

# Facts on mortality with shipments of ornamental fish

By Alex Ploeg

As in every industry which works with live animals, mortality is a topic that is avoided as much as possible.

Unfortunately, there is also little independent scientific information available and as a result, mortality figures are chosen which suit the purpose of those choosing them: importers will claim low mortality and animal welfare groups choose high mortality figures. The latter was strongly boosted by a publication of Olivier (2001) in which she mentions mortalities of 25-40% in every step of the transport chain, resulting in a total mortality of up to 73% for the total transport chain.

These figures resulted in research initiated by the Dutch pet trade association Dibevo (2005) dealing with the topic of mortalities in the exotic pet

trade. The report not only dealt with mortality but also described the exotic pet trade in the Netherlands. The report is still available from Dibevo, but it has been written in Dutch.

## Commercial aspects

Although importers are very reluctant to talk about mortality with others and among themselves, it is a very open issue in the relationship with the supplier, the exporter. The general term for it is DOA (Dead On Arrival). The general agreement on DOA, as is also set out in the terms and conditions of sale implemented by almost all exporters, is that importers must claim DOA within 24 hours after arrival. As a practical result, the reported DOA in fact includes those mortalities on arrival, as well as the mortalities occurring during the first day.

	Mortality rate	Cumulative mortality rate
Before transport	30-40%	35%
During transport	25-30%	48%
At the wholesaler	25-30%	62%
At the retailer	25-30%	73%

The general agreement on DOA is that the value of the DOA as reported within 24 hours may either be deducted from the invoice

*Mortality in the ornamental fish industry as estimated by Katia Olivier (2001). For actual mortality figures see table on page 121.*

(most common) or will be replaced in a subsequent shipment. The freight costs and all other costs related to transport (customs, veterinary inspection, etc) with respect to the DOA are, however, at the importer's expense. This way it is certain that it is to the benefit of both parties to limit DOA's as much as possible.

**Causes for mortality**

There are three structural causes for mortality in ornamental fish:

a) The preparation for packing and the packing itself requires expertise. As indicated in the chapter on this topic, fish must be prepared for transport, e.g. by starvation for a certain period to allow them to empty their digestive tracts and the

proper compounds must be added to the packing water.

b) Errors may also be made in the packing itself. On the one hand, there is always pressure on exporters to pack as densely as possible. The more fish which can be packed in one litre water, the less total weight and therefore, the lower the costs for the importer. The other side of the story is that excessively dense packing results in mortalities and as we have seen, high mortalities will only cost the exporter and importer money.

There is a critical balance and good, experienced exporters have fixed packing quantities for specific species and sizes, which they do

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*Closing the bags, here with rubber bands, is a crucial moment in packing fish. If not closed properly the bags will leak.*

**Photo: Svein Fosså**

not violate, even under pressure. Bad exporters might give in to the demands of bad importers, those who do not understand this causal relationship, and will be confronted with higher than necessary mortalities and thus higher costs and lower profits. Inexperienced packers can also lead to leaking bags. Leaking bags usually cause massive mortality as a result of escaping oxygen. Sometimes even all of the water leaks out.

- c) There are also external factors, factors on which the exporter nor the importer have scarcely any influence.

It can start as early as the cargo hold of the airplane which is either not heated or not sufficiently heated. A test with temperature writers several years ago has taught us that, although rare, it did occur that due to improper temperatures, the temperature can drop during the flight to below the minimum temperature, sometimes to be restored later during the flight. Airlines, however, have also learned from these lessons and in recent years, only very rarely do fish arrive excessively cold temperatures.

From personal experience I know that styrofoam boxes can sometimes become damaged during transport. I have seen holes on the boxes more than 20 cm in diameter, caused by a clumsy maneuver with a forklift. Such holes not only can cause mortality by resulting in temperature changes in the box (remember, northern European winters often experience temperatures below zero), but also it can make the bags leak.



*Proper handling at airports is important. A good relation with the airline can solve eventual problems.* **Photo: Alex Ploeg**

In addition, freight handling staff at airport platforms may ruin the shipment by leaving it too long in the hot sun or on the platform. I have even seen them store boxes for several hours in a warehouse just in front of an open door with a snowstorm raging outside.

I have seen one shipment with discus and cardinal tetras which originated from Brazil, the final destination being Amsterdam. Due to the bad weather, the flight stopped in Paris and the fish were shipped by open truck to Amsterdam...and this was in the middle of the winter with below-zero temperatures. When the fish arrived, the temperature of the water was 10-12°C. Nonetheless, a majority of the fish survived, in fact all of the discus survived.

The first choice for every exporter and importer is to ship by direct flights from the point of origin to the

final destination. However, sometimes this is not possible. If not, then it is preferable to book a connecting flight where the fish will not have to leave the airplane, since every time the shipment is handled the risks increase. Unfortunately due to European legislation, shipments for the European Union must leave the first airport of entry into the EU for the veterinarian border inspection. Very often the result is excessive delays. In other words, a shipment through Frankfurt to Amsterdam arriving at 6 in the morning in Frankfurt usually does not continue its flight to Amsterdam before 16:00 or 17:00, despite hourly flights.

It is usually up to the importer to select the airline and with issues such as those mentioned above, it is often possible to see distinct differences in handling between the various airlines and the freight

handlers they hire. Complaints lodged with the airline might result in improvement, however, if this is not the case, then a change of airline will often be the only alternative, despite a higher freight rate. Unfortunately in many cases there is hardly any choice.

Despite the many words dedicated to them, calamities such as those described under c) only rarely occur. The problem is that when they do occur, they result in relatively high mortality rates, sometimes even full boxes. It is comparable to an airplane dropping out of the sky. It is extremely rare, but when it happens the number of casualties is high.

The rate of mortality as described under a) and b) are usually low to very low, depending on the expertise of the packers. There is a high selection pressure on good packers. If packers cause higher mortality than necessary, it is noticed and reported to the exporter. If it happens more often, the importers contact new suppliers. Nowadays exporters are waiting in line to supply importers.

Nonsense based on estimates  
As mentioned, Katia Olivier's report (2001) cites very high mortality percentages. This report was produced for Infofish in the FAO Globefish series. Infofish in general has a good reputation and for this reason the report was cited by many immediately.

Reading it more carefully, it appeared that the percentages mentioned were derived from estimates. The basis for the estimates was reports of incidents and quotes from some importers.

If these figures were correct, they would have very serious effects on the profitability of the import companies. For the Dibevo report, I produced a calculation roughly based on an actual shipment from Singapore, consisting of 50 boxes with 30,000 ornamental fish for a Dutch importer. The example is based on an actual shipment to a Dutch importer in which the figures were rounded off.

I have checked all of the related costs and the costs of the fish and checked the gross profit as a percentage of the cost price, with a margin of 125% on the cost price of the fish, including all costs. From personal experience I know that most importers must have over 50% profit margin on the fish to be able to cover all their other costs such as salaries, heating, administration, etc. With 50%, the company does not earn a profit; in order to earn a profit, a higher percentage is required. It is a theoretical calculation but it indicates that importers must be really keen on mortalities (see table), since with mortality rate as high as 10% at arrival and during storage prior to sale, the profitability of the importing company is under a great deal of pressure. With the estimated mortality of 25-30% which Olivier estimated for arrival at the wholesaler plus the 25-30% she

	Cost in €	Quantity of fishes	Price each	Profit	Gross profit margin
Purchase of fish from Singapore	6000	30,000	0.20		
Costs (freight, customs clearing etc.) 50 boxes at 55 Euros	3000				
Total costs	9300		0.31		
Selling price at a 125% mark-up			0.70		
Profit at 0% mortality	9300	30,000	0.31	11,625	56%
Profit at 5% mortality	9300	28,500	0.33	10,579	53%
Profit at 10% mortality	9300	27,000	0.34	9533	51%
Profit at 15% mortality	9300	25,500	0.36	8486	48%
Profit at 20% mortality	9300	24,000	0.39	7440	44%
Profit at 25% mortality	9300	22,500	0.41	6394	41%
Profit at 30% mortality	9300	21,000	0.44	5348	37%
Profit at 35% mortality	9300	19,500	0.48	4301	32%
Profit at 40% mortality	9300	18,000	0.52	3255	26%
Profit at 45% mortality	9300	16,500	0.56	2209	19%
Profit at 50% mortality	9300	15,000	0.62	1163	11%

**Table 1.** Effect on Gross profit margin with increasing percentage of mortality.

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estimated for the period the fish were at the wholesaler's facility (total mortality estimates at 44-51%), every importing company would be bankrupt within months.

### Reality demonstrated by research

Although it is scarce, there is some actual information available on DOAs. In 1999 the independent researcher Claudia Vinke reported about five import shipments. The shipment of 100-2000 specimens, mainly marine fish, showed 30%, 1%, 0.5%, 1% and 0.1 % mortality. The 30% was caused by leaking bags, combined with a delayed shipment. The 0.1% represented a koi shipment where the

considered to be a difficult fish, he had followed what happened in the chain from the collection by the fisherman to the retailer. For the DOA he reported 0.15% and mortality rates at the wholesaler's facility 0.81%.

For the Dibevo report, we asked a student, Tim Verhoeff, of the University of Wageningen (Netherlands) to check imports from a number of Dutch imports. He visited them upon arrival of the shipment and after a week. For over a total of 140,508 specimens, he observed a DOA of 0.75% and an additional mortality of 1.27% during the week following arrival. The higher percentage in mortality during the time

					<b>Cumulative</b>
<b>Author</b>	<b>Weber</b>	<b>Vinke</b>	<b>Verhoeff</b>	<b>Chao</b>	<b>Chao</b>
<b>Year</b>	<b>2001</b>	<b>2001</b>	<b>2003</b>	<b>2003</b>	<b>2003</b>
<b>Before transportation</b>				<1%	<1,00%
<b>During transportation</b>	1,47%	1%	0,75%	0,15%	<1,15%
<b>At the wholesaler</b>	1.47%		1,27%	0,81%	<1,96%
<b>At the retailer</b>				3,50%	<5,46%

**Table II.** Mortality in shipments of ornamental fish as registered by independent research.

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veterinary inspection resulted in an official warning for excessively high density packing (!?).

A study conducted by Weber (also in 2001 and also independent) in Switzerland resulted in 1.47 % mortality during transport and another 1.47% during the stay at the wholesaler's facility. Prof. Chao (2003) of the University of Amazonas informed me that for cardinal tetras,

the fish were at the wholesaler's was caused by an outbreak of a disease after an arrival with 0% DOA.

Wild caught versus tank-raised Little is known about the differences in mortalities between wild-caught and tank-raised fish. None of the authors mentioned have provided any information on this aspect. The 140,508 specimens as reported by Tim Verhoeff also included 13,493

specimens involving wild caught. Of this amount 2.62% arrived dead, primarily in one of the shipments. In tank-raised fish only the mortality rate was 0.4%.

It is tempting to conclude that wild-caught fish are more sensitive than tank-raised fish. One should however also keep in mind that wild-caught fish can sometimes be collected when they are in very poor condition due to overcrowding, lack of food and outbreak of disease. Some freshwater fish are collected in varzea lakes, isolated lakes left behind when the seasonal flooding recedes, leaving fish in an ever-decreasing area until they dry out completely.

### **Conclusion**

The result of the literature and the sample taken by Tim Verhoeff, all based on observations instead of estimates, all fall within the same range, somewhere between 0.4-1.5% upon arrival and some 0.8-1.5% during the time spent at the importer or wholesaler's facility.