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SHORT COMMUNICATION

Application of Propiscin – a safe anesthetic for huchen, *Hucho hucho* (L.) culture

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Abstract. Anesthetics are a group of pharmaceuticals that have been used primarily in intensive fish culture to immobilize fishes and to reduce the effects of stress and mortality during and after manipulation and when transporting large stocks of fish. Nonetheless, many studies have shown that the majority of the anesthetics applied at present have strong toxic effects on fish; thus, it is possible to anesthetize fish only for short periods. Propiscin, a new anesthetic, has been tested successfully, and it allows fish to be anesthetized for up to 30 minutes. Propiscin is a 0.2% stabilized solution of etomidate which can be administered either as a bath or an aerosol. When administered correctly, the required cessation of sense perception and motor reflexes in fish can be obtained in about 2-4 minutes, depending on water temperature and fish size. Clinical tests were conducted on many fish species, including huchen. The results of this study showed that Propiscin is a safe, minimally toxic, very effective product for reducing the impact of polyethiological stress in huchen culture.

Keywords: anesthesia, fish, salmonids

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Anesthetics are a group of pharmacological preparations that are required when manipulating fish, especially during tagging. They have been in long-term and extensive use in intense fish culture, for instance to reduce the effects of fish stress and mortality when manipulating and transporting large stocks of fish. When placed in water baths containing Propiscin or when it is applied as an aerosol, fish absorb it through the gills and partly through the skin (Siwicki 1984). Many anesthetics are known to be useful in fisheries: chloroform, 2-phenoxyethanol, methylpentynol, urethane, MS-222, and clove oil. However, research has shown that the majority of these are highly toxic to fish, and this means that only very short periods of general anesthesia are possible, which can make manipulation difficult. Some of them cause chemical stress and can have a negative impact on eggs and sperm (Ball and Cowen 1959, Allison 1961, Crawford and Hulsey 1963).

Consequently, new, less toxic, effective anesthetics are required for modern fish culture. This led to the development of Propiscin at the Inland Fisheries Institute in Poland. The active ingredient is etomidate, which was used widely as an fish anesthetic in the twentieth century (Amend et al. 1982, Escoubet 1982, Limsuwan 1982, Limsuwan et al. 1983, Plumb et al. 1983). Propiscin has been shown to be highly effective as it induces short general anesthesia lasting about 30 minutes (Szkudlarek and

Table 1
Clinical progression of general anesthesia in huchen

No.	Anesthetic state	Time
1.	Tranquility period	10-20 s
2.	Unrest period	0.5-1.0 min
3.	General anesthesia period (anesthetized state)	
	3.1. Shallow general anesthesia	0.5-3 min
	– limited or lack of consciousness	
	3.2. Full general anesthesia	30 min
	– lying on one side	
4.	Suffocation period (asphyxiation state) which is the result of overdosing the injection or exposing fish in a water bath for more than 1 h	
	– irregular and decreasing movements of gills	
	– excrement discharge	

Table 2
Progression of general anesthesia induced with recommended doses of Propiscin in different sized huchen

Fish size	Water temperature (°C)	Propiscin dose (ml l^{-1})	Periodrequired to induce anesthesia (min)	Time of anesthesia (min)	Maximum recovery time (min)
fingerling	5.0	0.5	3.0-5.0	5	30-40
fingerling	5.0	1.0	2.5-3.0	5	20-40
spawners	5.0	0.5	3.5-5.5	5	40-60
spawners	5.0	1.0	2.5-3.5	5	30-40
spawners	5.0	1.5	2.0-2.5	5	30-40
spawners	4.5	1.0	2.0-2.5	30	60-80

Zakęś 1996, Trzebiatowski et al. 1996, Kazuń and Siwicki 2001). As has been demonstrated by research, Propiscin has all the advantages of general anestheticagents: it does not act as a respiratory system depressant, it causes only a slight drop in blood pressure, it is a safe preparation, and, what is maybe most important, it has not been found to be teratogenic or carcinogenic. The manufacturer intends Propiscin to be applied only to fish, and it has never been tested on humans. Propiscin has proved to be very effective, and, when administered in a water bath, it can induce a short period of general anesthesia that lasts about 30 minutes, depending on water temperature, fish species, and the length of time the fish are kept in the solution. The fish roused when they were transferred from the solution to clean water, and, generally, the shorter the time they were held in the Propiscin solution, the quicker they roused.

The results of an earlier *in vitro* research suggests indicate that Propiscin, in contrast to etomidate alone, does not cause allergic responses or tissue irritation (Amend et al. 1982, Kazuń and Siwicki 2001). When applied in a water bath, Propiscin did not cause a change in water pH or CO_2 content; however, the anesthetized fish did consume less oxygen (Kazuń and Siwicki 2001). The objective of the current study was to evaluate the anesthetic potential of Propiscin for huchen, *Hucho hucho* (L.). We examined the influence of different concentrations of Propiscin for inducing effective anesthesia and the practical application of it during controlled spawning, fish manipulation, and transport.

Clinical observations of the progression of general anesthesia at 4.5-5°C were conducted on 10 to 25 fish during each replicate, depending on needs. Clinical observations of the fish were also performed in plastic bags at a water temperature 10.0°C during twelve-hour transportation sessions. A total of 140 fish with body weights ranging from 5 to 15,000 g were tested.

Primarily, clinical observations of the effects of general anesthesia were performed. The behavioral responses of the fish to Propiscin were also observed to determine the timing of the five major stages of anesthesia (Table 1), which were similar to those applied by Schoettger and Julin (1967). The Propiscin concentration was deemed effective when the preparation induced stage 3 anesthesia within three minutes and maintained it for at least 30 minutes after the fish were transferred from the solution to clean, oxygenated water. The progression of general anesthesia for huchen of different sizes is presented in Table 2. The progression of Propiscin-induced general anesthesia depended on water temperature, fish size, and the length of time the fish were kept in the solution. A long recovery period of up to 80 minutes has also been observed among other salmonids such as rainbow trout. Generally, there is no difference in recovery time between Propiscin and etomidate, which is longer than that of MS-222 or quinaldine (Amend et al. 1982, Limsuwan et al. 1983, Plumb et al. 1983, Kazuń and Siwicki 2001).

Popular anesthetics such as MS-222 and 2-phenoxyethanol permit keeping fish in the anesthetic solution for short periods and do not cause full myorelaxation. When applied in a water bath, Propiscin can provide up to 1 h of general anesthesia during which the fish can be manipulated freely. The lack of allergic response or irritation allows treating fish with this preparation repeatedly. Propanidid, another anesthetic, produced similar effects (Siwicki 1984). Propiscin acts as a tranquillizer when administered for transport. The dose required is much lower than that for general anesthesia, with an optimal dose for huchen of about 0.1 ml of Propiscin per liter of water at a temperature of 10.0°C. During observations, the fish swim freely, but their movements are slower than normal. The current study indicated that Propiscin is a safe, minimally toxic, very effective product for reducing the influence of polyethiological stress in huchen culture.

Author contributions. A.K.S. designed the experiment. K.K. and M.K. performed the experiment and analyzed the data. A.K.S. And K.K. wrote the paper.

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