander and pike (BOHL, 1999)

Transport at 10-12 °C and 0.5 % added sodium chloride	
Fish species	**Total volumes: Fish**
Zander 1-year (approx. 8-12 cm; 8 g)	25:1
Zander 2-year (approx. 20-30 cm)	20:1
Older zander (from 30 cm)	15:1
Pike 1-year (approx. 15-25 cm)	6:1
Pike 2-year	5:1

2.7.3 Transport of eels

Transporting glass eels should take place at low transport water temperatures of 6-8 °C in order to keep the fish calm. The oxygen supply should not be too high. For larger eels, the aeration inlet should be attached to the container floor to stop the eels pressing it upwards or pushing it over, meaning the oxygen is no longer distributed evenly. Glass, stock and harvest-ready eels can also be transported "damp", as they can breathe through their skin. Transport can take place in polystyrene boxes, onto which ice is laid thereby providing the necessary moisture as it melts. Reference values for the transport of eels are given in Table 9.

Table 9: Reference values for the transport of eels (BOHL, 1999)

Transport at 3-15 °C for up to 24 hours		
Fish species	**Wet transport in 1 m³ water**	**Damp transport on a 1 m² surface**
Glass eels	75 kg	6 kg
Stocking eels	275 kg	25 kg
Harvest-ready eels	400 kg	40 kg

2.7.4 Transport of fertilised salmonid eggs in egg transport boxes

Transporting eggs is possible in special egg transport boxes (Fig. 9). For this, the eggs are laid in a thin layer onto a tray in a transport box (Fig. 10). These trays are often separated into small compartments to reduce the chance of the eggs slipping during the journey. Ice is placed on the tray above. This melts during transport and in doing so, cools and provides moisture for the eggs. All the trays in the box are perforated. Therefore, thaw water constantly flows over the eggs, and no low-oxygen zones form.

Fig. 9: Insulated egg transport box (left) with special insert for egg transport (right)

Fig. 10: Inserts for transporting salmonid eggs, with eggs (left) and covered with ice for moisture and cooling (right)

2.7.5 Transport of ornamental fish

A basic distinction is made between “cold-water” fish (e.g. pond fish) and thermophilic species (tropical or subtropical ornamental fish) when transporting ornamental fish. The appropriate temperature range or the previous holding temperature should be maintained when transporting the respective fish species. Consequently, the transport bags should be placed in well-insulated containers (transport boxes), which are equipped with heat packs during longer journeys. Especially with small ornamental fish, transport bags with rounded or sealed corners are essential to prevent injuries and losses through the fish becoming trapped. The packing itself must follow the procedure already described in Point 2.1, whereby a water/gas ratio of 1/3 to 2/3 should generally be observed (Fig. 11). Fish species with hard dermal fin rays should be packed in several bags inside each other, which if necessary are protected against piercing by an intermediate layer of packaging or newspaper. In contrast to other species, transport bags with high-backed fish should be placed upright in transport boxes and stabilised in this position (Fig. 12). In principle, only the same species of ornamental fish should be packed together in one container,

especially as some species release poisonous substances. Large and aggressive individuals should be packed individually.

Fig. 11: Filling a transport bag with oxygen (left: bag without gas with 1/3 water and fish; centre: transport bag filled with oxygen; right: closed transport bag)

Fig. 12: Transport in insulated boxes. As a deviation of the basic rule, standing transport of high-backed fish

3 Statutory regulations for the transportation of fish

The transport of live vertebrate animals, therefore also fish, is regulated in *Regulation (EC) No 1/2005* (*Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport and related operations and amending Directives 64/432/EEC and 93/119/EC and Regulation (EC) No 1255/97*) and the *TierSchTrV* (*Decree on the protection of animals during transport and the implementation of Council Regulation (EC) No 1/2005 (Decree on the protection of animals during transport - TierSchTrV)*). These regulations serve to protect the animals during transport (*Section 1 (1) TierSchTrV in conjunction with Article 1 (1) of Regulation (EC) No 1/2005). Regulation (EC) No 1/2005* and the *TierSchTrV* only apply to the transport of fish carried out in connection with an economic activity and also include cases which directly or indirectly involve or aim at a financial gain (*Paragraph1 Section2 TierSchTrV* in conjunction with *Article 1 (5) Regulation (EC) No 1/2005).* Thus, the regulations do not apply, for example, to fishing associations if these do not operate commercially. However, the provision of *Section 7* (obligations of the sender) and *Section 8* (*c.o.d. shipments*) of the *TierSchTrV* (see Point 2.4) and the provisions set out in the *TierSchG (Animal Welfare Act)* must also be taken into consideration in the case of a non-economic activity.

3.1 General conditions for transport

Article 3 of *Regulation (EC) No 1/2005* covers the general conditions for the transport of live animals. Thus, fish transport must not take place if this could cause injury or undue suffering to the animals. The fish must be fit for the journey, and arrangements must be made in advance to minimise the length of the journey as far as possible. Furthermore, the welfare of the animals must be checked regularly and maintained in an appropriate manner. The means of transport must be designed, constructed, maintained and operated so as to avoid injury and suffering and ensure the safety of the animals. Furthermore, the personnel handling the animals must be appropriately trained and qualified (depending on fitness for transport, means of transport and transport practices). Here, training as a fish farmer is naturally sufficient qualification, and every fish farmer may also appropriately train other persons (e.g. his driver).

3.2 Transport documentation

No transport documents are required if the fish farmer is transporting his own animals, in his own means of transport for a distance of less than 50 km from their holding. Then only *Article 3 (General conditions for the transport of animals)* and *Article 27* (*Inspections and annual reports by the competent authorities)* of *Regulation (EC) No 1/2005* (*Article 1 (2) (b) Regulation (EC) No 1/2005*) apply. Transport documentation must be carried when transporting animals a distance of more than 50 km, stating:

- the origin and ownership of the animals;
- their place of departure;
- the date and time of departure;
- their intended place of destination;
- the expected duration of the intended journey;

(*Article 4 (1) Regulation (EC) No 1/2005*). The transport documents can be informal; a delivery note with the necessary information is therefore sufficient.

When transporting live fish between EU Member States ("intra-Community trade"), TRACES notification is required and if necessary, also a health certificate to be issued by the Veterinary Office (see Chapter IV). Whether and which examinations are necessary in conjunction with this must be clarified with the competent authority. TRACES stands for "TRAde Control and Expert System" and should ensure, among other things, the traceability of animal movements.

For the transport of fish to third countries, i.e. States outside the EU, it may be necessary to check oneself with the consignee or the embassy of the receiving country regarding what kind of certificate and examination is necessary. Here, the issuing authority is again the Veterinary Office. When importing fish from third countries, a TRACES notification must be created at the border inspection post.

3.3 Transporter authorisation

If the fish are to be transported over a distance greater than 65 km, authorisation as a transporter is required from the Veterinary Office (*Article 6 (1) in conjunction with (7) Regulation (EC) No 1/2005).*

The transporter, according to *Article 2 (x)* of *Regulation (EC) No 1/2005*, is any natural or legal person transporting animals on his own account, or for the account of a third party.

The transporter authorisation will only be issued by the Veterinary Office if the applicants are also established in the Member State where they apply for authorisation. They must have demonstrated that they have sufficient and appropriate staff, equipment and operational procedures at their disposal to enable them to comply with the Regulation. Furthermore, they must have no record of serious infringements of Community legislation and/or national legislation on the protection of animals in the three years preceding the date of the application (*Article 10 (1) Regulation (EC) No 1/2005*).

For transporter authorisation, a distinction is made between journeys of up to 8 hours and journeys of over 8 hours. Journeys of up to 8 hours require Type 1 authorisation (see Appendix 2); journeys over 8 hours require Type 2 authorisation (see Appendix 3), which also applies to all other journeys (*Annex III Forms Chapter I and Chapter II Regulation (EC) No 1/2005)*. Both forms of authorisation are valid for a maximum of five years (*Article10 (2) and Article 11 (3) Regulation (EC) No 1/2005*). Journeys lasting over 8 hours are considered long journeys and applicants additionally have to submit contingency plans in the event of emergencies (*Article 11 (1) (b) (iv) Regulation (EC) No 1/2005*). The contingency plans must include how to handle the animals in critical situations and come into play, for example, in the case of technical faults with the transport vehicle.

The certificate of approval for the means of transport is not generally necessary for the transport of live fish, as special containers are used for this (*Art.7 (1) in conjunction with (3) Regulation (EC) No 1/2005*). Furthermore, no journey log (*Article 5 (4) Regulation (EC) No 1/2005*) and certificate of competence of the drivers according to *Article 17 (2)* of *Regulation (EC) No 1/2005* is required (*Article 6 (5) Regulation (EC) No 1/2005*).

3.4 Means of transport and containers

Transporters must transport the fish in accordance with the technical rules set out in *Annex I* of *Regulation (EC) No 1/2005* (*Article 6 (3) Regulation (EC) No 1/2005*).

The fish must only be transported if they are fit for the intended journey (*Annex I Chapter I Fitness for transport Regulation (EC) No 1/2005*). The means of transport, containers and their fittings shall be designed, constructed, maintained and operated so as to avoid injury and suffering and to ensure the safety of the fish, as well as to protect the fish from adverse changes in climatic conditions, and to prevent the animals escaping (*Annex I Chapter II Means of transport (1) Regulation (EC) No 1/2005*). Furthermore, they should be easy to clean and disinfect. Jolting and shaking movements of the containers must be prevented, and the containers must be secured to the means of transport so as to prevent displacement due to the movement of the means of transport (*Annex I Chapter II (5) in conjunction with Annex I Chapter III Transport practices Regulation (EC) No 1/2005*). Additionally, the containers must be clearly and visibly marked, indicating the presence of live animals (*Annex I Chapter II (2) in conjunction with (5) Regulation (EC) No 1/2005*). Furthermore, suitable equipment for loading and unloading must be carried (*Annex I Chapter II (2) Regulation (EC) No 1/2005)*.

Moreover, according to *Section 13* of the *TierSchTrV* (*Cold-blooded vertebrates and invertebrates*), fish must only be transported in containers in which the water volume offers sufficient opportunity for movement of the animals. Incompatible fish and fish of considerably different sizes must be transported separately from each other. Furthermore, the particular water quality and temperature requirements of the individual species must be taken into consideration and guaranteed, and a sufficient oxygen supply ensured. Cold-blooded vertebrates with the exception of fish from temperate climatic regions and invertebrates must only be transported in containers that are insulated to prevent large fluctuations in temperature (*Section 13 (1) TierSchTrV*). Packaging with sufficient moisture is permitted for transporting eels. Domestic transportation of crustaceans can take place in water or temporarily on damp mats.

3.5 Shipping

During domestic shipping of live fish, the sender must ensure that the deliverable postal addresses of the sender and consignee, as well as the type and number of animals are written on the container in accordance with *Section 7* of the *TierSchTrV.* Information about contingency care must also be given on the container. Furthermore, the sender must inform the consignee about the time of transport, the expected arrival time and the means of shipping prior to shipping taking place.

If the fish are sent by cash on delivery, *Section 8* of the *TierSchTrV* must also be observed. Thus, the sender can only send the fish by cash on delivery with a written order for the fish and a written confirmation by the consignee that the animals will be accepted immediately on arrival.

3.6 Import and export

If, in the framework of an economic activity, fish are to be exported to or imported from third countries, this must only occur via customs offices with associated border

inspection posts or other office of exit, which the Federal Office for Consumer Protection and Food Safety has published in the Federal Gazette (*Section 14 (1)* and *Section 16 TierSchTrV*). The exporter and importer must inform the border inspection post or other office of exit of the expected arrival of the transport with the type and number of animals at least one workday in advance (*Section 14 (2)* and *Section 15 (2) TierSchTrV*).

3.7 Checks

Transports can be stopped and checked at any time (*Section 20 (1) TierSchTrV*). The Veterinary Office carries out random or targeted checks of the animals, means of transport and accompanying documents (*Article 15(1) in conjunction with Article 27 (1) Regulation (EC) No 1/2005*), to check for compliance with the provisions of *Regulation (EC) No 1/2005* and the *TierSchTrV*. Checks can also take place at exit points and border inspection posts (*Article 21 Regulation (EC) No 1/2005*). The transport documentation and a copy of the transporter authorisation must be made available to the competent authority upon request during checks made when the animals are transported (*Article 4 (2) and Article 6 (1) in conjunction with Article 6 (8) Regulation (EC) No 1/2005*).

Furthermore, the Veterinary Office checks compliance with the animal welfare regulations by inspecting the animals and means of transport during import and transit at the border inspection post (*Paragraph19 Section1 TierSchTrV*). A documentation check and an identification check (check of the labelling of the container and of the animals within the containers with the information in the accompanying documents) also take place.

3.7.1 Infringements

Infringements of the regulation *Regulation (EC) No 1/2005* and the *TierSchTrV* represent an administrative offence in accordance with *Article 23*, *Article25* and *Article 26* of *Regulation (EC) No 1/2005* and also according to
Section 21 of the *TierSchTrV*, and are subject to penalties. The legal basis is *Section 18a No. 1 TierSchG*.

4 Legal aspects regarding fish diseases

There must be no transfer of fish diseases resulting from the transport of live fish. For this reason, the specifications of the Fish Disease Prevention Ordinance (*FischSeuchV*) must be complied with during the transport of fish.

Thus, a transporter is obliged to keep a log (Section 8 (1) No. *3 FischSeuchV*) of

- the name and address of the previous holder and the purchaser;
- the place and date of transfer;
- the fish species;
- the average weight and the number or total weight of the respective fish species;
- every water change during the journey, with information about the source of the new water and the site of release of the used water;
- the mortality during the journey, broken down into type of transport and species transported.

At the end of the calendar year, the logbook or loose-leaf carbon-paper systems must be stored for at least three years (*Section 8 (2) FischSeuchV*).

Furthermore, according to *Section 18* of the *FischSeuchV,* fish from aquaculture systems must only be transported in vehicles and containers that are watertight and can be closed during the journey, so that no more than the avoidable amount of water can be lost. They must be easy to clean and disinfect. Additionally, it must be ensured when performing a water change during the journey that fish transported from aquaculture, fish at the site of water change and the fish at the place of destination are not at risk of disease due to the water change. Resulting liquids must not be discharged directly into bodies of water. Vehicles and containers in which aquaculture fish were transported, as well as all the appliances used for catching, loading, unloading and transfer must be cleaned and disinfected before the next use.

When bringing fish for farming, culture or conditioning, for stocking or further processing for human consumption into a protected area or an area subject to a surveillance or eradication programme authorised by the Commission, the carriage of an animal health certificate in accordance with *Annex 2* of the *FischSeuchV* (domestic) or according to *Annex II* of *Regulation (EC) No 1251/2008* (intra-Community) is obligatory *Section 13 (1) FischSeuchV*). Reference has already been made to the TRACES requirements in Point 3.2.

The stipulations of the Intra-Community Animal Disease Protection Ordinance *(BmTierSSchV)* must also be observed during the import, export and transit of fish within the Community.

4.1 Checks

The records are checked by the Veterinary Office and these must be presented on request. At the end of the calendar year, the records

for the respective calendar year must be stored for at least three years. The records must not be removed from the business without the Veterinary Office consent (*Section 8 (2) FischSeuchV*).

4.1.1 Infringements

Violation of the provisions of the *FischSeuchV* represents an administrative offence in accordance with *Section 29* of the *FischSeuchV*, and is subject to penalties.

5 Oxygen bottles / liquid oxygen tanks

Oxygen is regarded as equipment during the transport of fish in containers. This means the oxygen is not transported as dangerous goods, as the set-up is such as to allow the gradual release of the oxygen. Thus, fish transports are excluded from complying with the stipulations of the European Agreement concerning the international carriage of dangerous goods by road (*ADR) (ADR, Annex A Part 1 Chapter 1.1 subsection 1.1.3.2 (e)*). This applies both to transports in which the fish are provided with oxygen, as well as for supplies from liquid oxygen tanks.

Despite this exemption from the *ADR* provisions and with it from the Dangerous Goods by Road, Rail and Inland Waterways Ordinance (*GGVSEB*), oxygen bottles and liquid oxygen tanks must be constructed, equipped and tested to comply with the *GGVSEB* stipulations when transporting live fish. Thus, there is the obligation to label the oxygen bottles and liquid oxygen tanks with hazard labels and the UN number and a valid inspection sticker. The oxygen bottle must be transported with the valves closed and protection caps, as long as there are no fish to supply or the gas bottle is not being used. Furthermore, the oxygen bottle must not be transported together with highly flammable loads (above all oils and fats), and a portable 2 kg fire extinguisher must be carried. At least one window must be slightly open when transporting oxygen bottles in a closed vehicle. The oxygen bottles or liquid oxygen tanks must be sufficiently secured and attached to the fish containers or to the loading area of the vehicle used. The gas supply line from the pressure reducer to the fish container must be flexible and there must be no build-up of dangerous excess pressure when operating the container. Additionally, the oxygen bottle must not protrude over the side of the vehicle. As much oxygen (in gas or liquid form) can be carried as is required for the transport of the fish and a possible return journey.

If the oxygen bottle or liquid oxygen tanks are transported but not connected to a fish container, the so-called “small load exemption” rule can be exploited (exemption in connection with amounts transported per transport unit). This means, up to 1000 l (volume) of oxygen and 1000 kg liquid oxygen (“1000-point rule”, where 1 l oxygen or l kg liquid oxygen equate to 1 point) can be transported to a large extent exempt of the ADR stipulations. In this case, only the provisions stated above must be observed.

6 Road transport

The provisions for road traffic must also be observed in the framework of fish transportation (*Professional Driver Qualification Act - BKrFQG); Regulation (EC) No 561/2006 of the European Parliament and of the Council of 15 March 2006 on the harmonisation of certain social legislation relating to road transport*; German *Regulation implementing the law on road haulage crews (Fahrpersonalverordnung, FPersV)*; *Regulation (EU) No 165/2014 of the European Parliament and of the Council of 4 February 2014 on tachographs in road transport; German Road Traffic Licensing Order (Straßenverkehrs-Zulassungs-Ordnung, StVZO*).

6.1 Basic qualification and further training

Drivers, who transport goods by road for commercial purposes using road vehicles, for whom a Class C1, C1E and CE driving licence is required, are subject to the German Professional Driver Qualification Act (*Section 1 (1) of the German Berufskraftfahrer-Qualifizierungs-Gesetz, BKrFQG*).

This means drivers working in agriculture and forestry or aquaculture are exempt from *BKrFQG* if the journeys they make are for their own purposes according to *Section 2 (1) No. 7 of the German Road Haulage Act* (*Güterkraftverkehrsgesetz, GüKG*). This exemption from *BKrFQG* can be found in *Section 1 (2) No. 5 BKrFQG* and only applies if driving the road vehicle is not the main occupation of the driver.

Furthermore, the *BKrFQG* does not apply to drivers for charitable clubs, if these are occasional, non-profitable journeys of goods for their members or non-profit-making purposes (*Section 2 (1) GüKG*).

After successful basic training according to *BKrFOG,* further training is obligatory every 5 years (*Section 5 (1) BKrFQG*).

6.2 Driving times, breaks and rest periods

Breaks and rest periods must be observed when transporting live fish in a road vehicle, where the maximum permissible mass of the vehicle, including any trailer, or semi-trailer, exceeds 2.8 t (*Article 2 (1) (a) Regulation (EC) No 561/2006 in conjunction with Section 1 (1) No.1 FPersV*). Exempt are vehicles or combinations of vehicles with a maximum permissible mass not exceeding 7.5 t used for the non-commercial carriage of goods (*Article 3 (h) Regulation (EC) No 561/2006 in conjunction with Section 1 (2) No. 2 FPersV*) and vehicles used by the fishing company for goods transportation, especially for those used to transport of live animals, in the framework of the company's own activities in a radius of up to 100 km of the place where the vehicle is based (*Section 1 (2) No. 1 in conjunction with Section 18 (1) No. 2 FPersV*).

For transports over 2.8 t not exempt according to *Section 1 (2) No. 1 and No. 2 FPersV* from *Articles 4, 6 to 9* of *Regulation (EC) No 561/2006*, the following must be observed:

Daily driving time (*Article 6 (1) Regulation (EC) No 561/2006*)

- Maximum 9 hours
    - Can be extended to at most 10 hours not more than twice during the week.

Weekly driving time (*Article 6 (2) Regulation (EC) No 561/2006*)

- Maximum 56 hours

Breaks (*Article7 Regulation (EC) No 561/2006*)

- At least 45 minutes after every driving time of 4.5 hours.
- It is possible to split these into intervals of initially at least 15 minutes and then at least 30 minutes.

Daily rest period (*Article 4 (g) in conjunction with Article 8 Regulation (EC) No 561/2006*)

This describes the daily time period which the driver has free for his own activities and includes a

- regular daily rest period
    - Rest of at least 11 hours
    - Splitting this time is possible but then it must be at least a 12-hour rest period, with the first period of at least 3 hours and the second at least 9 hours

and a

- reduced daily rest period
    - Rest of at least 9 hours but less than 11 hours
    - Maximum 3 reduced daily rest periods between two weekly rest periods

Weekly rest period (*Article 4 (h) in conjunction with Article 8 Regulation (EC) No 561/2006*)

This starts no later than at the end of six 24-hour periods from the end of the previous weekly rest period (*Article 8 (6) Regulation (EC) No 561/2006*) and a covers a

- regular weekly rest period
    - Rest of at least 45 hours

and a

- reduced weekly rest period
    - Rests of less than 45 hours, during which a reduction to a minimum period of 24 consecutive hours if possible, must then compensated

Additionally, the (working) times for other work must be taken into consideration.

The times must be recorded (*Section 1 (6) FPersV*). The records for each day must be made separately and all the necessary information for the current day and previous 24 calendar days must be carried.

6.3 Tachographs

6.3.1 Analogue and digital tachographs

Vehicles with a maximum permissible mass exceeding 3.5 t used to transport persons or goods in road traffic must be equipped with analogue or digital recording equipment or tachograph (*Article 3 (1) Regulation (EU) No 165/2014 in conjunction with Article 2 (1) Regulation (EC) No 561/2006*). It is obligatory that vehicles put into service for the first time

since 01 May 2006 are fitted with digital recording equipment *Article 27 Regulation (EC) No 561/2006*).

Exempt are those vehicles or combinations of vehicles with a maximum permissible mass not exceeding 7.5 t used for the non-commercial carriage of goods (*Article 3 (1) Regulation (EU) No 165/2014 in conjunction with Article 3 (h) Regulation (EC) No 561/2006*) and vehicles which are used by fishing companies, especially those used to transport of live animals, in the framework of the company's own activities in a radius of up to 100 km of the place where the vehicle is based (*Section 18 (1) No. 2 FPersV*).

6.3.2 Calibratable tachograph

The fitting of a calibratable tachograph is compulsory for vehicles with a maximum permissible mass of 7.5 t and over (*Section 57a (1) No. 1 StVZO*), unless the vehicle is already equipped with an analogue or digital tachograph (*Section 57a (3) StVZO*). Again, this does not apply to vehicles which are used by fishing companies, especially for those used to transport of live animals, in the framework of the company's own activities in a radius of up to 100 km of the place where the vehicle is based (*Section 57a (1)* Nr. 4 *StVZO in conjunction with Section 18 (1) No. 2 FPersV*).

Generally, vehicles over 3.5 t put into service for the first time since 2 March 2019 must be fitted with a digital recording equipment for the 2nd generation, a so-called "intelligent tachograph" (*Article 8 to 10 Regulation (EU) No 165/2014 in conjunction with Art.6 Implementing Regulation (EU) 2016/799*).

If a vehicle, which is not subject to the above-mentioned regulations, is fitted with an analogue or digital tachograph, then use of the equipment is mandatory (*Section 1 (7) FPersV*).

6.4 Records

The recordings of the driving times, breaks and rest periods for the transport of fish in vehicles with a maximum permissible mass of over 2.8 t and not exceeding 3.5 t must be handwritten (*Section 1 (6) FPersV*).

For transports in vehicles with a maximum permissible mass of more than 3.5 t, this must be performed by an analogue or digital tachograph or a calibratable tachograph.

All the manual records, printouts and record sheets from the current day and previous 28 calendar days must be carried (Section *1 (6) FPersV in conjunction with Article 36 (1) and (2) Regulation (EU) No 165/2014*). These documents must be stored in legible condition and chronological order for one year (*Section 1 (6) FPersV in conjunction with Section 57a (2) StVZO*).

As already mentioned above, non-commercial carriage of goods, vehicles not exceeding 7.5 t, and vehicles used by fishing companies in the framework of the company's own activities in a radius of up to 100 km of the place where the vehicle is based are exempt (*Section 1 (6) in conjunction with Section 18 (1) No. 2 FPersV*).

6.5 Checks

The checks for compliance with the social legislation relating to road transport are carried out by the police or the Federal Office for Goods Transport. At any time, the manual records, printouts and record sheets of the current day and the previous 28 days must be presented to the control officers on request, when not exempt from the obligation to record (*Art.36(1)(i) Regulation (EU) No 165/2014 in conjunction with Paragraph57a Section2 StVZO*).

The undertaking must archive the documents, records of results and other relevant data passed to them by the enforcement authorities concerning checks carried out on them at their premises and/or on their drivers at the roadside for a period of one year, and present it to the control officers on request (*Paragraph2a FPersV*).

6.5.1 Infringements

Violations of the *FPersV* (*Section 21 FPersV*), *Regulation (EC) No 561/2006* (*Article 19 Regulation (EC) No 561/2006)*, *Regulation (EU) No 165/2014* (*Section 23 FPersV*) and the *StVZO* (*Section 69a (5) StVZO*) are an administrative offence and are subject to penalties. Non-compliance with the social provisions relating to road transport leads to investigation proceedings in accordance with the German Administrative Offence Act (*Gesetz über Ordnungswidrigkeiten, OWiG*).

7 Summary of the legal obligations (HARRER, 2011)

Transport in connection with economic activity:

- Carriage of transport documents for journeys ≥ 50 km
- Transporter authorisation necessary for journeys > 65 km

Means of transport and containers

- Fitness for transport
- Prevention of injuries and suffering of the fish
- Protection against harmful adverse climatic conditions
- Secure fastening of the containers to the means of transport
- Sufficient water volume and oxygen supply
- Observation of the water quality and temperature requirements
- Separation of incompatible fish and fish of considerably different sizes
- Label stating “Live animals”

Prevention of the transmission of fish diseases

- Obligation to keep records
- Cleaning and disinfection of the means of transport, containers and all other equipment
- Meet all the precautions during a water change

“Small load exemption” (1000 points) for transport of oxygen bottles and liquid oxygen tanks

Compliance with the **driving times, breaks and rest periods** when travelling in vehicles with a maximum permissible mass > 2.8 t

Fitting of a **digital tachograph** in vehicles with a maximum permissible mass > 3.5 t

Fitting of a **calibratable tachograph** in vehicles with a maximum permissible mass ≥ 7.5 t

8 Summary of the legal framework for the transportation of fish

Protection of fish during transport

- Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport and related operations and amending Directives 64/432/EEC and 93/119/EC and Regulation (EC) No 1255/97
- Verordnung zum Schutz von Tieren beim Transport und zur Durchführung der Verordnung (EG) Nr. 1/2005 des Rates (Decree on the protection of animals during transport and the implementation of Council Regulation (EC) No 1/2005 (Decree on the protection of animals during transport - TierSchTrV) of 11 February 2009 (only available in German)
- Tierschutzgesetz (Animal Welfare Act - TierSchG) of 24 July 1972, redrafted 18 May 2006 (only available in German)

Fish diseases

- Fischseuchenverordnung (Fish Disease Prevention Ordinance - FischSeuchV) of 24 November 2008 (only available in German)
- Commission Regulation (EC) No 1251/2008 of 12 December 2008 implementing Council Directive 2006/88/EC as regards conditions and certification requirements for the placing on the market and the import into the Community of aquaculture animals and products thereof and laying down a list of vector species
- Verordnung über das innergemeinschaftliche Verbringen sowie die Einfuhr und Durchfuhr von Tieren und Waren (Intra-Community Animal Disease Protection Ordinance - BmTierSSchV) (only available in German)

Road transport

- Gesetz über die Grundqualifikation und Weiterbildung der Fahrer bestimmter Kraftfahrzeuge für den Güterkraft- oder Personenverkehr (Professional Driver Qualification Act - BKrFQG) of 14 August 2006 (only available in German)
- Güterkraftverkehrsgesetz (Road Haulage Act, GüKG) of 22 June 1998 (only available in German)
- Regulation (EC) No 561/2006 of the European Parliament and of the Council of 15 March 2006 on the harmonisation of certain social legislation relating to road transport and amending Council Regulations (EEC) No 3821/85 and (EC) No 2135/98 and repealing Council Regulation (EEC) No 3820/85
- Regulation (EU) No 165/2014 of the European Parliament and of the Council of of 4 February 2014 on tachographs in road transport, repealing Council Regulation (EEC) No 3821/85 on recording equipment in road transport and amending Regulation (EC) No 561/2006 of the European Parliament and of the Council on the harmonisation of certain social legislation relating to road transport
- Commission Implementing Regulation (EU) 2016/799 of 18 March 2016 implementing Regulation (EU) No 165/2014 of the European Parliament and of the Council laying down the requirements for the construction, testing, installation, operation and repair of tachographs and their components

- Verordnung zur Durchführung des Fahrpersonalgesetzes (Regulation implementing the law on road haulage crews
  - FPersV) of 27 June 2005 (only available in German)
- Straßenverkehrs-Zulassungs-Ordnung (Road Traffic Licensing Order, StVZO) of 26 April 2012 (only available in German)
- European Agreement concerning the international carriage of dangerous goods by road (ADR) of 30 September 1957, adjusted every two years to the newest technical and legal findings
- Verordnung über die innerstaatliche und grenzüberschreitende Beförderung gefährlicher Güter auf der Straße, mit Eisenbahnen und auf Binnengewässern (Dangerous goods by road, rail and inland waterways ordinance - GGVSEB) of 17 June 2009 (only available in German)

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10 Appendix

Appendix 1

Reference values for fish transports in closed and open systems

Table 10: Empirical values for the transport of large fry and fingerlings in plastic bags (BOHL, 1999)

Fish species / Length	Volumes	Water volume	Water temperature	Number / Weight	Max. duration
Trout 4-6 cm	50 l	15 l	10 °C	500 pcs/ 800-1000 g	12 h
Trout 6-9 cm	50 l	15 l	10 °C	300 pcs/ 1000-1200 g	12 h
Trout 9-12 cm	50 l	15 l	10 °C	150 pcs/ 1300-1500 g	12 h
Trout 12-15 cm	50 l	15 l	10 °C	70 pcs/ Approx. 1800 g	12 h
Pike 4-7 cm	50 l	15 l	6-8 °C	1000 pcs/ 800-1200 g	12 h
Zander 3-5 cm	30 l	15 l	10 °C	2000 pcs/ 800 g	12 h
Zander 6-9 cm	30 l	15 l	10 °C	400 pcs/ 1200 g	12 h
Zander 9-12 cm	30 l	15 l	10 °C	150 pcs/ 1200 g	12 h
Carp (K_V) 3-4 cm	30 l	15 l	12-15 °C	1500 pcs/ Approx. 1500 g	12 h

Table 11: Reference values for transport amounts of sack fry (given in thousands) in plastic bags with 50 l total volume (20 l water and fry + 30 l oxygen) (BERKA, 1986; BOHL, 1999)

	Water temperature															
	10 °C				15 °C				20 °C				25 °C			
	Transport duration in hours															
Fish species	**4**	**8**	**12**	**(24)**	**4**	**8**	**12**	**(24)**	**4**	**8**	**12**	**(24)**	**4**	**8**	**12**	**(24)**
River trout	20	15	10	5	-	-	-	-	-	-	-	-	-	-	-	-
Brook trout	20	15	10	5	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow trout	25	20	15	10	20	15	10	5	15	10	5	3	-	-	-	-
Grayling	40	30	25	20	30	25	20	15	-	-	-	-	-	-	-	-
Whitefish	80	60	50	40	-	-	-	-	-	-	-	-	-	-	-	-
Pike	80	50	40	30	50	30	25	20	-	-	-	-	-	-	-	-
Carp	-	-	-	-	200	150	100	50	120	80	60	40	100	80	60	30
Tench	-	-	-	-	100	80	60	30	60	40	30	15	60	40	30	15
Grass carp	-	-	-	-	-	-	-	-	60	50	40	30	40	30	25	15
Catfish	-	-	-	-	-	-	-	-	60	50	40	30	40	30	25	15
Dace/chub	-	-	-	-	100	80	60	40	80	60	40	20	-	-	-	-
Barbel	-	-	-	-	100	80	60	40	80	60	40	20	-	-	-	-
Common nase	-	-	-	-	100	80	60	40	80	60	40	20	-	-	-	-

Table 12: Reference values for transport numbers of fry in plastic bags (20 l water and fish + 30 l oxygen) (BOHL, 1999)

	Water temperature					
	10 °C		15 °C		20 °C	
	Transport duration					
Fish species	**up to 5 h**	**up to 10 h**	**up to 5 h**	**up to 10 h**	**up to 5 h**	**up to 10 h**
Salmonids	2 kg	1 kg	1.3 kg	0.6 kg	-	-
Carp	-	-	3 kg	1.5 kg	2 kg	1 kg
Grass carp	-	-	2.5 kg	1.25 kg	1.75 kg	0.8 kg
Pike	1.5 kg	0.75 kg	1 kg	0.5 kg	-	-

Table 13: Empirical values from successful transport of salmonids in open systems (RAPP, 2013, in preparation)

Volumes	Fish weight / Individual weight	Oxygen	Duration
1000 l	225 kg/250-500 g	5 l/min	3 h
1250 l	250 kg/250-500 g	4.5 l/min	up to 8 h
1800 l	300 kg/100-200 g	10-12 /min	6-8 h
1800 l	350 kg/200-1000 g	12-13 l/min	6 h
1800 l	250 kg/30-100 g	8-10 l/min	6 h
1800 l	150 kg/20 g	7-8 l/min	6 h
1800 l	90 kg/3 g	5 l/min	6 h
1800 l	50-60 kg/1 g	4 l/min	6 h
1800 l	20 kg/0.2 g feeding fry	3 l/min	6 h
2400/2230 l	325 kg/30-100 g	10 l/min	10-12 h
2400/2230 l	400 kg/250-500 g	10 l/min	10-12 h

Table 14: Reference values for transport amounts of different fish species and fish sizes in open systems (BOHL, 1999)

Fish species Weight / Age	Volumes: Fish weight	Water temperature	Duration
Trout and char 250-	4.5:1	10-12 °C	3-5 h
1000 g	4:1 Winter	10 °C	6-8 h
	5.5:1 Summer	10-12 °C	10-20 h
Trout and char 150-	-	-	-
200 g	5:1	-	6-8 h
30-100 g	6.8-7:1	10-12 °C	up to 12 h
10-20 g	10:1	-	6-8 h
Trout and char 5 g	-	-	-
3 g	13:1	-	6-8 h
1.5-3 g	15:1	10-12 °C	10-12 h
	20-25:1	-	6-8 h
Carp K_3	2:1	-	up to 10 h
K_2	2.2:1	10-12 °C	up to 10 h
K_1	3.3:1	-	up to 12 h
K_v	5:1	over 12 °C	up to 4 h
	10-16:1	not below 15 °C	5-10 h

Appendix 2

Transporter authorisation pursuant to *Article 10 (1) Regulation (EC) No 1/2005*

1. **TRANSPORTER AUTHORISATION No**			
2. **TRANSPORTER IDENTIFICATION** 2.1. Company name			**TYPE 1** **NOT VALID** **FOR LONG JOURNEYS**
2.2. Address			
2.3. Town	2.4. Postal code	2.5. Member State	
2.6. Telephone	2.7. Fax	2.8. Email	
3. **AUTHORISATION LIMITED TO CERTAIN** Types of animals ☐		Modes of transport ☐	
Specify here:			
Expiry date.....			
4. **AUTHORITY ISSUING THE AUTHORISATION** 4.1. Name and address of the authority			
4.2. Telephone	4.3. Fax	4.4. Email	
4.5. Date	4.6. Place	4.7. Official stamp	
4.8. Name and signature of the official			

Appendix 3

Transporter authorisation pursuant to *Article 11 (1) Regulation (EC) No 1/2005*

1. **TRANSPORTER AUTHORISATION No**			
2. **TRANSPORTER IDENTIFICATION** 2.1. Company name			**TYPE 2** **VALID FOR ALL JOURNEYS INCLUDING LONG JOURNEYS**
2.2. Address			
2.3. Town		2.4. Postal code	2.5. Member State
2.6. Telephone	2.7. Fax		2.8. Email
3. **SCOPE OF THE AUTHORISATION** limited to certain Types of animals ☐		Modes of transport ☐	
Specify here:			
Expiry date……..			
4. **AUTHORITY ISSUING THE AUTHORISATION** 4.1. Name and address of the authority			
4.2. Telephone	4.3. Fax		4.4. Email
4.5. Date	4.6. Place		4.7. Official stamp
4.8. Name and signature of the official			