Superchilling Fish Products

Nile perch (*Lates niloticus*) fillet

Zoetermeer, 14-09-2018

Participating companies

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Contents

Summary

Superchilling is a common preservation technique in the fresh fish, poultry and meat industry. This technique is used to reduce the temperature of the product to the point of initial freezing; low enough to substantially reduce bacterial activity but high enough to avoid significant levels of ice crystal growth that can cause structural damage. In the Nile Perch industry this preservation technique has been used for many decades. Fresh Nile perch fillets are superchilled before exporting them from the Lake Victoria region to the EU and other overseas destinations.

This report will give more insight in the superchilling technique used in the Nile perch value chain and will provide an objective standard to determine whether superchilled fish products have (previously) been frozen.

Validated research and a company induced self-monitoring plan, which used almost 1,000 Nile perch samples, showed that superchilling results in fresh Nile perch fillets to be chilled to average temperatures of -0.7 to -1.6 °C within 30 to 52 minutes. Due to temperature management the cold chain is maintained and microbiological values of superchilled Nile perch fillets are kept well below the maximum limits.

In this research a HADH enzymatic test was carried out by an European Referential Laboratory to measure the mitochondrial enzyme HADH in the Nile perch fillets. HADH will be released after cell damage which is a result of the formation of ice crystals in the product. Therefore HADH acts as an indicator which shows whether Nile perch fillets have previously been deep frozen. The HADH enzymatic test in this research shows that Nile perch fillets that underwent a superchilling treatment did not come from sources of deep frozen Nile perch.

1. Introduction

For many years fresh Nile perch fillets from lake Victoria are imported into the EU while maintaining the cold chain by using the superchilling technique. In the FAO-SIFAR note (J.J. Waterman *et al.*, 2001) superchilling is defined as a technique that reduces the temperature of fish uniformly to a point slightly below that which is obtained in melting ice. It should be noted that seawater freezes at about -2°C or -3°C, depending on salinity, and that Regulation 852/2004 does allow ice to be made of seawater, so the temperature of melting ice should encompass sub-zero temperatures to at least -3°C. This technique is used to reduce the temperature of the product to the point of initial freezing; low enough to substantially reduce bacterial activity but high enough to avoid significant levels of ice crystal growth that can cause structural damage. Besides suppressing harmful microbes superchilling maintains food freshness and preserves nutritional quality (Banerjee *et al.*, 2017; Shavel *et al.,* 2015*;* Kaale *et al.*, 2011; Chun-hua *et al.*, 2014). Superchilling is a well-known technique in the fresh fish and meat industry and is described for species like salmon, cod, squid, poultry, prawns and pork (Massaquoi *et al.*, 2011; Duun *et al.*, 2008; Duun *et al.*, 2008; Jones, 2015; Thordarson *et al., 2017)*. Superchilling is also used as a preservation technique for fresh Nile Perch products from the East-African region.

The *aim* of this research is to give more insights in the superchilling technique used in the Nile perch value chain. This research will describe how the cold chain for superchilled Nile perch works and what impact it has on quality and food safety of the fresh fish product. Secondly, this research will provide an objective standard to determine if fish products have been (previously) frozen to clarify that raw material of fresh fish are superchilled and no deep frozen Nile perch is used.

The methods used while performing this research are described in chapter 2. The results are depicted in chapter 3 and discussed in chapter 4.

2. Method

2.1. General

The results described in this report originate from two types of research:

- Validated research by an independent party;
- Company induced self-monitoring program.

In both types of research data from superchilled Nile perch from Uganda, Tanzania and Kenya were gathered. During the validated research by an independent party (30 May 2018 to 5 June 2018) data from the most important stages between processing and arrival of the product at destination were verified by an independent organisation (e.g. the competent authority of the third country, independent quality bureaus and certified laboratories). The advantage of involving a scientific third party is that the outcomes are validated and independent. During the company induced self-monitoring program (December 2017 to March 2018) extra information was gathered from different stages in the superchilling process without a validation of an independent third party. The advantage of a company induced self-monitoring program however, is that it generates an increased amount of information of different stages in the superchilling process in a less costly manner. , Below more information about the research steps are given.

2.2. Validated research by independent party

Nile perch are caught in Lake Victoria and processed in the surrounding countries Uganda, Tanzania and Kenya. Superchilled Nile Perch filets from different suppliers of these countries were used for this research. Suppliers are mentioned in table 2.1

Table 2.1: Nile Perch suppliers for validated research

Company code	Company name	Country
EAS	East Africa Sea Food Ltd.	Nairobi, Kenya
SUP	Supreme Perch Ltd.	Bukoba, Tanzania
FRE	Fresh Perch Ltd.	Entebbe, Uganda
KAR	Karmic Foods Ltd.	Kampala, Uganda

From each of above mentioned suppliers six samples were taken for research. The following information was gathered:

- General information:
  - Date of sampling
  - Presentation form of sample
  - Supplier information
- Information about the superchilling process:
  - Core fillet temperature at start of the treatment
  - Core fillet temperature at the end of the treatment
  - Duration superchilling technique
  - Type of freezer
  - Name of independent controller
- Information about the cold chain during transport:
  - Datalogger information during transport
  - Temperature at destination

    - Name of independent controller at destination
- Microbiological information random fillets at destination:
    - Done by an ISO:17025 laboratory, tested on:
        - Total Plate Count (conform ISO 4833-1)
        - Enterobacteriaceae (conform ISO 21528-2)
        - Salmonella (equivalent to ISO 6579 (GEN 25/05-11/08))
        - E.coli (conform ISO 16649-2)
        - Listeria monocytogenes (equivalent to ISO 11290-2 (AES 10/05-09/06))
- Research of random samples by an EU reference Laboratory to differentiate frozen from unfrozen fish, using:
    - Enzyme determination of HADH according to https://link.springer.com/article/10.1007/s002170050481

To differentiate frozen from unfrozen fish it is decided to look at enzyme determination of HADH instead of a histological test. With negative temperatures close to 0°C, some ice crystals could occur which possibly could create cell damage and therefor false positive results. The HADH test is a common enzymatic method that was initially developed to distinguish fresh from thawed meat is the β-hydroxyacyl-CoA-dehydrogenase method (HADH) (Gottesmann & Hamm, 1983; Hoz *et al.,* 1993) that takes advantage of the disruption of cell mitochondria induced by freezing and thawing of whole meat. The principle of this method is applicable and tested on several animal species among which fish. The spectrophotometric method measures the conversion rate of NADH to NAD+ by monitoring the decrease in absorption at 340 nm as shown in the following reaction:

$$Acetoacetyl - coenzyme\ A + NADH + H + \overset{\boldsymbol{HADH}}{\longleftrightarrow} \beta - hydroxybutyl - coenzyme\ A + NAD +$$

2.3. Company induced self-monitoring program

In the company induced self-monitoring program almost 1,000 samples were used to get more information about the superchilling process. Nine dataloggers were used to monitor the transport temperature of the Nile perch samples collected from suppliers mentioned in table 2.2.

Table 2.2: Nile Perch suppliers for company self-monitoring program

Company code	Company name	Country	# samples superchilling Process	Transport
NPF	Nile Perch Fisheries Ltd.	Tanzania	28	2
VPL	Victoria Perch Ltd.	Tanzania	43	1
LBL	Lake Bounty Ltd.	Uganda	430	0
FPL	Fresh Perch Ltd.	Uganda	290	2
LEFP	Lake Eco Fish Processing Ltd.	Uganda	177	2
SPL	Supreme Perch Ltd.	Tanzania	0	2

From each of the above mentioned suppliers the superchilling process was monitored. The following information was gathered:

- General information:
    - Date of sampling
    - Supplier information
- Information about the superchilling process:
    - Core fillet temperature at start of the treatment
    - Core fillet temperature at the end of the treatment
    - Duration superchilling technique

Beside data about the superchilling process, transport temperature data was collected from five of above mentioned suppliers. Data loggers were placed directly inside the fish boxes. Some data loggers have been inserted on the fish before superchilling to also monitor this process.

- Information about the cold chain during transport:
    - Datalogger information during transport
    - Core fillet temperature at arrival at European establishment

3. Results

3.1. Validated research by independent party

3.1.1. General information

For the validated research the private sector collected information, validated by independent parties, about the superchilling process, cold chain during transport, product core temperature at destination at the Europe establishment, microbiology of the product at destination and product enzyme determination of HADH. In total:

- 24 samples of Nile perch fillets from the in table 2.1 mentioned companies were measured to get more insights of the superchilling process;
- 4 data loggers are used to get more insights of the cold chain during transport of the superchilled products;
- 4 boxes of Nile perch fillets were measured at arrival of the Europe establishment to get more insights into the temperature of the superchilled products at arrival.
- 4 samples of Nile perch fillets from four companies were measured on HADH to check if the superchilled products were frozen or unfrozen.

Information about the outcomes are described in the paragraphs 3.1.2, 3.1.3, 3.1.4, 3.1.5 and 3.1.6. More detailed information can be found in the annex I.

3.1.2. Superchilling process

Figure 3.1.1 shows the core fillet temperatures at the start of the superchilling process for the in table 2.1 mentioned suppliers of superchilled Nile perch. In total 24 samples were taken. The average core temperature differ between 1.2 °C (Supreme Perch Ltd.) and 2.8 °C (East African Sea Food Ltd.).

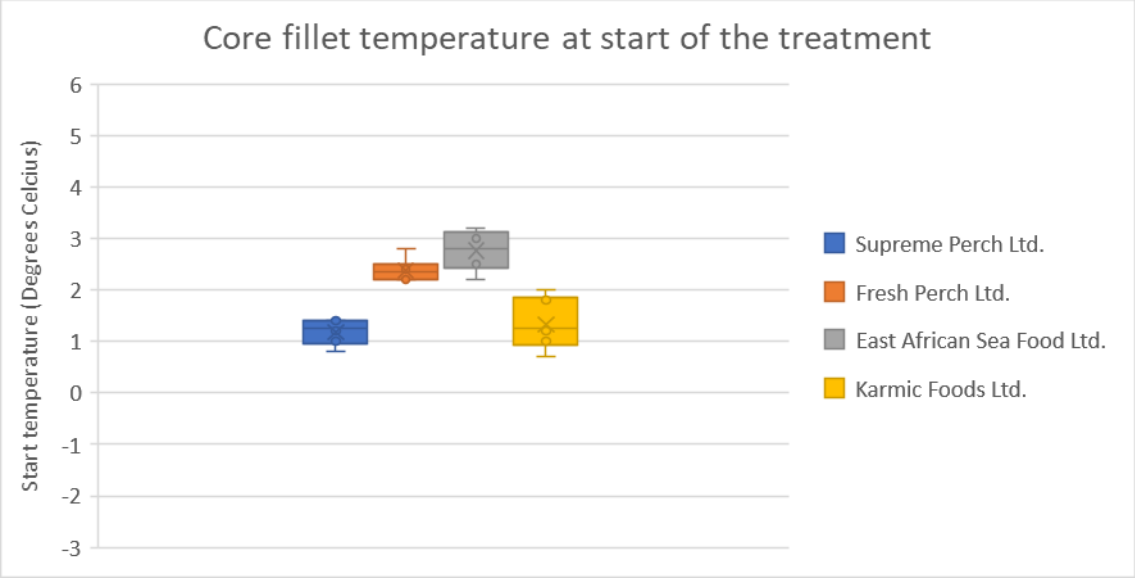

Figure 3.1.1: Core fillet temperature at start superchilling phase, 24 samples gathered in the period 30 May 2018 – 5 June 2018.

The maximum temperature measured was 3.2 °C (East African Sea Food Ltd.). The minimum temperature measured came from Karmic Foods Ltd., 0.7 °C.

Figure 3.1.2 shows the core fillet temperatures at the end of the superchilling process for the in table 2.1 mentioned suppliers of superchilled Nile perch. The average core temperature differ between -0.7 °C (Karmic Foods Ltd.) and -1.6 °C (Supreme Perch Ltd.).

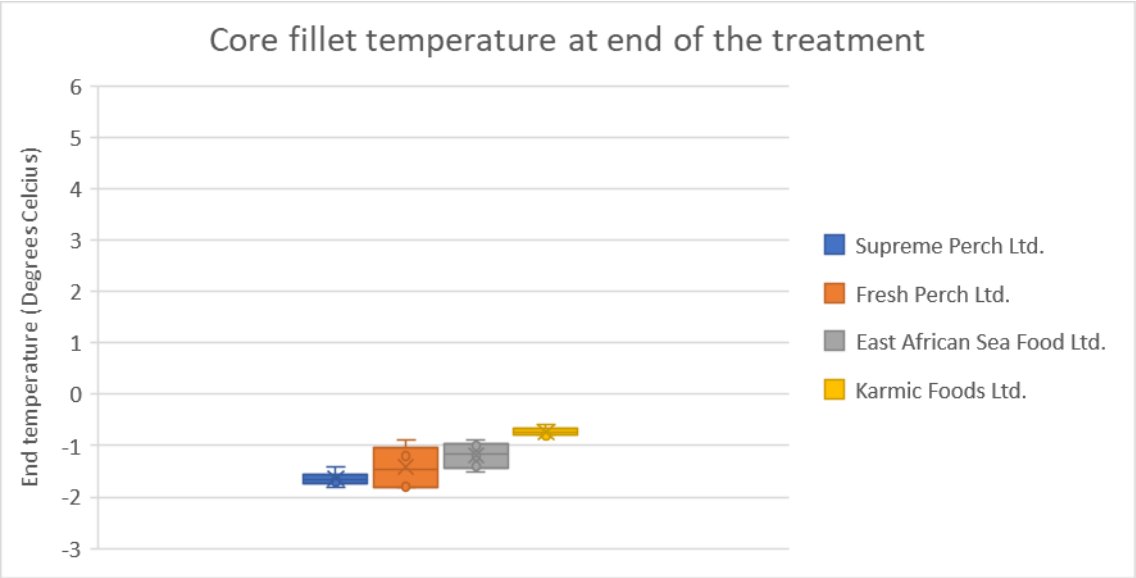

Figure 3.1.2: Core fillet temperature at end superchilling phase, 24 samples gathered in the period 30 May 2018 – 5 June 2018.

The maximum temperature measured was -0.6 °C (Karmic Foods Ltd.). The minimum temperature measured came from Fresh Perch Ltd., -1.8 °C.

Figure 3.1.3 shows the duration of superchilling process for the in table 2.1 mentioned suppliers of superchilled Nile perch. The average treatment differ between 30 minutes (Karmic Foods Ltd.) and 44 minutes (Supreme Perch Ltd.).

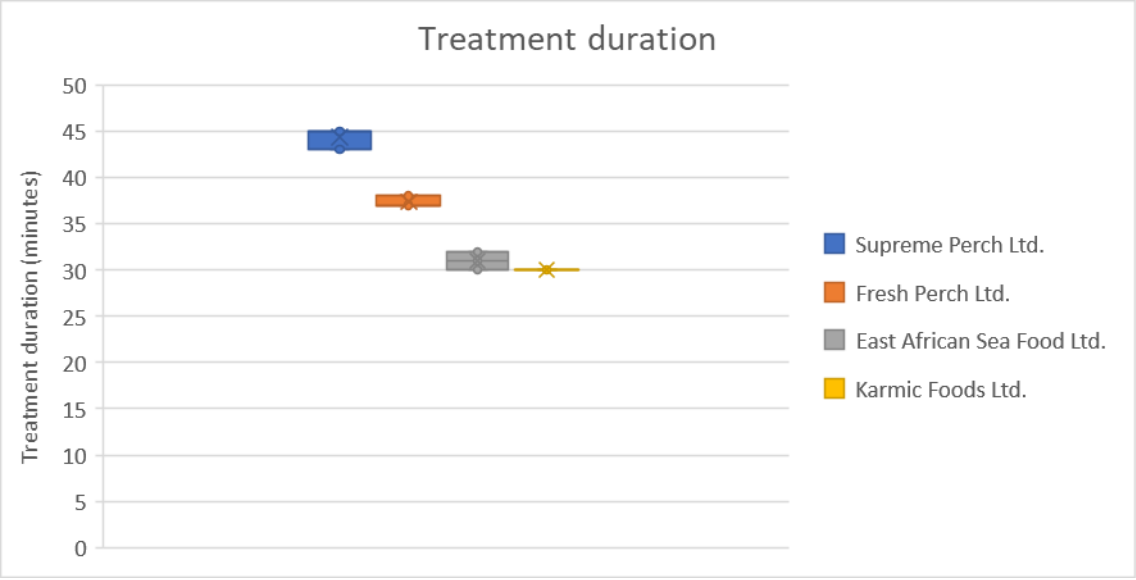

Figure 3.1.3: Treatment duration superchilling process, 24 samples gathered in the period 30 May 2018 – 5 June 2018.

The maximum treatment duration was 45 minutes (Supreme Perch Ltd.). The minimum treatment duration came from East African Sea Food Ltd. and Karmic Foods Ltd., 30 minutes.

Table 3.1.1 shows the independent party that was involved in getting the information about the superchilling process described in chapter 3.1.2.

Table 3.1.1: Independent parties worked on the validated research in the superchilling process.

SUPPLIER	COUNTRY	INDEPENDENT PARTY
SUPREME PERCH LTD.	Tanzania	Director of Fisheries Division, Ministry of Agriculture and Fisheries
FRESH PERCH LTD.	Uganda	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries
EAST AFRICAN SEA FOOD LTD.	Kenya	State Department of Fisheries, Ministry of Agriculture, Livestock and Fisheries
KARMIC FOODS LTD.	Uganda	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries

3.1.3. Transport

From four different suppliers one polystyrene box with samples was accompanied with a data logger to monitor the temperature of the fillets during transport. The graphs gathered from the dataloggers can be found in Annex I A1.4.

- One logger was used for the samples coming from Supreme Perch Ltd. - Tanzania (1 logger put into the fish box after superchilling). The Logistic time (Africa establishment →Europe establishment) recorded by the data logger was ~76 hours with a thermal increase during the transport of +1.3 °C.
- One logger was used for the samples coming from Fresh Perch Ltd. - Uganda (1 logger put into the fish box after superchilling). The Logistic time (Africa establishment →Europe establishment) recorded by the data logger was ~51 hours with a thermal increase during the transport of +2.1 °C. *The data logger shows a temperature increase halfway the transport. For a period of 8-9 hours surface temperature increased to +2 °C (see annex I A1.4).*
- One logger was used for the samples coming from Karmic Foods Ltd. - Uganda (1 logger put into the fish box after superchilling). The Logistic time (Africa establishment →Europe establishment) recorded by the data logger was ~119 hours with a thermal increase during the transport of +1.2 °C.
- One logger was used for the samples coming from East Africa Sea Food Ltd. - Kenya (1 logger put into the fish box after superchilling). The Logistic time (Africa establishment →Europe establishment) recorded by the data logger was ~116 hours with a thermal increase during the transport of +1.9 °C. *The data logger shows a temperature increase around the first of June 2018. For a period of ~4 hours surface temperature was >5 °C (see annex I A1.4).*

From the for sample boxes the core temperature at arrival Europe establishment were measured. In table 3.1.2 you can find the results of these measurements.

The core temperature at arrival Europe establishment varied between -1.6 and +0.5 °C. The maximum temperature was measured from the sample of East African Sea Food Ltd., +0.5 °C. The minimum temperature measured was -1.6 °C (Supreme Perch Ltd.). Detailed information about temperatures at arrival Europe establishment can be found in Annex I A1.2.

Table 3.1.2: Average temperature samples at arrival at an European establishment, 4 sample boxes were measured in the period 1 June 2018 – 8 June 2018.

PRODUCER	CORE TEMPERATURE SAMPLES
SUPREME PERCH LTD.	-1.6
FRESH PERCH LTD.	-0.8
EAST AFRICAN SEA FOOD LTD.	0.5
KARMIC FOODS LTD.	-0.5

RIKILT Wageningen University was the independent party that was involved in collecting the information about transport described in chapter 3.1.3.

3.1.4. Microbiological analyses

From each supplier mentioned in table 2.1 two samples were taken to get insights in the microbiological values after arrival (table 3.1.3). The samples were taken by Mérieux NutriScience, an ISO 17025 certified laboratory in the Netherlands. More details of the lab results can be found in Annex I A1.3. In all samples no salmonella was found and E.Coli and Listeria levels were <10 CFU per gram. Total plate count varied between 26,000 CFU/G (Karmic Foods Ltd.) and >300,000 CFU/G (Supreme Perch Ltd.).

Table 3.1.3: Microbiological information from 8 samples, gathered from the supplier mentioned in table 2.1.

SUPPLIER	PRODUCTION DATE	ANALYSES DATE	TOTAL PLATE COUNT (CFU/G)	ENTEROBACTERIACEAE (CFU/G)	SALMONELLA (/25G)	E. COLI (CFU/G)	LISTERIA MONOCYTOGENES (CFU/G)
FRESH PERCH LTD.	30-5-2018	1-6-2018	140,000	1,200	Absent	<10	<10
FRESH PERCH LTD.	30-5-2018	1-6-2018	300,000	720	Absent	<10	<10
EAST AFRICAN SEAFOOD LTD.	30-5-2018	4-6-2018	180,000	740	Absent	<10	<10
EAST AFRICAN SEAFOOD LTD.	30-5-2018	4-6-2018	280,000	750	Absent	<10	<10
KARMIC FOODS LTD.	30-5-2018	4-6-2018	210,000	250	Absent	<10	<10
KARMIC FOODS LTD.	30-5-2018	4-6-2018	26,000	130	Absent	<10	<10
SUPREME PERCH LTD.	5-6-2018	8-6-2018	>300.000	9.900	Absent	<10	<10
SUPREME PERCH LTD.	5-6-2018	8-6-2018	>300.000	6.200	Absent	<10	<10

3.1.5. Enzyme determination of HADH

Figure 3.1.4 shows the positive reference sample of a Nile Perch that is deep frozen. The Enzymatic HADH activity decrease ratio determines if fish products were frozen or not.

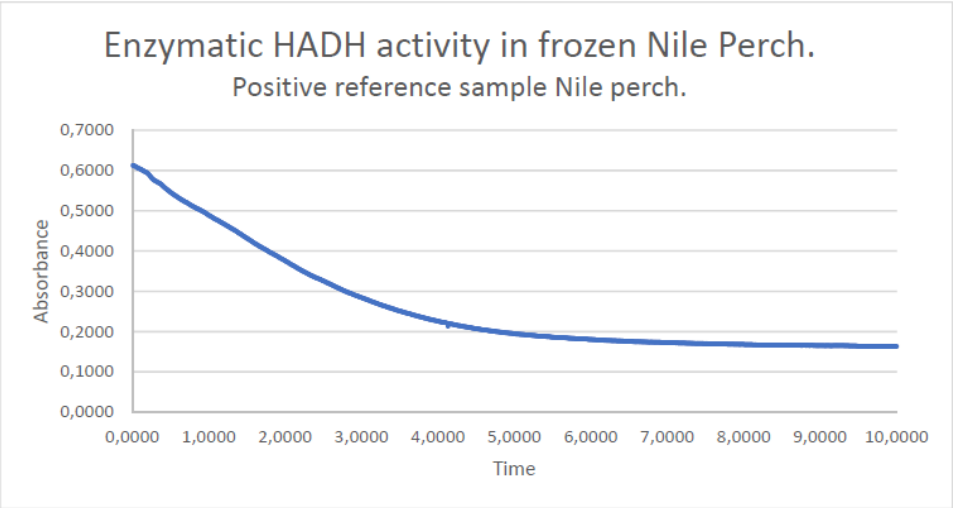

Figure 3.1.4: Enzymatic HADH activity in laboratory reference sample Nile Perch. Frozen for 48 hours at -24 °C. Source: RIKILT Wageningen University.

Figure 3.1.5, 3.1.6, 3.1.7 and 3.1.8 show the enzymatic HADH activity for superchilled samples from the supplier mentioned in table 2.1. The Enzymatic HADH activity decrease ratio in all samples show that the superchilled Nile Perch fillets have not been frozen. The full RIKILT report about enzymatic HADH activity can be found in annex I A1.2.

RIKILT Wageningen University was the independent party that was involved in collecting the information about enzymatic HADH activity in this chapter.

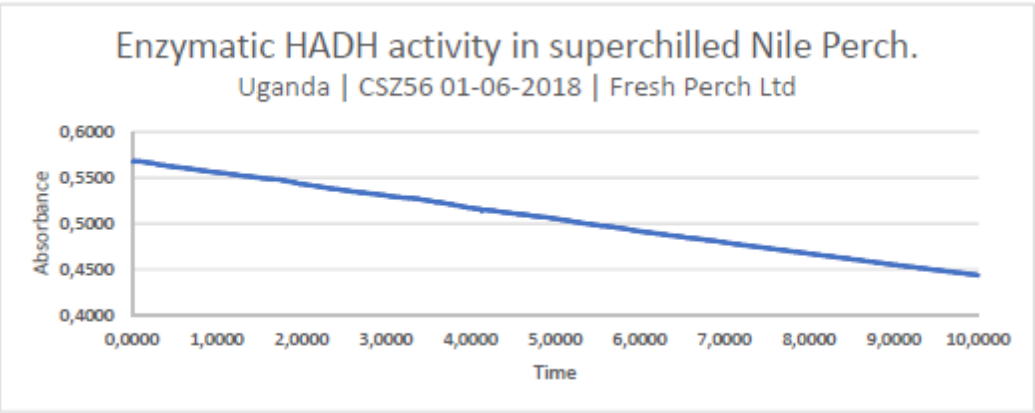

Figure 3.1.5: Enzymatic HADH activity superchilled Nile Perch from Fresh Perch Ltd. Uganda, 1 June 2018. Source: RIKILT Wageningen University.

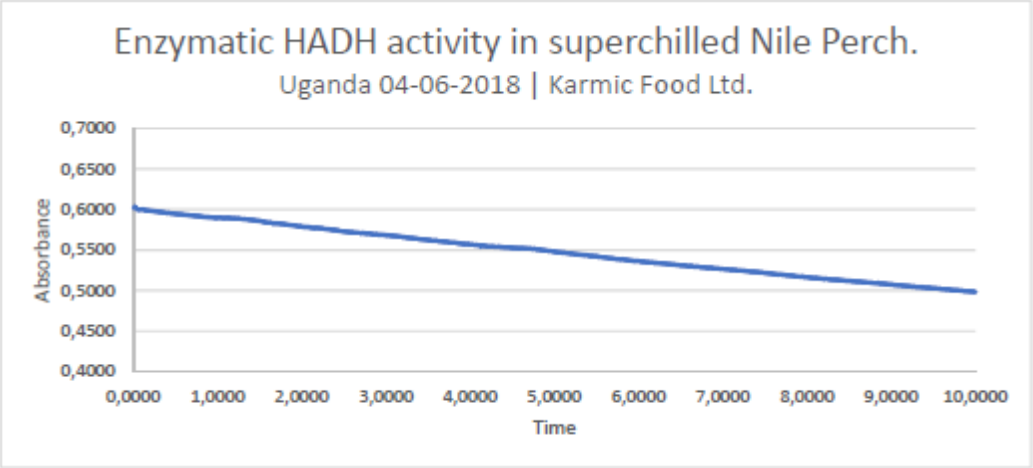

Figure 3.1.6: Enzymatic HADH activity superchilled Nile Perch from Karmic Foods Ltd. Uganda, 4 June 2018. Source: RIKILT Wageningen University.

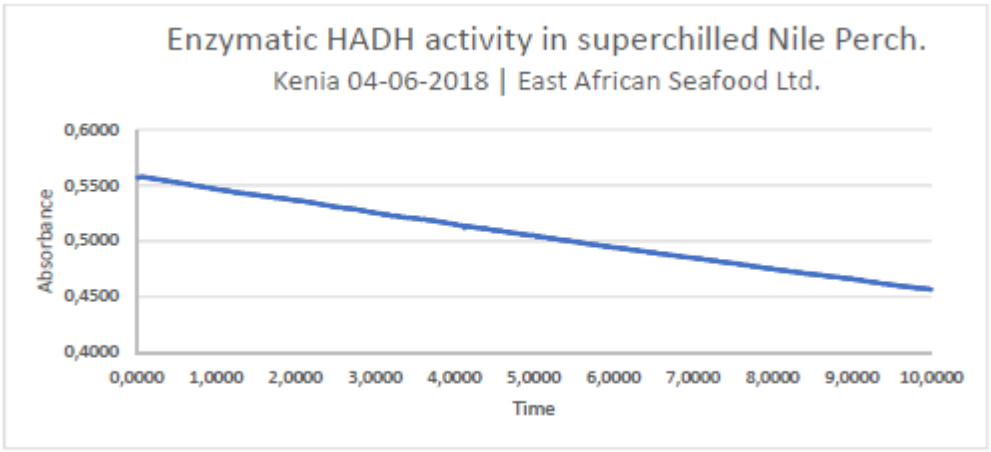

Figure 3.1.7: Enzymatic HADH activity superchilled Nile Perch from East African Seafood Ltd. Kenya, 4 June 2018. Source: RIKILT Wageningen University.

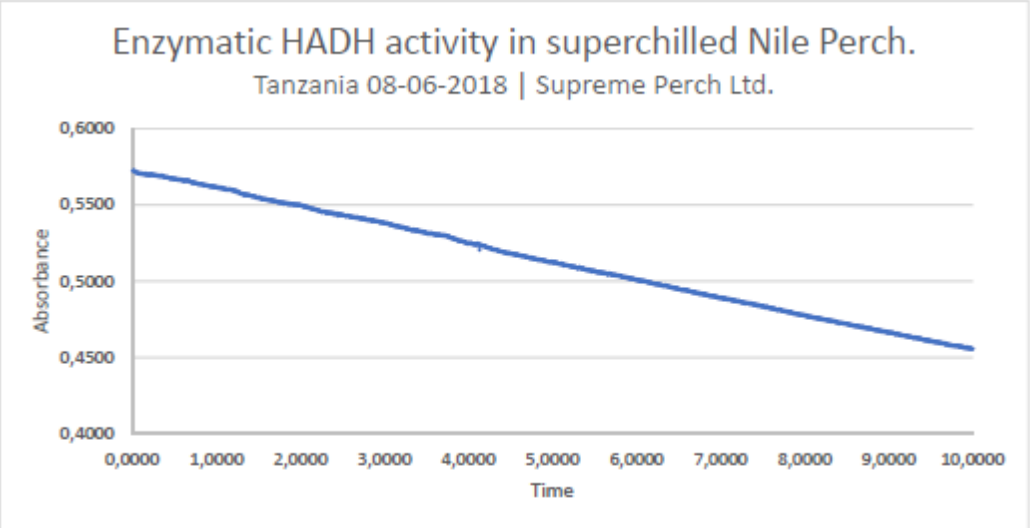

Figure 3.1.8: Enzymatic HADH activity superchilled Nile Perch from Supreme Perch Ltd. Kenya, 8 June 2018. Source: RIKILT Wageningen University.

3.2. Company self-monitoring program

3.2.1. General information

The private sector collected information about the superchilling process, cold chain during transport and core temperature at destination Europe establishment. In total:

- 968 samples of Nile perch fillets were measured to get more insights of the superchilling process;
- 9 data loggers are used to get more insights of the cold chain during transport of the superchilled products;
- 474 samples of Nile perch fillets were measured at arrival Europe establishment to get more insights into the temperature of the superchilled products at arrival.

Information about the outcomes are described in the paragraphs 3.2.2 and 3.3.3.

3.2.2. Superchilling process

Figure 3.2.1 and table 3.2.1 show the core fillet temperatures at the start of the superchilling process for five different suppliers of superchilled Nile perch. In total 968 samples were taken. The average core temperature differ between 0.2 °C (Victoria Perch Ltd.) and 3.6 °C (Lake Bounty Ltd.).

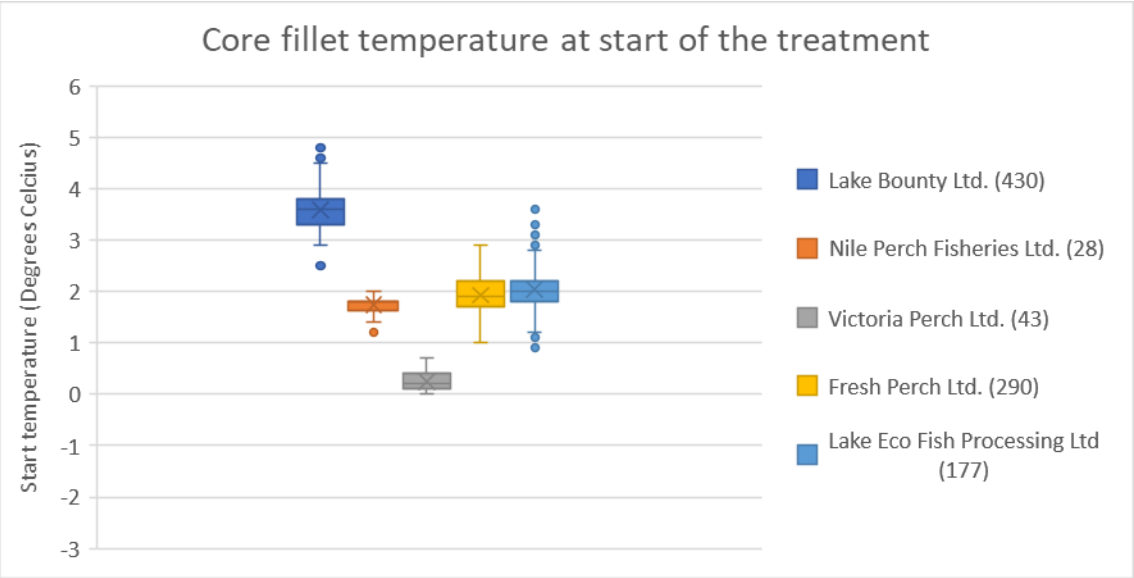

Figure 3.2.1: Core fillet temperature at start superchilling phase, 968 samples gathered in the period December 2017 – March 2018.

The maximum temperature measured was 4.8 °C (Lake Bounty Ltd.). The minimum temperature measured came from Victoria Perch Ltd., 0 °C.

Table 3.2.1: Core fillet temperature at start superchilling phase, 968 samples gathered in the period December 2017 – March 2018.

	LAKE BOUNTY LTD.	NILE PERCH FISHERIES LTD.	VICTORIA PERCH LTD.	FRESH PERCH LTD.	LAKE ECO FISH PROCESSING LTD
# SAMPLES	430	28	43	290	177
AVERAGE	3.6	1.7	0.2	1.9	2.0
FIRST QUARTILE	3.3	1.7	0.1	1.7	1.8
MEDIAN	3.6	1.8	0.2	1.9	2.0
THIRD QUARTILE	3.8	1.8	0.4	2.2	2.2

Figure 3.2.2 and table 3.2.2 show the core fillet temperatures at the end of the superchilling process for the five different suppliers of superchilled Nile perch. The average core temperature differ between -0.9 °C (Nile Perch Fisheries Ltd.) and -1.6 °C (Lake Bounty Ltd. & Victoria Perch Ltd.).

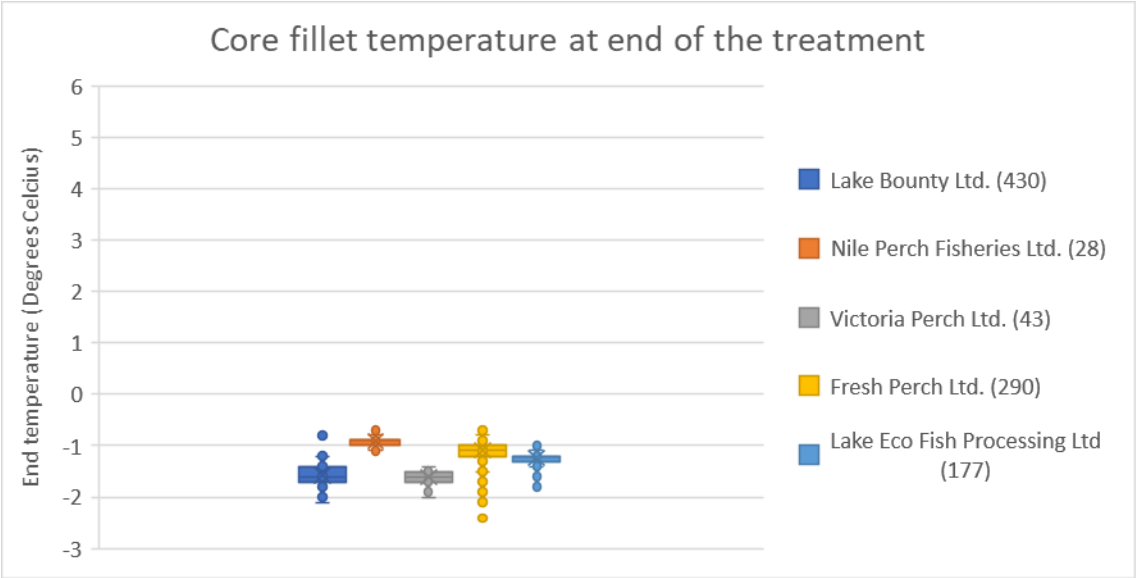

Figure 3.2.2: Core fillet temperature at end superchilling phase, 968 samples gathered in the period December 2017 – March 2018.

The maximum temperature measured was -0.6 °C (Fresh Perch Ltd.). The minimum temperature measured came from Fresh Perch Ltd., -2.4 °C.

Table 3.2.2: Core fillet temperature at end superchilling phase, 968 samples gathered in the period December 2017 – March 2018.

	LAKE BOUNTY LTD.	NILE PERCH FISHERIES LTD.	VICTORIA PERCH LTD.	FRESH PERCH LTD.	LAKE ECO FISH PROCESSING LTD
# SAMPLES	430	28	43	290	177
AVERAGE	-1.6	-0.9	-1.6	-1.1	-1.2
FIRST QUARTILE	-1.7	-1.0	-1.7	-1.2	-1.3
MEDIAN	-1.6	-0.9	-1.6	-1.1	-1.2
THIRD QUARTILE	-1.4	-0.9	-1.5	-1.0	-1.2

Figure 3.2.3 and table 3.2.3 show the duration of superchilling process for the five different suppliers of superchilled Nile perch. The average treatment differ between 32 minutes (Fresh Perch Ltd.) and -52 minutes (Victoria Perch Ltd.).

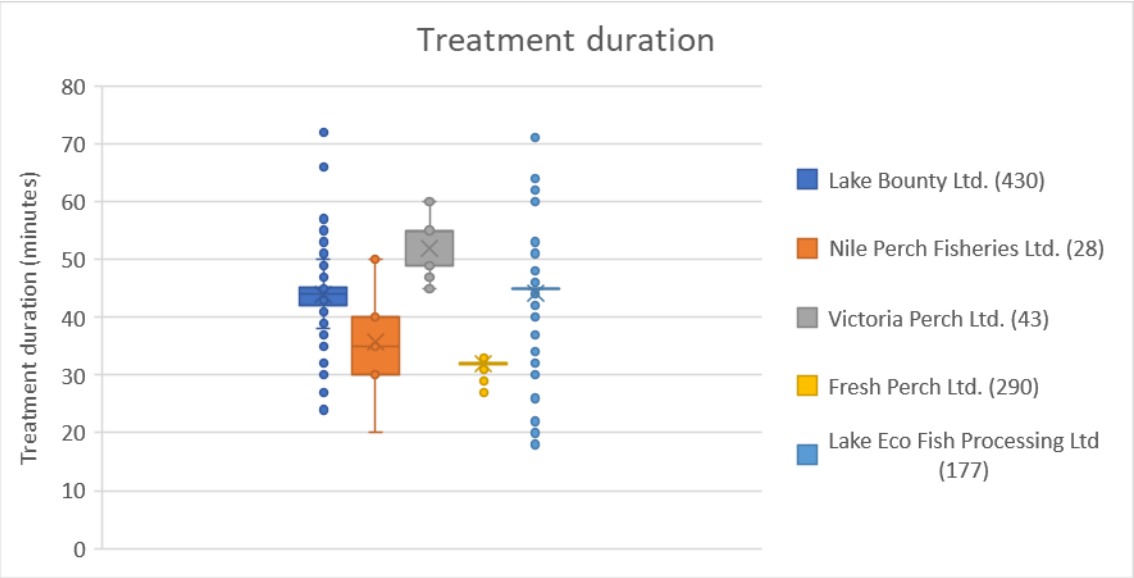

Figure 3.2.3: Treatment duration superchilling process, 968 samples gathered in the period December 2017 – March 2018.

The maximum treatment duration was 72 minutes (Lake Bounty Ltd.). The minimum treatment duration came from Nile Perch Fisheries Ltd., 20 minutes.

Table 3.2.3: Treatment duration superchilling process, 968 samples gathered in the period December 2017 – March 2018.

	LAKE BOUNTY LTD.	NILE PERCH FISHERIES LTD.	VICTORIA PERCH LTD.	FRESH PERCH LTD.	LAKE ECO FISH PROCESSING LTD
# SAMPLES	430	28	43	290	177
AVERAGE	44	36	52	32	44
FIRST QUARTILE	42	30	49	32	45
MEDIAN	44	35	55	32	45
THIRD QUARTILE	45	40	55	32	45

3.2.3. Transport

For 9 samples data loggers were used to monitor the temperature of the fillets during transport. The graphs gathered from the dataloggers can be found in Annex II A2.2.

- Two loggers were used for samples coming from Fresh Perch Ltd. - Uganda (1 data logger put into the fish box before superchilling and 1 logger put into the fish box after superchilling. The Logistic time (Africa establishment →Europe establishment) recorded by the data logger was ~36 hours with a thermal increase during the transport of +1.5 °C.
- Two loggers were used for samples coming from Lake Eco Fish Processing Ltd.- Uganda (1 data logger put into the fish box before superchilling and 1 logger put into the fish box after superchilling. The Logistic time (Africa establishment →Europe establishment) recorded by the data logger was ~36 hours with a thermal increase during the transport of +1.8 °C.
- Two loggers were used for samples coming from Nile Perch Fisheries Ltd. - Tanzania (1 data logger put into the fish box before superchilling and 1 logger put into the fish box after

superchilling. The Logistic time (Africa establishment →Europe establishment) recorded by the data logger was ~58 hours with a thermal increase during the transport of +0.6 °C.

- Two loggers were used for samples coming from Supreme Perch Ltd. – Tanzania (1 data logger put into the fish box before superchilling and 1 logger put into the fish box after superchilling. The Logistic time (Africa establishment →Europe establishment) recorded by the data logger was ~92 hours with a thermal increase during the transport of +0.6 °C.
- One logger was used for samples coming from Victoria Perch Ltd. – Tanzania (1 logger put into the fish box after superchilling). The Logistic time (Africa establishment →Europe establishment) recorded by the data logger was ~58 hours with a thermal increase during the transport of +0.2 °C.

From 474 samples the core temperature at arrival Europe establishment were measured. In figure 3.2.4 you can find the results of these measurements.

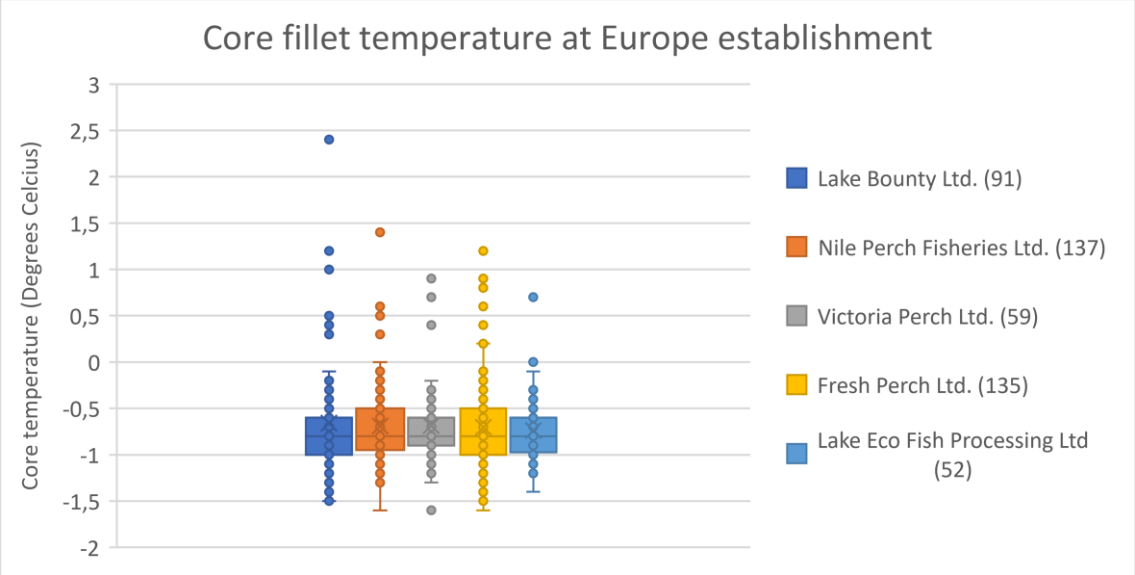

Figure 3.2.4: Core fillet temperature at arrival Europe establishment, 474 samples gathered in the period December 2017 – March 2018.

The average temperature at arrival Europe establishment was -0.7 °C for all suppliers. 75% of the samples had temperatures between -0.9/-1.0 °C and -0.5/-0.6 °C (Table 3.2.4). The maximum temperature was measured at a sample from Lake Bounty Ltd, +2.4 °C. The minimum temperature measured was -1.6 °C (Victoria Perch Ltd.). Detailed information about temperatures at arrival Europe establishment can be found in Annex II A2.3.

Table 3.2.4: Core fillet temperature at arrival Europe establishment, 474 samples gathered in the period December 2017 – March 2018.

	LAKE BOUNTY LTD.	NILE PERCH FISHERIES LTD.	VICTORIA PERCH LTD.	FRESH PERCH LTD.	LAKE ECO FISH PROCESSING LTD
# SAMPLES	91	137	59	135	52
AVERAGE	-0.7	-0.7	-0.7	-0.7	-0.7
FIRST QUARTILE	-1.0	-0.9	-0.9	-1.0	-0.9
MEDIAN	-0.8	-0.8	-0.8	-0.8	-0.8
THIRD QUARTILE	-0.6	-0.5	-0.6	-0.5	-0.6

4. Conclusions

From existing literature and collected research data the following can be concluded:

Literature:

- Superchilling exists already for many years;
- Superchilling is already used in the fresh fish and meat industry and is described for species like salmon, cod, squid, poultry, prawns and pork (Massaquoi *et al.*, 2011; Duun *et al.*, 2008; Jones, 2015; Thordarson *et al., 2017)*;
- Superchilling is defined as a technique that reduces the temperature of fish uniformly to a point slightly below that obtained in melting ice (J.J. Waterman *et al.*, 2001);
- It should be noted that seawater freezes at about -2°C or -3°C, depending on salinity, and that Regulation 852/2004 does allow ice to be made of seawater, so the temperature of melting ice should encompass sub-zero temperatures at least to -3°C;
- Superchilling is used to reduce the temperature of the product to the point of initial freezing; low enough to substantially reduce bacterial activity but high enough to avoid significant levels of ice crystal growth that can cause structural damage.

Research project:

- Blast freezers are used to superchill Nile perch fillets. Average superchill duration fluctuated between 30 and 52 minutes;
- The average superchilled Nile perch fillet temperature did not reach temperatures below -1.6ºC. Minimum temperature measured after superchilling was -2.4ºC;
- The average superchilled Nile perch fillet temperatures stay within the temperature margins of melting ice;
- The average core temperature of the superchilled Nile perch fillets at destination fluctuate between +0.5ºC and -1.6ºC;[1]
- Microbiological analysis of different samples did not show any salmonella occurrence, and <10 CFU per gram E.Coli and Listeria levels. Total plate count varied between 26,000 CFU/g and >300,000 CFU/g;
- Enzymatic HADH activity ratio in all samples shows in an objective way that superchilled Nile Perch fillets do not originate from deep frozen fish products.

Overall, based on the above mentioned bullets it is concluded that superchilling is a good alternative to maintain the cold chain of fresh fisheries products effectively and that deep frozen products are not used in the superchilling process. Moreover, literature studies and microbiological analyses show that superchilling suppresses bacterial activity, maintains food freshness and preserves nutritional quality.

[1] In a normal situation polystyrene boxes are full of Nile Perch fillets. In the research project boxes were filled with only six fillets per box. Due to the high amount of free space in some of the boxes more energy was spent cooling the air in the boxes, which resulted in relatively high temperatures in these boxes at destination (around +0.5ºC).

5. References

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Annex I Validated research by independent party

A1.1 Superchilling information at origin

In the table below information about the superchilling procedure is given for the samples used for the validated research in this report.

Date	Supplier	Samplenr	Start treatment	End treatment	treatment duration	Freezer temperature	Freezer type	Independant authority	Country
5-6-2018	Supreme Perch Ltd.	1	0,8	-1,6	45	-20	Blast Freezer	Director of Fisheries Division, Ministry of Agriculture and Fisheries	Tanzania
5-6-2018	Supreme Perch Ltd.	2	1,4	-1,6	45	-20	Blast Freezer	Director of Fisheries Division, Ministry of Agriculture and Fisheries	Tanzania
5-6-2018	Supreme Perch Ltd.	3	1	-1,8	43	-20	Blast Freezer	Director of Fisheries Division, Ministry of Agriculture and Fisheries	Tanzania
5-6-2018	Supreme Perch Ltd.	4	1,3	-1,4	43	-20	Blast Freezer	Director of Fisheries Division, Ministry of Agriculture and Fisheries	Tanzania
5-6-2018	Supreme Perch Ltd.	5	1,2	-1,7	45	-20	Blast Freezer	Director of Fisheries Division, Ministry of Agriculture and Fisheries	Tanzania
5-6-2018	Supreme Perch Ltd.	6	1,4	-1,7	45	-20	Blast Freezer	Director of Fisheries Division, Ministry of Agriculture and Fisheries	Tanzania
30-5-2018	Fresh Perch Ltd.	1	2,2	-1,8	37	-25	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	Fresh Perch Ltd.	2	2,4	-1,1	37	-25	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	Fresh Perch Ltd.	3	2,2	-1,7	37	-25	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	Fresh Perch Ltd.	4	2,4	-1,2	37	-25	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	Fresh Perch Ltd.	5	2,8	-1,8	38	-25	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	Fresh Perch Ltd.	6	2,3	-0,9	38	-25	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	East African Sea Food Ltd.	1	2,6	-1,2	31	-18	Blast Freezer	State Department of Fisheries, Ministry of Agriculture, Livestock and Fisheries	Kenya

30-5-2018	East African Sea Food Ltd.	2	3,2	-0,9	32	-18	Blast Freezer	State Department of Fisheries, Ministry of Agriculture, Livestock and Fisheries	Kenya
30-5-2018	East African Sea Food Ltd.	3	3,1	-1,4	31	-18	Blast Freezer	State Department of Fisheries, Ministry of Agriculture, Livestock and Fisheries	Kenya
30-5-2018	East African Sea Food Ltd.	4	2,5	-1,1	30	-18	Blast Freezer	State Department of Fisheries, Ministry of Agriculture, Livestock and Fisheries	Kenya
30-5-2018	East African Sea Food Ltd.	5	2,2	-1	30	-18	Blast Freezer	State Department of Fisheries, Ministry of Agriculture, Livestock and Fisheries	Kenya
30-5-2018	East African Sea Food Ltd.	6	3	-1,5	32	-18	Blast Freezer	State Department of Fisheries, Ministry of Agriculture, Livestock and Fisheries	Kenya
30-5-2018	Karmic Foods Ltd.	1	1	-0,8	30	-20	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	Karmic Foods Ltd.	2	0,7	-0,7	30	-20	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	Karmic Foods Ltd.	3	1,3	-0,8	30	-20	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	Karmic Foods Ltd.	4	1,2	-0,6	30	-20	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	Karmic Foods Ltd.	5	2	-0,8	30	-20	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda
30-5-2018	Karmic Foods Ltd.	6	1,8	-0,7	30	-20	Blast Freezer	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries	Uganda

Pictures and validation stamps of the samples are given below

Sample No.		
1	Company name:	SUPREME PERCH (Bukoba) LTD P.O.Box 1139 Bukoba, Tanzania
	Product information	Chilled Nile perch fillet *(Lates niloticus)*
	Presentation form	Individual bagged fillet
	Batch No.	0323718
	Date of sampling	05.06.2018
	Type of freezer	Blast freezer
	Name of the independent controller Controller and organization	Director of Fisheries Division, Ministry of Agriculture, Livestock and Fisheries.

PHYTOSANITARY INSPECTOR * FISH QUALITY * REPUBLIC OF TANZANIA KAGERA * FISHERIES DIVISION *

START: Before entering the chilling room

Start core Temperature	+0.8° C
Start time chilling	11:00AM
Temperature of freezing	- 20° C

STOP: After exiting the chilling room

Finish core Temperature	- 1.6° C
Finish time chilling	11:45AM
Temperature of freezing	-20 ° C

Sample No.		
2	Company name:	SUPREME PERCH (Bukoba) LTD P.O.Box 1139 Bukoba, Tanzania
	Product information	Chilled Nile perch fillet *(Lates niloticus)*
	Presentation form	Individual bagged fillet
	Batch No.	0323718
	Date of sampling	05.06.2018
	Type of freezer	Blast freezer
	Name of the independent controller Controller and organization	Director of Fisheries Division, Ministry of Agriculture, Livestock and Fisheries.

START: Before entering the chilling room

Start core Temperature	+1.4° C
Start time chilling	11:00AM
Temperature of freezing	- 20° C

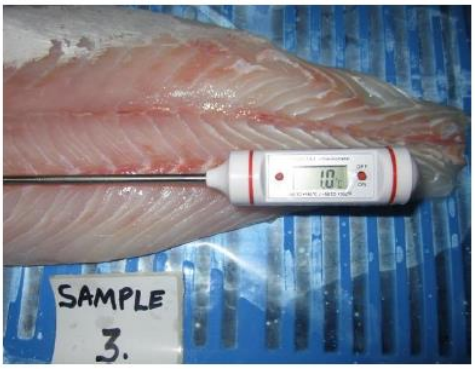
STOP: After exiting the chilling room

Finish core Temperature	- 1.6° C
Finish time chilling	11:45AM
Temperature of freezing	-20 ° C

Sample No.		
3	Company name:	SUPREME PERCH (Bukoba) LTD P.O.Box 1139 Bukoba, Tanzania
	Product information	Chilled Nile perch fillet *(Lates niloticus)*
	Presentation form	Individual bagged fillet
	Batch No.	0323718
	Date of sampling	05.06.2018
	Type of freezer	Blast freezer
	Name of the independent controller Controller and organization	Director of Fisheries Division, Ministry of Agriculture, Livestock and Fisheries.

PHYTOSANITARY INSPECTOR FISH QUALITY REPUBLIC OF TANZANIA KAGERA FISHERIES DIVISION

START: Before entering the chilling room



Start core Temperature	+1.0° C
Start time chilling	11:07AM
Temperature of freezing	- 20° C

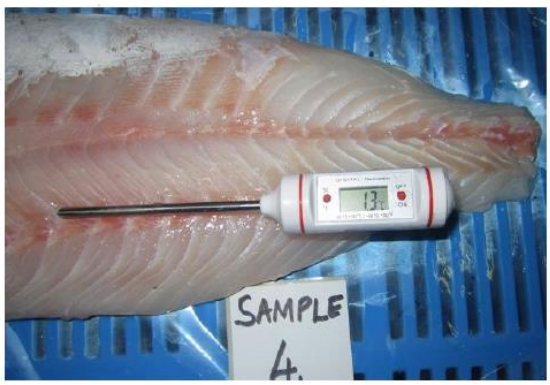
STOP: After exiting the chilling room

Finish core Temperature	- 1.8° C
Finish time chilling	11:50AM
Temperature of freezing	-20 ° C

Sample No.		
4	Company name:	SUPREME PERCH (Bukoba) LTD P.O.Box 1139 Bukoba, Tanzania
	Product information	Chilled Nile perch fillet *(Lates niloticus)*
	Presentation form	Individual bagged fillet
	Batch No.	0323718
	Date of sampling	05.06.2018
	Type of freezer	Blast freezer
	Name of the independent controller Controller and organization	Director of Fisheries Division, Ministry of Agriculture, Livestock and Fisheries.

PHYTOSANITARY INSPECTOR FISH QUALITY REPUBLIC OF TANZANIA KAGERA FISHERIES DIVISION

START: Before entering the chilling room



Start core Temperature	+1.3° C
Start time chilling	11:07AM
Temperature of freezing	- 20° C

STOP: After exiting the chilling room

Finish core Temperature	- 1.4° C
Finish time chilling	11:50AM
Temperature of freezing	-20 ° C

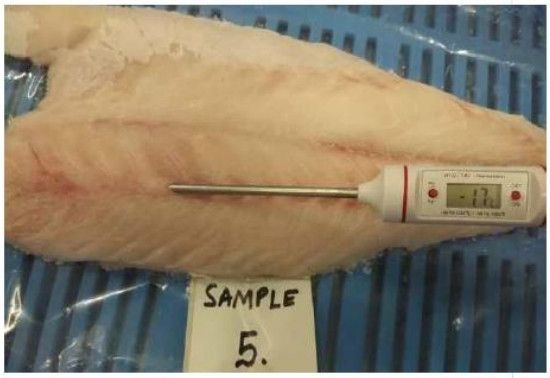
Sample No.	
5	

Company name:	SUPREME PERCH (Bukoba) LTD P.O.Box 1139 Bukoba, Tanzania
Product information	Chilled Nile perch fillet *(Lates niloticus)*
Presentation form	Individual bagged fillet
Batch No.	0323718
Date of sampling	05.06.2018
Type of freezer	Blast freezer
Name of the independent controller Controller and organization	Director of Fisheries Division, Ministry of Agriculture, Livestock and Fisheries.

START: Before entering the chilling room

Start core Temperature	+1.2° C
Start time chilling	11:10AM
Temperature of freezing	- 20° C

STOP: After exiting the chilling room

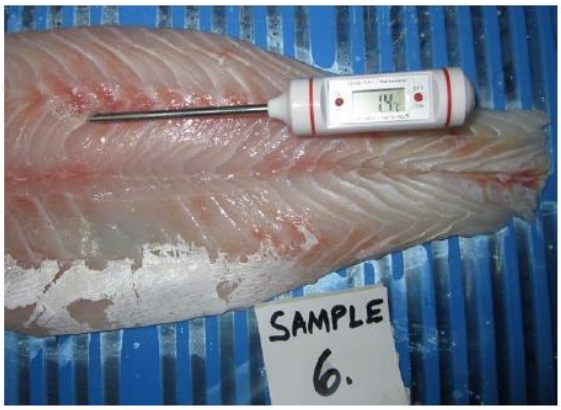


Finish core Temperature	- 1.7° C
Finish time chilling	11:55AM
Temperature of freezing	-20 ° C

Sample No.	
6	

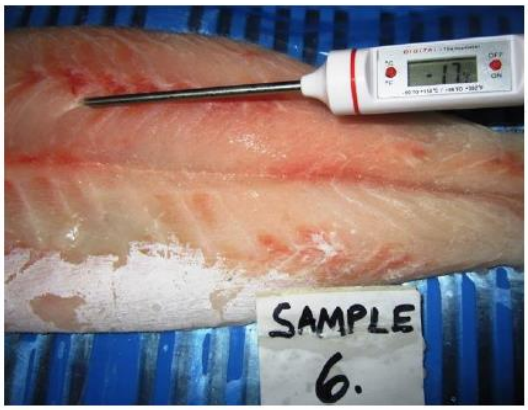
Company name:	SUPREME PERCH (Bukoba) LTD P.O.Box 1139 Bukoba, Tanzania
Product information	Chilled Nile perch fillet *(Lates niloticus)*
Presentation form	Individual bagged fillet
Batch No.	0323718
Date of sampling	05.06.2018
Type of freezer	Blast freezer
Name of the independent controller Controller and organization	Director of Fisheries Division, Ministry of Agriculture, Livestock and Fisheries.

START: Before entering the chilling room



Start core Temperature	+1.4° C
Start time chilling	11:10AM
Temperature of freezing	- 20° C

STOP: After exiting the chilling room



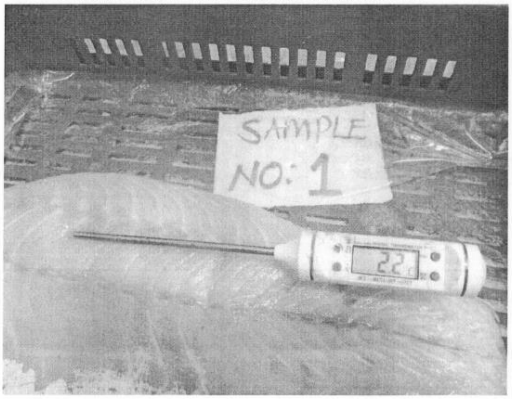
Finish core Temperature	-1.7 ° C
Finish time chilling	11:55AM
Temperature of freezing	-20 ° C

Sample No. 1

Company name	Fresh Perch Limited P.O Box 671, Entebbe - Uganda
Product information	Chilled Nile perch fillet *(Lates niloticus)*
Presentation form	Individually bagged fillet
Batch No.	C-2218-0113126
Date of sampling	30.05. 2018
Type of freezer	Blast freezer
Name of the independent controller and organization.	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)

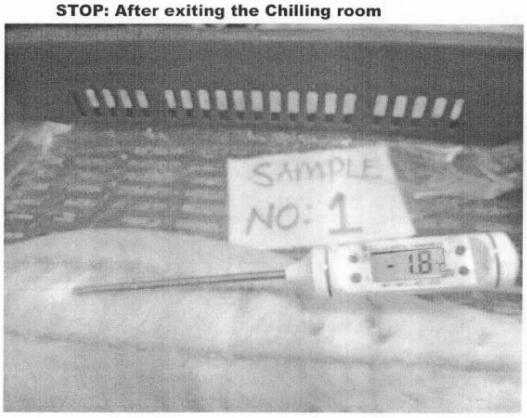
DIRECTORATE OF FISHERIES RESOURCES
FISH INSPECTION SERVICES
30 MAY 2018
P. O. BOX
ENTEBBE - UGANDA

START: Before entering the Chilling room



Start core Temperature	+2.2 ° C
Start time chilling	08.13 am
Temperature of freezing	-25 ° C

STOP: After exiting the Chilling room



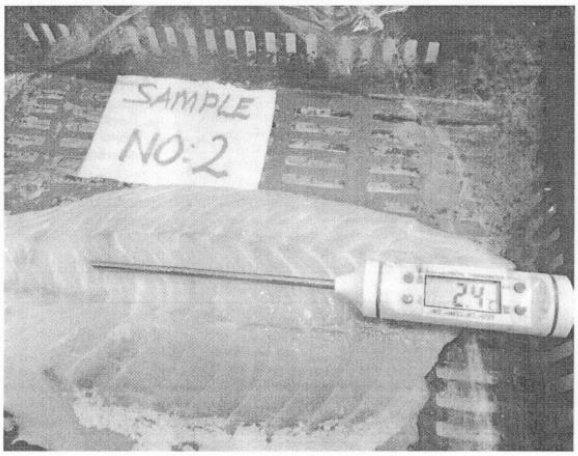
Finish core Temperature	-1.8° C
Finish time chilling	08.50 am
Temperature of freezing	-25 ° C

Sample No. 2

Company name	Fresh Perch Limited P.O Box 671, Entebbe - Uganda
Product information	Chilled Nile perch fillet *(Lates niloticus)*
Presentation form	Individually bagged fillet
Batch No.	C-2218-0113126
Date of sampling	30.05. 2018
Type of freezer	Blast freezer
Name of the independent controller	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)

DIRECTORATE OF FISHERIES RESOURCES
FISH INSPECTION SERVICES
30 MAY 2018
P. O. BOX
ENTEBBE - UGANDA

START: Before entering the Chilling room



Start core Temperature	+2.4 ° C
Start time chilling	08.13 am
Temperature of freezing	-25 ° C

STOP: After exiting the Chilling room

Finish core Temperature	-1.1° C
Finish time chilling	08.50 am
Temperature of freezing	-25 ° C

Sample No. 3

Company name	**Fresh Perch Limited P.O Box 671, Entebbe - Uganda**
Product information	**Chilled Nile perch fillet *(Lates niloticus)***
Presentation form	**Individually bagged fillet**
Batch No.	**C-2218-0113126**
Date of sampling	**30.05. 2018**
Type of freezer	**Blast freezer**
Name of the independent controller	**Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)**

DIRECTORATE OF FISHERIES RESOURCES
FISH INSPECTION SERVICES
30 MAY 2018
P. O. BOX 671
ENTEBBE - UGANDA

START: Before entering the Chilling room

Start core Temperature	**+2.2 ° C**
Start time chilling	**08.15 am**
Temperature of freezing	**-25 ° C**

STOP: After exiting the Chilling room

Finish core Temperature	**-1.7° C**
Finish time chilling	**08.52 am**
Temperature of freezing	**-25 ° C**

Sample No. 4

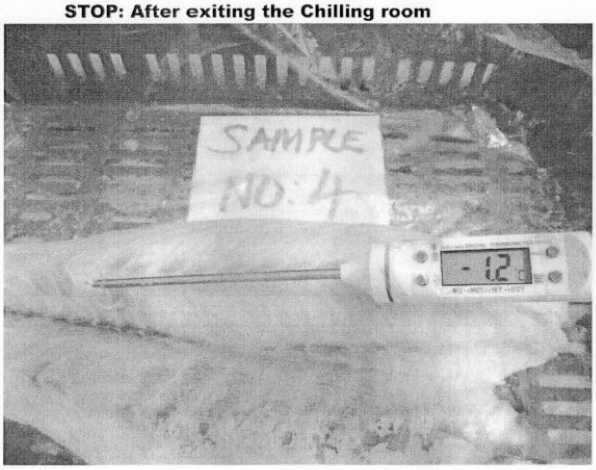
Company name	**Fresh Perch Limited P.O Box 671, Entebbe - Uganda**
Product information	**Chilled Nile perch fillet *(Lates niloticus)***
Presentation form	**Individually bagged fillet**
Batch No.	**C-2218-0113126**
Date of sampling	**30.05. 2018**
Type of freezer	**Blast freezer**
Name of the independent controller	**Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)**

DIRECTORATE OF FISHERIES RESOURCES
FISH INSPECTION SERVICES
30 MAY 2018
P. O. BOX 671
ENTEBBE - UGANDA

START: Before entering the Chilling room

Start core Temperature	**+2.4 ° C**
Start time chilling	**08.15 am**
Temperature of freezing	**-25 ° C**

STOP: After exiting the Chilling room



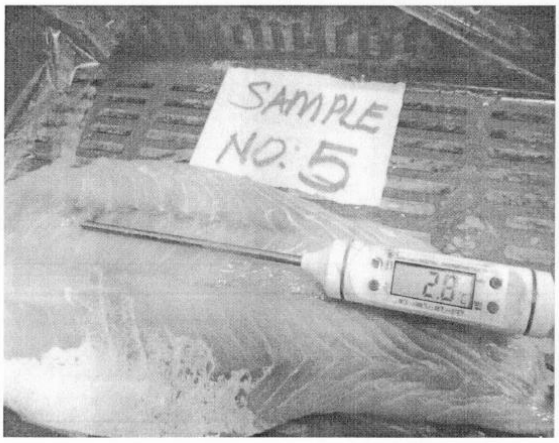
Finish core Temperature	**-1.2° C**
Finish time chilling	**08.52 am**
Temperature of freezing	**-25 ° C**

Sample No. 5

Company name	**Fresh Perch Limited P.O Box 671, Entebbe - Uganda**
Product information	**Chilled Nile perch fillet *(Lates niloticus)***
Presentation form	**Individually bagged fillet**
Batch No.	**C-2218-0113126**
Date of sampling	**30.05. 2018**
Type of freezer	**Blast freezer**
Name of the independent controller	**Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)**

DIRECTORATE OF FISHERIES RESOURCES
FISH INSPECTION SERVICES
30 MAY 2018
P. O. BOX 4
ENTEBBE - UGANDA

START: Before entering the Chilling room



Start core Temperature	**+2.8 ° C**
Start time chilling	**08.17 am**
Temperature of freezing	**-25 ° C**

STOP: After exiting the Chilling room

Finish core Temperature	**-1.8° C**
Finish time chilling	**08.55 am**
Temperature of freezing	**-25 ° C**

Sample No. 6

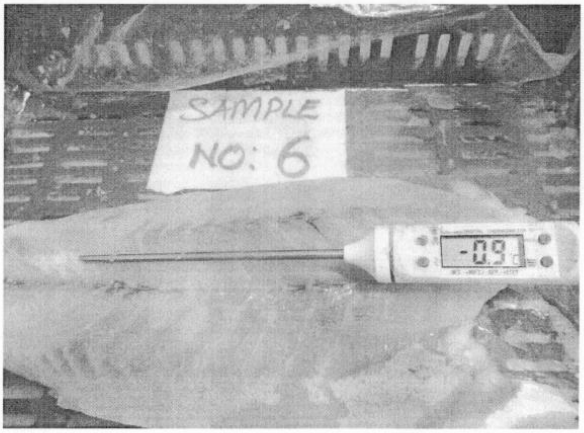
Company name	**Fresh Perch Limited P.O Box 671, Entebbe - Uganda**
Product information	**Chilled Nile perch fillet *(Lates niloticus)***
Presentation form	**Individually bagged fillet**
Batch No.	**C-2218-0113126**
Date of sampling	**30.05. 2018**
Type of freezer	**Blast freezer**
Name of the independent controller	**Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)**

DIRECTORATE OF FISHERIES RESOURCES
FISH INSPECTION SERVICES
30 MAY 2018
P. O. BOX 4
ENTEBBE - UGANDA

START: Before entering the Chilling room

Start core Temperature	**+2.3 ° C**
Start time chilling	**08.17 am**
Temperature of freezing	**-25 ° C**

STOP: After exiting the Chilling room



Finish core Temperature	**-0.9° C**
Finish time chilling	**08.55 am**
Temperature of freezing	**-25 ° C**

East African Sea Food Ltd.

X 


Chilled Nile Perch Fillets
EAS003
E31830/CF/14
30/05/2018
MINISTRY OF AGRICULTURE LIVESTOCK AND FISHERIES
STATE DEPARTMENT OF FISHERIES


Product name:
Sample number: EAS004
Batch number: E31830/CF/02
Date of sampling: 30/05/2018
Sign and stamp:
MINISTRY OF AGRICULTURE LIVESTOCK AND FISHERIES
STATE DEPARTMENT OF FISHERIES


Before chilling
Product name: Chilled Nile Perch Fillets
Sample number: EAS006
Batch number: E31830/CF/02
Date of sampling: 30/05/2018
Sign and stamp:
MINISTRY OF AGRICULTURE, LIVESTOCK AND FISHERIES
DEPARTMENT OF FISHERIES
DIGITAL
HOLD
TEST
3.0°C
OFF
ON
-50°C TO +150°C


°C
°F
22.2
OFF
ON
-50°C TO +300°C
Before chilling
Product name: Chilled Nile Perch Fillets
Sample number: EAS005
Batch number: E31830/CF/02
Date of sampling: 30/05/2018
Sign and stamp:
MINISTRY OF AGRICULTURE, LIVESTOCK AND FISHERIES
DEPARTMENT OF FISHERIES


After chilling
Product name:
Sample number:
Batch number:
Date of sampling:
Sign and stamp:
EAS/04
E31830/CF/02
30/05/2018
MINISTRY OF AGRICULTURE
STATE DEPARTMENT OF FISHERIES
DIGITAL
HOLD
TEST
OFF
ON
-1.1°C
-50°C TO +150°C


After chilling
Product name:
Sample number:
Batch number:
Date of sampling:
Sign and stamp:
Chilled Nile Perch Fillets
EAS/03
E31830/CF/14
30/05/2018
MINISTRY OF AGRICULTURE
STATE DEPARTMENT OF FISHERIES
DIGITAL
HOLD
TEST
OFF
ON
-1.4°C
-50°C TO +150°C


After chilling
Product name: Chilled Nile Perch Fillets
Sample number: EAS006
Batch number: E31830/CF/02
Date of sampling: 30/05/2018
Sign and stamp:
DIGITAL
HOLD
TEST
OFF
ON
-50°C TO +150°C


After chilling
Product name: Chilled Nile Perch Fillets
Sample number: EAS005
Batch number: E31830/CF/02
Date of sampling: 30/05/2018
Sign and stamp:
DIGITAL
HOLD
TEST
OFF
ON
-50°C TO +150°C

SAMPLE NO. 01	
COMPANY NAME	KARMIC FOODS LIMITED (EAN U10/06), PLOT 8-13, OFF ENTEBBE ROAD, ENTEBBE, P.O.BOX:27929, KAMPALA, UGANDA
PRODUCT INFORMATION	CHILLED NILE PERCH FILLETS (*Lates niloticus*)
PRESENTATION FORM	INDIVIDUALLY BAGGED FILLETS
BATCH NUMBER	K18150A72401
DATE OF SAMPLING	30.05.2018
TYPE OF FREEZER	BLAST CHILLER
NAME OF THE INDEPENDENT CONTROLLER AND ORGANIZATION.	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)

START: Before entering the Blast Chiller

Start core Temperature	+1.0°C
Start time chilling	12:30 PM
Temperature of freezing	-20°C

STOP: After exiting the Blast Chiller

Finished core Temperature	-0.8°C
Finish time chilling	1:00 PM
Temperature of freezing	-20°C

Signature & Stamp (Competent Authority):-

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FISH INSPECTION SERVICES
30 MAY 2018
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SAMPLE NO. 02	
COMPANY NAME	KARMIC FOODS LIMITED (EAN U10/06), PLOT 8-13, OFF ENTEBBE ROAD, ENTEBBE, P.O.BOX:27929, KAMPALA, UGANDA
PRODUCT INFORMATION	CHILLED NILE PERCH FILLETS (*Lates niloticus*)
PRESENTATION FORM	INDIVIDUALLY BAGGED FILLETS
BATCH NUMBER	K18150A72401
DATE OF SAMPLING	30.05.2018
TYPE OF FREEZER	BLAST CHILLER
NAME OF THE INDEPENDENT CONTROLLER AND ORGANIZATION.	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)

START: Before entering the Blast Chiller

Start core Temperature	+0.7°C
Start time chilling	12:35 PM
Temperature of freezing	-20°C

STOP: After exiting the Blast Chiller

Finished core Temperature	-0.7°C
Finish time chilling	1:05 PM
Temperature of freezing	-20°C

Signature & Stamp (Competent Authority):- _____

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FISH INSPECTION SERVICES
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ENTEBBE - UGANDA

SAMPLE NO. 03	
COMPANY NAME	KARMIC FOODS LIMITED (EAN U10/06), PLOT 8-13, OFF ENTEBBE ROAD, ENTEBBE, P.O.BOX:27929, KAMPALA, UGANDA
PRODUCT INFORMATION	CHILLED NILE PERCH FILLETS (*Lates niloticus*)
PRESENTATION FORM	INDIVIDUALLY BAGGED FILLETS
BATCH NUMBER	K18150A72401
DATE OF SAMPLING	30.05.2018
TYPE OF FREEZER	BLAST CHILLER
NAME OF THE INDEPENDENT CONTROLLER AND ORGANIZATION.	Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)

START: Before entering the Blast Chiller

STOP: After exiting the Blast Chiller

Start core Temperature	+1.3°C
Start time chilling	12:35 PM
Temperature of freezing	-20°C

Finished core Temperature	-0.8°C
Finish time chilling	1:05 PM
Temperature of freezing	-20°C

Signature & Stamp (Competent Authority):- _____

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FISH INSPECTION SERVICES
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SAMPLE NO. 04	
COMPANY NAME	KARMIC FOODS LIMITED (EAN U10/06), PLOT 8-13, OFF ENTEBBE ROAD, ENTEBBE, P.O.BOX:27929, KAMPALA, UGANDA
PRODUCT INFORMATION	CHILLED NILE PERCH FILLETS (*Lates niloticus*)
PRESENTATION FORM	INDIVIDUALLY BAGGED FILLETS
BATCH NUMBER	K18150A72401
DATE OF SAMPLING	30.05.2018
TYPE OF FREEZER	BLAST CHILLER
NAME OF THE INDEPENDENT CONTROLLER AND ORGANIZATION.	**Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)**

START: Before entering the Blast Chiller

Start core Temperature	+1.2°C
Start time chilling	12:35 PM
Temperature of freezing	-20°C

STOP: After exiting the Blast Chiller

Finished core Temperature	-0.6°C
Finish time chilling	1: 05PM
Temperature of freezing	-20°C

Signature & Stamp (Competent Authority):- _____

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FISH INSPECTION SERVICES
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SAMPLE NO. 05	
COMPANY NAME	KARMIC FOODS LIMITED (EAN U10/06), PLOT 8-13, OFF ENTEBBE ROAD, ENTEBBE, P.O.BOX:27929, KAMPALA, UGANDA
PRODUCT INFORMATION	CHILLED NILE PERCH FILLETS (*Lates niloticus*)
PRESENTATION FORM	INDIVIDUALLY BAGGED FILLETS
BATCH NUMBER	K18150A72401
DATE OF SAMPLING	30.05.2018
TYPE OF FREEZER	BLAST CHILLER
NAME OF THE INDEPENDENT CONTROLLER AND ORGANIZATION.	**Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)**

START: Before entering the Blast Chiller

Start core Temperature	+2.0°C
Start time chilling	12:40 PM
Temperature of freezing	-20°C

STOP: After exiting the Blast Chiller

Finished core Temperature	-0.8°C
Finish time chilling	1:10 PM
Temperature of freezing	-20°C

Signature & Stamp (Competent Authority):- _____

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FISH INSPECTION SERVICES
30 MAY 2018
P. O. BOX 4
ENTEBBE - UGANDA

SAMPLE NO. 06	
COMPANY NAME	KARMIC FOODS LIMITED (EAN U10/06), PLOT 8-13, OFF ENTEBBE ROAD, ENTEBBE, P.O.BOX:27929, KAMPALA, UGANDA
PRODUCT INFORMATION	CHILLED NILE PERCH FILLETS (*Lates niloticus*)
PRESENTATION FORM	INDIVIDUALLY BAGGED FILLETS
BATCH NUMBER	K18150A72401
DATE OF SAMPLING	30.05.2018
TYPE OF FREEZER	BLAST CHILLER
NAME OF THE INDEPENDENT CONTROLLER AND ORGANIZATION.	**Directorate of Fisheries Resource (Ministry of Agriculture, Animal Industry & Fisheries)**

START: Before entering the Blast Chiller

STOP: After exiting the Blast Chiller

Start core Temperature	+1.8°C
Start time chilling	12:40 PM
Temperature of freezing	-20°C

Finished core Temperature	-0.7°C
Finish time chilling	1:10 PM
Temperature of freezing	-20°C

Signature & Stamp (Competent Authority):- _____

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30 MAY 2018
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A1.2 Destination temperature and HADH results RIKILT Wageningen University

In the RIKILT report information about enzymatic HADH activity, but also sample temperatures at destination are given.

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Datum : Augustus 2018

Resultaten van de enzymatische HADH bepaling en temperatuurmetingen in het project superchilled Nijlbaars.

Enzymatische HADH detrermination :

A common enzymatic method that was initially developed to distinguish fresh from thawed meat is the β-hydroxyacyl-CoA-dehydrogenase method (HADH) (Gottesmann & Hamm, 1983) that takes advantage of the disruption of cell mitochondria induced by freezing and thawing of whole meat. This principle of this method is applicable and tested on several animal species among which fish.
The spectrophotometric method measures the conversion rate of NADH to NAD+ by monitoring the decrease in absorption at 340 nm as shown in fig.1.

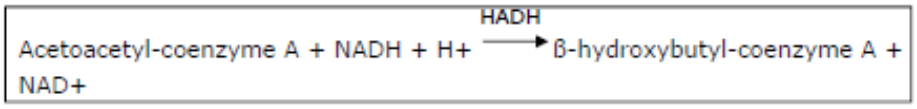

Fig.1 Conversion of NADH to NAD+ in the presence of mitochondrial HADH.

Resultaten:

Enzymatische bepaling:

1. Uganda | CSZ56 01-06-2018 | Fresh Perch Ltd
   Rikilt nr. to follow

In figuur 1 is absorptie afname gemeten van het monster Uganda | CSZ56 01-06-2018 tov van een bevroren referentiemonster nijlbaars (Figuur 5). De ratioberekeningen geven aan dat het monster niet bevroren is geweest.

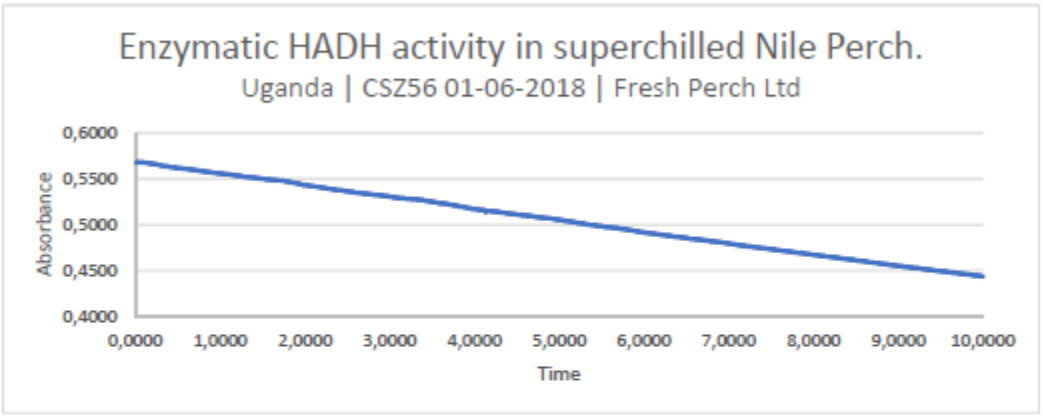

Fig.1 Enzymatic HADH activity in superchilled Nile Perch. Uganda | CSZ56 01-06-2018 | Fresh Perch Ltd

2. Uganda 04-06-2018 | Karmic Food Ltd.

Rikilt nr. RIK0519904

In figuur 2 is absorptie afname gemeten van het monster Uganda 04-06-2018 | Karmic Food Ltd. tov van een bevroren referentiemonster nijlbaars (Figuur 5). De ratioberekeningen geven aan dat het monster niet bevroren is geweest.

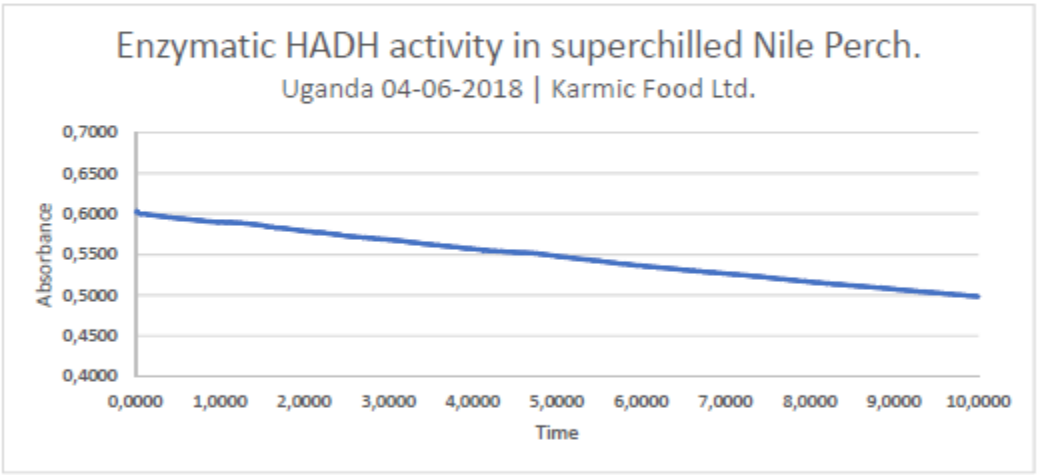

Fig.2 Enzymatic HADH activity in superchilled Nile Perch. Uganda | CSZ56 01-06-2018 | Fresh Perch Ltd

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3. Kenia 04-06-2018 | East African Seafood Ltd.

Rikilt nr. RIK0519905

In figuur 3 is absorptie afname gemeten van het monster Kenia 04-06-2018 | East African Seafood Ltd. tov van een bevroren referentiemonster nijlbaars (Figuur 5). De ratioberekeningen geven aan dat het monster niet bevroren is geweest.

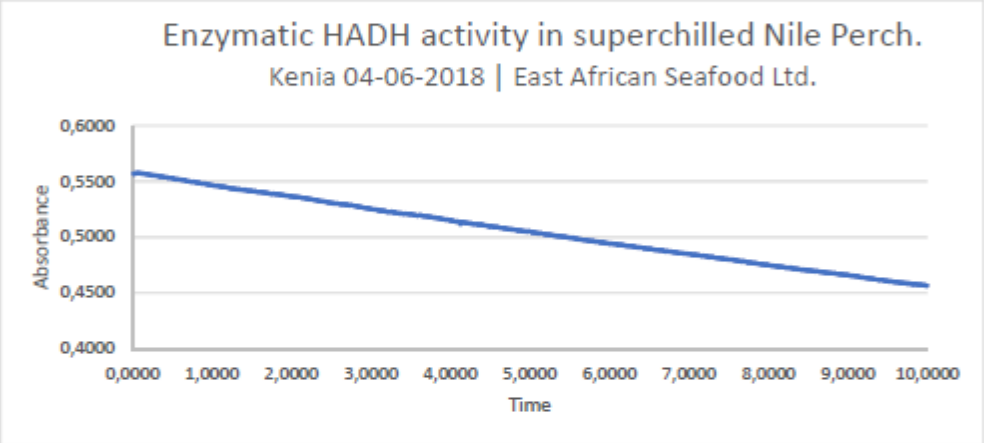

Fig.3 Enzymatic HADH activity in superchilled Nile Perch. Uganda | CSZ56 01-06-2018 | Fresh Perch Ltd

4. Tanzania 08-06-2018 | Supreme Perch Ltd.

Rikilt nr. RIK0519906

In figuur 4 is absorptie afname gemeten van het monster Tanzania 08-06-2018 | Supreme Perch Ltd. tov van een bevroren referentiemonster nijlbaars (Figuur 5). De ratioberekeningen geven aan dat het monster niet bevroren is geweest.

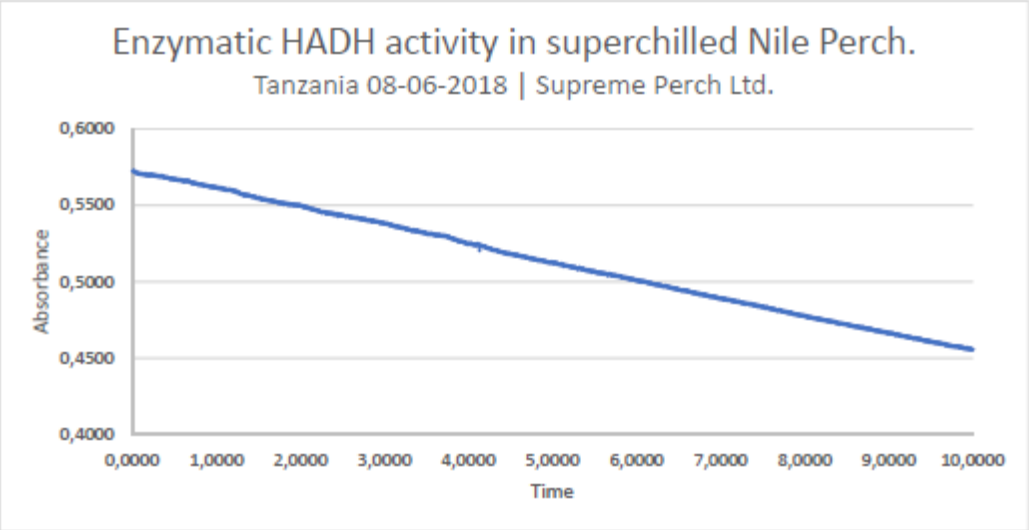

Fig.4 Enzymatic HADH activity in superchilled Nile Perch. Uganda | CSZ56 01-06-2018 | Fresh Perch Ltd

Bovenstaande monsters zijn gemeten ten opzichte van een bevroren monster Nijlbaars monster waarvan de enzymactiviteit is weergegeven in figuur. 5.

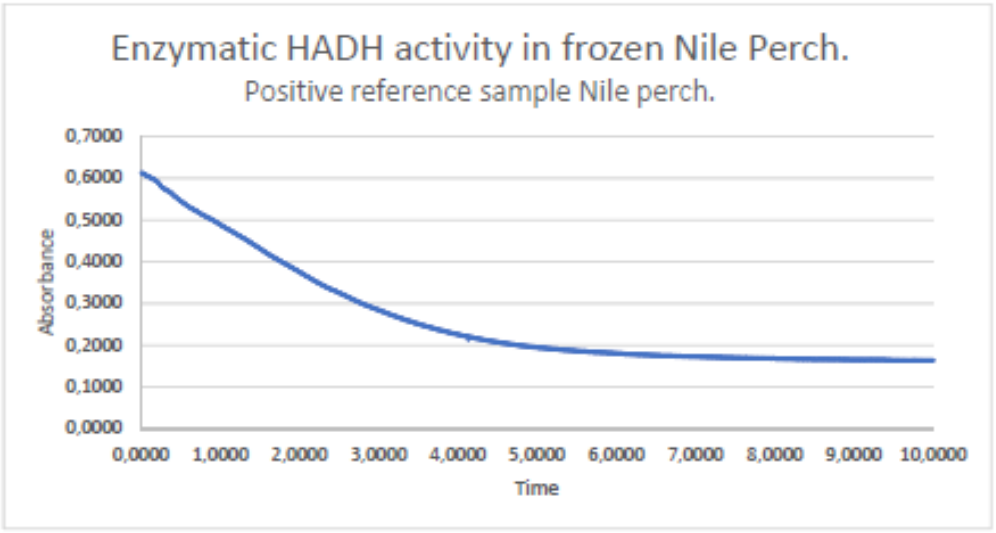

Fig.5 Enzymatic HADH activity in laboratory reference sample Nile Perch. Frozen for 48 h at -24 °C.

Temperatuur metingen en bemonstering.

Er zijn verspreid over 3 dagen in totaal 4 monsters ontvangen in gelijke witte tempex dozen die bij ontvangst bij 4 °C zijn opgeslagen in afwachting van de microbiologische bemonstering door Mérieux NutriSciences te Ede. Iedere bemonstering nam ca. 15 minuten in beslag waarbij er 4 filets uit iedere doos werden genomen voor microbiologische analysen.
De temperaturen van de monsters zijn gemeten door een probe in het middelpunt van iedere doos te steken omdat de individuele filets te dun zijn om een stabiel uitlezing te verkrijgen.
Hier onder staat in chronologische volgorde het fotoverslag met beschrijving.

1. Uganda | CSZ56 01-06-2018 | Fresh Perch Ltd
Rikilt nr. RIK0519903

Foto 1. Zending uit Uganda | CSZ56 01-06-2018 | Fresh Perch Ltd,
ontvangen op 1 juni 2018.
Monster zoals aangekomen.
Tijdstip aanvang bemonstering : 12:45

Foto 2. Zending uit Uganda | CSZ56 01-06-2018 | Fresh Perch Ltd,
ontvangen op 1 juni 2018.
Doos na openen voor bemonstering.

Foto 3. Zending uit Uganda | CSZ56 01-06-2018 | Fresh Perch Ltd, ontvangen op 1 juni 2018.
4 filets genomen door Mérieux NutriSciences voor microbiologische analysen.

Foto 4. Zending uit Uganda | CSZ56 01-06-2018 | Fresh Perch Ltd, ontvangen op 1 juni 2018.
Gemeten kern temperatuur : -0,8 °C.

2. Uganda 04-06-2018 | Karmic Food Ltd.
Rikilt nr. RIK0519904

Foto 5. Zending uit Uganda 04-06-2018 | Karmic Food Ltd. ontvangen op 4 juni 2018.
Monster zoals aangekomen.
Tijdstip aanvang bemonstering : 11:15

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3. Kenia 04-06-2018 | East African Seafood Ltd.
Rikilt nr. RIK0519905

Foto 6. Zending uit Kenia 04-06-2018 | East African Seafood Ltd.ontvangen op 4 juni 2018.
Monster zoals aangekomen.
Tijdstip aanvang bemonstering : 11:15

Foto 7. Zending uit Uganda 04-06-2018 | Karmic Food Ltd. (Links op de foto)en Kenia (Rechts op de foto)
04-06-2018 | East African Seafood Ltd.ontvangen op 4 juni 2018.
Beide monsters zoals aangekomen

Foto 8. Zending uit Uganda 04-06-2018 | Karmic Food Ltd. (Links op de foto) en Kenia 04-06-2018 | East African Seafood Ltd. ontvangen (Rechts op de foto) op 4 juni 2018.
Doos na openen voor bemonstering.
Gemeten kern temp. Uganda 04-06-2018 | Karmic Food Ltd.: -0,5 °C.
Gemeten kern temp. Kenia 04-06-2018 | East African Seafood Ltd.: 0,5 °C.

4. Tanzania 08-06-2018 | Supreme Perch Ltd.
Rikilt nr. RIK0519906

Foto 9. Zending uit Tanzania 08-06-2018 | Supreme Perch Ltd.
ontvangen op 8 juni 2018.
Monster zoals aangekomen.

Foto 10. Zending uit Tanzania 08-06-2018 | Supreme Perch Ltd.
Doos na openen voor bemonstering.
Tijdstip aanvang bemonstering : 14:45

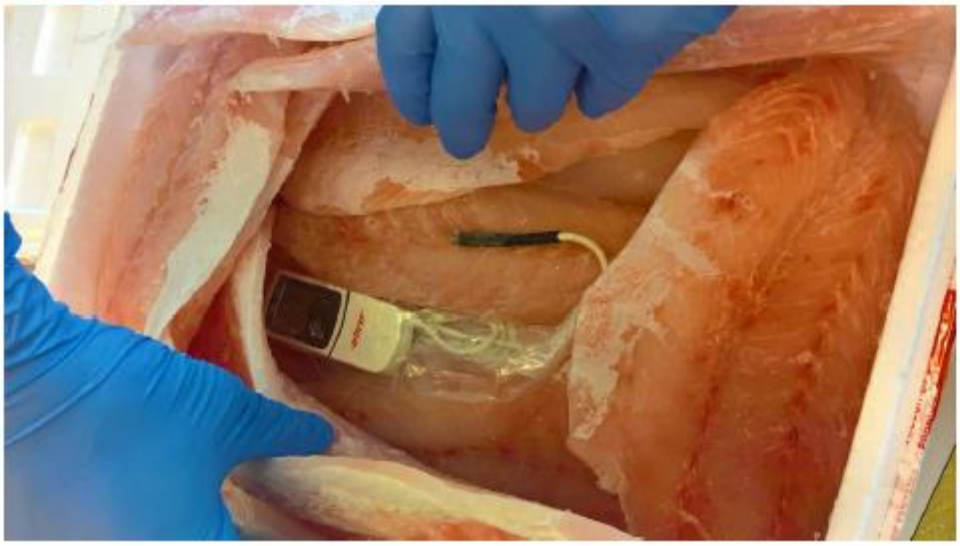

Foto 11. Zending uit Tanzania 08-06-2018 | Supreme Perch Ltd.
Transport temperatuurlogger in de kern van de filets.

Foto 12. Zending uit Tanzania 08-06-2018 | Supreme Perch Ltd.
Gemeten kern temperatuur : -1,6 °C.

A1.3 Microbiological analysis Mérieux NutriSciences

Below the outcomes of the microbiological analysis by Mérieux Nutrisciences are given.

Monstergegevens

Nr. 17994122

Product	: Chilled nile perch fillet
Monsternamedatum	: 01-06-2018 12:51
Datum start analyse	: 01-06-2018
Monstername door	: Mérieux NutriSciences (geaccrediteerd)
Conditie ontvangst	: Gekoeld
Productiedatum	: 30-05-2018
Code	: C-221S-0113126
Overige informatie	: Fresh Perch Limited P.O box 671, Entebbe - Urganda
Conditie van verpakking	: Ongeopend

Analyseresultaten

Q	Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q	Tellen van Aeroob mesofiel kiemgetal conform ISO 4833-1	140000	kve/g	-	07-06-2018
Q	Tellen van Enterobacteriaceae 1 conform ISO 21528-2	1200	kve/g	-	04-06-2018
Q	Aantonen van Salmonella Equivalent to ISO 6579 (GEN 25/05-11/08)	Afwezig	/25g	-	05-06-2018
Q	Tellen van Escherichia coli conform ISO 16649-2	<10	kve/g	-	04-06-2018
Q	Tellen van Listeria monocytogenes equivalent to ISO 11290-2 (AES 10/05-09/06)	<10	kve/g	-	05-06-2018

Monsternummer 17994122:
1. Tellen van Enterobacteriaceae: Deze analyse is uitgevoerd zonder bevestiging/This analysis is performed without confirmation

Een met Q gemerkte analyse is uitgevoerd door een ISO 17025 geaccrediteerd laboratorium.
De « * » gemerkte resultaten zijn indicatieve waarden. De « E » gemerkte analyses zijn door derden uitgevoerd.
Dit verslag mag zonder schriftelijke toestemming van ons niet anders dan in zijn geheel gereproduceerd worden.
Enkel en uitsluitend het origineel en ondertekend verslag is bindend. De resultaten hebben enkel betrekking op het onderzochte monster.

Mérieux NutriSciences

Jean-François LECRIGNY
Operations Manager

Silliker Netherlands B.V. trading as Mérieux NutriSciences
Pascalstraat 25 • 6716 AZ • EDE • Postbus 153 • 6710 BD EDE
Tel +31 (0)318 64 94 44 • Fax +31 (0)318 62 04 09 • Kvk.nr. 09063961 • www.merieuxnutrisciences.nl

Monstergegevens

Nr. 17994126

Product	: Chilled nile perch fillet
Monsternamedatum	: 01-06-2018 12:51
Datum start analyse	: 01-06-2018
Monstername door	: Mérieux NutriSciences (geaccrediteerd)
Conditie ontvangst	: Gekoeld
Productiedatum	: 30-05-2018
Code	: C-221S-0113126
Overige informatie	: Fresh Perch Limited P.O box 671, Entebbe - Urganda
Conditie van verpakking	: Ongeopend

Analyseresultaten

Q	Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q	Tellen van Aeroob mesofiel kiemgetal conform ISO 4833-1	300000	kve/g	-	07-06-2018
Q	Tellen van Enterobacteriaceae 1 conform ISO 21528-2	720	kve/g	-	04-06-2018
Q	Aantonen van Salmonella Equivalent to ISO 6579 (GEN 25/05-11/08)	Afwezig	/25g	-	05-06-2018
Q	Tellen van Escherichia coli conform ISO 16649-2	<10	kve/g	-	04-06-2018
Q	Tellen van Listeria monocytogenes equivalent to ISO 11290-2 (AES 10/05-09/06)	<10	kve/g	-	05-06-2018

Monsternummer 17994126:

1. Tellen van Enterobacteriaceae: Deze analyse is uitgevoerd zonder bevestiging/This analysis is performed without confirmation

Een met Q gemerkte analyse is uitgevoerd door een ISO 17025 geaccrediteerd laboratorium.
De « * » gemerkte resultaten zijn indicatieve waarden. De « E » gemerkte analyses zijn door derden uitgevoerd.
Dit verslag mag zonder schriftelijke toestemming van ons niet anders dan in zijn geheel gereproduceerd worden.
Enkel en uitsluitend het origineel en ondertekend verslag is bindend. De resultaten hebben enkel betrekking op het onderzochte monster.

Mérieux NutriSciences

Jean-François LECRIGNY
Operations Manager

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Monstergegevens

Nr. 18004487

Product	: Chiled nile perch fillet (Lates niloticus)
Monsternamedatum	: 04-06-2018 12:23
Datum start analyse	: 04-06-2018
Monstername door	: Mérieux NutriSciences (geaccrediteerd)
Conditie ontvangst	: Gekoeld
Productiedatum	: 30-05-2018
Code	: E31830/CF/14 EAS002
Overige informatie	: East African Seafood LtD.-Kenya
Conditie van verpakking	: Ongeopend

Analyseresultaten

Q	Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q	Tellen van Aeroob mesofiel kiemgetal conform ISO 4833-1	180000	kve/g	-	10-06-2018
Q	Tellen van Enterobacteriaceae 1 conform ISO 21528-2	740	kve/g	-	07-06-2018
Q	Aantonen van Salmonella Equivalent to ISO 6579 (GEN 25/05-11/08)	Afwezig	/25g	-	06-06-2018
Q	Tellen van Escherichia coli conform ISO 16649-2	<10	kve/g	-	07-06-2018
Q	Tellen van Listeria monocytogenes equivalent to ISO 11290-2 (AES 10/05-09/06)	<10	kve/g	-	09-06-2018

Monsternummer 18004487:

1. Tellen van Enterobacteriaceae: Deze analyse is uitgevoerd zonder bevestiging/This analysis is performed without confirmation

Een met Q gemerkte analyse is uitgevoerd door een ISO 17025 geaccrediteerd laboratorium.
De « * » gemerkte resultaten zijn indicatieve waarden. De « E » gemerkte analyses zijn door derden uitgevoerd.
Dit verslag mag zonder schriftelijke toestemming van ons niet anders dan in zijn geheel gereproduceerd worden.
Enkel en uitsluitend het origineel en ondertekend verslag is bindend. De resultaten hebben enkel betrekking op het onderzochte monster.

Mérieux NutriSciences

Jean-François LECRIGNY
Operations Manager

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Monstergegevens

Nr. 18004491

Product	: Chiled nile perch fillet (Lates niloticus)
Monsternamedatum	: 04-06-2018 12:23
Datum start analyse	: 04-06-2018
Monstername door	: Mérieux NutriSciences (geaccrediteerd)
Conditie ontvangst	: Gekoeld
Productiedatum	: 30-05-2018
Code	: E31830/CF/14 EAS003
Overige informatie	: East African Seafood LtD.-Kenya
Conditie van verpakking	: Ongeopend

Analyseresultaten

Q	Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q	Tellen van Aeroob mesofiel kiemgetal conform ISO 4833-1	280000	kve/g	-	10-06-2018
Q	Tellen van Enterobacteriaceae 1 conform ISO 21528-2	750	kve/g	-	07-06-2018
Q	Aantonen van Salmonella Equivalent to ISO 6579 (GEN 25/05-11/08	Afwezig	/25g	-	06-06-2018
Q	Tellen van Escherichia coli conform ISO 16649-2	<10	kve/g	-	07-06-2018
Q	Tellen van Listeria monocytogenes equivalent to ISO 11290-2 (AES 10/05-09/06)	<10	kve/g	-	09-06-2018

Monsternummer 18004491:

1. Tellen van Enterobacteriaceae: Deze analyse is uitgevoerd zonder bevestiging/This analysis is performed without confirmation

Een met Q gemerkte analyse is uitgevoerd door een ISO 17025 geaccrediteerd laboratorium.
De « * » gemerkte resultaten zijn indicatieve waarden. De « E » gemerkte analyses zijn door derden uitgevoerd.
Dit verslag mag zonder schriftelijke toestemming van ons niet anders dan in zijn geheel gereproduceerd worden.
Enkel en uitsluitend het origineel en ondertekend verslag is bindend. De resultaten hebben enkel betrekking op het onderzochte monster.

Mérieux NutriSciences

Jean-François LECRIGNY
Operations Manager

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Pascalstraat 25 • 6716 AZ • EDE • Postbus 153 • 6710 BD EDE
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Monstergegevens

Nr. 18004495

Product	: Chiled nile perch fillet (Lates niloticus)
Monsternamedatum	: 04-06-2018 12:22
Datum start analyse	: 04-06-2018
Monstername door	: Mérieux NutriSciences (geaccrediteerd)
Conditie ontvangst	: Gekoeld
Productiedatum	: 30-05-2018
Code	: K18150A72401 Sampel 03
Overige informatie	: Karmic foods LtD.-urganda
Conditie van verpakking	: Ongeopend

Analyseresultaten

Q	Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q	Tellen van Aeroob mesofiel kiemgetal conform ISO 4833-1	210000	kve/g	-	10-06-2018
Q	Tellen van Enterobacteriaceae 1 conform ISO 21528-2	250	kve/g	-	07-06-2018
Q	Aantonen van Salmonella Equivalent to ISO 6579 (GEN 25/05-11/08)	Afwezig	/25g	-	06-06-2018
Q	Tellen van Escherichia coli conform ISO 16649-2	<10	kve/g	-	07-06-2018
Q	Tellen van Listeria monocytogenes equivalent to ISO 11290-2 (AES 10/05-09/06)	<10	kve/g	-	09-06-2018

Monstemummer 18004495:
1. Tellen van Enterobacteriaceae: Deze analyse is uitgevoerd zonder bevestiging/This analysis is performed without confimation

Een met Q gemerkte analyse is uitgevoerd door een ISO 17025 geaccrediteerd laboratorium.
De « * » gemerkte resultaten zijn indicatieve waarden. De « E » gemerkte analyses zijn door derden uitgevoerd.
Dit verslag mag zonder schriftelijke toestemming van ons niet anders dan in zijn geheel gereproduceerd worden.
Enkel en uitsluitend het origineel en ondertekend verslag is bindend. De resultaten hebben enkel betrekking op het onderzochte monster.

Mérieux NutriSciences

Jean-François LECRIGNY
Operations Manager

Silliker Netherlands B.V. trading as Mérieux NutriSciences
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Monstergegevens

Nr. 18004499

Product	: Chiled nile perch fillet (Lates niloticus)
Monsternamedatum	: 04-06-2018 12:23
Datum start analyse	: 04-06-2018
Monstername door	: Mérieux NutriSciences (geaccrediteerd)
Conditie ontvangst	: Gekoeld
Productiedatum	: 30-05-2018
Code	: K18150A72401 Sampel 02
Overige informatie	: Karmic food LtD.-Urganda
Conditie van verpakking	: Ongeopend

Analyseresultaten

Q	Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q	Tellen van Aeroob mesofiel kiemgetal conform ISO 4833-1	26000	kve/g	-	10-06-2018
Q	Tellen van Enterobacteriaceae 1 conform ISO 21528-2	130	kve/g	-	07-06-2018
Q	Aantonen van Salmonella Equivalent to ISO 6579 (GEN 25/05-11/08)	Afwezig	/25g	-	06-06-2018
Q	Tellen van Escherichia coli conform ISO 16649-2	<10	kve/g	-	07-06-2018
Q	Tellen van Listeria monocytogenes equivalent to ISO 11290-2 (AES 10/05-09/06)	<10	kve/g	-	09-06-2018

Monsternummer 18004499:
1. Tellen van Enterobacteriaceae: Deze analyse is uitgevoerd zonder bevestiging/This analysis is performed without confirmation

Een met Q gemerkte analyse is uitgevoerd door een ISO 17025 geaccrediteerd laboratorium.
De « * » gemerkte resultaten zijn indicatieve waarden. De « E » gemerkte analyses zijn door derden uitgevoerd.
Dit verslag mag zonder schriftelijke toestemming van ons niet anders dan in zijn geheel gereproduceerd worden.
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Monstergegevens

Nr. 18048805

Product	: Chillid nile perch fillet tanzania
Monsternamedatum	: 08-06-2018 14:07
Datum start analyse	: 08-06-2018
Monstername door	: Mérieux NutriSciences (geaccrediteerd)
Conditie ontvangst	: Bevroren
Productiedatum	: 05-06-2018
THT datum	: 17-06-2018
Code	: Anova nr 1273 L 4729
Overige informatie	: Supreme Perch (Mwanza) Ltd.
Conditie van verpakking	: Ongeopend

Analyseresultaten

Q	Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q	Tellen van Aeroob mesofiel kiemgetal conform ISO 4833-1	>300000	kve/g	-	13-06-2018
Q	Tellen van Enterobacteriaceae 1 conform ISO 21528-2	9900	kve/g	-	11-06-2018
Q	Aantonen van Salmonella Equivalent to ISO 6579 (GEN 25/05-11/08)	Afwezig	/25g	-	11-06-2018
Q	Tellen van Escherichia coli conform ISO 16649-2	<10	kve/g	-	11-06-2018
Q	Tellen van Listeria monocytogenes equivalent to ISO 11290-2 (AES 10/05-09/06)	<10	kve/g	-	12-06-2018

Monsternummer 18048805:
1. Tellen van Enterobacteriaceae: Deze analyse is uitgevoerd zonder bevestiging/This analysis is performed without confirmation

Een met Q gemerkte analyse is uitgevoerd door een ISO 17025 geaccrediteerd laboratorium.
De « * » gemerkte resultaten zijn indicatieve waarden. De « E » gemerkte analyses zijn door derden uitgevoerd.
Dit verslag mag zonder schriftelijke toestemming van ons niet anders dan in zijn geheel gereproduceerd worden.
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Monstergegevens

Nr. 18048810

Product	: Chillid nile perch fillet tanzania
Monsternamedatum	: 08-06-2018 14:07
Datum start analyse	: 08-06-2018
Monstername door	: Mérieux NutriSciences (geaccrediteerd)
Conditie ontvangst	: Bevroren
Productiedatum	: 05-06-2018
THT datum	: 17-06-2018
Code	: Anova nr 1273 L 4729
Overige informatie	: Supreme Perch (Mwanza) Ltd.
Conditie van verpakking	: Ongeopend

Analyseresultaten

Q	Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q	Tellen van Aeroob mesofiel kiemgetal conform ISO 4833-1	>300000	kve/g	-	13-06-2018
Q	Tellen van Enterobacteriaceae 1 conform ISO 21528-2	6200	kve/g	-	11-06-2018
Q	Aantonen van Salmonella Equivalent to ISO 6579 (GEN 25/05-11/08)	Afwezig	/25g	-	11-06-2018
Q	Tellen van Escherichia coli conform ISO 16649-2	<10	kve/g	-	11-06-2018
Q	Tellen van Listeria monocytogenes equivalent to ISO 11290-2 (AES 10/05-09/06)	<10	kve/g	-	12-06-2018

Monsternummer 18048810:
1. Tellen van Enterobacteriaceae: Deze analyse is uitgevoerd zonder bevestiging/This analysis is performed without confirmation

Een met Q gemerkte analyse is uitgevoerd door een ISO 17025 geaccrediteerd laboratorium.
De « * » gemerkte resultaten zijn indicatieve waarden. De « E » gemerkte analyses zijn door derden uitgevoerd.
Dit verslag mag zonder schriftelijke toestemming van ons niet anders dan in zijn geheel gereproduceerd worden.
Enkel en uitsluitend het origineel en ondertekend verslag is bindend. De resultaten hebben enkel betrekking op het onderzochte monster.

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A1.4 Data loggers

Graphs of dataloggers used in the validated research in this report are given below:

Supreme Perch Ltd.

Measurement

General information

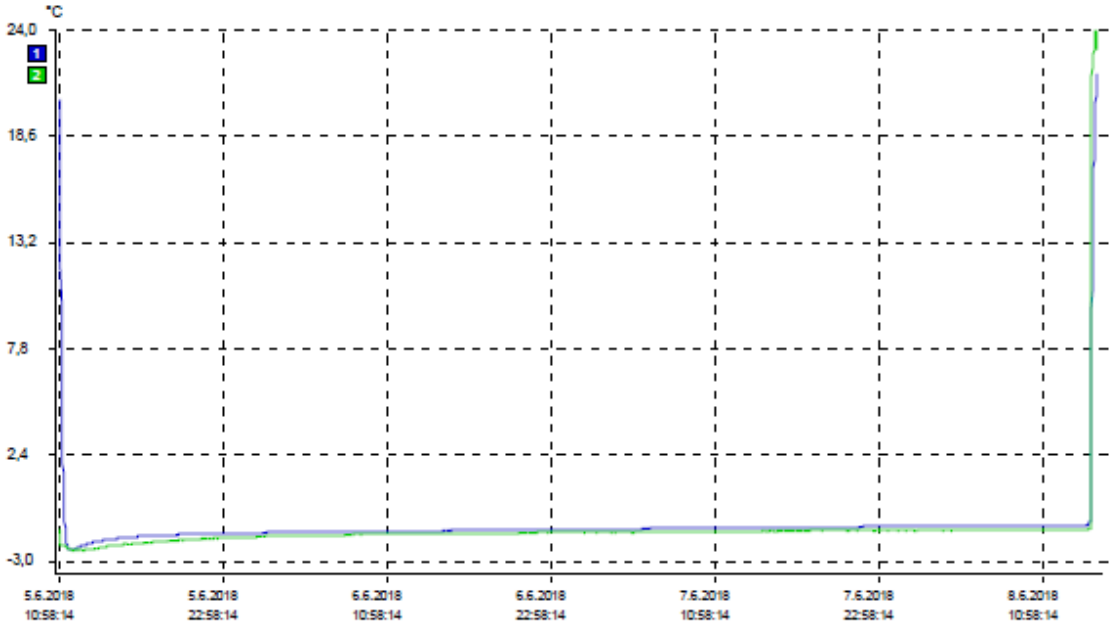
Long distance refrigerated transport

Device information

Logger type	EBI 300 V1.39.0	Programmed by	Wilma
Serial	73248235	Profile ID	ID6
Probe type	TPC 300		

Logging configuration

Mode	Until memory is full	Start time	5.6.2018 10:58:14
Interval	1 min.	Stop time	8.6.2018 14:57:14
Duration	3d 03:59:00	Data count	4560
	0 min.		



	Low limit	High limit
1 °C	-30,0	30,0
2 °C	-30,0	30,0

Signature

8.6.2018 14:58:12 UTC+02:00
EBI300.pdf

www.ebro.com

Measurement

General information

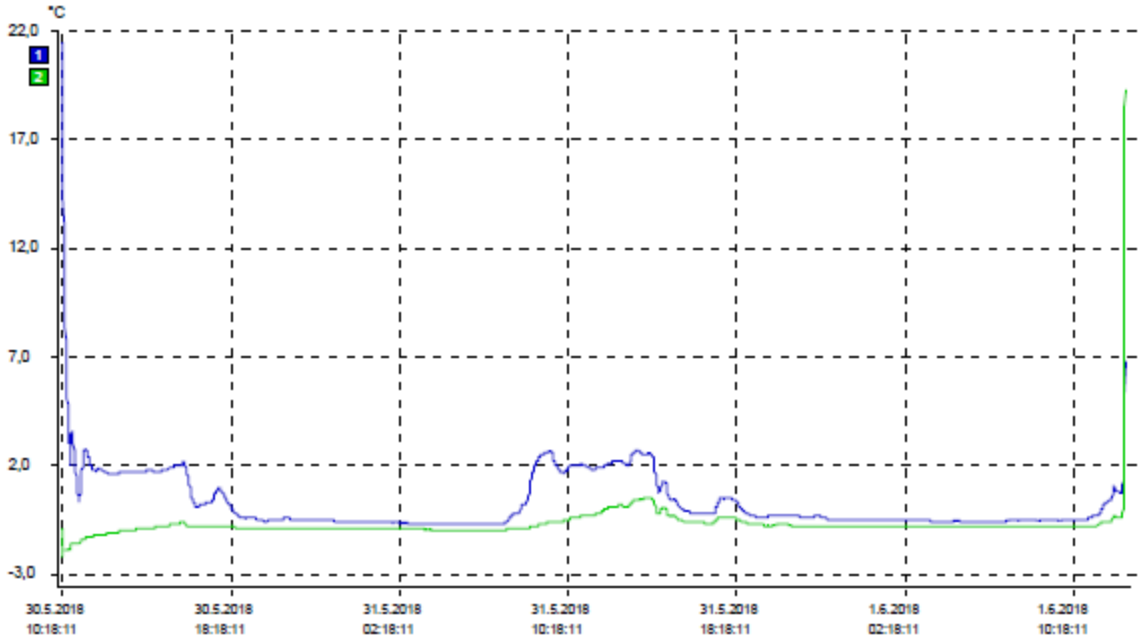
Long distance refrigerated transport

Device information

Logger type	EBI 300 V1.39.0	Programmed by	Wilma
Serial	73248218	Profile ID	ID6
Probe type	TPC 300		

Logging configuration

Mode	Until memory is full	Start time	30.5.2018 10:18:11
Interval	1 min.	Stop time	1.6.2018 12:48:11
Duration	2d 02:30:00	Data count	3031
	0 min.		



	Low limit	High limit
1 °C	☑ -30,0	☑ 30,0
2 °C	☑ -30,0	☑ 30,0

Signature

1.6.2018 13:10:44 UTC+02:00
EBI300.pdf

www.ebro.com

Data Report

TempLog ONE

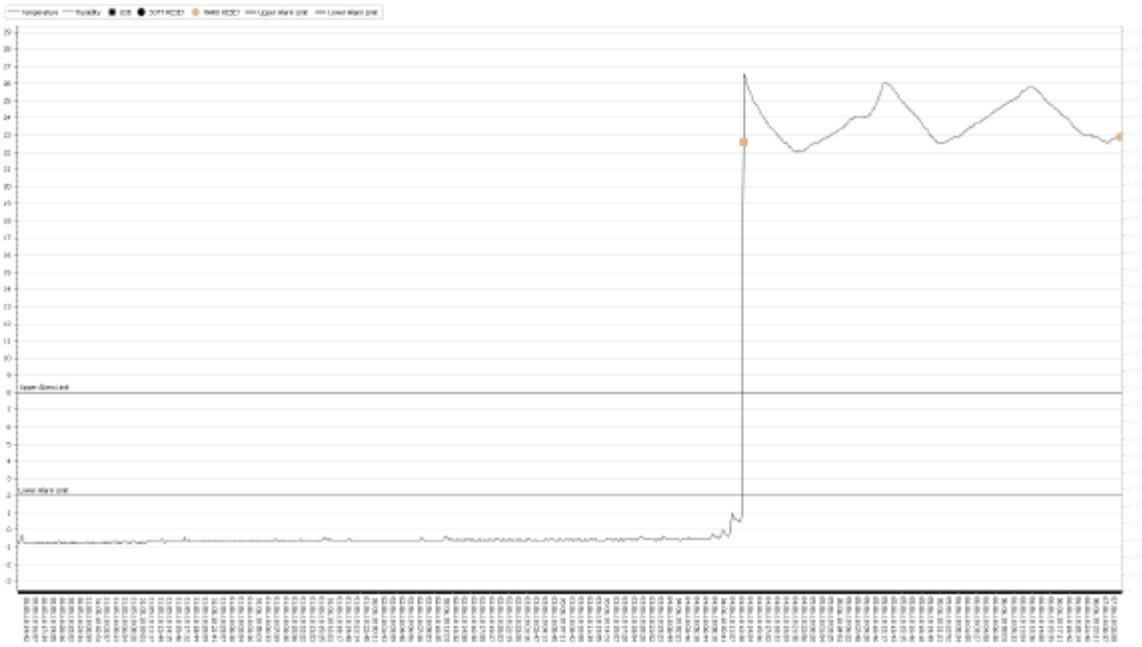
Device Information

Serial Number:	1510012224	**Capacity:**	5000
Measurement Interval:	9 minute	**Startup Delay:**	30 minute
Upper Alarm Limit:	8°C	**Device Type and Version:**	
Upper Alarm Time:	30 minute	**Description:**	
Lower Alarm Limit:	2°C		
Lower Alarm Time:	30 minute		

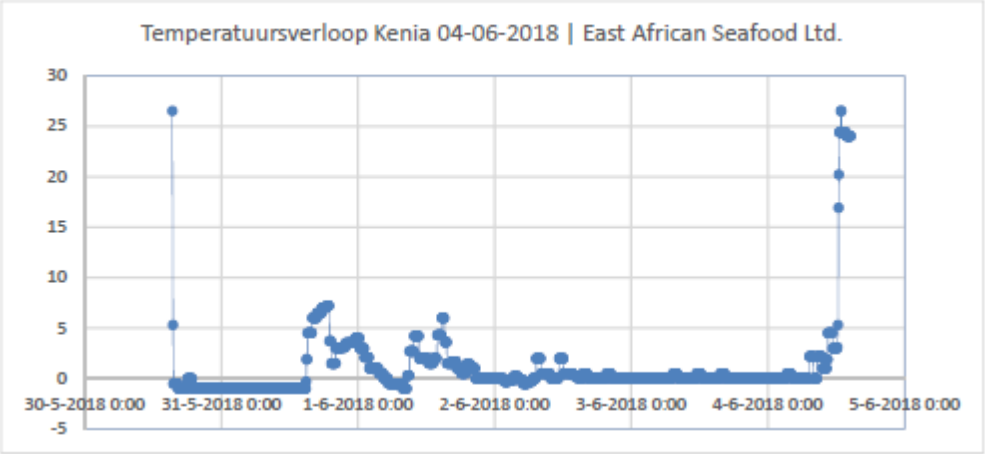
Logging Summary

Record Count:	1215	**Minimum:**	-0,8°C
Measurement Interval:	9 minute	**Maximum:**	26,6°C
Startup Time:	30.05.2018 13:12:00	**Average:**	7,81°C
Finish time:	07.06.2018 03:18:00	**Alarm Count:**	2

Temperature Chart



East African Sea Food Ltd.



Annex II Company self-monitoring program

A2.1 Superchilling information at origin

Raw data information of the superchilling process are given in table below.

Lake Bounty Ltd. – Uganda					
Date	Sample #	Start Temperature	End Temperature	Delta T°	Treatment duration (m)
14-dec	1	3,1	-1,8	4,9	36
14-dec	2	3	-1,6	4,6	37
14-dec	3	3,5	-1,9	5,4	43
14-dec	4	3,3	-1,5	4,8	46
14-dec	5	3,8	-1,7	5,5	45
14-dec	6	4	-1,7	5,7	48
14-dec	7	3,8	-1,8	5,6	43
14-dec	8	4,3	-1,6	5,9	46
14-dec	9	4,4	-1,9	6,3	58
14-dec	10	3,8	-1,5	5,3	56
15-dec	11	3,3	-1,6	4,9	45
15-dec	12	3,1	-1,4	4,5	44
15-dec	13	3,8	-1,7	5,5	45
15-dec	14	3,6	-1,2	4,8	45
15-dec	15	3,3	-1,5	4,8	45
15-dec	16	4,2	-1,9	6,1	42
15-dec	17	3,4	-1,3	4,7	46
15-dec	18	4,5	-1,7	6,2	45
15-dec	19	4,6	-1,9	6,5	44
15-dec	20	3,2	-1,6	4,8	57
17-dec	21	3,1	-1,4	4,5	30
17-dec	22	3,8	-1,7	5,5	39
17-dec	23	3,3	-1,5	4,8	40
17-dec	24	3,4	-1,7	5,1	40
17-dec	25	2,9	-1,3	4,2	30
17-dec	26	3,9	-1,8	5,7	35
17-dec	27	3,8	-2	5,8	35
17-dec	28	3,4	-1,6	5	47
17-dec	29	4,2	-1,7	5,9	36
17-dec	30	4,2	-1,5	5,7	45
19-dec	31	3,2	-1,7	4,9	66
19-dec	32	3,4	-1,5	4,9	48
19-dec	33	3,3	-1,6	4,9	53
19-dec	34	3,2	-1,3	4,5	52
19-dec	35	3,8	-1,8	5,6	44
19-dec	36	4	-1,4	5,4	44
19-dec	37	3,6	-1,9	5,5	43
19-dec	38	3,3	-1,7	5	44

19-dec	39	4,1	-1,8	5,9	47
19-dec	40	4,3	-1,6	5,9	38
22-dec	41	3,6	-1,4	5	42
22-dec	42	3,1	-1,7	4,8	43
22-dec	43	3,8	-2	5,8	43
22-dec	44	3,4	-0,8	4,2	43
22-dec	45	3,7	-1,6	5,3	42
22-dec	46	4,1	-1,9	6	44
22-dec	47	3,5	-1,4	4,9	43
22-dec	48	4,4	-1,2	5,6	44
22-dec	49	4,2	-1,5	5,7	46
22-dec	50	3,6	-1,9	5,5	46
28-dec	51	3,5	-1,9	5,4	42
28-dec	52	3,3	-1,6	4,9	43
28-dec	53	3,4	-2	5,4	43
28-dec	54	4,4	-1,7	6,1	44
28-dec	55	4,2	-1,8	6	36
28-dec	56	3,3	-1,4	4,7	27
28-dec	57	3,6	-1,7	5,3	44
28-dec	58	3,2	-1,6	4,8	44
28-dec	59	3,4	-1,2	4,6	45
28-dec	60	3,9	-1,5	5,4	47
2-jan	61	3,2	-1,9	5,1	38
2-jan	62	3,5	-1,7	5,2	44
2-jan	63	3,8	-2	5,8	44
2-jan	64	4	-1,8	5,8	43
2-jan	65	4,2	-1,6	5,8	38
2-jan	66	3,8	-2,1	5,9	42
2-jan	67	3,9	-2	5,9	43
2-jan	68	4,1	-1,7	5,8	43
2-jan	69	4,4	-1,4	5,8	43
2-jan	70	3,8	-1,6	5,4	42
3-jan	71	3,5	-1,8	5,3	43
3-jan	72	3	-1,4	4,4	43
3-jan	73	3,3	-1,5	4,8	46
3-jan	74	3,6	-1,7	5,3	45
3-jan	75	3,9	-1,4	5,3	45
3-jan	76	4,1	-1,9	6	42
3-jan	77	3,7	-2	5,7	44
3-jan	78	3,1	-1,5	4,6	45
3-jan	79	3,4	-1,7	5,1	43
3-jan	80	3,6	-1,8	5,4	46
4-jan	81	3,6	-1,9	5,5	43
4-jan	82	3,4	-1,7	5,1	44
4-jan	83	3,6	-1,8	5,4	44

4-jan	84	3,2	-1,6	4,8	45
4-jan	85	4,1	-1,4	5,5	53
4-jan	86	4	-1,5	5,5	42
4-jan	87	3,9	-1,2	5,1	45
4-jan	88	3,7	-1,4	5,1	43
4-jan	89	3,5	-1,7	5,2	45
4-jan	90	3,4	-1,5	4,9	45
5-jan	91	3,7	-1,8	5,5	48
5-jan	92	3,5	-1,6	5,1	43
5-jan	93	3,8	-1,4	5,2	43
5-jan	94	3,1	-1,7	4,8	44
5-jan	95	3,7	-1,6	5,3	45
5-jan	96	3	-1,2	4,2	45
5-jan	97	3,4	-1,3	4,7	45
5-jan	98	3,3	-1,5	4,8	45
5-jan	99	3,8	-1,8	5,6	45
5-jan	100	3,6	-1,6	5,2	45
10-jan	101	3,6	-1,6	5,2	43
10-jan	102	3,2	-1,4	4,6	46
10-jan	103	3,5	-1,7	5,2	45
10-jan	104	3,3	-1,5	4,8	43
10-jan	105	3,7	-1,6	5,3	43
10-jan	106	3,2	-1,2	4,4	45
10-jan	107	4,3	-1,9	6,2	46
10-jan	108	3,5	-1,3	4,8	44
10-jan	109	3,8	-1,7	5,5	44
10-jan	110	3,3	-1,5	4,8	45
12-jan	111	3,4	-1,7	5,1	44
12-jan	112	3,6	-1,4	5	42
12-jan	113	3,3	-1,6	4,9	44
12-jan	114	3,5	-1,3	4,8	43
12-jan	115	3,6	-1,5	5,1	46
12-jan	116	3,2	-1,2	4,4	42
12-jan	117	4,3	-1,4	5,7	44
12-jan	118	4,1	-1,8	5,9	43
12-jan	119	3,8	-1,7	5,5	43
12-jan	120	4	-1,9	5,9	44
13-jan	121	3,4	-1,8	5,2	42
13-jan	122	3,2	-1,6	4,8	42
13-jan	123	3,5	-1,3	4,8	41
13-jan	124	3	-1,7	4,7	45
13-jan	125	3,3	-1,2	4,5	45
13-jan	126	3,9	-1,4	5,3	45
13-jan	127	3,7	-1,6	5,3	46
13-jan	128	3,4	-1,5	4,9	46

13-jan	129	3,1	-1,2	4,3	44
13-jan	130	3,5	-1,4	4,9	45
16-jan	131	3,9	-1,5	5,4	43
16-jan	132	3,6	-1,7	5,3	43
16-jan	133	3,8	-1,9	5,7	44
16-jan	134	3,5	-1,4	4,9	47
16-jan	135	4,4	-1,6	6	42
16-jan	136	4,2	-1,2	5,4	42
16-jan	137	3,8	-1,3	5,1	44
16-jan	138	4	-1,4	5,4	43
16-jan	139	4,3	-1,6	5,9	42
16-jan	140	3,7	-1,7	5,4	45
17-jan	141	3,8	-1,4	5,2	45
17-jan	142	3,6	-1,6	5,2	45
17-jan	143	3,4	-1,8	5,2	45
17-jan	144	3,9	-1,4	5,3	43
17-jan	145	3,8	-1,6	5,4	44
17-jan	146	3,5	-1,3	4,8	45
17-jan	147	4,1	-1,7	5,8	44
17-jan	148	4,3	-1,5	5,8	44
17-jan	149	3,7	-1,3	5	45
17-jan	150	3,5	-1,2	4,7	45
18-jan	151	3,2	-1,3	4,5	48
18-jan	152	3,7	-1,5	5,2	49
18-jan	153	3,6	-1,7	5,3	35
18-jan	154	3,3	-1,2	4,5	28
18-jan	155	3,4	-1,7	5,1	27
18-jan	156	3,5	-1,3	4,8	44
18-jan	157	3,4	-1,5	4,9	32
18-jan	158	3,8	-1,4	5,2	40
18-jan	159	3,4	-1,6	5	41
18-jan	160	3,2	-1,4	4,6	30
20-jan	161	3,6	-1,7	5,3	45
20-jan	162	3,1	-1,6	4,7	45
20-jan	163	3,4	-1,8	5,2	43
20-jan	164	3,3	-1,4	4,7	42
20-jan	165	3,8	-1,6	5,4	44
20-jan	166	3,2	-1,7	4,9	45
20-jan	167	4,1	-1,4	5,5	44
20-jan	168	3,9	-1,5	5,4	44
20-jan	169	3,7	-1,3	5	45
20-jan	170	3,5	-1,4	4,9	55
23-jan	171	3,6	-1,8	5,4	42
23-jan	172	3,4	-1,6	5	44
23-jan	173	3,6	-1,4	5	44

23-jan	174	3,2	-1,9	5,1	45
23-jan	175	4,1	-1,4	5,5	43
23-jan	176	4	-1,5	5,5	42
23-jan	177	3,9	-1,3	5,2	45
23-jan	178	3,7	-1,4	5,1	43
23-jan	179	3,5	-1,7	5,2	45
23-jan	180	3,6	-1,2	4,8	44
26-jan	181	3,5	-1,5	5	42
26-jan	182	3,4	-1,3	4,7	44
26-jan	183	3,7	-1,9	5,6	41
26-jan	184	3,3	-1,6	4,9	42
26-jan	185	3,7	-1,7	5,4	43
26-jan	186	3,6	-1,5	5,1	50
26-jan	187	3	-1,6	4,6	46
26-jan	188	3,8	-1,8	5,6	52
26-jan	189	3,7	-1,6	5,3	45
26-jan	190	3,3	-1,7	5	45
27-jan	191	3,3	-1,6	4,9	43
27-jan	192	3,5	-1,3	4,8	39
27-jan	193	3,7	-1,5	5,2	43
27-jan	194	3,5	-1,4	4,9	44
27-jan	195	3,8	-1,7	5,5	45
27-jan	196	3,6	-1,8	5,4	46
27-jan	197	3,3	-1,5	4,8	36
27-jan	198	4,5	-1,5	6	33
27-jan	199	3,7	-1,6	5,3	43
27-jan	200	4,2	-1,7	5,9	37
27-jan	201	3,3	-1,6	4,9	43
27-jan	202	3,5	-1,3	4,8	39
27-jan	203	3,7	-1,5	5,2	42
27-jan	204	3,5	-1,4	4,9	44
27-jan	205	3,8	-1,7	5,5	45
27-jan	206	3,6	-1,8	5,4	46
27-jan	207	3,3	-1,5	4,8	36
27-jan	208	4,5	-1,5	6	43
27-jan	209	3,7	-1,6	5,3	43
27-jan	210	4,2	-1,7	5,9	37
30-jan	211	3,2	-1,7	4,9	66
30-jan	212	3,4	-1,5	4,9	48
30-jan	213	3,3	-1,6	4,9	53
30-jan	214	3,2	-1,3	4,5	43
30-jan	215	3,8	-1,8	5,6	44
30-jan	216	4	-1,4	5,4	44
30-jan	217	3,6	-1,9	5,5	43
30-jan	218	3,3	-1,7	5	44

30-jan	219	4,1	-1,8	5,9	47
30-jan	220	4,3	-1,6	5,9	42
2-feb	221	3,4	-1,5	4,9	43
2-feb	222	3,6	-1,7	5,3	43
2-feb	223	3,8	-1,9	5,7	44
2-feb	224	3,5	-1,4	4,9	47
2-feb	225	4,4	-1,6	6	52
2-feb	226	4,2	-1,2	5,4	42
2-feb	227	3,8	-1,3	5,1	44
2-feb	228	4	-1,4	5,4	43
2-feb	229	4,3	-1,6	5,9	42
2-feb	230	3,7	-1,7	5,4	45
9-feb	231	3,6	-1,8	5,4	46
9-feb	232	3,8	-1,6	5,4	46
9-feb	233	3,5	-1,7	5,2	48
9-feb	234	3,7	-1,9	5,6	46
9-feb	235	4,1	-1,5	5,6	47
9-feb	236	3,4	-1,4	4,8	44
9-feb	237	3,6	-2	5,6	45
9-feb	238	4,4	-1,2	5,6	45
9-feb	239	4	-1,5	5,5	47
9-feb	240	3,7	-1,7	5,4	45
10-feb	241	3,5	-1,6	5,1	45
10-feb	242	3,7	-1,4	5,1	45
10-feb	243	3,4	-1,8	5,2	43
10-feb	244	3,9	-1,4	5,3	42
10-feb	245	3,8	-1,9	5,7	44
10-feb	246	3,6	-1,7	5,3	45
10-feb	247	4,1	-1,4	5,5	44
10-feb	248	3,9	-1,5	5,4	44
10-feb	249	3,7	-1,3	5	45
10-feb	250	3,4	-1,2	4,6	45
10-feb	251	3,5	-1,8	5,3	43
10-feb	252	3	-1,4	4,4	46
10-feb	253	3,5	-1,3	4,8	47
10-feb	254	3,2	-1,3	4,5	43
10-feb	255	4,3	-1,6	5,9	42
10-feb	256	4,2	-1,5	5,7	43
10-feb	257	3,4	-1,6	5	43
10-feb	258	3,6	-1,3	4,9	39
10-feb	259	4	-1,9	5,9	49
10-feb	260	4,5	-1,7	6,2	39
14-feb	261	2,9	-1,4	4,3	35
14-feb	262	3	-1,8	4,8	40
14-feb	263	3,8	-1,7	5,5	40

14-feb	264	3,9	-1,6	5,5	40
14-feb	265	3,2	-1,7	4,9	35
14-feb	266	3,2	-1,7	4,9	40
14-feb	267	3,1	-1,4	4,5	47
14-feb	268	3,2	-1,5	4,7	45
14-feb	269	3,6	-1,7	5,3	55
14-feb	270	3	-1,8	4,8	40
15-feb	271	3,4	-1,7	5,1	40
15-feb	272	3,2	-1,6	4,8	35
15-feb	273	4,8	-1,5	6,3	48
15-feb	274	3,4	-1,7	5,1	45
15-feb	275	3,7	-1,5	5,2	40
15-feb	276	3,8	-1,5	5,3	47
15-feb	277	3,3	-1,7	5	42
15-feb	278	3	-1,4	4,4	47
15-feb	279	3,4	-1,8	5,2	45
15-feb	280	2,9	-1,5	4,4	55
18-feb	281	3	-1,7	4,7	40
18-feb	282	3,7	-1,7	5,4	35
18-feb	283	3,4	-1,5	4,9	49
18-feb	284	3,4	-1,2	4,6	50
18-feb	285	3,7	-1,5	5,2	42
18-feb	286	3,2	-1,7	4,9	52
18-feb	287	3,5	-1,8	5,3	40
18-feb	288	3,1	-1,7	4,8	51
18-feb	289	3,3	-1,8	5,1	46
18-feb	290	3,5	-1,6	5,1	44
20-feb	291	3,2	-1,7	4,9	66
20-feb	292	3,4	-1,5	4,9	48
20-feb	293	3,3	-1,6	4,9	53
20-feb	294	3,2	-1,3	4,5	43
20-feb	295	3,8	-1,8	5,6	44
20-feb	296	4	-1,4	5,4	44
20-feb	297	3,6	-1,9	5,5	43
20-feb	298	3,3	-1,7	5	44
20-feb	299	4,1	-1,8	5,9	47
20-feb	300	4,3	-1,6	5,9	44
21-feb	301	3,7	-1,6	5,3	44
21-feb	302	3,5	-1,4	4,9	45
21-feb	303	3,9	-1,7	5,6	42
21-feb	304	3,4	-1,8	5,2	44
21-feb	305	3,2	-1,5	4,7	42
21-feb	306	3,3	-1,3	4,6	45
21-feb	307	3,1	-1,6	4,7	44
21-feb	308	3,8	-1,2	5	45

21-feb	309	3,5	-1,4	4,9	46
21-feb	310	3,3	-1,8	5,1	44
22-feb	311	3,5	-1,4	4,9	46
22-feb	312	3,3	-1,5	4,8	47
22-feb	313	3,6	-1,8	5,4	37
22-feb	314	3,2	-1,7	4,9	30
22-feb	315	3	-1,4	4,4	42
22-feb	316	3,4	-1,7	5,1	47
22-feb	317	3,1	-1,6	4,7	44
22-feb	318	3,5	-1,5	5	45
22-feb	319	3,7	-1,8	5,5	45
22-feb	320	3,5	-1,7	5,2	40
24-feb	321	3,7	-1,6	5,3	43
24-feb	322	3,5	-1,3	4,8	43
24-feb	323	3,6	-1,5	5,1	43
24-feb	324	3,4	-1,4	4,8	38
24-feb	325	3,8	-1,7	5,5	44
24-feb	326	3,6	-1,8	5,4	42
24-feb	327	3,3	-1,3	4,6	42
24-feb	328	3,4	-1,5	4,9	41
24-feb	329	3,7	-1,6	5,3	38
24-feb	330	3,5	-1,7	5,2	41
27-feb	331	3,8	-1,5	5,3	42
27-feb	332	3,4	-1,7	5,1	44
27-feb	333	3,6	-1,4	5	44
27-feb	334	3,2	-1,9	5,1	45
27-feb	335	4,1	-1,4	5,5	43
27-feb	336	4	-1,5	5,5	42
27-feb	337	3,9	-1,3	5,2	45
27-feb	338	3,7	-1,4	5,1	43
27-feb	339	3,5	-1,2	4,7	45
27-feb	340	3,3	-1,7	5	44
28-feb	341	2,9	-1,4	4,3	35
28-feb	342	3	-1,8	4,8	40
28-feb	343	3,8	-1,5	5,3	43
28-feb	344	3,9	-1,6	5,5	43
28-feb	345	3,2	-1,4	4,6	45
28-feb	346	3,5	-1,9	5,4	44
28-feb	347	3,1	-1,7	4,8	43
28-feb	348	3,2	-1,5	4,7	41
28-feb	349	3,6	-1,6	5,2	43
28-feb	350	3	-1,8	4,8	43
1-mrt	351	3,6	-1,5	5,1	40
1-mrt	352	3,4	-1,8	5,2	35
1-mrt	353	3,8	-1,7	5,5	48

1-mrt	354	3,6	-1,5	5,1	43
1-mrt	355	3,9	-1,7	5,6	47
1-mrt	356	3,6	-1,7	5,3	47
1-mrt	357	3,1	-1,5	4,6	42
1-mrt	358	3,2	-1,6	4,8	50
1-mrt	359	3,5	-1,7	5,2	46
1-mrt	360	3,7	-1,4	5,1	57
2-mrt	361	3,7	-1,6	5,3	42
2-mrt	362	3,5	-1,4	4,9	45
2-mrt	363	3,9	-1,7	5,6	42
2-mrt	364	3,4	-1,8	5,2	44
2-mrt	365	3,2	-1,5	4,7	44
2-mrt	366	3,6	-1,3	4,9	45
2-mrt	367	3,1	-1,6	4,7	46
2-mrt	368	3,8	-1,2	5	43
2-mrt	369	3,5	-1,4	4,9	42
2-mrt	370	3,7	-1,6	5,3	44
3-mrt	371	3,4	-1,7	5,1	57
3-mrt	372	3,8	-1,8	5,6	45
3-mrt	373	3,4	-1,5	4,9	45
3-mrt	374	3	-1,7	4,7	40
3-mrt	375	2,9	-1,6	4,5	24
3-mrt	376	3,8	-1,6	5,4	50
3-mrt	377	3,9	-1,2	5,1	52
3-mrt	378	3,8	-1,4	5,2	42
3-mrt	379	3,7	-1,5	5,2	48
3-mrt	380	3,9	-1,4	5,3	57
7-mrt	381	2,5	-1,4	3,9	45
7-mrt	382	3,7	-1,3	5	30
7-mrt	383	3,6	-1,7	5,3	50
7-mrt	384	3,3	-1,7	5	45
7-mrt	385	3,5	-1,9	5,4	52
7-mrt	386	3,5	-1,9	5,4	45
7-mrt	387	3,1	-1,6	4,7	56
7-mrt	388	3,1	-1,6	4,7	46
7-mrt	389	3	-1,5	4,5	46
7-mrt	390	3,2	-1,7	4,9	72
9-mrt	391	3,6	-1,9	5,5	46
9-mrt	392	3,8	-1,6	5,4	46
9-mrt	393	3,5	-1,7	5,2	48
9-mrt	394	3,7	-1,9	5,6	46
9-mrt	395	4,1	-1,5	5,6	47
9-mrt	396	3,4	-1,4	4,8	44
9-mrt	397	3,6	-2	5,6	45
9-mrt	398	4,4	-1,2	5,6	45

9-mrt	399	4	-1,5	5,5	47
9-mrt	400	3,7	-1,7	5,4	45
11-mrt	401	3,7	-1,5	5,2	24
11-mrt	402	3,8	-1,6	5,4	48
11-mrt	403	3	-1,7	4,7	48
11-mrt	404	3	-1,5	4,5	39
11-mrt	405	3,3	-1,5	4,8	47
11-mrt	406	4	-1,3	5,3	46
11-mrt	407	3,2	-1,4	4,6	35
11-mrt	408	3,4	-1,5	4,9	46
11-mrt	409	3,2	-1,4	4,6	40
11-mrt	410	4,3	-1,5	5,8	44
12-mrt	411	3,7	-1,5	5,2	24
12-mrt	412	3,8	-1,7	5,5	48
12-mrt	413	3	-1,9	4,9	48
12-mrt	414	3	-1,5	4,5	39
12-mrt	415	3,3	-1,6	4,9	47
12-mrt	416	4	-1,8	5,8	46
12-mrt	417	3,2	-1,4	4,6	35
12-mrt	418	3,4	-1,2	4,6	46
12-mrt	419	3,2	-1,3	4,5	40
12-mrt	420	4,3	-1,5	5,8	44
13-mrt	421	3,7	-1,5	5,2	44
13-mrt	422	3,8	-1,7	5,5	48
13-mrt	423	3,4	-1,9	5,3	47
13-mrt	424	3,5	-1,5	5	48
13-mrt	425	3,3	-1,6	4,9	44
13-mrt	426	4	-1,8	5,8	45
13-mrt	427	3,2	-1,4	4,6	44
13-mrt	428	3,4	-1,2	4,6	47
13-mrt	429	3,6	-1,3	4,9	44
13-mrt	430	4,1	-1,5	5,6	46
Nile Perch Fisheries Ltd. - Tanzania					
Date	Sample #	Start Temperature	End Temperature	Delta T°	Treatment duration (m)
13-dec	1	1,8	-1	2,8	40
15-dec	2	1,6	-1	2,6	40
15-dec	3	1,6	-1	2,6	40
16-dec	4	1,6	-0,8	2,4	40
19-dec	5	1,8	-1	2,8	40
24-dec	6	1,9	-0,9	2,8	35
31-dec	7	1,8	-0,8	2,6	30
3-jan	8	1,2	-0,8	2	30

7-jan	9	1,8	-0,9	2,7	30
12-jan	10	1,9	-0,8	2,7	20
14-jan	11	1,8	-0,9	2,7	30
17-jan	12	1,8	-1	2,8	40
20-jan	13	1,5	-0,9	2,4	40
28-jan	14	1,8	-0,9	2,7	30
31-jan	15	1,4	-1	2,4	50
3-feb	16	1,9	-1,1	3	40
4-feb	17	1,7	-0,9	2,6	40
10-feb	18	1,7	-0,9	2,6	30
11-feb	19	1,9	-0,9	2,8	30
14-feb	20	2	-1,1	3,1	40
14-feb	21	1,8	-0,9	2,7	30
17-feb	22	1,8	-1,1	2,9	35
24-feb	23	1,6	-1	2,6	35
28-feb	24	1,8	-0,7	2,5	50
28-feb	25	1,7	-0,9	2,6	30
3-mrt	26	2	-0,9	2,9	40
10-mrt	27	1,7	-0,9	2,6	35
11-mrt	28	1,8	-0,7	2,5	30
Victoria Perch Ltd. - Tanzania					
Date	Sample #	Start Temperature	End Temperature	Delta T°	Treatment duration (m)
7-dec	1	0,6	-1,5	2,1	49
8-dec	2	0,3	-1,4	1,7	45
13-dec	3	0,5	-1,5	2	45
15-dec	4	0,3	-1,8	2,1	47
17-dec	5	0,4	-1,6	2	46
20-dec	6	0,2	-1,5	1,7	45
21-dec	7	0,7	-1,7	2,4	60
22-dec	8	0,2	-1,8	2	60
24-dec	9	0,4	-1,6	2	45
27-dec	10	0,3	-1,4	1,7	50
28-dec	11	0,6	-1,5	2,1	49
29-dec	12	0,5	-1,5	2	50
3-jan	13	0,5	-1,5	2	45
12-jan	14	0,2	-1,5	1,7	55
14-jan	15	0,1	-1,5	1,6	55
17-jan	16	0,4	-1,5	1,9	45
18-jan	17	0,3	-1,9	2,2	45
20-jan	18	0,3	-1,5	1,8	55
21-jan	19	0,1	-1,6	1,7	55
27-jan	20	0,6	-1,9	2,5	55
28-jan	21	0,1	-1,4	1,5	55

31-jan	22	0,1	-1,7	1,8	55
1-feb	23	0,2	-1,5	1,7	55
4-feb	24	0	-1,6	1,6	55
7-feb	25	0,5	-1,5	2	45
8-feb	26	0	-1,9	1,9	55
10-feb	27	0	-1,8	1,8	55
11-feb	28	0,1	-1,6	1,7	55
14-feb	29	0,1	-1,6	1,7	50
15-feb	30	0,2	-1,6	1,8	55
17-feb	31	0,1	-1,5	1,6	55
18-feb	32	0,2	-1,8	2	55
21-feb	33	0,1	-1,5	1,6	55
22-feb	34	0,2	-1,5	1,7	55
24-feb	35	0	-2	2	55
25-feb	36	0,5	-1,6	2,1	55
28-feb	37	0	-1,6	1,6	50
1-mrt	38	0,2	-1,8	2	55
3-mrt	39	0,2	-1,7	1,9	50
4-mrt	40	0	-1,5	1,5	55
11-mrt	41	0,2	-1,6	1,8	50
11-mrt	42	0,2	-1,6	1,8	50
14-mrt	43	0,4	-1,5	1,9	55
Fresh Perch Ltd. - Uganda					
Date	Sample #	Start Temperature	End Temperature	Delta T°	Treatment duration (m)
7-dec	1	1,8	-1,3	3,1	31
7-dec	2	2	-1,1	3,1	33
7-dec	3	2	-1,1	3,1	33
7-dec	4	1,6	-1,1	2,7	30
7-dec	5	1,3	-1,2	2,5	31
7-dec	6	1,6	-1,4	3	31
7-dec	7	1,9	-1,2	3,1	32
7-dec	8	2,1	-1,1	3,2	29
7-dec	9	1,8	-1,1	2,9	32
7-dec	10	2,2	-1,2	3,4	32
9-dec	11	2	-1,1	3,1	32
9-dec	12	1,9	-1,1	3	31
9-dec	13	2	-1,1	3,1	32
9-dec	14	2,1	-1,1	3,2	33
9-dec	15	2	-1	3	32
9-dec	16	1,9	-1,1	3	33
9-dec	17	1,9	-1,6	3,5	33
9-dec	18	2,2	-1,1	3,3	32

9-dec	19	1,9	-1,2	3,1	32
9-dec	20	2,2	-1,4	3,6	32
20-dec	21	2,2	-1,2	3,4	31
20-dec	22	2	-1	3	32
20-dec	23	1,9	-1,2	3,1	32
20-dec	24	1,9	-1,1	3	33
20-dec	25	1,9	-1	2,9	32
20-dec	26	1,5	-1,1	2,6	32
20-dec	27	1,9	-1	2,9	33
20-dec	28	1,9	-1,1	3	32
20-dec	29	1,7	-1,1	2,8	32
20-dec	30	2,6	-1	3,6	33
27-dec	31	1,3	-1,1	2,4	32
27-dec	32	1,1	-1,1	2,2	32
27-dec	33	1,8	-1	2,8	33
27-dec	34	2,1	-1	3,1	32
27-dec	35	2,2	-1,1	3,3	32
27-dec	36	1,9	-0,8	2,7	31
27-dec	37	1,9	-0,9	2,8	32
27-dec	38	1,9	-1	2,9	33
27-dec	39	1,9	-1,1	3	32
27-dec	40	2,5	-1	3,5	30
9-jan	41	1,6	-1,1	2,7	32
9-jan	42	2	-1,1	3,1	33
9-jan	43	1,8	-1,3	3,1	34
9-jan	44	1,7	-1,3	3	32
9-jan	45	2,1	-1,1	3,2	34
9-jan	46	1,9	-1,1	3	33
9-jan	47	1,8	-1,2	3	32
9-jan	48	2	-1,3	3,3	33
9-jan	49	1,9	-1,1	3	33
9-jan	50	1,5	-0,8	2,3	32
11-jan	51	1,8	-1,1	2,9	31
11-jan	52	2	-1,1	3,1	32
11-jan	53	2,2	-1,1	3,3	32
11-jan	54	2,2	-1,5	3,7	33
11-jan	55	1,9	-1,1	3	32
11-jan	56	2,4	-1,2	3,6	32
11-jan	57	2	-1,2	3,2	33
11-jan	58	1,8	-1,1	2,9	33
11-jan	59	2	-1,1	3,1	32
11-jan	60	1,7	-1,4	3,1	33
12-jan	61	2	-0,9	2,9	31
12-jan	62	1,9	-1,1	3	33
12-jan	63	2,2	-0,9	3,1	31

12-jan	64	1,9	-1	2,9	32
12-jan	65	2,3	-0,9	3,2	33
12-jan	66	1,4	-1,1	2,5	33
12-jan	67	1,3	-1,1	2,4	32
12-jan	68	2,4	-1,1	3,5	32
12-jan	69	2,3	-1	3,3	32
12-jan	70	1,9	-1,1	3	31
14-jan	71	1,8	-1	2,8	33
14-jan	72	1,6	-1	2,6	33
14-jan	73	2,7	-1	3,7	33
14-jan	74	1,5	-1,2	2,7	33
14-jan	75	2,1	-0,8	2,9	32
14-jan	76	1,8	-1,1	2,9	32
14-jan	77	2,1	-1	3,1	32
14-jan	78	1,7	-1,1	2,8	32
14-jan	79	1,3	-0,9	2,2	33
14-jan	80	1,9	-1,1	3	31
16-jan	81	2,2	-1	3,2	34
16-jan	82	1,3	-1	2,3	27
16-jan	83	2,6	-1	3,6	34
16-jan	84	2,2	-0,8	3	32
16-jan	85	1,6	-1	2,6	34
16-jan	86	1,9	-0,8	2,7	33
16-jan	87	2	-0,6	2,6	32
16-jan	88	2	-1	3	33
16-jan	89	2	-0,8	2,8	33
16-jan	90	2	-0,8	2,8	32
17-jan	91	2,3	-0,8	3,1	31
17-jan	92	1,4	-0,6	2	32
17-jan	93	1,9	-1,4	3,3	32
17-jan	94	2,6	-0,8	3,4	33
17-jan	95	2	-0,6	2,6	32
17-jan	96	2	-0,8	2,8	32
17-jan	97	2	-0,6	2,6	33
17-jan	98	2,2	-1	3,2	32
17-jan	99	1,9	-0,6	2,5	32
17-jan	100	1,7	-0,8	2,5	33
18-jan	101	2,2	-0,8	3	31
18-jan	102	2,1	-0,6	2,7	32
18-jan	103	2,1	-0,6	2,7	32
18-jan	104	2,3	-0,6	2,9	33
18-jan	105	2,9	-0,6	3,5	32
18-jan	106	2,2	-0,6	2,8	32
18-jan	107	1,6	-1,8	3,4	33
18-jan	108	1,9	-1	2,9	33

18-jan	109	1,9	-1,1	3	32
18-jan	110	1,4	-1,1	2,5	33
21-jan	111	1,9	-0,8	2,7	32
21-jan	112	2,3	-1,1	3,4	32
21-jan	113	2,2	-1,1	3,3	33
21-jan	114	1,7	-1,4	3,1	32
21-jan	115	2,3	-1,1	3,4	34
21-jan	116	2,9	-1,2	4,1	32
21-jan	117	2	-1,6	3,6	32
21-jan	118	1,7	-1,4	3,1	32
21-jan	119	2,2	-1	3,2	33
21-jan	120	2	-1,6	3,6	31
23-jan	121	1,5	-1	2,5	32
23-jan	122	2,4	-1,6	4	32
23-jan	123	1,9	-2	3,9	32
23-jan	124	1,3	-1	2,3	31
23-jan	125	1,7	-1	2,7	32
23-jan	126	2	-0,6	2,6	29
23-jan	127	1,5	-1,1	2,6	31
23-jan	128	1,2	-1	2,2	31
23-jan	129	1,4	-1,8	3,2	32
23-jan	130	1,9	-1,6	3,5	32
26-jan	131	1,7	-1,1	2,8	32
26-jan	132	1,8	-1,1	2,9	32
26-jan	133	1,6	-1	2,6	32
26-jan	134	1,9	-1	2,9	31
26-jan	135	1,9	-1,1	3	32
26-jan	136	2,2	-1	3,2	29
26-jan	137	1,7	-1,2	2,9	31
26-jan	138	2	-1,4	3,4	31
26-jan	139	2	-1	3	32
26-jan	140	1,2	-1,2	2,4	32
26-jan	141	1,7	-1,1	2,8	32
26-jan	142	1,8	-1,1	2,9	32
26-jan	143	1,6	-1	2,6	32
26-jan	144	1,9	-1	2,9	31
26-jan	145	1,9	-1	2,9	32
26-jan	146	2,2	-1	3,2	29
26-jan	147	1,7	-1,2	2,9	31
26-jan	148	2	-1,4	3,4	31
26-jan	149	2	-1	3	32
26-jan	150	1,2	-1,2	2,4	32
29-jan	151	2,2	-1,8	4	31
29-jan	152	2,5	-1,6	4,1	32
29-jan	153	2,8	-1,1	3,9	32

29-jan	154	2,5	-1,5	4	33
29-jan	155	2,7	-1,1	3,8	32
29-jan	156	2,2	-1,1	3,3	32
29-jan	157	1,5	-1	2,5	33
29-jan	158	1,9	-0,8	2,7	33
29-jan	159	2,6	-2	4,6	32
29-jan	160	1,2	-1,3	2,5	33
1-feb	161	1,4	-1,1	2,5	31
1-feb	162	1,9	-1,2	3,1	32
1-feb	163	2	-1	3	32
1-feb	164	2,2	-1	3,2	33
1-feb	165	1,8	-1	2,8	32
1-feb	166	2,3	-1,4	3,7	32
1-feb	167	1,9	-1	2,9	33
1-feb	168	1,5	-1,4	2,9	33
1-feb	169	1,9	-1	2,9	32
1-feb	170	1,8	-1,4	3,2	33
2-feb	171	1,3	-1,9	3,2	29
2-feb	172	1,2	-1,3	2,5	32
2-feb	173	1,9	-2,1	4	33
2-feb	174	1,4	-1,3	2,7	32
2-feb	175	1,6	-1,3	2,9	31
2-feb	176	1,3	-2	3,3	32
2-feb	177	2	-1,8	3,8	32
2-feb	178	1,9	-1,3	3,2	31
2-feb	179	1,7	-2,4	4,1	31
2-feb	180	1,4	-1,8	3,2	32
6-feb	181	1,9	-1	2,9	31
6-feb	182	2,4	-1,2	3,6	32
6-feb	183	2,3	-1	3,3	32
6-feb	184	1,5	-1,2	2,7	32
6-feb	185	1,5	-0,6	2,1	33
6-feb	186	2,2	-1	3,2	32
6-feb	187	2	-1	3	31
6-feb	188	1,9	-1,1	3	33
6-feb	189	2,6	-1	3,6	32
6-feb	190	1,4	-1,1	2,5	33
8-feb	191	2,9	-1,1	4	33
8-feb	192	1,1	-0,8	1,9	32
8-feb	193	1,7	-0,8	2,5	31
8-feb	194	1,8	-1,1	2,9	33
8-feb	195	1,9	-1	2,9	32
8-feb	196	2,5	-0,8	3,3	31
8-feb	197	2,1	-0,8	2,9	32
8-feb	198	1,6	-0,8	2,4	33

8-feb	199	2,2	-1,1	3,3	32
8-feb	200	1,9	-0,8	2,7	32
9-feb	201	2,1	-0,8	2,9	32
9-feb	202	2	-1	3	32
9-feb	203	1,6	-1	2,6	32
9-feb	204	1,9	-0,8	2,7	31
9-feb	205	2,2	-1	3,2	31
9-feb	206	1,9	-0,8	2,7	31
9-feb	207	2,2	-1,4	3,6	33
9-feb	208	1,4	-0,9	2,3	32
9-feb	209	2,2	-0,9	3,1	31
9-feb	210	1,7	-0,9	2,6	34
13-feb	211	2	-0,8	2,8	31
13-feb	212	2	-1	3	32
13-feb	213	1,5	-0,9	2,4	32
13-feb	214	1,8	-0,9	2,7	32
13-feb	215	2,9	-0,9	3,8	34
13-feb	216	2,3	-1,7	4	32
13-feb	217	1,4	-1	2,4	32
13-feb	218	1,9	-1	2,9	32
13-feb	219	2,4	-1	3,4	33
13-feb	220	1,8	-1,2	3	32
15-feb	221	2,6	-1,1	3,7	29
15-feb	222	2,1	-1,1	3,2	30
15-feb	223	2,3	-0,9	3,2	33
15-feb	224	2	-0,9	2,9	32
15-feb	225	2,6	-0,8	3,4	31
15-feb	226	2,2	-1,5	3,7	34
15-feb	227	2,2	-1	3,2	32
15-feb	228	1,8	-1	2,8	31
15-feb	229	1,8	-1,5	3,3	31
15-feb	230	2	-1,2	3,2	32
16-feb	231	1,7	-1,1	2,8	30
16-feb	232	2,1	-0,9	3	32
16-feb	233	1,5	-1	2,5	31
16-feb	234	2,2	-0,7	2,9	33
16-feb	235	1,7	-1,1	2,8	32
16-feb	236	2,6	-1,1	3,7	31
16-feb	237	1,5	-1,3	2,8	32
16-feb	238	1,9	-1,1	3	33
16-feb	239	1,7	-0,9	2,6	32
16-feb	240	1,7	-1,1	2,8	32
17-feb	241	2	-1,2	3,2	31
17-feb	242	1,9	-1,1	3	32
17-feb	243	1,9	-0,9	2,8	32

17-feb	244	1,2	-1,1	2,3	32
17-feb	245	2,2	-1,4	3,6	34
17-feb	246	1,7	-1,8	3,5	32
17-feb	247	1,9	-1,1	3	32
17-feb	248	2,1	-1,1	3,2	32
17-feb	249	1,3	-1,2	2,5	33
17-feb	250	1,8	-0,9	2,7	32
21-feb	251	1,8	-1	2,8	31
21-feb	252	2,2	-1,2	3,4	32
21-feb	253	1,7	-1	2,7	32
21-feb	254	1,9	-1,1	3	32
21-feb	255	1,9	-0,8	2,7	30
21-feb	256	1,7	-1	2,7	32
21-feb	257	2,2	-1,2	3,4	32
21-feb	258	2	-0,6	2,6	31
21-feb	259	2,6	-1,1	3,7	32
21-feb	260	2	-1,1	3,1	32
22-feb	261	2,1	-1,7	3,8	33
22-feb	262	2,4	-1,1	3,5	32
22-feb	263	2,4	-0,6	3	31
22-feb	264	1,2	-1,1	2,3	32
22-feb	265	2,9	-0,6	3,5	31
22-feb	266	2,2	-0,8	3	32
22-feb	267	2,6	-1,1	3,7	31
22-feb	268	1,9	-0,9	2,8	32
22-feb	269	1,9	-0,9	2,8	31
22-feb	270	2,4	-1,4	3,8	31
1-mrt	271	1,6	-1,1	2,7	32
1-mrt	272	1,8	-0,9	2,7	32
1-mrt	273	2	-0,8	2,8	31
1-mrt	274	1,6	-1,1	2,7	31
1-mrt	275	1,8	-1	2,8	32
1-mrt	276	2,1	-0,8	2,9	30
1-mrt	277	1,9	-0,6	2,5	31
1-mrt	278	2,1	-1,4	3,5	32
1-mrt	279	2,2	-0,6	2,8	30
1-mrt	280	1,8	-0,8	2,6	31
9-mrt	281	2,3	-1,1	3,4	32
9-mrt	282	1,4	-1	2,4	31
9-mrt	283	2,4	-0,8	3,2	30
9-mrt	284	1,9	-0,8	2,7	30
9-mrt	285	1,3	-1,1	2,4	32
9-mrt	286	1	-1,1	2,1	32
9-mrt	287	1,4	-1,1	2,5	32
9-mrt	288	2	-1	3	31

9-mrt	289	1,7	-1,1	2,8	32
9-mrt	290	1,7	-1,1	2,8	33
Lake Eco Fish Processing Ltd. - Uganda					
Date	Sample #	Start Temperature	End Temperature	Delta T°	Treatment duration (m)
12-dec	1	2,2	-1	3,2	34
12-dec	2	2,1	-1,7	3,8	35
12-dec	3	1,7	-1,3	3	37
12-dec	4	2	-1,4	3,4	41
12-dec	5	1,9	-1,7	3,6	51
12-dec	6	1,7	-1,2	2,9	53
12-dec	7	1,9	-1,8	3,7	60
12-dec	8	1,3	-1	2,3	62
12-dec	9	1,7	-1,2	2,9	64
12-dec	10	2,4	-1,5	3,9	71
19-dec	11	1,9	-1,5	3,4	33
19-dec	12	2,1	-1,2	3,3	32
19-dec	13	2,3	-1,4	3,7	27
19-dec	14	0,9	-1,6	2,5	34
19-dec	15	2,5	-1,3	3,8	30
19-dec	16	1,4	-1,5	2,9	26
19-dec	17	2	-0,9	2,9	20
19-dec	18	1,9	-1,2	3,1	18
19-dec	19	1,7	-1,1	2,8	22
19-dec	20	2,2	-1,4	3,6	21
2-jan	21	1,3	-1,2	2,5	44
2-jan	22	1,8	-1,3	3,1	45
2-jan	23	2,2	-1,4	3,6	45
2-jan	24	1,4	-0,9	2,3	45
2-jan	25	1,3	-1,2	2,5	45
2-jan	26	1,9	-1,4	3,3	45
2-jan	27	2,2	-0,9	3,1	45
2-jan	28	1,6	-1,2	2,8	45
9-jan	29	2	-1,2	3,2	45
9-jan	30	2,2	-1,6	3,8	45
9-jan	31	1,9	-1,5	3,4	45
9-jan	32	2,2	-1,3	3,5	53
9-jan	33	1,4	-1,4	2,8	45
9-jan	34	2	-1,2	3,2	45
9-jan	35	1,4	-1,2	2,6	45
9-jan	36	1,8	-1,7	3,5	45
9-jan	37	1,5	-1,6	3,1	45
9-jan	38	1,1	-1,3	2,4	45

13-jan	39	1,4	-1,2	2,6	45
13-jan	40	1,9	-1,2	3,1	45
13-jan	41	2	-1,4	3,4	45
13-jan	42	2	-1,2	3,2	45
13-jan	43	1,8	-1,3	3,1	45
13-jan	44	2,2	-1,2	3,4	45
13-jan	45	1,4	-1,2	2,6	45
13-jan	46	2	-1,3	3,3	45
13-jan	47	1,8	-1,4	3,2	45
16-jan	48	1,2	-1,3	2,5	45
16-jan	49	1,6	-1,1	2,7	44
16-jan	50	1,8	-1,2	3	45
16-jan	51	2	-1,3	3,3	43
16-jan	52	1,6	-1,1	2,7	44
16-jan	53	2,2	-1,2	3,4	44
16-jan	54	1,4	-1,2	2,6	45
16-jan	55	2	-1,3	3,3	45
16-jan	56	1,8	-1,2	3	43
16-jan	57	2	-1,3	3,3	45
21-jan	58	1,5	-1,3	2,8	45
21-jan	59	1,6	-1,2	2,8	45
21-jan	60	1,2	-1,2	2,4	45
21-jan	61	1,6	-1,2	2,8	45
21-jan	62	1,3	-1,1	2,4	45
21-jan	63	1,3	-1,3	2,6	45
21-jan	64	1,2	-1,3	2,5	45
21-jan	65	2	-1,1	3,1	45
21-jan	66	1,6	-1,2	2,8	45
23-jan	67	2,3	-1,3	3,6	49
23-jan	68	2,1	-1,2	3,3	41
23-jan	69	1,9	-1,2	3,1	40
23-jan	70	2,4	-1,1	3,5	46
23-jan	71	2	-1,3	3,3	38
23-jan	72	2,2	-1,2	3,4	47
23-jan	73	1,8	-1,2	3	48
23-jan	74	2	-1,4	3,4	44
23-jan	75	2,3	-1,3	3,6	41
23-jan	76	2,1	-1,2	3,3	44
27-jan	77	2,2	-1,4	3,6	45
27-jan	78	1,9	-1,3	3,2	45
27-jan	79	2	-1,1	3,1	45
27-jan	80	2,1	-1,3	3,4	45
27-jan	81	2	-1,2	3,2	45
27-jan	82	1,4	-1,2	2,6	45
27-jan	83	2,1	-1,5	3,6	45

27-jan	84	2,1	-1,3	3,4	45
27-jan	85	1,2	-1,2	2,4	45
30-jan	86	1,1	-1,2	2,3	45
30-jan	87	2	-1,4	3,4	45
30-jan	88	1,8	-1,2	3	45
30-jan	89	2	-1,3	3,3	45
30-jan	90	1,6	-1,1	2,7	45
30-jan	91	2,2	-1,2	3,4	45
30-jan	92	1,4	-1,2	2,6	45
30-jan	93	2	-1,3	3,3	45
30-jan	94	1,8	-1,2	3	45
30-jan	95	2	-1,3	3,3	45
3-feb	96	1,4	-1,2	2,6	45
3-feb	97	2,1	-1,2	3,3	45
3-feb	98	2	-1,3	3,3	45
3-feb	99	2	-1,1	3,1	45
3-feb	100	1,6	-1,3	2,9	45
3-feb	101	2,2	-1,2	3,4	45
3-feb	102	1,4	-1,4	2,8	45
3-feb	103	2	-1,2	3,2	45
3-feb	104	1,8	-1,2	3	45
3-feb	105	2	-1,1	3,1	45
6-feb	106	2,1	-1,7	3,8	45
6-feb	107	2,2	-1,2	3,4	45
6-feb	108	1,9	-1,5	3,4	45
6-feb	109	2	-1,3	3,3	45
6-feb	110	1,7	-1,2	2,9	45
6-feb	111	2,1	-1,2	3,3	45
6-feb	112	2,2	-1,1	3,3	45
6-feb	113	2	-1,2	3,2	48
6-feb	114	1,8	-1,2	3	49
6-feb	115	2	-1,1	3,1	47
10-feb	116	1,2	-1,3	2,5	45
10-feb	117	1,8	-1,1	2,9	45
10-feb	118	2,1	-1,2	3,3	45
10-feb	119	2	-1,3	3,3	45
10-feb	120	2,2	-1,2	3,4	46
10-feb	121	1,9	-1,3	3,2	45
10-feb	122	1,8	-1,5	3,3	45
10-feb	123	2,1	-1,2	3,3	45
10-feb	124	1,7	-1,1	2,8	45
10-feb	125	2,2	-1,4	3,6	45
17-feb	126	2,2	-1,4	3,6	47
17-feb	127	2	-1,2	3,2	45
17-feb	128	2,2	-1,2	3,4	45

17-feb	129	2,1	-1,3	3,4	47
17-feb	130	2	-1,2	3,2	48
17-feb	131	1,7	-1,4	3,1	45
17-feb	132	1,8	-1,2	3	45
17-feb	133	2,1	-1,3	3,4	45
17-feb	134	1,9	-1,1	3	45
17-feb	135	2	-1,3	3,3	46
18-feb	136	2,4	-1,2	3,6	47
18-feb	137	2,7	-1,1	3,8	45
18-feb	138	2,8	-1,2	4	48
18-feb	139	2,6	-1,1	3,7	44
18-feb	140	2,9	-1	3,9	45
18-feb	141	3,2	-1,1	4,3	45
18-feb	142	3,1	-1,2	4,3	47
18-feb	143	2,7	-0,9	3,6	47
18-feb	144	3,6	-1,1	4,7	44
18-feb	145	2,8	-1	3,8	43
20-feb	146	2,3	-1,2	3,5	45
20-feb	147	2	-1,3	3,3	44
20-feb	148	2,5	-1,2	3,7	46
20-feb	149	2,6	-1,1	3,7	45
20-feb	150	2,8	-1,2	4	46
20-feb	151	3	-1,1	4,1	45
20-feb	152	3,4	-1,2	4,6	45
20-feb	153	2,1	-1,1	3,2	45
20-feb	154	3,3	-1,1	4,4	45
20-feb	155	2	-1,2	3,2	45
4-mrt	156	2,3	-1,1	3,4	32
4-mrt	157	2,1	-0,9	3	47
4-mrt	158	2,7	-1,2	3,9	48
4-mrt	159	3,2	-1,2	4,4	47
4-mrt	160	3,4	-1,3	4,7	46
4-mrt	161	2	-1,1	3,1	45
4-mrt	162	3	-1,3	4,3	48
4-mrt	163	2,9	-1,2	4,1	47
4-mrt	164	2	-1,3	3,3	47
4-mrt	165	2,6	-1,1	3,7	47
10-mrt	166	2,6	-1,1	3,7	48
10-mrt	167	2	-0,9	2,9	45
10-mrt	168	3,3	-1,2	4,5	46
10-mrt	169	3,4	-1,2	4,6	38
10-mrt	170	3,4	-1,3	4,7	47
10-mrt	171	2	-1,1	3,1	42
10-mrt	172	3	-1,2	4,2	47
10-mrt	173	2,7	-1,1	3,8	46

10-mrt	174	2,4	-0,9	3,3	45
10-mrt	175	2,2	-1,2	3,4	47
19-dec	176	1,7	-1,1	2,8	22
19-dec	177	2,2	-1,4	3,6	21

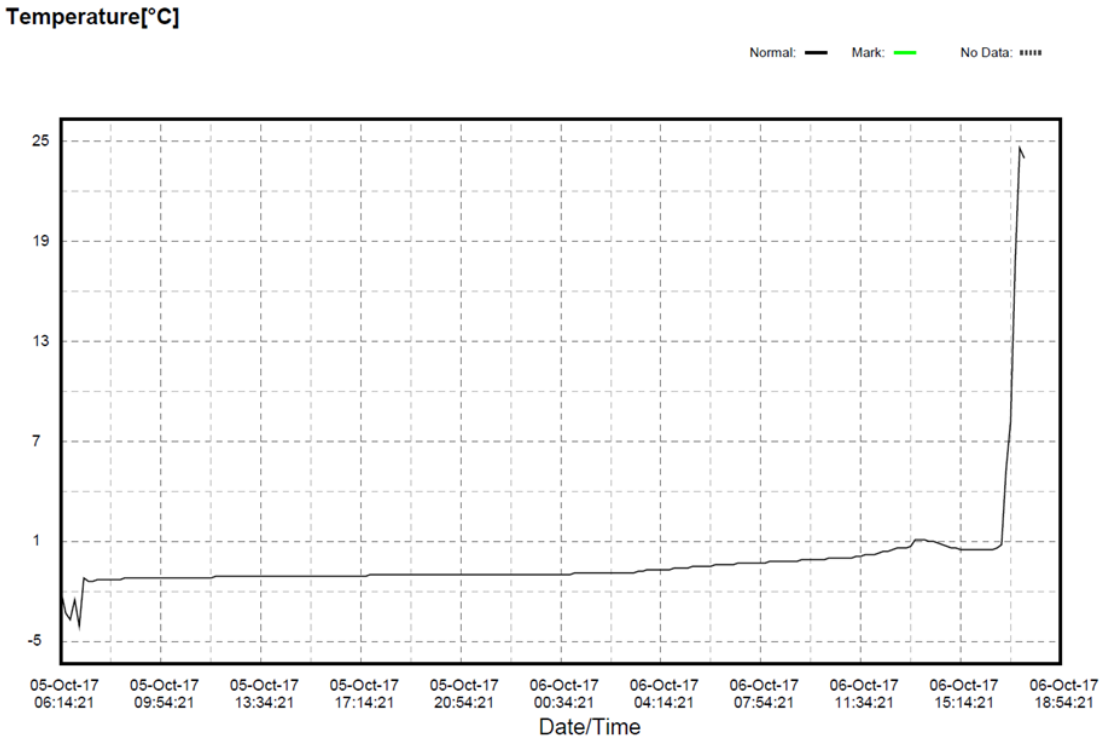
Table: Core fillet temperature at start and end superchilling phase, temperature difference between start and end superchilling phase and duration of superchilling. In total 968 samples gathered in the period December 2017 – March 2018. Source: Fiorital

A2.2 Data loggers

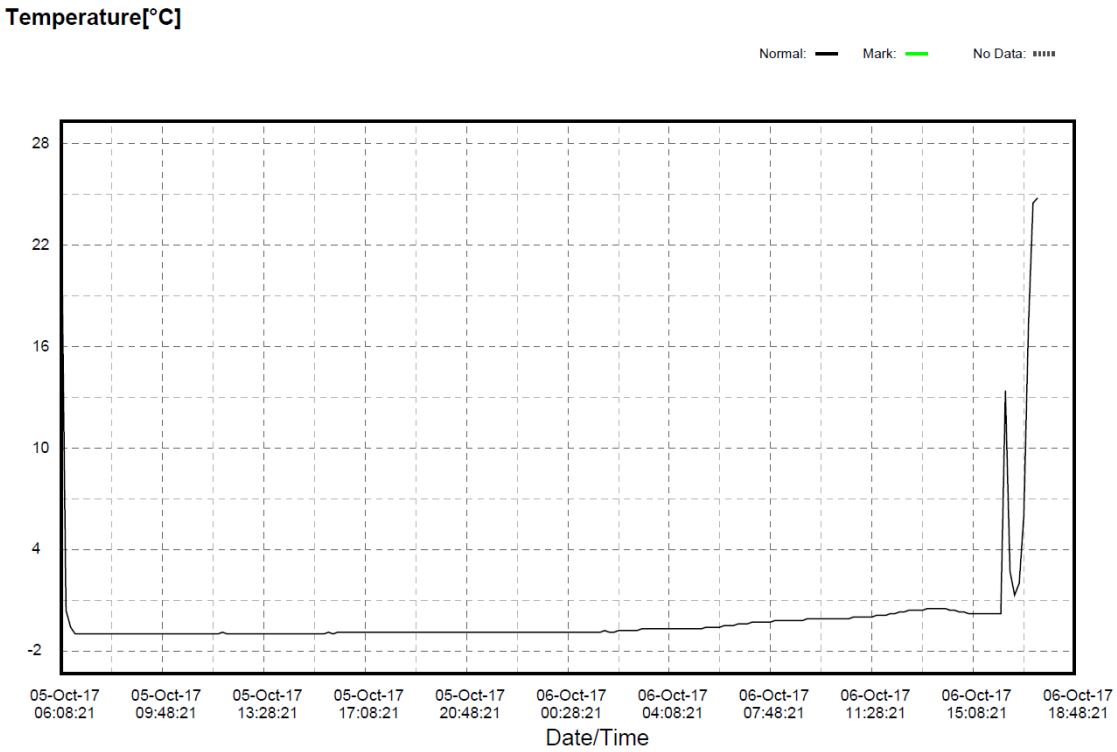
Graphs of dataloggers used in the company self-monitoring program are given in this Annex III.

Fresh Perch Ltd.

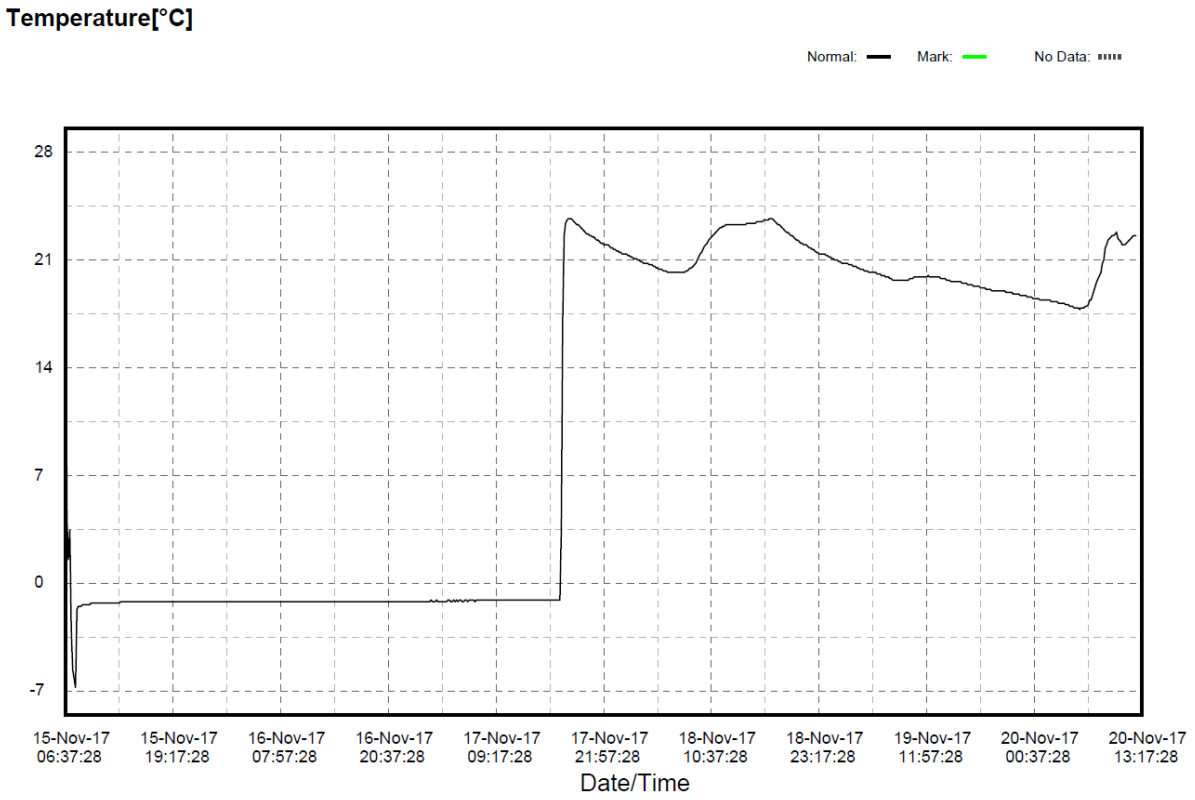
Before superchilling



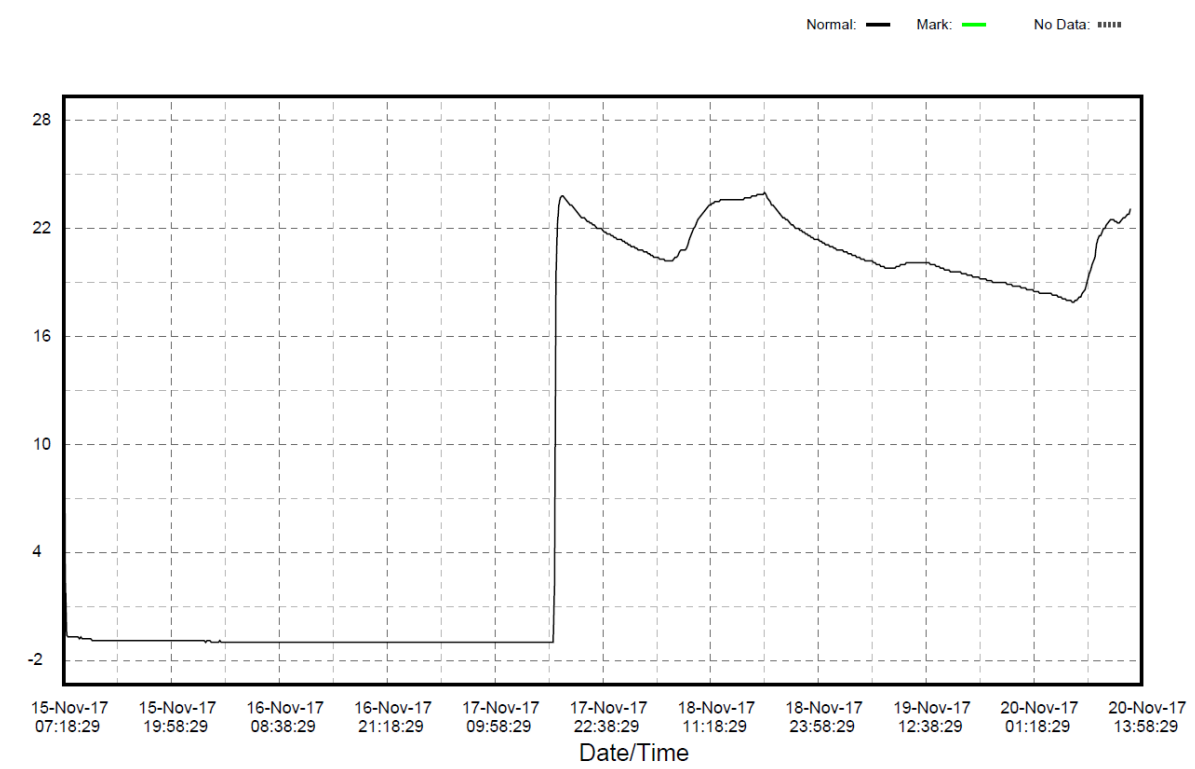
After superchilling



Before superchilling

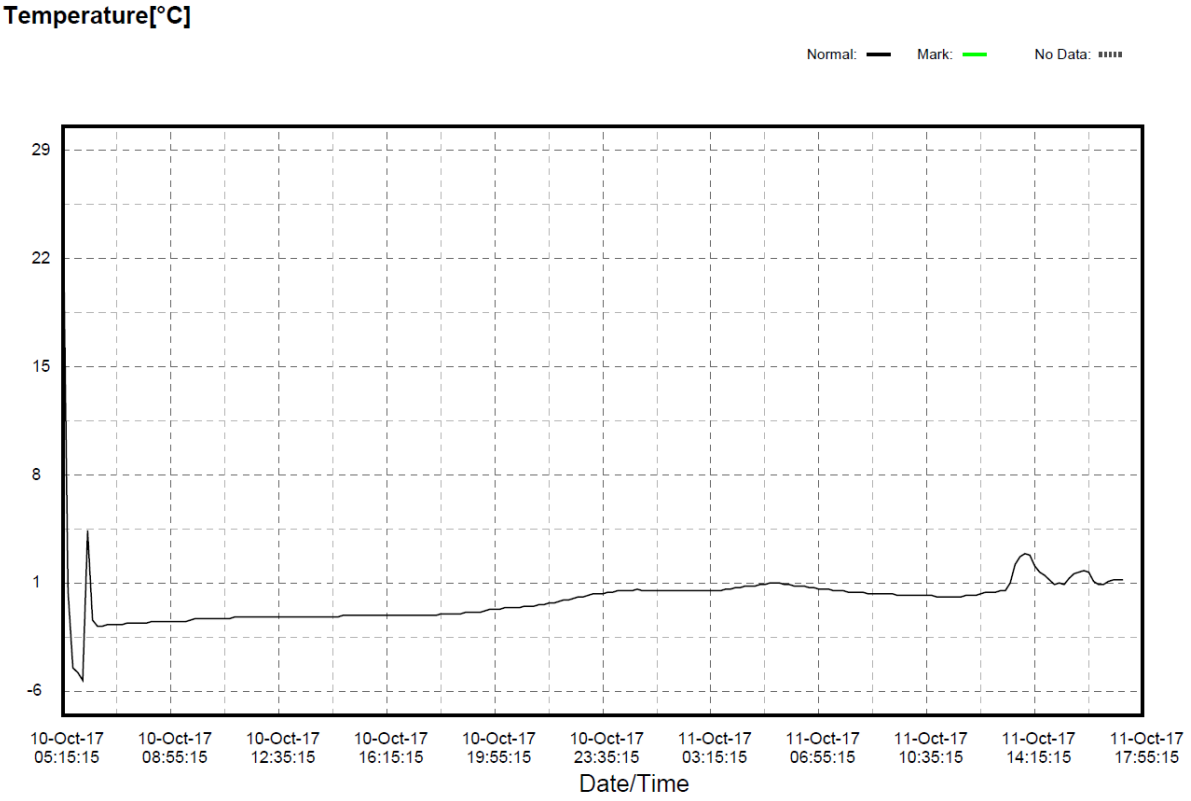


After superchilling

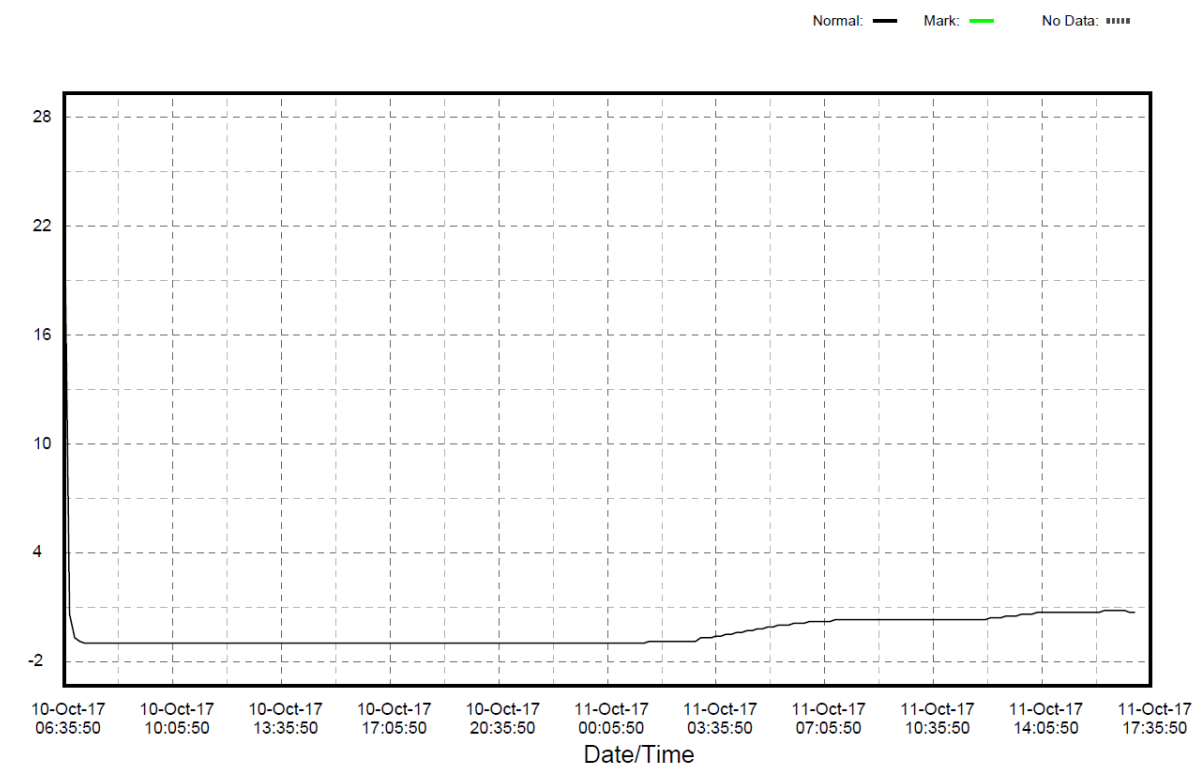


Lake Eco Fish Processing Ltd.

Before superchilling

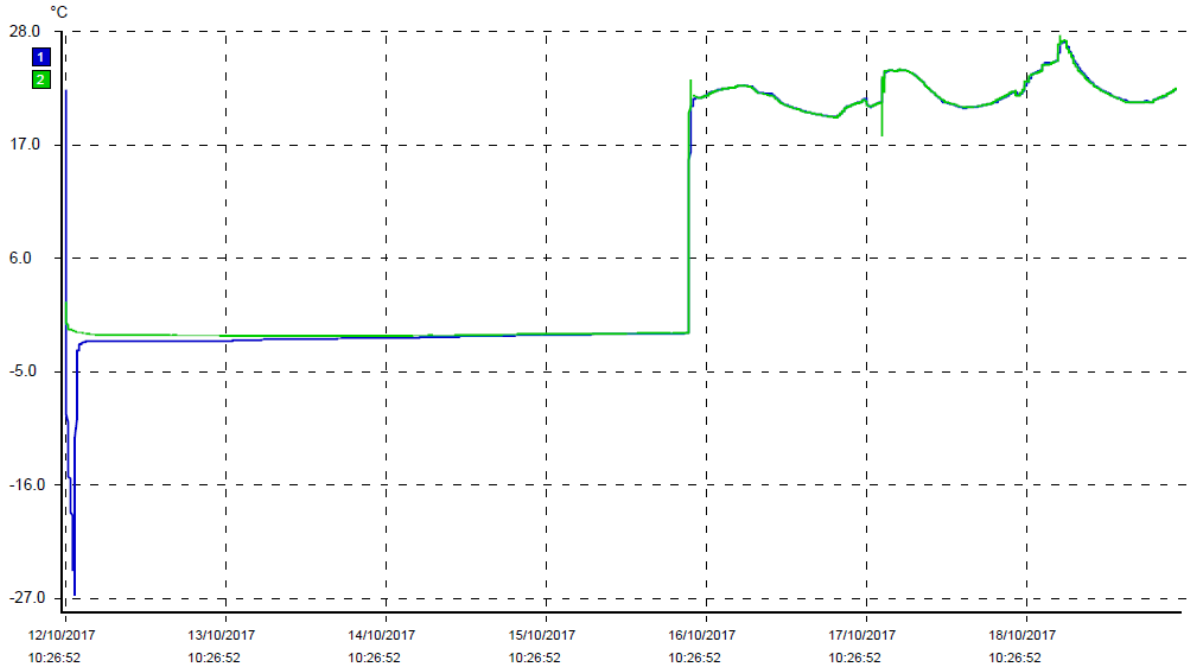


After superchilling

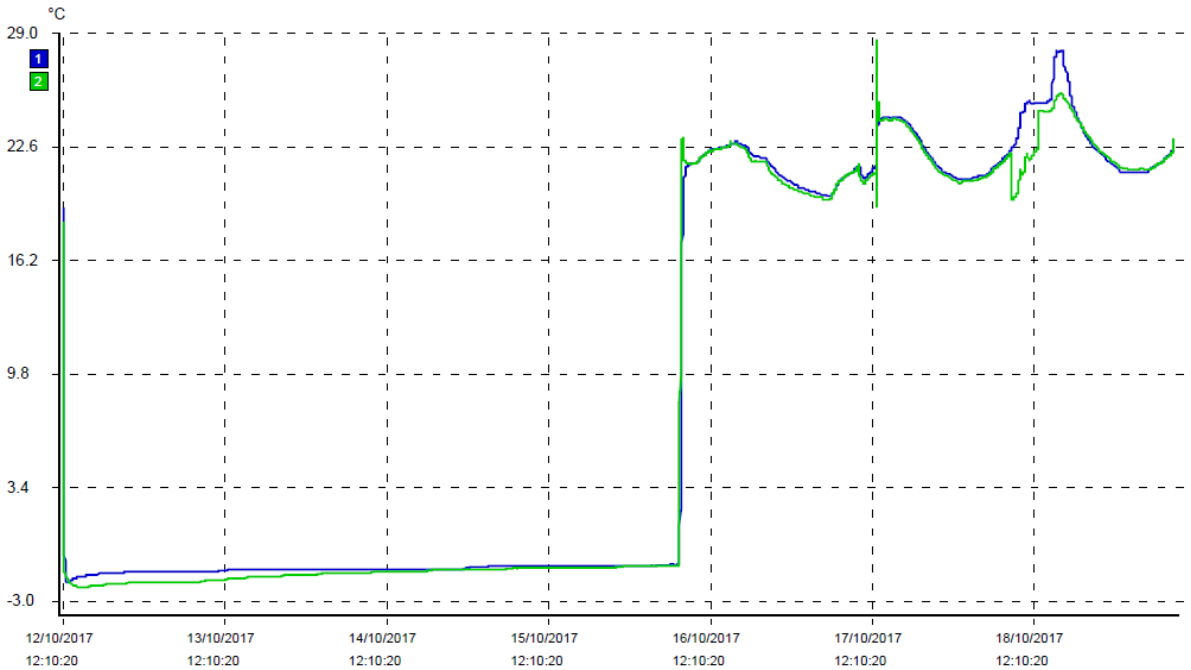


Supreme Perch Ltd.

Before superchilling

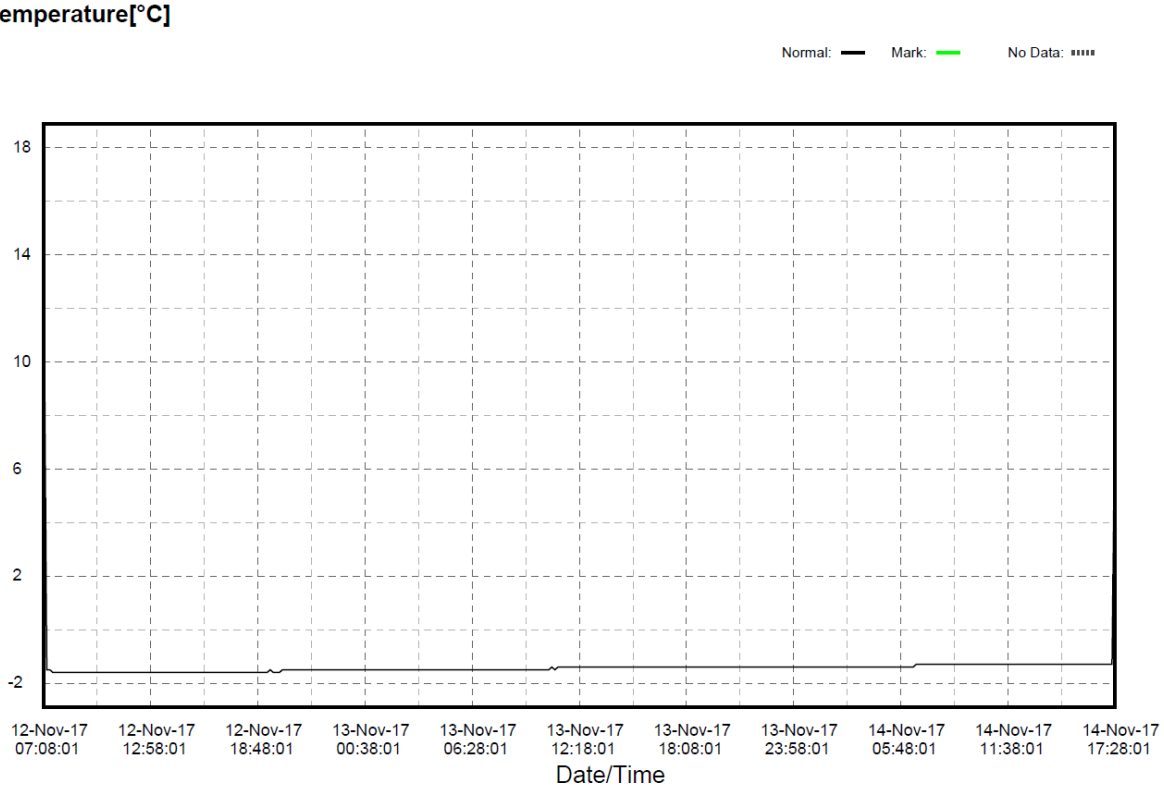


After superchilling



Victoria Perch Ltd.

After superchilling



A2.3 Arrival temperatures Europe establishments

In this Annex III raw data information of the arrival temperatures Europe establishments are given in table AIII.1.

Arrival Date	Core Temperature (°C)	Supplier
11-1-2017	-0,80	Fresh Perch Limited
12-1-2017	-1,10	Fresh Perch Limited
18-1-2017	-1,20	Fresh Perch Limited
19-1-2017	-1,50	Fresh Perch Limited
25-1-2017	-0,80	Fresh Perch Limited
26-1-2017	-1,20	Fresh Perch Limited
30-1-2017	-1,10	Fresh Perch Limited
1-2-2017	-0,40	Fresh Perch Limited
2-2-2017	-1,10	Fresh Perch Limited
6-2-2017	-0,70	Fresh Perch Limited
8-2-2017	-0,80	Fresh Perch Limited
9-2-2017	-1,20	Fresh Perch Limited
13-2-2017	-0,80	Fresh Perch Limited
15-2-2017	-0,30	Fresh Perch Limited
16-2-2017	-0,10	Fresh Perch Limited
20-2-2017	-1,00	Fresh Perch Limited
20-2-2017	-1,10	Fresh Perch Limited
22-2-2017	-0,30	Fresh Perch Limited
23-2-2017	-1,20	Fresh Perch Limited
27-2-2017	-0,50	Fresh Perch Limited
1-3-2017	-1,10	Fresh Perch Limited
2-3-2017	-0,80	Fresh Perch Limited
6-3-2017	-0,90	Fresh Perch Limited
8-3-2017	-1,10	Fresh Perch Limited
9-3-2017	-1,40	Fresh Perch Limited
13-3-2017	-1,10	Fresh Perch Limited
14-3-2017	0,60	Fresh Perch Limited
15-3-2017	-1,20	Fresh Perch Limited
16-3-2017	-0,80	Fresh Perch Limited
22-3-2017	-0,70	Fresh Perch Limited
27-3-2017	-0,80	Fresh Perch Limited
29-3-2017	0,80	Fresh Perch Limited
30-3-2017	-0,90	Fresh Perch Limited
3-4-2017	-0,70	Fresh Perch Limited
5-4-2017	-1,60	Fresh Perch Limited
6-4-2017	-0,80	Fresh Perch Limited
10-4-2017	-0,60	Fresh Perch Limited
12-4-2017	-0,60	Fresh Perch Limited
13-4-2017	-0,40	Fresh Perch Limited
18-4-2017	-0,60	Fresh Perch Limited
19-4-2017	-0,60	Fresh Perch Limited
21-4-2017	-0,90	Fresh Perch Limited

24-4-2017	-0,70	Fresh Perch Limited
27-4-2017	-0,40	Fresh Perch Limited
28-4-2017	-0,50	Fresh Perch Limited
2-5-2017	-0,40	Fresh Perch Limited
3-5-2017	-1,30	Fresh Perch Limited
4-5-2017	-1,10	Fresh Perch Limited
8-5-2017	-0,50	Fresh Perch Limited
10-5-2017	0,40	Fresh Perch Limited
10-5-2017	-0,80	Fresh Perch Limited
11-5-2017	-1,00	Fresh Perch Limited
15-5-2017	-0,60	Fresh Perch Limited
15-5-2017	-0,60	Fresh Perch Limited
18-5-2017	-0,4	Fresh Perch Limited
22-5-2017	-0,8	Fresh Perch Limited
10-5-2017	0,4	Fresh Perch Limited
25-5-2017	-0,6	Fresh Perch Limited
29-5-2017	1,2	Fresh Perch Limited
31-5-2017	-1,3	Fresh Perch Limited
1-6-2017	-1,1	Fresh Perch Limited
5-6-2017	-0,8	Fresh Perch Limited
7-6-2017	-0,7	Fresh Perch Limited
8-6-2017	-0,6	Fresh Perch Limited
14-6-2017	-0,9	Fresh Perch Limited
19-6-2017	-0,5	Fresh Perch Limited
21-6-2017	-0,6	Fresh Perch Limited
22-6-2017	-0,4	Fresh Perch Limited
26-6-2017	-0,7	Fresh Perch Limited
28-6-2017	-0,8	Fresh Perch Limited
29-6-2017	-1	Fresh Perch Limited
24-8-2017	0,2	Fresh Perch Limited
28-8-2017	-0,5	Fresh Perch Limited
31-8-2017	-0,8	Fresh Perch Limited
1-9-2017	-0,4	Fresh Perch Limited
7-9-2017	-0,7	Fresh Perch Limited
8-9-2017	-0,7	Fresh Perch Limited
14-9-2017	-0,9	Fresh Perch Limited
15-9-2017	-0,8	Fresh Perch Limited
21-9-2017	-1	Fresh Perch Limited
22-9-2017	-0,8	Fresh Perch Limited
5-10-2017	-0,8	Fresh Perch Limited
6-10-2017	-0,5	Fresh Perch Limited
6-10-2017	-0,5	Fresh Perch Limited
9-10-2017	-1	Fresh Perch Limited
12-10-2017	-1,3	Fresh Perch Limited
16-10-2017	-0,7	Fresh Perch Limited
17-10-2017	-0,8	Fresh Perch Limited
19-10-2017	-1	Fresh Perch Limited

23-10-2017	-1	Fresh Perch Limited
26-10-2017	-0,9	Fresh Perch Limited
27-10-2017	-0,7	Fresh Perch Limited
2-11-2017	-1	Fresh Perch Limited
6-11-2017	0,9	Fresh Perch Limited
9-11-2017	-0,9	Fresh Perch Limited
13-11-2017	-1	Fresh Perch Limited
14-11-2017	-0,7	Fresh Perch Limited
16-11-2017	-1,1	Fresh Perch Limited
20-11-2017	-0,9	Fresh Perch Limited
21-11-2017	-1	Fresh Perch Limited
23-11-2017	-0,9	Fresh Perch Limited
27-11-2017	-0,5	Fresh Perch Limited
29-11-2017	-0,3	Fresh Perch Limited
30-11-2017	-0,3	Fresh Perch Limited
4-12-2017	-0,3	Fresh Perch Limited
5-12-2017	-0,3	Fresh Perch Limited
7-12-2017	0,6	Fresh Perch Limited
11-12-2017	0,2	Fresh Perch Limited
12-12-2017	-0,3	Fresh Perch Limited
14-12-2017	-0,1	Fresh Perch Limited
18-12-2017	-0,3	Fresh Perch Limited
19-12-2017	-0,7	Fresh Perch Limited
10-1-2018	-0,8	Fresh Perch Limited
15-1-2018	-0,7	Fresh Perch Limited
18-1-2018	-1,1	Fresh Perch Limited
19-1-2018	-0,7	Fresh Perch Limited
22-1-2018	-0,7	Fresh Perch Limited
23-1-2018	-1,1	Fresh Perch Limited
25-1-2018	-0,8	Fresh Perch Limited
29-1-2018	-0,8	Fresh Perch Limited
29-1-2018	-0,8	Fresh Perch Limited
30-1-2018	-1	Fresh Perch Limited
1-2-2018	-1,1	Fresh Perch Limited
5-2-2018	-0,8	Fresh Perch Limited
6-2-2018	-0,2	Fresh Perch Limited
8-2-2018	-0,8	Fresh Perch Limited
12-2-2018	-0,8	Fresh Perch Limited
13-2-2018	-1	Fresh Perch Limited
15-2-2018	-1,2	Fresh Perch Limited
19-2-2018	-1	Fresh Perch Limited
20-2-2018	-1	Fresh Perch Limited
26-2-2018	-1	Fresh Perch Limited
27-2-2018	-0,80	Fresh Perch Limited
5-3-2018	-1,20	Fresh Perch Limited
5-3-2018	-0,60	Fresh Perch Limited
18-1-2017	-1,40	Lake Bounty Ltd

20-1-2017	-1,50	Lake Bounty Ltd
23-1-2017	-1,00	Lake Bounty Ltd
30-1-2017	-1,00	Lake Bounty Ltd
30-1-2017	-0,80	Lake Bounty Ltd
2-2-2017	-1,10	Lake Bounty Ltd
3-2-2017	-1,00	Lake Bounty Ltd
6-2-2017	-0,20	Lake Bounty Ltd
9-2-2017	-0,90	Lake Bounty Ltd
10-2-2017	-0,10	Lake Bounty Ltd
16-2-2017	-0,70	Lake Bounty Ltd
17-2-2017	-1,10	Lake Bounty Ltd
17-2-2017	-1,10	Lake Bounty Ltd
20-2-2017	-1,00	Lake Bounty Ltd
27-2-2017	-0,80	Lake Bounty Ltd
27-2-2017	-0,70	Lake Bounty Ltd
3-3-2017	-0,70	Lake Bounty Ltd
6-3-2017	-1,10	Lake Bounty Ltd
10-3-2017	-0,20	Lake Bounty Ltd
13-3-2017	-0,80	Lake Bounty Ltd
15-3-2017	-1,30	Lake Bounty Ltd
16-3-2017	-1,50	Lake Bounty Ltd
17-3-2017	-1,10	Lake Bounty Ltd
27-3-2017	-1,00	Lake Bounty Ltd
31-3-2017	-1,30	Lake Bounty Ltd
3-4-2017	1,20	Lake Bounty Ltd
7-4-2017	-0,70	Lake Bounty Ltd
14-4-2017	-0,80	Lake Bounty Ltd
21-4-2017	-0,70	Lake Bounty Ltd
21-4-2017	-0,80	Lake Bounty Ltd
28-4-2017	-0,60	Lake Bounty Ltd
5-5-2017	-0,70	Lake Bounty Ltd
5-5-2017	-1,20	Lake Bounty Ltd
8-5-2017	-1,10	Lake Bounty Ltd
12-5-2017	-0,60	Lake Bounty Ltd
15-5-2017	2,40	Lake Bounty Ltd
18-5-2017	-0,7	Lake Bounty Ltd
19-5-2017	-0,5	Lake Bounty Ltd
22-5-2017	-0,5	Lake Bounty Ltd
10-5-2017	-0,6	Lake Bounty Ltd
25-5-2017	-0,8	Lake Bounty Ltd
30-5-2017	-0,7	Lake Bounty Ltd
5-6-2017	-0,2	Lake Bounty Ltd
5-6-2017	-0,5	Lake Bounty Ltd
8-6-2017	-0,7	Lake Bounty Ltd
12-6-2017	-0,6	Lake Bounty Ltd
16-6-2017	0,5	Lake Bounty Ltd
19-6-2017	-0,3	Lake Bounty Ltd

26-6-2017	-0,8	Lake Bounty Ltd
3-7-2017	-0,6	Lake Bounty Ltd
3-7-2017	-0,6	Lake Bounty Ltd
9-7-2017	0,4	Lake Bounty Ltd
9-7-2017	-0,6	Lake Bounty Ltd
12-7-2017	-0,5	Lake Bounty Ltd
17-7-2017	-0,3	Lake Bounty Ltd
21-7-2017	-0,6	Lake Bounty Ltd
28-7-2017	0,3	Lake Bounty Ltd
7-8-2017	-0,5	Lake Bounty Ltd
11-8-2017	-0,7	Lake Bounty Ltd
18-8-2017	-0,8	Lake Bounty Ltd
24-8-2017	-1,2	Lake Bounty Ltd
1-9-2017	-0,6	Lake Bounty Ltd
8-9-2017	-0,8	Lake Bounty Ltd
15-9-2017	-0,7	Lake Bounty Ltd
22-9-2017	-0,7	Lake Bounty Ltd
29-9-2017	1	Lake Bounty Ltd
6-10-2017	-0,7	Lake Bounty Ltd
13-10-2017	-0,9	Lake Bounty Ltd
13-10-2017	-0,9	Lake Bounty Ltd
16-10-2017	-1	Lake Bounty Ltd
19-10-2017	-1	Lake Bounty Ltd
19-10-2017	-0,8	Lake Bounty Ltd
27-10-2017	-0,9	Lake Bounty Ltd
3-11-2017	-1,1	Lake Bounty Ltd
10-11-2017	-0,8	Lake Bounty Ltd
17-11-2017	-0,8	Lake Bounty Ltd
24-11-2017	-0,8	Lake Bounty Ltd
1-12-2017	-0,4	Lake Bounty Ltd
8-12-2017	-0,5	Lake Bounty Ltd
14-12-2017	-0,5	Lake Bounty Ltd
19-1-2018	-1	Lake Bounty Ltd
26-1-2018	-1,2	Lake Bounty Ltd
2-2-2018	-0,9	Lake Bounty Ltd
6-2-2018	-1	Lake Bounty Ltd
9-2-2018	-1	Lake Bounty Ltd
16-2-2018	-1	Lake Bounty Ltd
19-2-2018	-1,1	Lake Bounty Ltd
20-2-2018	-1,1	Lake Bounty Ltd
21-2-2018	-0,9	Lake Bounty Ltd
27-2-2018	-1,10	Lake Bounty Ltd
5-3-2018	-0,80	Lake Bounty Ltd
12-1-2017	-0,80	Lake Eco Fish Processing Ltd
19-1-2017	-0,90	Lake Eco Fish Processing Ltd
26-1-2017	-0,70	Lake Eco Fish Processing Ltd
2-2-2017	-0,80	Lake Eco Fish Processing Ltd

8-2-2017	-0,60	Lake Eco Fish Processing Ltd
9-2-2017	-0,10	Lake Eco Fish Processing Ltd
16-2-2017	-0,90	Lake Eco Fish Processing Ltd
23-2-2017	-1,00	Lake Eco Fish Processing Ltd
2-3-2017	-0,70	Lake Eco Fish Processing Ltd
8-3-2017	-0,40	Lake Eco Fish Processing Ltd
9-3-2017	-0,50	Lake Eco Fish Processing Ltd
16-3-2017	-0,80	Lake Eco Fish Processing Ltd
30-3-2017	-1,00	Lake Eco Fish Processing Ltd
6-4-2017	-0,30	Lake Eco Fish Processing Ltd
13-4-2017	-0,60	Lake Eco Fish Processing Ltd
21-4-2017	-0,90	Lake Eco Fish Processing Ltd
27-4-2017	-0,70	Lake Eco Fish Processing Ltd
5-5-2017	0,00	Lake Eco Fish Processing Ltd
18-5-2017	-0,6	Lake Eco Fish Processing Ltd
25-5-2017	-0,5	Lake Eco Fish Processing Ltd
1-6-2017	-1,4	Lake Eco Fish Processing Ltd
15-6-2017	-0,5	Lake Eco Fish Processing Ltd
22-6-2017	-1	Lake Eco Fish Processing Ltd
29-6-2017	0,7	Lake Eco Fish Processing Ltd
28-8-2017	-0,5	Lake Eco Fish Processing Ltd
31-8-2017	-0,9	Lake Eco Fish Processing Ltd
7-9-2017	-0,5	Lake Eco Fish Processing Ltd
14-9-2017	-0,7	Lake Eco Fish Processing Ltd
21-9-2017	-1	Lake Eco Fish Processing Ltd
28-9-2017	-0,7	Lake Eco Fish Processing Ltd
12-10-2017	-1	Lake Eco Fish Processing Ltd
12-10-2017	-0,8	Lake Eco Fish Processing Ltd
12-10-2017	-1,2	Lake Eco Fish Processing Ltd
26-10-2017	-1,2	Lake Eco Fish Processing Ltd
2-11-2017	-1	Lake Eco Fish Processing Ltd
9-11-2017	-0,7	Lake Eco Fish Processing Ltd
16-11-2017	-0,9	Lake Eco Fish Processing Ltd
23-11-2017	-0,9	Lake Eco Fish Processing Ltd
30-11-2017	-0,5	Lake Eco Fish Processing Ltd
5-12-2017	-0,7	Lake Eco Fish Processing Ltd
15-12-2017	-0,5	Lake Eco Fish Processing Ltd
11-1-2018	-0,7	Lake Eco Fish Processing Ltd
18-1-2018	-0,9	Lake Eco Fish Processing Ltd
25-1-2018	-1,1	Lake Eco Fish Processing Ltd
1-2-2018	-1	Lake Eco Fish Processing Ltd
6-2-2018	-0,8	Lake Eco Fish Processing Ltd
8-2-2018	-1	Lake Eco Fish Processing Ltd
15-2-2018	-0,8	Lake Eco Fish Processing Ltd
20-2-2018	-0,7	Lake Eco Fish Processing Ltd
22-2-2018	-0,7	Lake Eco Fish Processing Ltd
26-2-2018	-0,9	Lake Eco Fish Processing Ltd

1-3-2018	-1,10	Lake Eco Fish Processing Ltd
10-1-2017	-0,70	Nile Perch Fisheries Limited
11-1-2017	-1,10	Nile Perch Fisheries Limited
16-1-2017	-0,70	Nile Perch Fisheries Limited
16-1-2017	-0,80	Nile Perch Fisheries Limited
18-1-2017	-1,00	Nile Perch Fisheries Limited
23-1-2017	-0,70	Nile Perch Fisheries Limited
25-1-2017	-1,10	Nile Perch Fisheries Limited
30-1-2017	-0,50	Nile Perch Fisheries Limited
31-1-2017	-0,60	Nile Perch Fisheries Limited
1-2-2017	-0,70	Nile Perch Fisheries Limited
6-2-2017	-0,90	Nile Perch Fisheries Limited
6-2-2017	-0,70	Nile Perch Fisheries Limited
9-2-2017	-1,30	Nile Perch Fisheries Limited
13-2-2017	-0,20	Nile Perch Fisheries Limited
15-2-2017	-0,80	Nile Perch Fisheries Limited
20-2-2017	-1,00	Nile Perch Fisheries Limited
22-2-2017	-0,80	Nile Perch Fisheries Limited
27-2-2017	-0,80	Nile Perch Fisheries Limited
27-2-2017	-0,80	Nile Perch Fisheries Limited
2-3-2017	-1,10	Nile Perch Fisheries Limited
6-3-2017	-1,10	Nile Perch Fisheries Limited
8-3-2017	-0,50	Nile Perch Fisheries Limited
13-3-2017	-0,70	Nile Perch Fisheries Limited
15-3-2017	-0,70	Nile Perch Fisheries Limited
22-3-2017	-1,10	Nile Perch Fisheries Limited
27-3-2017	-1,00	Nile Perch Fisheries Limited
29-3-2017	-0,20	Nile Perch Fisheries Limited
3-4-2017	-0,50	Nile Perch Fisheries Limited
3-4-2017	-0,80	Nile Perch Fisheries Limited
5-4-2017	-0,70	Nile Perch Fisheries Limited
10-4-2017	-0,70	Nile Perch Fisheries Limited
10-4-2017	-0,70	Nile Perch Fisheries Limited
13-4-2017	-0,70	Nile Perch Fisheries Limited
18-4-2017	-1,00	Nile Perch Fisheries Limited
18-4-2017	-0,40	Nile Perch Fisheries Limited
19-4-2017	-1,00	Nile Perch Fisheries Limited
24-4-2017	-0,40	Nile Perch Fisheries Limited
24-4-2017	-0,40	Nile Perch Fisheries Limited
26-4-2017	-0,50	Nile Perch Fisheries Limited
2-5-2017	-0,60	Nile Perch Fisheries Limited
2-5-2017	-1,00	Nile Perch Fisheries Limited
3-5-2017	-0,70	Nile Perch Fisheries Limited
9-5-2017	-0,50	Nile Perch Fisheries Limited
15-5-2017	-0,60	Nile Perch Fisheries Limited
18-5-2017	-1,2	Nile Perch Fisheries Limited
22-5-2017	-0,6	Nile Perch Fisheries Limited

24-5-2017	-1	Nile Perch Fisheries Limited
29-5-2017	-0,8	Nile Perch Fisheries Limited
31-5-2017	-1,1	Nile Perch Fisheries Limited
5-6-2017	-1,6	Nile Perch Fisheries Limited
7-6-2017	-0,6	Nile Perch Fisheries Limited
12-6-2017	-0,8	Nile Perch Fisheries Limited
14-6-2017	-0,7	Nile Perch Fisheries Limited
20-6-2017	-0,9	Nile Perch Fisheries Limited
21-6-2017	-0,6	Nile Perch Fisheries Limited
26-6-2017	-0,7	Nile Perch Fisheries Limited
28-6-2017	-0,6	Nile Perch Fisheries Limited
3-7-2017	-0,8	Nile Perch Fisheries Limited
6-7-2017	-0,8	Nile Perch Fisheries Limited
10-7-2017	-0,5	Nile Perch Fisheries Limited
12-7-2017	-0,5	Nile Perch Fisheries Limited
17-7-2017	-0,2	Nile Perch Fisheries Limited
19-7-2017	1,4	Nile Perch Fisheries Limited
24-7-2017	-0,5	Nile Perch Fisheries Limited
27-7-2017	-0,2	Nile Perch Fisheries Limited
31-7-2017	-0,5	Nile Perch Fisheries Limited
2-8-2017	-0,6	Nile Perch Fisheries Limited
7-8-2017	0,5	Nile Perch Fisheries Limited
9-8-2017	-0,8	Nile Perch Fisheries Limited
14-8-2017	-0,5	Nile Perch Fisheries Limited
16-8-2017	-0,7	Nile Perch Fisheries Limited
17-8-2017	-0,9	Nile Perch Fisheries Limited
21-8-2017	-0,7	Nile Perch Fisheries Limited
23-8-2017	-1	Nile Perch Fisheries Limited
29-8-2017	0,6	Nile Perch Fisheries Limited
30-8-2017	-0,6	Nile Perch Fisheries Limited
4-9-2017	0,5	Nile Perch Fisheries Limited
13-9-2017	-0,8	Nile Perch Fisheries Limited
18-9-2017	-1	Nile Perch Fisheries Limited
20-9-2017	-0,9	Nile Perch Fisheries Limited
25-9-2017	0	Nile Perch Fisheries Limited
27-9-2017	-0,8	Nile Perch Fisheries Limited
3-10-2017	-0,3	Nile Perch Fisheries Limited
9-10-2017	-1,1	Nile Perch Fisheries Limited
12-10-2017	-1	Nile Perch Fisheries Limited
16-10-2017	-0,7	Nile Perch Fisheries Limited
18-10-2017	-1	Nile Perch Fisheries Limited
23-10-2017	-1	Nile Perch Fisheries Limited
25-10-2017	-0,8	Nile Perch Fisheries Limited
31-10-2017	-0,8	Nile Perch Fisheries Limited
31-10-2017	-1,2	Nile Perch Fisheries Limited
6-11-2017	-0,8	Nile Perch Fisheries Limited
8-11-2017	-1,3	Nile Perch Fisheries Limited

13-11-2017	-0,7	Nile Perch Fisheries Limited
13-11-2017	-1,1	Nile Perch Fisheries Limited
15-11-2017	-0,8	Nile Perch Fisheries Limited
20-11-2017	-0,9	Nile Perch Fisheries Limited
20-11-2017	-0,8	Nile Perch Fisheries Limited
20-11-2017	-1	Nile Perch Fisheries Limited
21-11-2017	-0,6	Nile Perch Fisheries Limited
22-11-2017	-1,1	Nile Perch Fisheries Limited
27-11-2017	-0,5	Nile Perch Fisheries Limited
27-11-2017	-0,5	Nile Perch Fisheries Limited
29-11-2017	-0,3	Nile Perch Fisheries Limited
4-12-2017	-0,3	Nile Perch Fisheries Limited
4-12-2017	-0,5	Nile Perch Fisheries Limited
6-12-2017	-0,5	Nile Perch Fisheries Limited
11-12-2017	0,6	Nile Perch Fisheries Limited
11-12-2017	0,3	Nile Perch Fisheries Limited
13-12-2017	-0,5	Nile Perch Fisheries Limited
18-12-2017	-0,3	Nile Perch Fisheries Limited
18-12-2017	-0,5	Nile Perch Fisheries Limited
20-12-2017	-0,3	Nile Perch Fisheries Limited
3-1-2018	-0,8	Nile Perch Fisheries Limited
10-1-2018	-1,1	Nile Perch Fisheries Limited
15-1-2018	-0,8	Nile Perch Fisheries Limited
17-1-2018	-0,1	Nile Perch Fisheries Limited
22-1-2018	-0,8	Nile Perch Fisheries Limited
23-1-2018	-1,1	Nile Perch Fisheries Limited
24-1-2018	-1,1	Nile Perch Fisheries Limited
29-1-2018	-0,8	Nile Perch Fisheries Limited
30-1-2018	-1,1	Nile Perch Fisheries Limited
31-1-2018	-1,1	Nile Perch Fisheries Limited
5-2-2018	-0,8	Nile Perch Fisheries Limited
6-2-2018	-0,8	Nile Perch Fisheries Limited
7-2-2018	-0,1	Nile Perch Fisheries Limited
12-2-2018	-0,8	Nile Perch Fisheries Limited
13-2-2018	-1	Nile Perch Fisheries Limited
14-2-2018	-0,9	Nile Perch Fisheries Limited
19-2-2018	-0,6	Nile Perch Fisheries Limited
20-2-2018	-0,9	Nile Perch Fisheries Limited
21-2-2018	-0,9	Nile Perch Fisheries Limited
26-2-2018	-0,8	Nile Perch Fisheries Limited
27-2-2018	-0,90	Nile Perch Fisheries Limited
28-2-2018	-0,90	Nile Perch Fisheries Limited
6-3-2018	-1,00	Nile Perch Fisheries Limited
5-3-2018	-0,80	Nile Perch Fisheries Limited
15-2-2017	-0,80	Omega Fish Ltd.
22-2-2017	-1,70	Omega Fish Ltd.
10-1-2017	-1,00	Victoria Perch Ltd

16-1-2017	-1,10	Victoria Perch Ltd
23-1-2017	-1,00	Victoria Perch Ltd
30-1-2017	-1,00	Victoria Perch Ltd
13-2-2017	-0,20	Victoria Perch Ltd
13-2-2017	-0,30	Victoria Perch Ltd
14-2-2017	-0,40	Victoria Perch Ltd
27-2-2017	-0,70	Victoria Perch Ltd
6-3-2017	-0,80	Victoria Perch Ltd
6-3-2017	-0,90	Victoria Perch Ltd
13-3-2017	-0,90	Victoria Perch Ltd
15-3-2017	-0,80	Victoria Perch Ltd
22-3-2017	-0,90	Victoria Perch Ltd
27-3-2017	-0,60	Victoria Perch Ltd
3-4-2017	-0,70	Victoria Perch Ltd
2-5-2017	-0,90	Victoria Perch Ltd
12-7-2017	-0,8	Victoria Perch Ltd
27-7-2017	-0,3	Victoria Perch Ltd
2-8-2017	-0,8	Victoria Perch Ltd
29-8-2017	-0,9	Victoria Perch Ltd
30-8-2017	-0,7	Victoria Perch Ltd
4-9-2017	0,4	Victoria Perch Ltd
13-9-2017	-1,3	Victoria Perch Ltd
20-9-2017	-0,6	Victoria Perch Ltd
27-9-2017	-1	Victoria Perch Ltd
12-10-2017	-1	Victoria Perch Ltd
18-10-2017	-0,8	Victoria Perch Ltd
30-10-2017	-0,8	Victoria Perch Ltd
2-11-2017	-1,6	Victoria Perch Ltd
6-11-2017	0,9	Victoria Perch Ltd
8-11-2017	-1,2	Victoria Perch Ltd
13-11-2017	0,7	Victoria Perch Ltd
15-11-2017	-1,1	Victoria Perch Ltd
20-11-2017	-0,8	Victoria Perch Ltd
22-11-2017	-0,9	Victoria Perch Ltd
29-11-2017	-0,9	Victoria Perch Ltd
4-12-2017	-0,4	Victoria Perch Ltd
6-12-2017	-0,7	Victoria Perch Ltd
13-12-2017	-0,6	Victoria Perch Ltd
18-12-2017	-0,3	Victoria Perch Ltd
20-12-2017	-0,5	Victoria Perch Ltd
3-1-2018	-0,7	Victoria Perch Ltd
8-1-2018	-1,1	Victoria Perch Ltd
9-1-2018	-0,8	Victoria Perch Ltd
10-1-2018	-0,8	Victoria Perch Ltd
17-1-2018	-0,8	Victoria Perch Ltd
22-1-2018	0,4	Victoria Perch Ltd
24-1-2018	-1	Victoria Perch Ltd

29-1-2018	-0,8	Victoria Perch Ltd
31-1-2018	-0,8	Victoria Perch Ltd
5-2-2018	-0,7	Victoria Perch Ltd
7-2-2018	-0,8	Victoria Perch Ltd
12-2-2018	-0,7	Victoria Perch Ltd
14-2-2018	-0,3	Victoria Perch Ltd
19-2-2018	-0,7	Victoria Perch Ltd
21-2-2018	-0,6	Victoria Perch Ltd
26-2-2018	-0,3	Victoria Perch Ltd
28-2-2018	-1,00	Victoria Perch Ltd
5-3-2018	-0,70	Victoria Perch Ltd

Table: Core fillet temperature at arrival Europe establishment, arrival date and supplier name for Nile Perch fillets. In total 474 samples gathered in the period December 2017 – March 2018. Source: Fiorital