

## ULTRAVIOLET STERILIZATION OF WATER IN A POOL FOR TONINA (*INIA GEOFFRENSIS*). A PRELIMINARY REPORT.

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### Introduction

After some ten years of practical experiences in handling and housing Bottlenosed dolphins (*Tursiops truncatus*) and Belugas or White whales (*Delphinapterus leucas*) (Gewalt, 1969; 1970a; 1970b; 1971), we finally planned to capture a number of Toninas, the freshwater dolphins (*Inia geoffrensis*) of the Orinoco. The author already reported shortly on this subject on the Conference of the I.A.A.A.M. in Amsterdam, 1975. As in catching our Belugas, we were lucky again, secured a number of Toninas and imported five of them alive in a very good condition in March 1975.

As far as housing was concerned we entertained the opinion that not too many problems could arise in building suitable facilities for freshwater animals as compared with the very complicated and expensive procedure of creating an "artificial ocean" for marine mammals. Unfortunately, this opinion did not prove to be quite correct.

### Initial system

Our newly built "Tonina-pool" was created by combining and enlarging two fish containers in our aquarium. The pool, with a capacity of about 75 m<sup>3</sup> and a turnover of 2½ hours, is inside a well heated house and was served by a system of two sand and gravel filters aided by flocculation with sodium aluminate. Unfortunately, however, we had to experience very soon that fresh water of 27 °C is an ideal and very dangerous substrate for the immediate development of mycotic and bacterial infections of all kinds in a house with an air content heated up to 30 °C, quite different from the relatively cool and chlorinated salt water that we use for Bottlenosed dolphins or even from the very cold (6 °C!) water for our Belugas.

We did not have any difficulties in inducing our Toninas to accept different kinds of food, but very soon we could observe considerable changes in their skin and finally skin diseases (Ostenrath, 1976). We had a lot of trouble to save the animals - we lost two out of five - and had to resort to repeated injections of antibiotics, but even then the situation in the Tonina-pool did not look satisfying at all. Besides the fact that we only arrived at the originally planned number of three animals in the pool by losses through death, the water quality and transparency remained completely unsatisfactory, although we had added a third filter very early on. Daily 12½% (10 - 12 m<sup>3</sup>) of the capacity of the pool was shed and replaced by tap water. A low level of chlorine was maintained, but all this did not yield outstanding results.

It was clear that the low input of chlorine (we did not dare to use high levels) in the small pool and the heavy organic load prevented breakpoint chlorination to be established. Consequently too high levels of combined chlorine may have been built up. Combined chlorine is known to be harmful to the skin of cetaceans. Chlorine levels had to be lowered and bacterial levels increased. Periodically we had to repeat antibiotic treatment - no pleasure for animal nor man - and finally we used the well

known Sigmamycin\*) which produced large scars in the animal's skin. Clearly a new approach to our water treatment was imperative.

### *UV-system*

We decided to introduce a different system of water sterilization which was carried out in close cooperation with WEDECO/Herford and Prof. Dr Schenck of the Max Planck-Institut für Strahlenchemie and his staff. The main point of the new system is the use of ultraviolet rays, a method which is not uncommon in various aquarium systems. However we were amazed that in our case the small apparatus of WEDECO, which at the same time is very simple and cheap, is performing its task with incredible effectivity. In our opinion, this system shows much promise for the successful keeping of different species of cetaceans and other aquatic mammals. It might even induce a new "style" in zoo-keeping of these animals. If this is feasible it would be, of course, much better to use in the future instead of chlorine, which is no biological medium, or of ozon ( $O_3$ ), which is a poisonous product, therefore needs extra care and is very expensive to install.

The procedure in our relatively small Tonina-pool is now as follows. After passing the filters the water flows through the WEDECO-ultraviolet sterilization system - a metal box measuring 156 cm long, 56 cm wide and 40 cm high - which is also installed in the Tonina-pool's cellar. Inside this box the water passes, at a rate of about 35 m<sup>3</sup>/hour, a quartz glass tube, which is penetrable for ultraviolet rays. The tube is surrounded by 19 ultraviolet lamps of 30 Watts each, which are alight permanently. No flocculation nor chlorination is used and daily 20 % of the water is changed.

### *Results*

The water tests executed by Prof. Schenck and his staff show the following results. During the initial period when chlorination was used the bacteriostatic level in 1 ml varied from a maximum of 48 million germs and 1100 colonies of coli bacteria to a minimum of 14 million germs and 300 colonies of coli bacteria. This unpleasant situation was found before as well as after the water passed the filters.

After installation of the UV-system chlorination was discarded and we could observe a prompt improvement of the situation. Immediately after passing the UV-system, but before entering the pool, the water contained no germs at all, i.e. ideal drinking water quality (Table I).

Table I

*Watertests of Tonina-pool water before and after the filters and after UV treatment, as determined by the Max-Planck-Institut für Strahlenchemie*

	before the filter	after the filter	after UV-system
germs/ml	22,000	20,250	0
col. E. coli/100 ml	23,500	7,000	0

\*) A Tetracyclin or Oleandomycin from PFIZER Comp./Karlsruhe.

After the two feedings each day and the consequent defaecation by the animals the number of germs in the pool is increasing for some time, but within the turnover time ideal water quality is reached again. In the opinion of the factory and experts it would even be possible to increase the running speed, in other words the time the UV-lamps act on the passing water could even be decreased. However, we are very much satisfied with the present results, especially with the very low current consumption. Before using the UV-system the water was muddy and brown coloured, but now it is very transparent and only discoloured for two to three hours after feeding.

#### Summary

A preliminary report has been given on the failure of conventional water treatment in a pool containing five, later three, Toninas, freshwater dolphins (*Inia geoffrensis*) from the Orinoco and the consequent installation of an ultraviolet sterilization system. The pool has a capacity of 75 m<sup>3</sup>, a turnover of 2½ hours and a water change of 20 % daily.

In the near future a detailed report on the WEDECO UV-unit E30 and the results obtained with this system in the Tonina-pool in the Duisburg Zoo will be given by Prof. Dr Schenck and Dr Gelmroth of the Max-Planck-Institut für Strahlenchemie. Information is available in the mean time from the Zoo Duisburg.

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