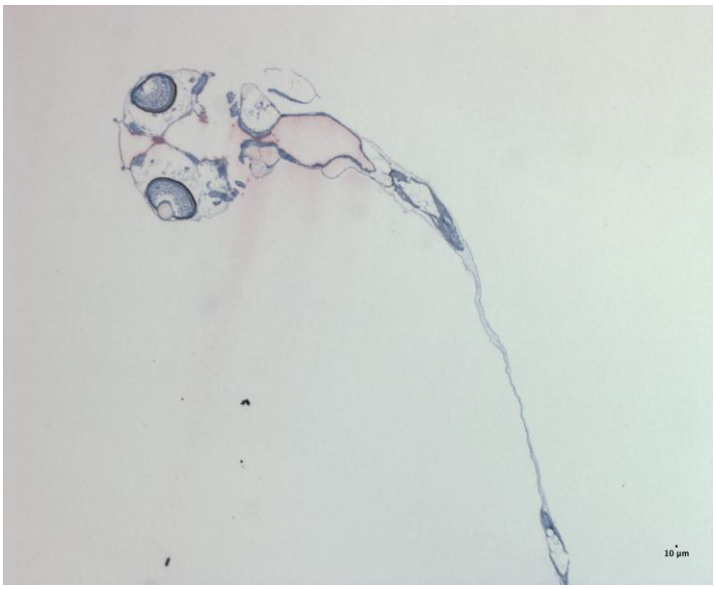
Vibrio splendidus virulence in experimentally challenged cod yolk sac larvae (*Gadus morhua*)



Thesis for the degree of

Master of Science in Aquamedicine

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Acknowledgements

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Siri Frafjord Ørstavik

Picture on front page: Cod, *Gadus morhua*, larvae challenged with LT 06 at 7dph. Challenge dose 10^6 CFU ml^{-1}. Scale bar = 10 µm

- Digestion is the great secret of life. -

Sydney Smith (1771-1845)

Preface

This thesis consists of seven main sections.

The introduction gives a quick overview of the cod farming industry and the bacterium in question, *Vibrio splendidus*. Due to the amount of information available, a selection of relevant literature has been used.

The material and method section describes the origin of the biological material, the challenge experiment and the methods used for analysis.

The result section provide results regarding bacterial count, hatching, and mortality, both cumulative mortality and statistical analysis of mortality. This section also presents the immunological findings, results from sequence analysis and light measurements.

The discussion interprets and comments the results. Furthermore, the results are compared to findings from other experiments. A conclusion with proposals for further experiments is also addressed.

References are presented in "Literature Cited", and are written after the guidelines for Diseases of Aquatic Organisms (DAO). The extended names of all journals are written, in contrast to the DAO recommendations for abbreviated version of all journal names.

The appendix includes a detailed description of the procedures used in the molecular laboratory at the Institute of Marine Research. BLAST results and an overview of sections stained are also presented here as well as results from the light measurements.

Abstract

Farming of Atlantic cod *Gadus morhua,* has become an important part of Norwegian aquaculture, but disease problems are frequent. Vibriosis caused by *Vibrio splendidus* has caused problems in aquaculture to early life stages of several marine species. It may also become a problem in cod hatcheries, as the bacterium is widely distributed in marine environments. The aim of the present study was to increase the understanding of *V. splendidus* infections in cod yolk sac larvae.

Cod eggs were randomly selected from a single batch delivered by a commercial hatchery. Single eggs were transferred to wells in multi well dishes. Each well contained 2 ml of 80% aerated and sterile seawater. The eggs were challenged with 7 different strains of *V. splendidus* the same day as they arrived. The experiment did also include a negative control group consisting of unchallenged larvae and two positive control groups consisting of larvae challenged with two strains of *Vibrio anguillarum*. For each challenge strain 2 x 3 trays were put up (except for the negative control). Three trays were put up with a high dose, approximately 10^6 colony forming units (CFU) ml^{-1} and three trays were put up with a low dose 10^4 CFU ml^{-1}. Two parallels were put up, one for mortality registration and one for immunohistological sampling. Presence of bacteria and pathological alterations were examined by immunohistochemistry. A total of 19 larvae from the negative control and 61 larvae from the challenged groups were investigated.

No groups challenged with *V. splendidus* showed mortality significantly different from the negative control. Immunohistochemistry however, displayed positively stained bacteria in the intestine of the larvae as well as pathology. The bacteria could be observed in all lengths of the gastrointestinal (g.i) tract, but most findings were concentrated in the intestine. Two of the strains displayed higher amounts of bacteria in the intestine than the other groups. Pathology was observed mainly as shredded and necrotic cells in the stomach and intestine.

Results indicate that *V. splendidus* is pathogenic to cod larvae, but a longer trial period would most likely be necessary to induce mortality.

Sammendrag

Oppdrett av atlantisk torsk *Gadus morhua*, har blitt en viktig del av norsk akvakultur, men sykdoms problemer er vanlige. Vibriose forårsaket av *Vibrio splendidus* har skapt problemer i akvakultur i tidlige livs stadier hos flere marine arter. Denne bakterien kan også tenkes å bli et problem i torskeklekkerier, ettersom bakterien er vidt utstrakt i det marine miljø. Målet med denne oppgaven var å øke forståelsen av *V. splendidus* infeksjon hos plommesekk-larver av torsk.

Torskeegg ble tilfeldig plukket fra et enkelt parti levert av et kommersielt anlegg i Hordaland på vestkysten av Norge. Eggene ble overført individuelt til brønner i et polystyren multibrønnbrett. Hver brønn inneholdt 2 ml 80% sterilt luftet sjøvann. Eggene ble smittet med 7 ulike stammer av *V. splendidus* samme dag som ankomst. Forsøket inneholdt også en negativ kontroll gruppe med usmittede larver og to positive kontrollgrupper med larver smittet med to ulike stammer av *Vibrio anguillarum*. For hver smittestamme ble 2 x 3 brett satt opp (utenom den negative kontrollen). Tre brett ble satt opp med en høy dose, omtrent 10^6 koloni dannende enheter (CFU) ml^{-1} og tre brett ble satt opp med en lav dose 10^4 CFU ml^{-1}. To paralleller ble satt opp, en til registrering av dødelighet og en til prøveuttak til immunhistokjemi. Tilstedeværelsen av bakterier og patologiske endringer ble undersøkt ved hjelp av immunhistokjemi. Til sammen ble 19 larver fra den negative kontrollen og 61 larver fra de smittede gruppene undersøkt.

Ingen av gruppene smittet med *V. splendidus* viste dødelighet som var signifikant ulik fra den negative kontrollen. Immunhistokjemi viste derimot positivt fargete bakterier i tarmen på larvene, så vel som patologi. Det kunne observeres bakterier i hele lengden av mage-tarm kanalen, men de fleste funn ble konsentrert til tarmen. To av bakterie stammene viste en høyere mengde av bakterier i tarmen enn de andre gruppene. Patologi ble hovedsakelig observert som avstøtte og døde celler i mage og tarm.

Resultatene indikerer at *V. splendidus* er patogent for torskelarver, men en lengre forsøksperiode kan være nødvendig for å forårsake dødelighet.

Contents

1 Introduction

1.1 Cod status, natural stock history

Atlantic cod, *Gadus morhua*, has been, and still is, one of the most important fish stocks in Norway (Aglen 2009). Already in the ninth century the Norwegians were processing dried cod and trading the surplus (Kurlansky 1998). Atlantic cod is widely distributed in the north Atlantic sea, from Cape Hatteras to the ice edge in the west, and from the Bay of Biscay to the northern parts of the Barents Sea in the east (Svåsand et al. 2004). There are different stocks, each with its own life history and migration pattern, and due to overfishing the natural stocks has been declining over the years. Most of the different stocks are today very small compared to historical levels (Svåsand et al. 2004), but the Northeast Arctic cod stock has been increasing and is today considered as viable. In the beginning of 2009 the total stock of Northeast Arctic cod was estimated to about 2.1 million tonnes, including a spawning stock of 840 000 tones (Aglen 2009).

1.2 Cod aquaculture

During 2008, 15.6 million cod fry were put into the sea in Norway, an increase of about 38% from 2007 (Directorate of Fisheries, http://www.fiskeridir.no/). The estimated harvest quantities of farmed cod in 2008 are estimated to be 13 500 tones (round weight) (Lassen 2009), which is an increase of about 2400 tonnes (25%) in comparison to 2007 (Directorate of Fisheries, http://www.fiskeridir.no/).

Production of cod has roots back to 1880, when a former ship`s officer, Captain G. M. Dannevig, started a cod hatchery in Flødevigen, in the south of Norway. Here he hatched cod larvae and put them into the sea to improve and stabilize the local cod stock (Moksness et al. 2004). These trials were conducted for nearly a decade, but unfortunately there are no data available

to document the effect. In the 1970s the motivation of the aquaculture industry increased as the natural cod stocks still declined, and after several attempts it was shown that it was possible to produce cod fry by feeding them with natural plankton. After years with little or no good results, there was in 1983 produced 70 000 cod fry in a pond, feeding on natural zoo plankton, known as semi intensive production. This became the beginning of a new period of cod production in Norway (Svåsand et al. 2004). Today the cod production is largely based on an intensive approach, where the larvae are held in tanks on land and fed produced live feed like rotifers and *Artemia spp*. and artificial feed pellets (van der Meeren et al. 2005).

1.3 Bacterial diseases in cod

As new species of marine organisms are presented as farming objects, or as farming of an organism expand, "new" diseases may appear and disease outbreaks may become more frequent. The production of juvenile cod is a bottleneck (Ringo & Birkbeck 1999), partly because of mortality caused by diseases during the larval and juvenile stages (Bricknell & Dalmo 2005). The most frequent problems of bacterial diseases in cod farming today are classical vibriosis, caused by *Vibrio anguillarum* (Bricknell et al. 2006, Samuelsen et al. 2006, Hellberg et al. 2009) typical or atypical *Aeromonas salmonicida* (Magnadòttir et al. 2002) and francisellosis, caused by the intracellular bacterium *Francisella noatunensis* (Ottem et al. 2009), first isolated in 2005 (Nylund et al. 2006, Olsen et al. 2006). Though these bacterial diseases are the most abundant in cod aquaculture, other bacterial diseases must not be forgotten.

1.4 *Vibrio splendidus*

Vibrio splendidus is a Gram negative, heterotrophic, formative motile rod shaped bacterium (Austin & Austin 2007a) that is widely distributed in the aquatic environment (Nealson et al. 1993, Farto et al. 1999). The *Vibrio*

genus and genera closely associated within the *Vibrionaceae* is commonly isolated from many different marine habitats and freshwater environments (Thompson et al. 2004). *V. splendidus* was first isolated from the aquatic environment in the late 1880s by a Dutch microbiologist named Martinus Beijernick (1851-1931), and was believed to be a non-pathogenic bacterium (reviewed by Thompson et al. 2004). It has been shown that *V. splendidus* have a survival time in fresh and salt water ranging from 0 to 130 days under artificial conditions. The survival was related to the salinity and nutrient concentration, and the best survival was seen when the parameters were close to those of seawater (Armada et al. 2003). This implies that *V. splendidus* is indigenous to marine environments and that eradication of the bacterium is not possible.

The immune system of fish matures during development of egg, larvae, and fry. Atlantic cod hatch at an ontogenetically primitive stage (Vadstein et al. 2004). Cod undergo a long larvae period before metamorphosis (Kjørsvik et al. 1991, Pedersen & Falk-Petersen 1992) and during these stages the larvae are vulnerable to diseases (reviewed by Bricknell et al. 2006). The non-specific immune system is regarded as the first line of defence against pathogens (Vadstein et al. 2004). It seems that bacterial problems in aquaculture often are a result of opportunistic bacteria, and not a specific pathogen (Munro et al. 1995).

In 1987, a new disease occurred in cultured turbot in northwest Spain. The causative agent isolated did resemble the bacterium *V. splendidus* (Lupiani et al. 1989). This is to my knowledge the first time the bacterium was found in fish. In later years *V. splendidus* has been isolated from several different aquatic organisms. The bacteria has been isolated from molluscs like pacific oyster *Crassostrea gigas*, both adult (Gay et al. 2004a), spat (early juvenile) (Waechter et al. 2002), juvenile (Lacoste et al. 2001), and larvae (Jeffries 1982, Sugumar et al. 1998), from oysters *Ostrea edulis* (Macian et al. 2000), and carpet shell clam *Ruditapes decussates*, both larvae and spat (Gòmez-Leòn et al. 2005). *V. splendidus* has also been isolated from scallop larvae *Pecten maximus* (Nicolas et al. 1996, Le Roux et al. 2004, Torkildsen et al.

2005). In fish, *V. splendidus* has been isolated from several species. In turbot *Scophthalmus maximus*, the bacterium has been isolated from both larvae (Myhr et al. 1991, Blanch et al. 1997, Thomson et al. 2005), juvenile (Angulo et al. 1994), and adults (Myhr et al. 1991, Montes et al. 2003). The bacteria have also been isolated from turbot in another study, but the developmental stage was not described (Farto et al. 1999). The bacteria have also been isolated from corkwing wrasse *Symphodus melops* (Jensen et al. 2003), common dentex *Dentex dentex* (Company et al. 1999, Sitjà-Bobadilla et al. 2007), gilt-head sea bream *Sparus aurata* (Sedano et al. 1996, Balebona et al. 1998), sea bass *Dicentrarchus labrax* (Myhr et al. 1991), and from sole *Solea solea* (Myhr et al. 1991).

Through experiments *V. splendidus* has been shown to be pathogenic to molluscs, like scallop larvae (Torkildsen et al. 2005, Sandlund et al. 2006), and pacific oysters, both larvae (Jeffries 1982, Sugumar et al. 1998), spat (Le Roux et al. 2002, Gay et al. 2004a, Gay et al. 2004b) and juveniles (Lacoste et al. 2001). *V. splendidus* has also been shown to be pathogenic to other molluscs like carpet shell clam (Gòmez-Leòn et al. 2005), and to short-necked calms *Ruditapes phillippinarum* (Le Roux et al. 2002). In fish the bacterium have been shown to be pathogenic to turbot larvae (Gatesoupe et al. 1999, Thomson et al. 2005) and juveniles (Angulo et al. 1994), and gilt head sea bream, both larvae (Sedano et al. 1996) and juveniles (Balebona et al. 1998). The bacterium has also been shown to be pathogenic to corkwing wrasse (Bergh & Samuelsen 2007), and fingerling rainbow trout *Oncorhynchus mykiss* (Santos et al. 1997). In a study performed by Reid et al. (2009) on bacterial populations in the gut of developing cod larvae, the virulence of *V. splendidus* were studied. Their results proved both virulent and non virulent strains of *V. splendidus*. *V. splendidus* strain DMC-1 (identical to the strain used in this study) isolated and pathogenic to turbot larvae (Thomson et al. 2005) was also pathogenic to cod larvae, while *V. splendidus* strains isolated from cod larvae were however not pathogenic to cod larvae in this trial. To my knowledge this is the first time that *V. splendidus* has been shown to be pathogenic to cod. The bacterium has been isolated from cod before (Santos et al. 1997, Sandlund et al. unpublished

results), but until 2009, no studies had been published on the virulence of *V. splendidus* to cod.

1.5 *V. splendidus,* a causative agent of vibriosis in fish

V. splendidus strains can cause septicaemia and vibriosis in fish (Austin & Austin 2007b). In adult and juveniles the bacteria has been isolated from external ulcers and kidney (Sitjà-Bobadilla et al. 2007), and also internally from liver, spleen and fluid from within the peritoneal cavity (Lupiani et al. 1989). The bacterium has also been isolated from haemorrhagic areas in the mouth of turbot (Angulo et al. 1994). Adult and juvenile fish diseased with *V. splendidus* may display loss of appetite (Jensen et al. 2003). External signs of disease can be haemorrhagic foci of the base of fins, around the mouth and the anus (Lupiani et al. 1989). Diseased fish can also display distension of the abdomen. Internally, there can be a swollen stomach and intestine, haemorrhagic walls of the peritoneal cavity and ascites can also be observed (Lupiani et al. 1989, Angulo et al. 1994). As *V. splendidus* is an opportunistic bacterium (Nicolas et al. 1996) indigenous to the marine environment (Thompson et al. 2004) this may explain why it has been isolated from several marine organisms.

1.6 Background and aim

In a previous study performed by Sandlund et al. (unpublished results), one of the unchallenged larval control groups, experienced an increase in mortality. Isolation of *V. splendidus* from homogenized larvae, and immunohistochemistry of deceased larvae showed presence of *V. splendidus* in the intestine. Loss of necrotic epithelial cells in the mucosa of the gastrointestinal tract (g.i) and necrotic gill tissue was observed. The reason why the control group became infected with *V. splendidus* or how it came into the environment of the cod larvae is not known. None of the other groups tested positive for the presence of *V. splendidus* by means of

immunohistochemistry, and *V. splendidus* was not isolated from any of the groups.

The aim of the present study was to experimentally investigate, by means of mortality rates and immunohistochemistry, the virulence of different strains of *Vibrio splendidus* to cod yolk sac larvae, *Gadus morhua*.

2 Material and methods

2.1 Eggs

Eggs were collected from the commercial cod hatchery Sagafjord SeaFarm AS, Stord municipality, in the county of Hordaland, Western Norway (59° 45'N, 5° 29'E). The brood stock was caught by local fishermen in the county of Møre and Romsdal, and kept in tanks of 40 m^3. Each tank contained 60-80 fish. The brood stock spawned naturally, and the fertilized eggs were collected. The eggs were disinfected with glutardialdehyde (300 ppm) for 10 minutes before being transferred to 150 litres dark containers. The average temperature was 6.5-7°C (Dr. Erling Otterlei, Sagafjord SeaFarm AS, Stord, personal communication 2008). The eggs were transported to the laboratories of the Institute of Marine Research in Bergen city by car and ferry. They were carried in isolated plastic bags with seawater and oxygen, within a container made of expanded polystyrene. The transport time was approximately 3 hours.

2.2 Bacteria

The bacteria used in this challenge experiment were *Vibrio splendidus* strain LT06, which has been isolated from and shown to be pathogenic to scallop larvae (Torkildsen et al. 2005, Sandlund et al. 2006), strain DMC-1, isolated from and pathogenic to turbot larvae (Thomson et al. 2005) and 5 strains isolated from an experiment by Sandlund et al. (unpublished results) (table 2.1).

Table 2.1: Overview of the different bacterial strains used in this experiment, the species from which they were isolated and references.

Bacteria	**Origin.**	**References**
LT 06	Great scallop, *Pecten maximus*	(Torkildsen et al. 2005)
DMC-1	Turbot larvae, *Scophthalmus maximus*	(Thomson et al. 2005)
HI 22094	Cod larvae, *Gadus morhua*	(Sandlund et al. unpublished results)
HI 22095	Cod larvae	(Sandlund et al. unpublished results)
HI 22099	Cod larvae	(Sandlund et al. unpublished results)
HI 22107	Cod larvae	(Sandlund et al. unpublished results)
HI 22109	Cod larvae	(Sandlund et al. unpublished results)
HI 21413	Cod larvae	(Sandlund & Bergh 2008)
HI 21429	Cod larvae	(Sandlund & Bergh 2008)

Included in the experiment were also three control groups: one negative control group, challenged with phosphate buffered saline (PBS) (EMD Biosciences, Inc. San Diego, California), and two positive control groups challenged with two strains of *Vibrio anguillarum*, strains HI 21413 and HI 21429. These strains have already been shown to cause high mortality in challenge experiments with cod yolk sac larvae (Sandlund & Bergh 2008). These three controls were included to compare the mortality rates of the challenged larva against known extremes.

All bacteria were stored at -80°C in a 20% glycerol/Difco™ 2216 Marine Broth (MB) (Becton, Dickinson and Company, Sparks, USA). The bacteria were grown in Erlenmeyer flasks containing 50 ml of MB, and shaken in a IKA® KS 260 control incubator (IKA®-WERKE GMBH8 CO. KG D-79219, Staufer, Germany) at 80 rpm, 7°C and for 48 hours. The same temperature (7°C) was used to culture the bacteria, as the temperature of the water, and the room where the challenge experiment was conducted.

The total cell number was determined by counting cell suspensions diluted in PBS in an Improved Neubauer counting chamber (Helber chamber, C.A. Hausser & son, Philadelphia, USA). The cultures were washed three times by centrifuging in an Eppendorf Centrifuge 5810R (Eppendorf AG, Hamburg, Germany), at 4000 rpm, 4°C and for 10 minutes, and resuspended in 50 ml of PBS. The bacteria were visibly checked in microscope (Leitz, Dialux 20) for motility following the washing procedure and counted again. By plating on Difco™ 2216 Marine Agar (MA) (Becton, Dicinson and Company, Sparks, USA), the viability of the bacteria were checked and colony forming units (CFU) were counted. The bacteria were incubated for 48 hours in a Termaks Series 6000 incubator (Termaks AS, Bergen, Norway) prior to counting.

Based on the total cell number, the final bacterial concentration in our wells was adjusted to approximately 10^6 and 10^4 bacteria ml^{-1}.

2.3 Antiserum

The antiserum used in the present study was made against strain LT06 (anti-LT06) and used in the study by Sandlund et al. (2006). It was produced by the method described by Oeding (1957). The bacteria were killed by formalin, and washed prior to administration by intravenous injection to rabbits.

In the recent study performed by Sandlund et al. (unpublished results), the bacterial strains used in the present study were identified as the probable causative agent of the mortality from the use of this antiserum (anti-LT06). The bacteria were identified as different strains of *V. splendidus*.

During the experiment it was necessary to absorb more specific antiserum, as it was drained. To enhance the specificity of the antiserum, it was absorbed by a method modified from Knappskog et al. (1993). Based on experiences with anti-LT06 from Sandlund et al. (2006), the antiserum was absorbed by the same protocol (table 7.1, appendix).

Anti-LT06 was tested for cross reaction on bacterial smears from different bacterial strains and larval tissue samples prior to the experiment. It had been tested earlier, with negative results, for cross reaction against *V. anguillarum* strain HI 610, *Vibrio logei,* strain HI 21039 (Sandlund et al. unpublished results), *Vibrio pectenicida* strain A496 and *Pseudoalteromonas* strain LT 13 (Sandlund et al. 2006). Prior to the experiment the antiserum was also tested against all the different strains of *V. splendidus* used to confirm positive staining of the bacteria.

2.4 Immunohistochemistry

The immunohistochemistry was modified from the experiment described by Sandlund et al. (2006). Live weakened or moribund larvae were sampled for immunohistochemistry. It was important to sample live larvae, as deceased larvae could display post mortem changes. Larvae sampled were immediately fixed in 4% phosphate-buffered formaldehyde (table 7.2, appendix). After 24-48 hours, the samples were dehydrated in ethanol, cleared in xylen and infiltrated in paraffin (Histokinette 2000 Reichert-Jung

Automatic tissue processor, Cambridge instrument company, Slough, England) (table 7.3, appendix). The larval were then embedded in histowax (Kunz instruments WD-4, Kunz Instruments A/S, Copenhagen, Denmark). Larval samples were sectioned at 3 and 2 µm (Leica RM 2255, Leica Microsystem, Nusslock GmbH, Nusslock, Germany) and placed on a microscopic slide. The sections were then incubated at 60 ºC for 30 minutes (Melag Apparate, Berlin, Germany), dewaxed in xylene baths, rehydrated in a series of ethanol baths, washed in running tap water, and left to dry (table 7.4, appendix).

To ensure that the different liquid material used during the immunohistochemistry were concentrated on the section of larvae, and to minimize the use of reagent, the sections were marked with a Dako pen (Dako, Code S2002, Glostrup, Denmark). The sections were then blocked with 5% bovine serum albumin (BSA) in Tris-hydroxymethyl-aminomethane buffer (TRIS) for 20 minutes to prevent non-specific antibody binding. The absorbed polyclonal rabbit antiserum, anti-LT06 was diluted in 2.5% BSA in TRIS. The final concentration of the antiserum was 1:50 early in the experiments and 1:100 later in the experiment. The concentration was changed because of too much unspecific coloring of the intestinal mucosa. A Vectostain® universal ABC-AP kit (AK5200, Vector Laboratories Inc, Burlingame, California), and DAKO Fuchin Substrate-Cromogen system (Dako North America Inc, Carpinteria, California) were used to stain *V. splendidus*. A positive staining reaction appeared as red coloration of the bacteria. Haematoxylin (Sandon Instant Haematoxylin, Anatomical Pathology USA, Pittsburgh, USA) was used for counterstaining and gave the larval tissue a blue colour (for full immunohistochemical procedure, see table 7.7, appendix). The sections were examined for bacteria and pathology in a Leica DMRBE microscope (Leica Microskopie and systeme GmbH, Wetzlar, Germany), and photographed using a Micropublisher 5.0 RTV camera (Qimaging, Surrey, Canada). All incubations were performed at room temperature in a fume hood/humidity chamber. Unchallenged larvae were used as negative control, and larvae

sampled from the experiment by Sandlund et al. (unpublished results), was used as positive control.

2.5 Haematoxylin-Erythrosine-Saffron (HES) staining

HES staining were performed to observe pathology in the larvae.

After the sections have been heated at 60ºC for 30 minutes, dewaxed in a xylene bath, rehydrate in a series of ethanol baths and washed in running water (table 7.4, appendix), the sections were stained with Haematoxylin, 1% erythrosine and saffron (table 7.8, appendix). The different staining media were added through a series of baths in order to stain nuclei, muscle and cytoplasm and connective tissue respectively.

2.6 Challenge experiments

When arriving at the Institute of Marine Research, eggs were randomly selected and placed separately in wells in a 24-wells polystyrene multi-dish (Nunc, Roskilde, Denmark). The wells contained 2 ml of 80% aerated sterile seawater. The wells were challenged with *V. splendidus* strains LT06, DMC-1, HI 22094, HI 22095, HI 22099, HI 22107 and HI 22109, and *V. anguillarum* strain HI 21413 and HI 21429 the same day. To each well, 100 µl of bacterial suspension was added. The final concentrations in the wells were set to be approximately 10^6 and 10^4 bacteria ml^{-1} based on total cell count. For negative control, 100 µl PBS was added instead of bacterial suspension.

This challenge experiment included one negative control group consisting of unchallenged larvae, seven groups challenged with different *V. splendidus* strains (table 2.1), and two positive groups challenged with different *V. anguillarum* strains. Each group (except the negative control group) had one high challenge dose, 10^6 bacteria ml^{-1}, and one low challenge dose, 10^4 bacteria ml^{-1}. Three plates were used for the negative control group and for every bacterial concentration. This gave a total of 72 larvae for each

treatment group to register mortality. The mortality was registered every day. Three extra plates were also set up for most groups, to provide material for immunohistological examination. However, this was not done for larval groups challenged with DMC-1, HI 21413 and HI 21429. The two *V. anguillarum* strains, HI 21413 and 21429 were only used as positive controls of mortality. *V. splendidus* strain DMC-1 was not included because testing of anti-LT06 showed that this specific antiserum did not positively stain this strain. Considering the mortality this can cause to turbot larvae, it was however included among the mortality groups to see whether it would induce the same mortality to cod larvae.

The plates were put up in the same order as mentioned in table 2.1, with the high dose in front and the low dose in the back on a shelf (figure 2.1). Each group of three plates were placed on top of each other, and held at the same position throughout the experiment. The plates for mortality studies were held at the left shelf and the trays for immunohistological examinations were held at the right shelf. The trays with positive control were held in the middle in the top shelf (figure 2.1). The trays for mortality studies and for immunohistological examination were put up with the same ranking (table 2.1).

The day hatching reached 50%, 96 hours post challenge, was set as day 0. To ensure that the bacteria were established in the larva, the first immunohistological sample was taken out day 2 post hatch (dph), (day 6 post challenge), and every day until the experiment was terminated at 19 dph. A total of three larvae were sampled from each group every day, except from day 11, when 4 larvae samples were taken out. This was due to the rise in mortality.

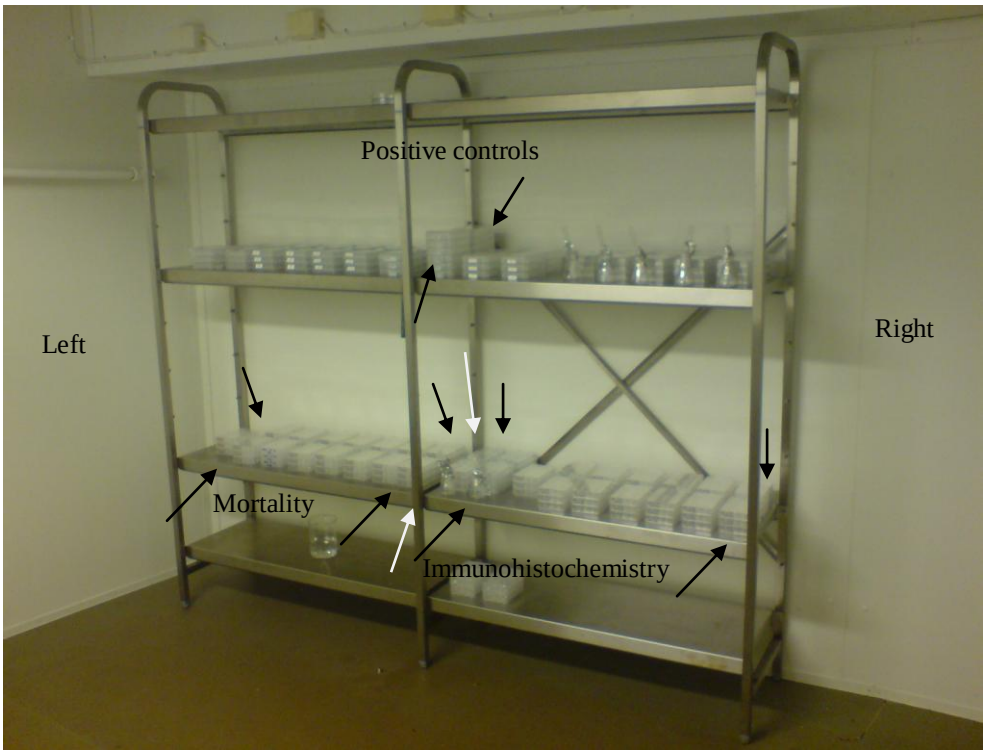

Figure 2.1: Overview of the layout of the 24-wells polystyrene multi-dishes. The arrows indicate where the light mesurements were taken, in front and in back of the wells. The two white arrows indicate the middle measure points taken for wavelengths

The eggs/larvae were kept in a climate room at 7°C with a 12 hour day and 12 hour night artificial light regime. The artificial light used was from a 60 W Philips Classic tone light bulb. Light mesurements were taken in front and in back of the wells on the shelves (figure 2.1). The light intensity was measured by a biospherical instrument (Biospherical Instrument Inc. San Diego, California, USA, model nr Q SL-100) and wavelength was measured by TriOS RAMSES-ACC-VIS Irradiance Sensor (TriOS Optical Sensor, Oldenburg, Germany). When measuring wavelengths, one measurement measured 195 wavelengths in a 360° circle. The measurement of wavelengths was performed by Dr. Are Folkestad (Norwegian Institute for Water Research (NIVA) Gaustadalléen 21, N-0349 OSLO, Norway) and myself. The analyses of the data were performed by Dr. Folkestad.

2.7 Statistical analyses of mortality rates

Survival and mortality data observed in the experiment were not distributed normally and a non-parametric test was performed. A 2 x 2 contingency table ($p < 0.0055$ Bonferroni correction) was performed using Statistica, version 8.0 (StatSoft, Tulsa, USA). Multiple independent tests were used in order to elucidate differences in mortality between the challenged larval groups and the larval negative control group. A Bonferroni correction was applied to minimize possibility of type II error (Rice 1989). A total of 9 bacterial strains were tested, and the p value was corrected by 9 ($p = 0.05/9 = 0.0055$) (Rice 1989). As there was only 1 degree of freedom, Yates correction was applied.

2.8 Genetic characterization

2.8.1 DNA isolation

At 7 days post challenge, 100 µl of water samples were taken from two challenged wells of each group. Water was sampled from wells where larvae had been removed for immunohistological examination or from wells where the larva had been deceased for a short period of time (one day at the most), so that removal of water would not affect the mortality results. These samples were plated out and grown to pure culture on blood agar (15‰ NaCl) (Oxoid nutrient agar, Oxoid LtD, Hampshire, England and lamb blood, TCS Biosciences Ltd, Botolph Claydon Buckingham, Great Brittan) (table 7.10, appendix) and incubated at 15°C for 48 hours. For DNA isolation, pure cultures of the bacteria were grown in MB for 48 hours and then centrifuged at 6000 rpm for 10 minutes. The following work was performed with the cell pellet. DNA was extracted using DNeasy blood and tissue kit 250 (Qiagen GmbH, Hilden, Germany). The purification of DNA was performed as described in the protocol "Isolation of genomic DNA from Gram negative bacteria", provided by the manufacturer.

2.8.2 Polymerase chain reaction (PCR) of 16S rRNA genes

Universal primers 27f (5' AGAGTTTGATCMTGGCTCAG 3') and 1492r (5' TACGGYTACCTTGTTACGACTT 3') (Weisburg et al. 1991) were used for 16S rDNA analysis. The amplification was performed in a 20 µl reaction mixture containing 2.0 µl 10X PCR buffer, 1.2 µl 25mM $MgCl_2$, 0.2 µl 5 U/µl taq polymerase (Go Taq® Flexi DNA Polymerase, Promega, Madison, Wisconsin, USA), 3.2 µl 1.25 mM dNTP (Promega, Madison, Wisconsin, USA), 1.0 µl 10 µM of each primer, 7.4 µl nuclease free water (Ambion, Cambrigeshire, United Kingdom), and 4 µl DNA. Mixture without DNA template was used as negative control. The amplification was carried out in a Gene Amp® PCR system 9700 (Applied Biosystems, California, USA) at 95℃ for 5 minutes (enzyme activation), 30 cycles of 94℃ for 1 minute (denaturation), annealing temperature at 55℃ for 1 minute, 72℃ for 1 minute (extending), and 72℃ for 10 minutes (extend/hold). The products were then held at 4°C overnight in a refrigerator.

2.8.3 Gel electrophoresis

The PCR product was visualized with gel electrophoresis. This was performed as follows: a solution containing 5 µl PCR products, mixed with 1 µl of 6X loading buffer (Promega, Madison, Wisconsin, USA) were loaded into wells in a gel made of 1% agarose. A total of 5 µl of ladder 1 Kb Plus DNA (Track It™, Promega Madison, Wisconsin, USA) was used as marker. The gel was placed in 0.5 Tris borat EDTA (TBE) buffer and run at 65 Volts for 35 minutes. The gel was stained with ethidium bromide, exposed to UV-lights and the bands were photographed in a Bio imaging system from Syngene (Cambridge, England).

2.8.4 DNA purification

The PCR product was purified using ExoSAP-IT® (USB Corporation, Ohio, USA). The purification was performed with 10 µl of PCR product, and 4 µl of ExoSAP-IT mix. This procedure removes remaining dNTP and primers from the PCR product. These leftovers can affect the sequencing reaction. The purification was performed in a PCR system at 37°C for 15 minutes (degrading remaining primers and nucleotides), 80°C for 15 minutes (inactivation), and a 4°C hold.

2.8.5 DNA sequencing

The sequencing was performed, with forward and reverse primers. The sequence reaction contained 1 µl 2.5X Big Dye 3.1, 1.5 µl 5X sequencing buffer, 2.0 µl 10 µM primer, 2.5 µl RNAse free water, and 3 µl template. The sequence reaction was performed in a Gene Amp® PCR system 9700 at 96°C for 1 minute, 25 cycles of 96°C for 10 seconds, annealing temperature at 50°C for 5 seconds, 60°C for 4 minutes. The product was then held at 4°C. Every sample was added 10 µl nuclease free water, and kept at -20°C. The product was then brought to the sequencing laboratory at Høyteknologisenteret in Bergen, where the sequence analyses were performed.

2.8.6 Alignment and sequence analysis

The nucleotide sequences from the PCR were aligned using AlignX in ContigExpress (Informax, Fredrick, MA, USA), and the 16S rRNA encoding gene sequences were searched for nucleotide-nucleotide matches in the BLAST database at the National Center for Biotechnology Information (NCBI, http://www.ncbi.nlm.nih.gov/) to establish identification.

3 Results

3.1 Bacterial counts

The counts of colony forming units (CFU) after 48 hours of incubation showed a difference from the total cell counts done prior to the challenge experiment. The bacterial concentration the eggs/larvae were exposed to, calculated from CFU ml^{-1}, can be seen in table 3.1

Table 3.1: Bacterial concentration in the challenged wells (CFU ml^{-1}).

Bacteria strain	**Challenge dose in wells (10^6 CFU ml^{-1}).**	**Challenge dose in well (10^4 CFU ml^{-1}).**
LT 06	4.6×10^6	4.6×10^4
DMC-1	5.1×10^5	5.1×10^3
HI 22094	1.2×10^6	1.2×10^4
HI 22095	1.0×10^6	1.0×10^4
HI 22099	1.3×10^6	1.3×10^4
HI 22107	7.8×10^5	7.8×10^3
HI 22109	8.1×10^5	8.1×10^3
HI 21413	1.6×10^7	1.6×10^5
HI 21429	2.1×10^7	2.1×10^5

3.2 Hatching

The hatching occurred over several days. The eggs started to hatch 48 hours after incubation and challenge, and within 96 hours the hatching was up to 54%. This was considered as day 0. At 1 day post hatch (dph), hatching was up to 85 and at 2 dph the last eggs hatched. A total of 86% of the eggs hatched successfully.

3.3 Mortality

3.3.1 Cumulative mortality

The percentage of mortality was calculated and plotted against dph for both the high dose groups (10^6 CFU ml^{-1}) and the low dose groups (10^4 CFU ml^{-1}) (figure 3.1 and 3.2 respectively). All groups challenged with high and low doses of the different strains of *V. splendidus* experienced a low mortality rate the first 11 dph. After 11 dph there was a rapid increase in mortality. In the positive control groups, challenged with HI 21413 and HI 21429, mortality was registered from hatching onwards, and already 2 dph these groups experienced an increase in mortality. The same mortality pattern was observed for both the high dose groups and the low dose groups (se figure 3.1 and 3.2).

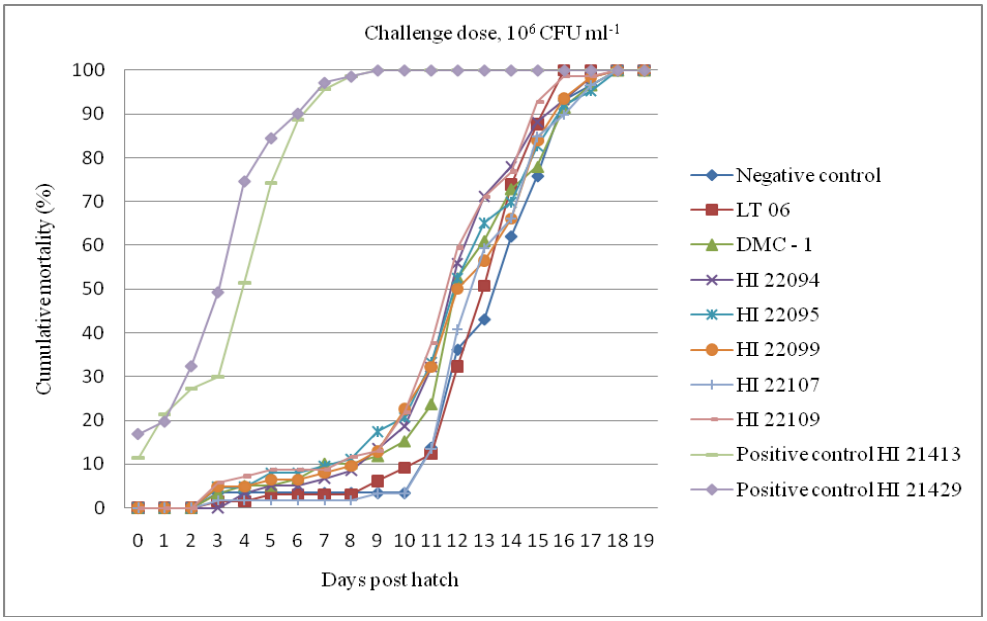

Figure 3.1: *Gadus morhua*, challenge dose 10^6 CFU ml¯1. Days post hatching (x-axis) plotted against percentage of cumulative mortality (y-axis). Negative control larvae were not challenged with bacteria. Positive controls were challenged with various stains of *V. anguillarum*. Remaining names refer to bacterial strains of *V. splendidus*.

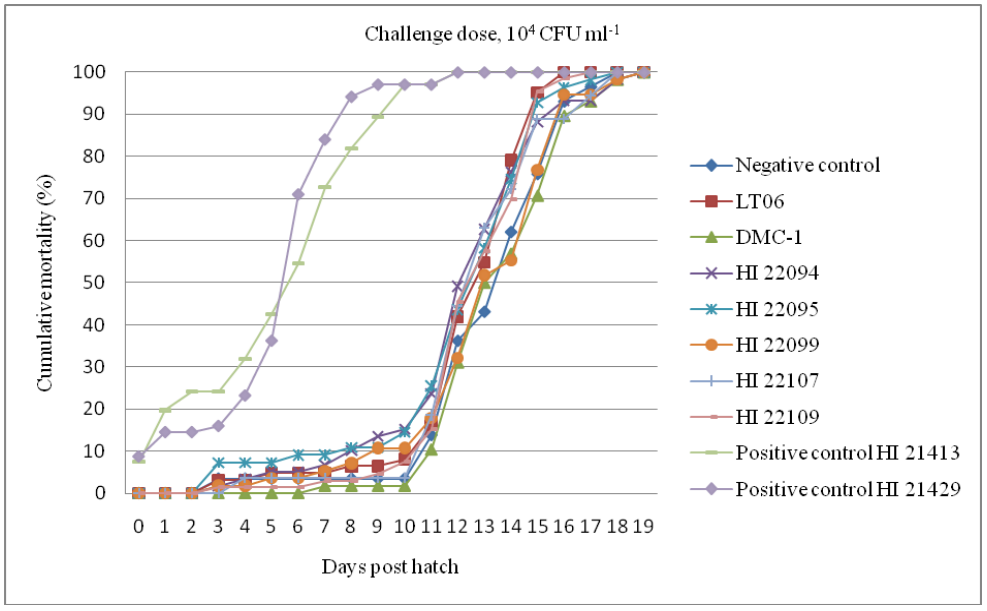

Figure 3.2: *Gadus morhua*, challenge dose 10^4 CFU ml¯1. Days post hatching (x-axis) plotted against percentage of cumulative mortality (y-axis). Negative control larvae were not challenged with bacteria. Positive controls were challenged with various strains of *V. anguillarum*. Remaining names refer to bacterial strains of *V. splendidus*.

3.3.2 Statistical analysis of mortality

Mortality in the negative control group and groups challenged with *V. splendidus* groups were not significantly different when compared, except from at the end of the experiment, at 11 dph (table 3.2). When the mortality of the negative control group were compared to the positive control groups, there was however a significant difference. These differences in mortality rates were significant both for the high challenge dose group and the low challenge dose group, and occurred throughout the whole experiment (tables 3.2 and 3.3).

Table 3.2: Yates-corrected Chi square (χ^2) values and p-values ($p < 0.0055$ Bonferroni correction) for individual 2x2 contingency table of negative control vs. high dose groups of all strains (10^6 CFU ml^{-1}). Control refers to negative control, and HI 21413 and HI 21429 represent the positive control groups challenged with *V. anguillarum*. All significant p-values are in **bold**. Day = days post hatch.

	Day 2		Day 5		Day 8		Day 11		Day 13	
Strain	χ^2	p-value	χ^2	p-value	χ^2	p-value	χ^2	p-value	χ^2	p-value
Control vs. LT06			0,01	0,9204	0,15	0,6941	0,87	0,3514	0,07	0,7912
Control vs. DMC-1			0	0,9844	1,15	0,2829	3,5	0,0614	2,53	0,1114
Control vs. HI22094			0,24	0,6231	0,16	0,6909	5,39	0,0203	3,82	0,0507
Control vs. HI 22095			0,01	0,9248	0,96	0,3284	6,71	0,0096	2,58	0,1085
Control vs. HI 22099			0,01	0,9393	0,47	0,4911	7,91	**0,0049**	1,79	0,1804
Control vs. HI 22107			0	0,9880	0	0,9880	0,24	0,6231	0,09	0,7589
Control vs. HI22109			0,3	0,5865	0,72	0,3977	7,58	0,0059	5,9	0,0152
Control vs. HI 21413	12,08	**0,0005**	32,72	**0**	104,99	**0**	116,26	**0**	116,26	**0**
Control vs. HI 21429	10,87	**0,001**	63,29	**0**	109,59	**0**	117,24	**0**	117,24	**0**

Table 3.3: Yates-corrected Chi square (χ^2) values and p-values ($p < 0.0055$ Bonferroni correction) for individual 2x2 contingency table of negative control vs. low dose groups of all strains (10^4 CFU ml^{-1}). Control refers to negative control, and HI 21413 and HI 21429 represent the positive control groups challenged with *V. anguillarum*. All significant p-values are in **bold**. Day = days post hatch.

	Day 2		Day 5		Day 8		Day 11		Day 13	
Strain	χ^2	p-value	χ^2	p-value	χ^2	p-value	χ^2	p-value	χ^2	p-value
Control vs. LT06			0,19	0,6592	0,01	0,9393	0,47	0,4911	0,21	0,6489
Control vs. DMC-1			0,51	0,4757	0	1	0	1	0,15	0,6943
Control vs. HI22094			0,24	0,6231	0,16	0,6909	3,5	0,0614	1,51	0,2193
Control vs. HI 22095			0,24	0,6266	0,73	0,3935	3,04	0,0811	0,38	0,5391
Control vs. HI 22099			0	0,9754	0	0,968	1,33	0,2495	0,07	0,795
Control vs. HI 22107			0,19	0,6623	0,19	0,6623	0,19	0,6623	0,48	0,4866
Control vs. HI22109			0,14	0,7055	0,14	0,7055	0,36	0,5460	0,74	0,3891
Control vs. HI 21413	10,75	**0,001**	14,62	**0,0001**	58,73	**0**	104,73	**0**	57	**0**
Control vs. HI 21429	7,24	0,0072	8,54	**0,0035**	78,95	**0**	107,65	**0**	59,06	**0**

3.4 Immunohistochemistry

Thirty-seven sections of 19 negative control larvae were investigated by means of immunohistochemistry (figure 3.3). Positively stained bacteria were observed in one of these sections, however pathology was not observed. In contrast to this, immunohistochemistry showed positively stained bacteria present in sections from larvae sampled from all different challenged groups. The bacteria that were present in the larvae seemed to be concentrated in the gastrointestinal (g.i) tract. The g.i tract consists of the oesophagus, stomach and all lengths of the intestine. Bacteria were mainly observed in the intestine, as single cells or clusters of bacteria in the lumen (figures 3.4 and 3.6). From 61 challenged larvae, 128 sections were investigated by means of immunohistochemistry. Of these, 65 sections showed appearance of free bacterial cells or clusters of bacteria in the lumen of the intestine (figures 3.4, 3.6 and 3.7). Bacteria were also observed attached to the mucosa of the intestine (figure 3.7), or within the mucosa (figures 3.5 and 3.8). Some of these sections displayed presence of necrosis in surrounding area (figure 3.8). Nine sections presented bacteria in the mouth cavity (figure 3.9). In one of the sections, bacteria could also be observed attached to the epithelium of the gall bladder lumen (figure 3.11). In 20 sections bacteria were observed between and around the gill arches (figure 3.10). Larvae from two different challenged groups, LT06 and HI 22094, displayed a higher amount of bacteria than larvae from the other challenged groups (table 3.5). Apparently, all larvae challenged with these strains displayed high amounts of bacteria and no major individual differences were observed (figures 3.4, 3.5 and 3.6). Bacteria were also observed in the g.i tract of all the other challenged groups, HI 22095, HI 22099, HI 22107 and HI 22109 (figure 3.11), but in these sections they were not as frequent (table 3.5). All positive control larvae used during the immunohistochemistry presented positively stained bacteria in the g.i tract.

Pathology could be observed from 4 dph and onwards. No differences in occurrence among the different challenged groups could be found. In 38 of 128 sections shredded and necrotic cells were observed in the stomach, the

intestine and in the area close to anus (figures 3.8, 3.12, and 3.13). Shredding of cell layer in the mouth cavity was observed in one section (figure 3.9). No sections showed pathology in or around the gills. Pathological alterations were observed with a slightly higher frequency in sections from larvae from two groups, HI 22099 and HI 22109 (table 3.5). Nine of 21 sections of larvae from challenge group HI 22099, and 8 of 19 sections of larvae from challenge group HI 22109 presented pathology. However pathology was also observed in all other challenged groups (table 3.5). Pathology could not be seen in all sections, hence there were no individual differences. A detailed section overview can be seen in the Appendix (chapter 7.7).

A weak unspecific red coloring in the brush border of the mucosa was present in all examined larvae (figure 3.3), both negative and positive controls and challenged larvae.

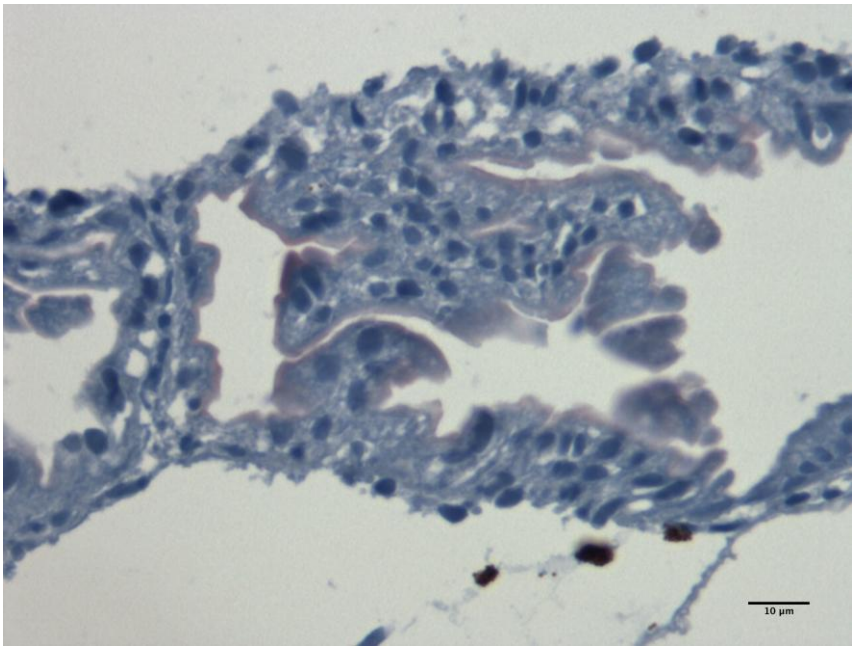

Figure 3.3: *Gadus morhua.* Intestine of 7 dph control larva. Scale bar 10 µm. (Magnification 630x)

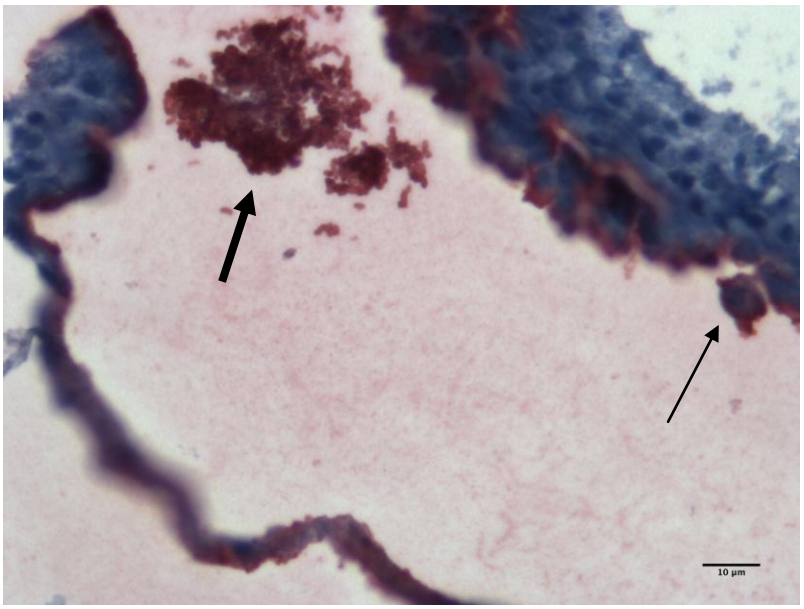

Figure 3.4: *Gadus morhua*. Intestine of 7 dph larva challenged with HI 22094. Challenge dose 10^6 CFU ml^{-1}. A large number of positively stained bacteria are present (bold arrow). Necrotic cells are visible along the intestinal wall (arrow). Scale bar 10 µm. (Magnification 630x)

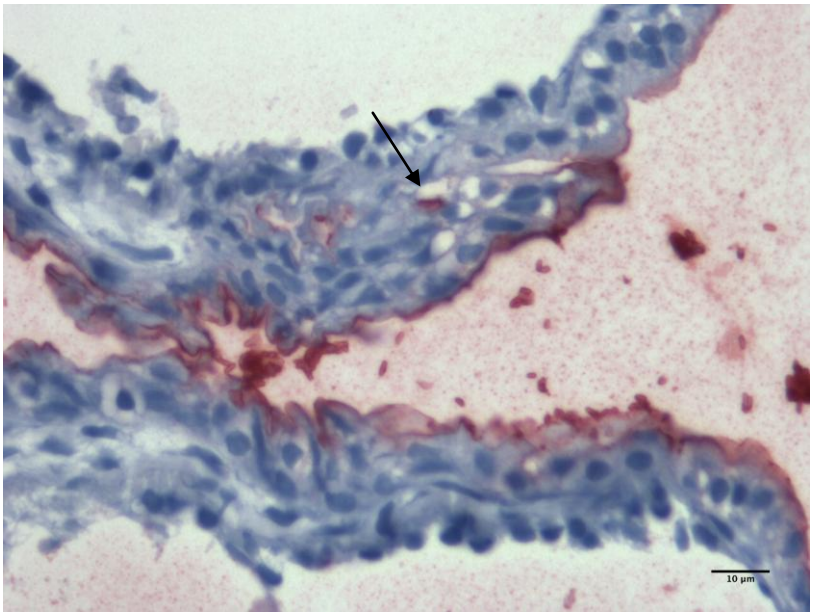

Figure 3.5: *Gadus morhua*. Oesophagus of 7 dph larva challenged with LT 06. Challenge dose 10^6 CFU ml^{-1}. A large number of positively stained bacteria are presented. Some positively stained bacteria are present in the mucosa (arrow). Scale bar 10 µm. (Magnification 630x)

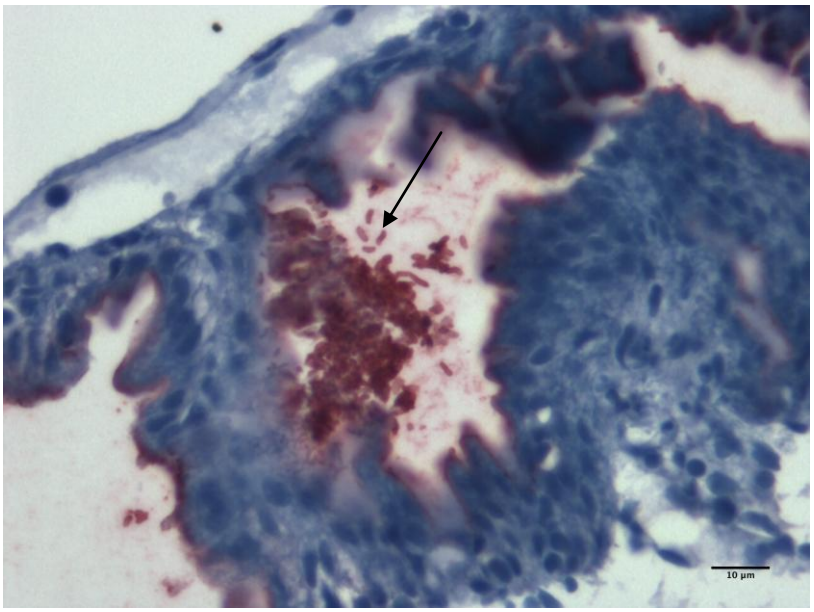

Figure 3.6: *Gadus morhua*. Intestine of 7 dph larva challenged with LT 06. Challenge dose 10^6 CFU ml^{-1}. A large number of positively stained bacteria are present, both single bacterial cells (arrow) and clusters. Scale bar 10 µm. (Magnification 630x)

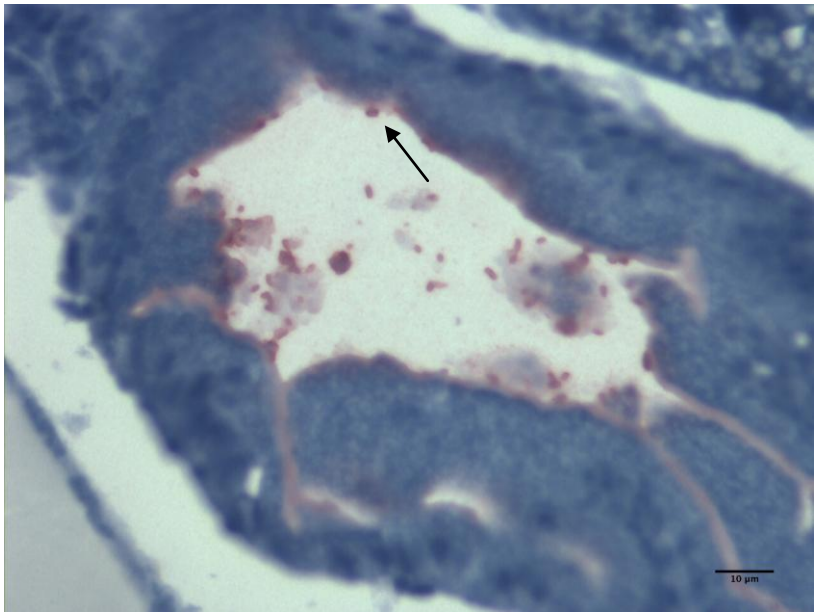

Figure 3.7: *Gadus morhua*. Intestine of 4 dph larva challenged with HI 22109. Challenge dose 10^6 CFU ml^{-1}. A number of positively stained bacteria are present in the lumen, and attached to the brush border of the intestine (arrow). Scale bar 10 µm. (Magnification 630x)

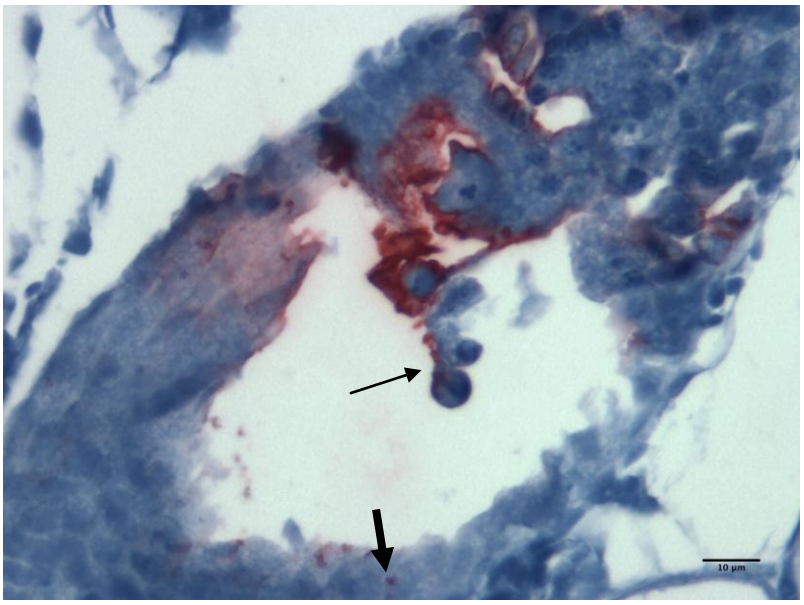

Figure 3.8: *Gadus morhua*. Intestine of 5 dph larva challenged with HI 22099. Challenge dose 10^6 CFU ml^{-1}. Positively stained bacteria are present in the mucosa (bold arrow) and in the lumen. Shredded and necrotic cells are visible in the lumen (arrow). Scale bar 10 µm. (Magnification 630x)

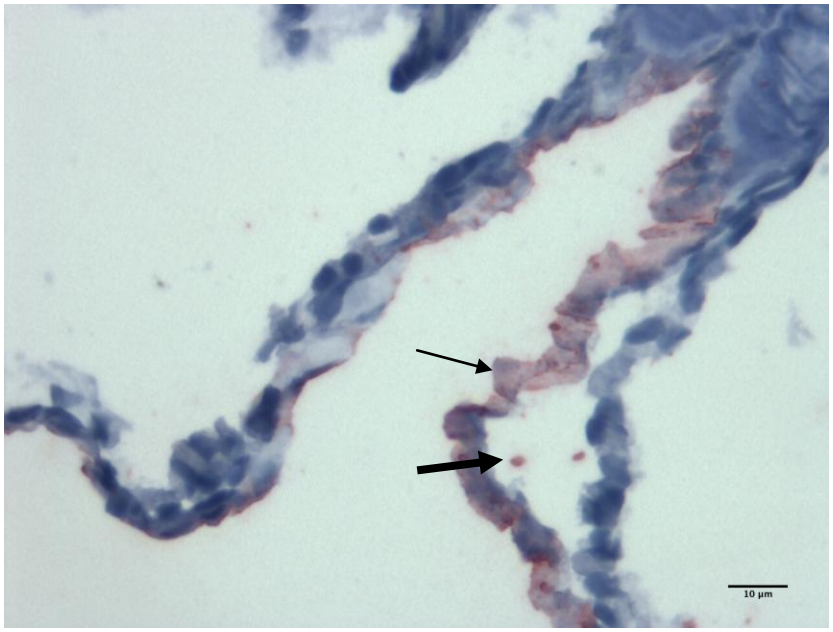

Figure 3.9: *Gadus morhua*. Mouth cavity of 7 dph larva challenged with LT 06. Challenge dose 10^4 CFU ml^{-1}. Positively stained bacteria are present in the mucosa and in the lumen (bold arrow). Disassembly between sub-mucosal and mucosal layer (arrow) can be observed. Scale bar 10 µm. (Magnification 630x)

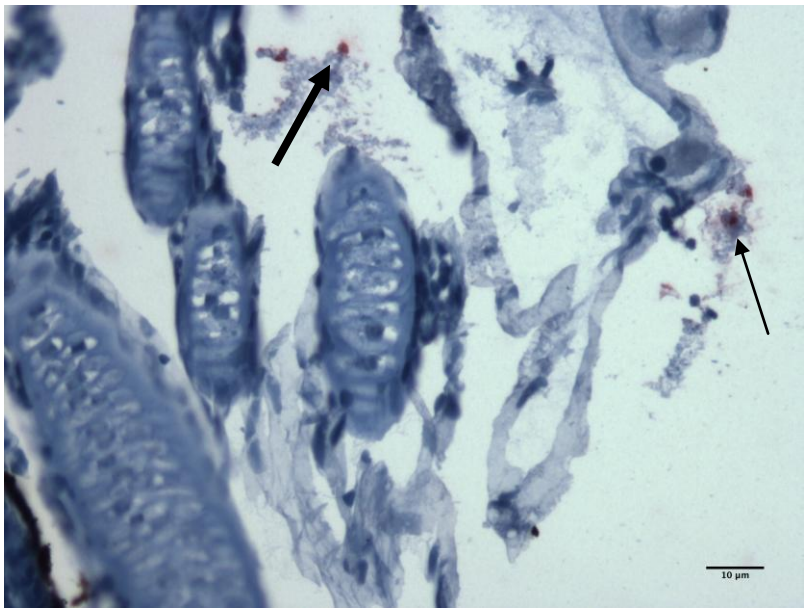

Figure 3.10: *Gadus morhua*. Gills of 9 dph larva challenged with HI 22095. Challenge dose 10^6 CFU ml^{-1}. Positively stained bacteria are present between the gill arches (bold arrow) and outside the operculum (arrow). Scale bar 10 µm. (Magnification 400x)

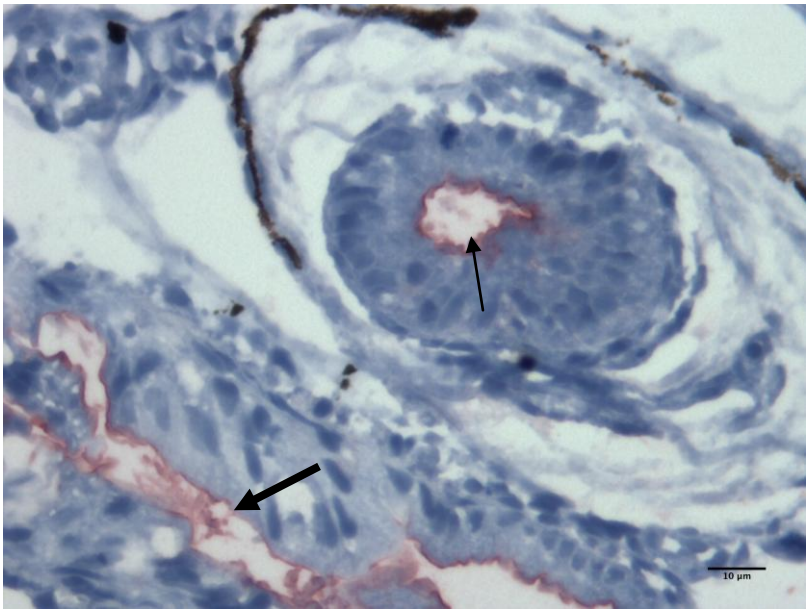

Figure 3.11: *Gadus morhua*. Gall bladder and oesophagus of 4 dph larva challenged with HI 22109. Challenge dose 10^6 CFU ml^{-1}. Positively stained bacteria are present in the oesophagus (bold arrow) and in the gall bladder (arrow). Scale bar 10 µm. (Magnification 630x)

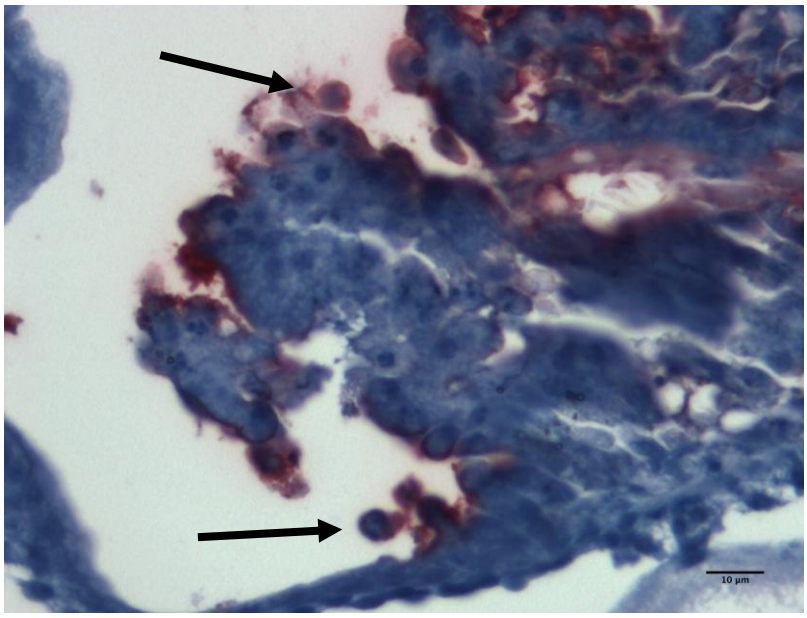

Figure 3.12: *Gadus morhua*. Intestine of 5 dph larva challenged with HI 22099. Challenge dose 10^6 CFU ml^{-1}. Shredded and necrotic cells are visible in the lumen (arrows). Scale bar 10 µm. (Magnification 630x)

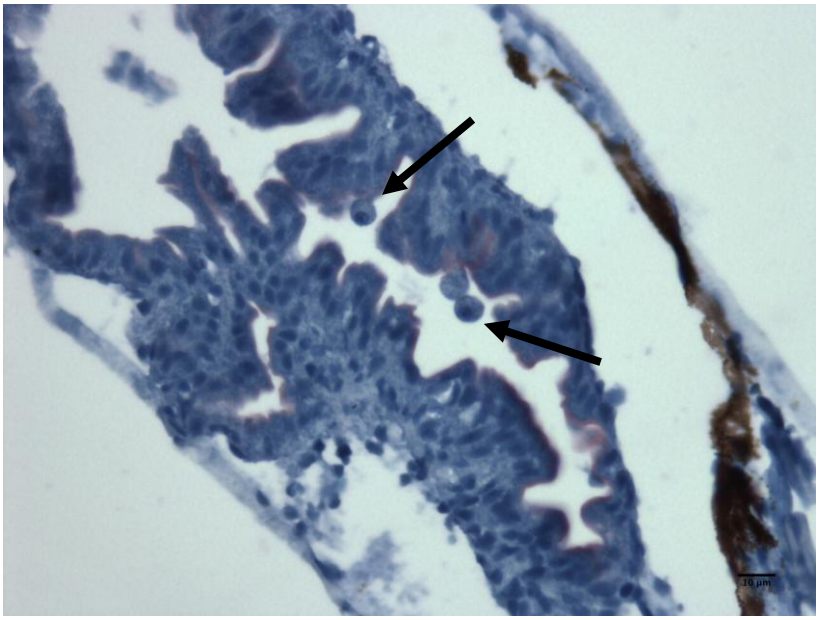

Figure 3.13: *Gadus morhua*. Intestine of 8 dph larva challenged with HI 22099. Challenge dose 10^6 CFU ml^{-1}. Shredded necrotic cells are visible (arrows). Scale bar 10 µm. (Magnification 400x)

Table 3.5: Overview over total amount of larval sections stained from different challenged doses and how many sections registered with positively stained bacteria and pathology (pycnotic and necrotic cells).

	10^6 CFU ml^{-1}		10^4 CFU ml^{-1}	
Challenge strain	**Sections with positive bacteria**	**Sections with pathology**	**Sections with positive bacteria**	**Sections with pathology**
LT 06	15/16 93%	5/16 31%	5/12 41%	5/12 41%
HI 22094	9/11 81%	2/11 18%	0/10 0%	4/10 40%
HI 22095	10/21 47%	4/21 19%	1/3 33%	0/3 0%
HI 22099	10/21 47%	9/21 42%	0/0 0%	0/0 0%
HI 22107	6/15 40%	4/15 26%	0/0 0%	0/0 0%
HI 22109	9/19 47%	8/19 42%	0/0 0%	0/0 0%

3.5 Sequence analysis

Sequences from the control stocks were aligned against sequences from the correlating challenged wells. The results show that the isolates recovered from the challenged wells were identical to the isolates from stock (99.9%). The differences occurred in the end of the sequences, where the nucleotides were unspecific (N). There was however a difference in wells challenged with *V. anguillarum* were *V. splendidus* also were recovered (table 7.11, appendix). Samples recovered from the negative control wells were aligned against all challenged wells. The results show that *V. splendidus* recovered from the unchallenged wells were not identical to *V. splendidus* strains used during the challenge experiment. Samples recovered from the negative control wells were however close to identical (99.9%) when aligned against

V. splendidus recovered from wells challenged with *V. anguillarum* strains HI 21413 and HI 21429.

The 16s rRNA encoding gene sequences isolated from water samples were searched for nucleotide-nucleotide matches in the BLAST database to establish identification. The results revealed that *V. splendidus* was present in all groups including the unchallenged control and the groups challenged with *V. anguillarum* (table 7.11, appendix). The similarity between the samples and sequences in the gene bank were at 99%.

3.6 Light mesurements

The light intensity was measured to be an average of 0.71234 µE m^{-2} sec^{-1} in front of the 24-well polystyrene multi-dish (Nunc, Roskilde, Denmark) and an average of 0.4586 µE m^{-2} sec^{-1} in the back of the multi-dishes (figure 2.1 and tables 7.12-7.16 in appendix). The average wavelengths were measured to be 636 nm. A total of 39 wavelength measurements were taken. For every wavelength sample, see tables 7.17-7.56 in appendix.

4 Discussion

The aim of the present study was to experimentally investigate the virulence of *Vibrio splendidus* to cod yolk sac larvae, *Gadus morhua*. The results from the experiment showed that none of the groups challenged with different *V. splendidus* strains displayed any significant difference in mortality compared to the negative control group. Furthermore, there were no significant differences in mortality among the different challenged groups. When the negative control was compared to the positive controls, the results revealed a significant difference in mortality. The positive groups abbreviated strongly from all other groups, reaching approximately 50% mortality at 4-5 days post hatch (dph) and 95% mortality at 8-9 dph. This mortality pattern is supported by experiments performed by Sandlund & Bergh (2008) and demonstrates the validity of the experimental model. The immunohistochemical examinations of larvae displayed presence of bacteria and pathology in the gastrointestinal (g.i) tract, indicating virulence of *V. splendidus* to cod yolk sac larvae. Differences were observed among the challenged groups regarding the amount of bacteria in the g.i tract and pathological alterations of the larvae. This indicates that some strains may be more virulent than others.

There is an apparent contradiction between the results from the immunohistochemical examinations and the mortality results. When reviewing the sections of larvae, pathology was observed in all challenged groups, except for the negative control. The pathological findings indicate that infection were in progress, but did not reach a lethal stage during the course of the experiment. Reid et al. (2009) showed that *V. splendidus* strain DMC-1, originally isolated from turbot larvae and identical to the strain used in this study, caused mortality of cod larvae when inoculated through live feed. However, Reid et al. (2009) also showed that *V. splendidus* strains isolated from cod larvae did not cause mortality projecting from the negative control. During the present experiment bacteria and pathology were present in larvae challenged with *V. splendidus* strain LT 06, a strain

isolated from and shown to cause disease to scallop larvae (Torkildsen et al. 2005, Sandlund et al. 2006). The results from Reid et al. (2009) and the present experiment indicates that some strains of *V. splendidus* are pathogenic to more than one species.

When examined by immunohistochemistry, positively stained bacteria were observed in the g.i tract in 65 of 128 sections of challenged larvae. The bacteria seemed to be concentrated in the intestine. Larvae challenged with LT06 and HI 22094 apparently caused higher abundance of bacteria in the g.i tract, even though positively stained bacteria were observed in larvae sampled from all groups challenged with *V. splendidus*. Positively stained bacteria were also observed around the gill arches in 20 of 128 sections, but no clear difference among challenged groups could be seen. In conclusion, results from immunohistochemistry regarding the presence of bacteria, indicates that there may be a difference in virulence among the different strains of *V. splendidus* used in the present experiment.

The larvae were not fed during the course of the experiment and at 10 dph and onwards all groups (apart from the positive control) experienced an increase in mortality. As larvae starved longer than 9 dph cannot survive (Kjørsvik et al. 1991), and as there were no significant differences in mortality between the negative control and the groups challenged with *V. splendidus*, this mortality can therefore most likely be explained by starvation.

Results from the PCR with general primers for 16S rRNA, 27f and 1492r, showed that this gene sequence was sufficient to distinguish between *V. splendidus* and *Vibrio anguillarum*, thus sequencing of other genes were not done. Through PCR analysis presence of *V. splendidus* was shown in all groups, including the negative and positive controls. The positive controls, challenged with *V. anguillarum*, also showed presence of *V. anguillarum* through PCR analysis. However, alignment of the sequences showed that the *V. splendidus* isolates from the positive and negative control groups were not identical to the stock strains. Hence, the *V. splendidus* strains isolated from the controls are most likely different from the strains used for

challenge. Sequences from the isolates from the challenged wells were found to be 99.9% alike their correlating sequences from stock strains. This supports the conclusion that the *V. splendidus* strains isolated from the control groups were not the same as the strains used in the challenge experiment. The introduction of *V. splendidus* to the unchallenged groups probably occurred when the eggs were incubated in the wells.

When the eggs are incubated in the wells some water will follow from their container. *V. splendidus* is an indigenous and widespread bacterium in the marine environments (Nealson et al. 1993, Farto et al. 1999) and is widely known from both molluscs and fish, as previously mentioned in Chapter 1.4. This may explain the isolation of *V. splendidus* from the unchallenged wells. The method used to transfer the eggs is not sterile, as the eggs possess an epibiotic microflora (Hansen & Olafsen 1999) which also will inoculate the water in the wells. Only 1 out of 37 sections of examined negative control larvae displayed positively stained bacteria. This observation was however not repeated in any of the other sections examined from that particular larva. This observation alone is therefore not conclusive regarding the presence of *V. splendidus* in the negative control larvae. However, together with the positive PCR analysis, it indicates that the negative and positive control larvae also were exposed to *V. splendidus*. It should be noted that none of the negative control larvae examined displayed pathology. Thus the *V. splendidus* strains recovered from the negative wells may well be non-virulent, as they had no detectable negative effect on the larvae.

In the present experiment larvae were challenged with *V. splendidus* added through water, a method that has previously been shown to cause mortality of turbot larvae *Scophthalmus maximus* (Gatesoupe et al. 1999, Hjelm et al. 2004), and corkwing wrasse *Symphodus melops* (Bergh & Samuelsen 2007). Bath challenge mimics the natural challenge situation, as the larvae hatches in an environment to which bacteria has been added. Cod yolk sac larvae starts to drink water right after hatching (Mangor-Jensen & Adoff 1987), and as *V. splendidus* were administered through water, the larvae may have drunk water containing bacteria as soon as they hatched. The microflora of

marine fish becomes established almost immediately after hatching (reviewed by Hansen & Olafsen 1999), and as drinking commences, the establishment of the microflora will be affected by the surrounding water (Olafsen 2001). Previous bath challenge experiments with cod yolk sac larvae (Engelsen et al. 2008, Sandlund & Bergh 2008) have shown this method to be an adequate way to infect cod yolk sac larvae.

Prior to the experiment the antiserum anti-LT 06 was tested for cross reaction against *V. anguillarum* strain HI 610, *Vibrio logei* strain HI 21039 (Sandlund et al. unpublished results), *Vibrio pectenicida* strain A496 and *Pseudoalteromonas* strain LT 13 (Sandlund et al. 2006). None of these tests showed positive staining of bacteria. The antiserum was also tested on bacterial smears of all the different strains of *V. splendidus* used in the experiment. Results showed positively staining of all the bacterial strains, except *V. splendidus* strain DMC-1. This demonstrated that the antiserum is relatively specific, as it does not positively stain all *V. splendidus* or other bacterial strains.

Alignment showed that strains isolated from the challenged wells were identical to their correlating strains which the larvae were challenged with. Results from immunohistochemistry showed positively stained bacteria in larvae from groups challenged with *V. splendidus*. Based on alignment, results from immunohistochemistry, and the specificity of anti-LT 06, I conclude that the strains which were used for challenge were identical to the strains that gave positive immunohistochemistry results. As some strains of *V. splendidus* do not seem to react with the antiserum used in this experiment, there is therefore possible that such strains could have been present without being detected.

The challenge doses used during this experiment (10^6 and 10^4 colony forming unites (CFU) ml^{-1}) did not cause mortality, but was seemingly high enough to cause infections and pathology. This may indicate that *V. splendidus* may be pathogenic to cod when the larva is exposed to the bacterium in great amounts. Using a similar protocol, Hjelm et al. (2004) showed an increase in mortality of turbot yolk sac larvae challenged with

DMC-1 at a challenge dose of 10^7 CFU ml^{-1}, which can be considered a very high dose. This may indicate that a higher challenge dose in the present experiment could have provided different mortality results.

The challenge doses were prepared to 10^6 and 10^4 bacteria ml^{-1} in the wells, estimated from total counts. An additional estimate was made by plating out on Marine Agar (MA) and incubating for 48 hours before CFU were counted. The CFU counts were diverging from the total cell counts and the challenge dosed varied among the groups. Considering that there was no difference in mortality occurring between the negative control group and the different challenge groups, and that the mortality of the positive control were significantly higher than of the other groups, the variation in challenge doses did most likely not affect the results.

Immunohistochemistry was chosen as method because of its ability to stain specific bacteria with specific antisera, together with its ability to show pathology by counter straining the tissue with haematoxylin. The immunohistochemical examinations showed pathology in all challenged groups, but with different frequencies, indicating a difference in virulence among the different strains. This is supported by previous challenge experiments with *V. splendidus* (Santos et al. 1997, Gatesoupe et al. 1999, Thomson et al. 2005, Reid et al. 2009), where different strains gave different outcomes in terms of mortality. The pathology was observed as shredded and necrotic cells and disassembly between the mucosal and sub-mucosal layers in the g.i tract. Similar pathology has also been observed by Sedano et al. (1996) where the virulence of *V. splendidus* to gilt head sea bream larvae, *Sparus aurata*, following oral infection, was tested. In the present experiment pathology occurred early, from 4 dph and onwards and an increased pathology could be observed as time passed. As the volume of the yolk sac decreases there is an increase in drinking rate (Mangor-Jensen & Adoff 1987), thus more bacteria are introduced to the g.i tract. Increased pathological findings towards the end of the experiment can be explained partly by heightened ingestion of bacteria, and partly by action of bacteria already introduced.

The initial immunohistochemistry results showed a red coloring in the mucosa of the g.i tract in both the negative control larvae and the challenged larvae. This unspecific red coloring was probably caused by alkaline phosphatase activity in the mucosa. The immunohistochemistry was performed with an alkaline phosphatase kit. This can affect the outcome of unspecific red coloration. From trials conducted with the antiserum prior to the experiment, it was decided to use the antiserum in a 1:50 dilution with 2.5% bovine serum albumin (BSA) in TRIS buffer. To minimize the expression of alkaline phosphatase activity the antiserum was diluted to 1:100 with 2.5% BSA in TRIS buffer. This was done to see if it would prevent a strong expression of unspecific red coloring. Immunohistochemistry with antiserum diluted 1:100 still showed unspecific red coloring, but it was nearly invisible. A peroxidase kit could have minimized coloring of the alkaline phosphatase activity (Ingrid Uglenes Fiksdal, Institute of Marine Research, personal communication 2009), but as coloring was nearly invisible with the antisera diluted in 1:100 with 2.5% BSA in TRIS buffer using the alkaline phosphate kit, it was decided to continue using the established protocol.

To give a correct impression of the pathology the larvae were sampled alive. Post mortal changes occur fast and can falsify information regarding pathology. The larvae were sampled as close to moribund as possible, based on visual judgement. Sampled larvae were put directly into 4% phosphate-buffered formaldehyde fix. Ideally the larvae should be anesthetized to death first, but due to changes the anaesthesia may provoke in the tissue, this was not done. Considering the size of the larvae, they were dead in a matter of seconds in the 4% phosphate-buffered formaldehyde fix. This method is considered acceptable, and has been used in earlier experiments with marine fish larvae (Bergh et al. 1997, Engelsen et al. 2008, Sandlund et al. unpublished results).

The larvae were first sectioned at 3 µm. When these sections were viewed in microscope, it was difficult to get an accurate view of the cell structure. The remaining larvae were therefore sectioned at 2 µm. Due to the thin sections

the information retrieved may be incomplete. The bacterium is small, and if bacteria only occur in one part of the larvae, one may not find more positive sections. The method gives an overview of bacteria and pathology present, but the sensitivity is limited. Only a few sections were stained from each larva, and even if the sections were selected and taken from different places, important alterations may be overlooked. When sections showed a positive result, more sections were stained, but due to limited amount of time only an assorted number of sections were stained. Ideally, more sections should have been stained.

Results from the PCR show that the majority of the isolated bacteria were identical to those used during the challenge experiment. Water samples were taken from wells where larvae were deceased or removed, so that the removal of water did not affect the mortality or immunohistochemical results. The samples were plated out on blood agar (15‰ NaCl) and incubated for 48 hours. Blood agar was chosen as growth medium for the bacteria as *V. splendidus* is a haemolytic bacterium. Haemolytic colonies were chosen for growth of pure cultures of *V. splendidus*. Samples taken from wells challenged with *V. anguillarum* were also grown on blood agar as some strains of this bacterium also are haemolytic. The morphology of cultures from these samples varied, and both strong haemolytic and less or non-haemolytic bacteria were present. Selected isolates were streaked out until pure cultures were obtained, and later sequenced. Results showed presence of both *V. anguillarum* and *V. splendidus* in the positive controls, in comparison to the negative control where only *V. splendidus* were recovered. These findings are supported by the fact that *V. splendidus* is an indigenous and widespread bacterium in the marine environment.

Lights measured in the experiment showed that the larvae were exposed to a light intensity ranging from 0.3321-0.7970 µE m^{-2} sec^{-1} (tables 7.12-7.16 in appendix). The cod eggs are pelagic, and in their natural environment, the eggs are exposed to light, depending on their stock, and the geographical region where they are spawned. Larvae from different regions will be exposed to different light conditions and intensity (van der Meeren &

Jørstad 2001, Puvanendran & Brown 2002). In order to create an environment as natural as possible at the hatchery, the cod eggs are exposed to light in 12 hours periods of the day. This includes 2 hours of gloaming prior to and after 8 hours of light (Erling Otterlei, Saga Fjord SeaFarm, personal communication 2008). Previous studies have shown that eggs and larvae exposed to natural artificial light regime (12:12) have good survival and growth (van der Meeren & Jørstad 2001). Puvanendran & Brown (2002) demonstrated that the effect of light intensity is greatest in the period 0-28 dph. They concluded that the light intensity should be at least 19.89 µE m^{-2} sec^{-1} to have a maximal growth during this period. Puvanendran & Brown (2002) also found that a longer day length had a positive effect on larval growth. Both the long day lengths and a strong light intensity gave better survival of cod larvae. Van der Meeren & Jørstad (2001) found similar effects of light intensity and day lengths when observing survival. They did however not observe better growth in experiments involving longer day periods. This indicates that a natural artificial light regime will have a positive effect on the survival of cod larvae. During this experiment 86% of the eggs hatched, and the light period did not seem to negatively affect the hatching. The larvae did not seem to be stressed by the light, and the mortality of the negative control did not exceed any previous experiments on newly hatched cod yolk sac larvae performed at the Institute of Marine Research (Engelsen et al. 2008, Sandlund & Bergh 2008). The light measurements taken for this experiment showed that there was not much difference in the amount of light the larvae were exposed to, depending on the placement of the trays (Are Folkestad, Norwegian Institute for Water Research, personal communication, 2009).

5 Conclusion and suggestions for further work

This study demonstrates that cod yolk sac larvae, *Gadus morhua*, experimentally bath challenged with *Vibrio splendidus*, displayed presence of bacteria and pathology in the gastrointestinal (g.i) tract. This indicates that *V. splendidus* is virulent to cod yolk sac larvae, even though the mortality did not exceed the negative control. The low mortality of the negative control larvae indicates that the eggs were healthy from the outset. The results indicate that the challenge doses were not sufficiently high to cause mortality, but that the bacterium is pathogenic to cod yolk sac larvae. Strains LT 06 and HI 22094 appeared to be more virulent then others, as a higher frequency of bacteria were observed in larvae from these challenged groups. It seems that if this experiment had been allowed to continue longer, an increase in mortality, amount of bacteria and pathology in the g.i tract, could have been the results. This would demand feeding of the larvae. Until further research has been conducted, this is just speculation.

Marine larvae share their environment with opportunistic pathogens, like *V. splendidus*. Pathogens like *V. splendidus* may cause disease problems in cod larvae if occurring in sufficient high numbers. To protect the larvae, early prophylactic countermeasures are a necessity. Studies suggest that by adding probiotics to the rearing water, marine larvae may be protected from disease (Hjelm et al. 2004, Planas et al. 2006). Vaccination is also an effective prophylactic treatment. However, cod should reach a size of >2 g before a good protection is obtained by vaccination (Schrøder et al. 2006), thus the larvae in this study could not be vaccinated. As bacterial problems often occur prior to this size (>2g), good husbandry and hygiene, and protection by adding probiotics to the rearing water are possible prophylaxes.

To my knowledge this is the first study of the virulence of *V. splendidus* to cod yolk sac larvae during bath challenge. Previously, virulence of *V. splendidus* administered orally via live feed to cod larvae has been

demonstrated (Reid et al. 2009), but virulence to bath challenged cod yolk sac larvae has not been reported before. It seems logical to conclude that the mortality following challenge of *V. splendidus* would demand either a longer experimental period or administration via live feed. Further investigation of the virulence of different *V. splendidus* strains to cod larvae should therefore include bath challenge of fed larva or inoculation via live feed.

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7 Appendix

7.1 Absorption of antiserum to *Vibrio splendidus* strain LT06 (anti-LT 06)

Table 7.1: Procedure for absorption of antiserum.

Step	Procedure
Step 1	Cultures of LT13 and A496 were grown in 25 ml Marine Broth (MB) for 48 hours.
Step 2	The bacteria were fixed in 2% formaldehyde for 20 minutes.
Step 3	The bacteria were washed three times in sterile phosphate-buffered saline (PBS) and centrifuged at 4000 rpm for 10 minutes at 4 ºC.
Step 4	Anti-LT 06 (1 ml) was incubated with a total of 5 ml of the other two bacteria suspensions for three hours in a shaking incubator and shaken at 90 rpm. 1 ml of LT06 serum 5 ml of LT13 culture 5 ml of A496 culture
Step 5	After incubation, the solutions were centrifuged at 4000 rpm for 10 minutes at 4 ºC.
Step 6	The supernatant (absorbed antiserum) was removed and frozen at -20 ºC

7.2 Phosphate-buffered formaldehyde (4%)

Table 7.2: Procedure for preparation of 4% phosphate-buffered formaldehyde solution. The procedure was performed inside a fume hood.

Step	Procedure
Step 1	8.15 g of Na_2HPO_4 x $2H_2O$ were added to a bottle.
Step 2	Then 4 g of NaH_2PO_4 x H_2O were added to the bottle
Step 3	Then 900 ml of lukewarm tap water were added, and the phosphate salts were dissolved.
Step 4	100 ml of 37% formaldehyde were added in a bottle.
Step 5	The pH of the solution were tested, and regulated to pH 7.2.

7.3 Preparation of tissue samples prior to immunohistochemistry

After fixation, before the larval samples could be embedded in paraffin and sectioned, all water present in the larvae needed to be replaced with paraffin. The larvae samples were therefore fixated for 24-48 hours before they were brought through a series of ethanol and xylen baths and at last the paraffin bath in a Histokinette (Reichert-Jung, Reichert-Jung UK, Yeoul Road, Great Brittan), before histowax was added to the samples using a wax dispenser WD-4 (Kunz Instruments A/S, Copenhagen, Denmark).

Table 7.3: Procedure for preparation of the larvae prior to embedding in histowax. h = hour. The procedure was performed in a Histokinette within a fume hood.

Bath	Treatment	Duration
Nr 1	50% ethanol	1 hr
Nr 2	70% ethanol	1 hr
Nr 3	80% ethanol	1 hr
Nr 4	96% ethanol	1 hr
Nr 5	96% ethanol	1 hr
Nr 6	100% ethanol	1 hr
Nr 7	100% ethanol	1 hr
Nr 8	Xylen	2 hr
Nr 9	Xylen	2 hr
Nr 10	Paraffin/Histowax 56-58°C	2 hr
Nr 11	Paraffin/Histowax 56-58°C	2 hr

The larvae were embedded in paraffin with a wax dispenser inside a fume hood, before they were sectioned and placed on a slide. The sections were then incubated at 60 ºC for 30 minutes, to ensure that the section would remain adhered to the glass, dewaxed in xylene baths, and rehydrate it in a series of ethanol baths.

Table 7.4: Procedure for removing histowax from the tissue sections. Min = minutes. The procedure was performed inside a fume hood

Bath	Treatment	Duration
Nr 1	Xylen	10 min
Nr 2	100% ethanol	5 min
Nr 3	100% ethanol	5 min
Nr 4	96% ethanol	5 min
Nr 5	80% ethanol	5 min
Nr 6	50% ethanol	5 min
Nr 7	Running tap water	5 min

7.4 Tris-hydroxymethyl-aminomethane (TRIS)-buffer

Table 7.5: Procedure for preparation of tris-hydroxymethyl-aminomethane (TRIS)-buffer, concentrated solution.

Step	Procedure
Step 1	60.57 g Tris (hydroxymethyl)-aminomethane powder (Merck KGaA, Darmstadt, Germany) were added in a bottle.
Step 2	Then 610 ml distilled water were added, and automatic stirring were used to dissolve the powder.
Step 3	390 ml 1N HCl were added to the solution and the pH were regulated to 7.6.
Step 4	Before usage the solution were autoclaved and cooled down. The solution was kept in a refrigerator.

Table 7.6: Procedure for preparation of TRIS working solution.

Step	Procedure
Step 1	100 ml of TRIS concentrated solution were added to a bottle.
Step 2	Then 7.2 g NaCl were added and the solution was mixed.
Step 3	900 ml of distilled water were then added to the mix, and the solution was shaken until all the powder was dissolved. The solution was kept refrigerated.

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7.5 Procedure for immunohistochemistry: using the reaction kit Vectostain® universal ABC-AP.

Table 7.7: Procedure for immunohistochemical testing on sections. The procedure was performed inside a fume hood. The sections must not dry out during the procedure.

Step	Procedure
Step 1	The sections that were to be tested were located, and rehydrated according to table 7.4. Before the immunohistochemistry staining could proceed, a Dako pen were used around the sections.
Step 2	To minimize the possibility of non-specific antibody binding with the antisera, the sections were blocked by using a 5% bovine serum albumin (BSA) in TRIS buffer for 20 minutes.
Step 3	The reagent were knocked of the sections, and the sections were incubated with polyclonal primary antisera, anti-LT06, diluted to 1:100 in 2.5% BSA in TRIS buffer for 30 minutes.
Step 4	After 30 minutes the reagent were knocked off and the sections were washed for 5 minutes in TRIS buffer.
Step 5	A Vectostain ® universal ABC-AP kit were used to stain *Vibrio splendidus*. The secondary antisera were prepared, consisting of 1 drop of secondary antiserum bottle and 2. 5 ml of 2.5% BSA in TRIS buffer were added. The secondary antisera were added to the sections and incubated for 30 minutes.
Step 6	While the secondary antisera were working, the ABComplex/AP was prepared. 1 drop of bottle A, and 1 drop of bottle B of ABComplex/AP bottles were added to a tube, and mixed well. 5 ml of 2. 5% BSA in TRIS buffer were then added. The ABComplex/AP has to be made a minimum of 30 minutes before usage.
Step 7	After 30 minutes, the secondary antisera were knocked of the sections, and the sections were washed in TRIS buffer for 5 minutes.
Step 8	The ABComplex/AP were added to the sections, and incubated for 30 minutes.
Step 9	The complex were knocked off, and the sections were washed in TRIS buffer for 5 minutes

Step 10	When the sections were being washed, the DAKO Fuchin Substrate-Cromogen system, which was used to dye the section again were prepared. 3 drops of fuchsin chromogen agent and 3 drops of fuchsin activating agent were added into a tube and mixed together. The solutions were incubated for 1 minute and 2 ml of fuchsin substrate buffer were added. The solution has to be used immediately after it is made. The sections were covered with the solution and incubated for 5 minutes.
Step 11	The haematoxylin was prepared for counterstaining. It was filtrated using Folder filtrers (Whatman® GmbH, Dassel, Germany), and was then ready for use.
Step 12	The sections were washed in running cold tap water for 5 minutes.
Step13	The sections were then counterstained in haematoxylin for 1. 5 minutes.
Step 14	After staining the sections were washed in cold running tap water for 4 minutes. This worked the haematoxylin and gave the tissue of the larvae a blue coloring.
Step 15	The sections were then ready, and cover glass was mounted over the sections. 1-2 drops of Aquatex® mounting medium (Chemi-Teknik, Oslo, Norway) were added on a cover glass, and put over the section. It is important to make sure that there are no air bubbles.
Step 16	After 20 minutes, the sections were ready for histology screening.
Step 17	The sections were stored in a dark environment

7.6 Haematoxylin-Erythrosine-Saffron (HES) staining

The histowax were removed from the sections, as described in table 7.4.

The sections were then moved through a series of baths (table 7.8).

Table 7.8: Procedure for HES staining. Min = minutes, sec = seconds. The procedure was performed inside a fume hood

Bath	Treatment	Duration
1	Haematoxylin	1.5 minutes
2	Running tap water (Wash)	4 minutes
3	1% Erythrosine	1.5 minutes
4	Running tap water (Wash)	1 minute
5	96% ethanol	1 minute
6	100% ethanol	1 minute
7	100% ethanol	1 minute
8	Saffron (ethanol diluted)	20 seconds
9	100% ethanol	1 minute
10	Xylen	5 minutes
11	Xylen	5 minutes

The sections were covered with Assistant-Histokitt mounting medium (Glaswarenfabrik Karl Hecht KG, Sondheim / Rhön, Germany) and microscope cover glass, they were then left in a fume hood for at least 2 days (48 hours) to air out.

7.7 Section overview

An overview of sections stained is presented in table 7.9[a] and 7.9[b]. It shows how many larvae section from each day (dph), and how many sections are stained from these larvae. The negative control sections are presented with bacteria present in the gastrointestinal (g.i) tract and pathology. Sections from the different challenged doses, 10^6 CFU ml^{-1} and 10^4 CFU ml^{-1}, are listed according to the presence of bacteria in the intestine, in the mouth cavity, in the gall blather and in and around the gill arches. Pathology is presented as pathology in the g.i tract.

Table 7.9[a]: Overview of sectioned stained, presenting positively stained bacteria and pathology.

Challenge	Sections of dph	Sections with bacteria present in the g.i tract	Sections with pathology	Sections of dph 10^6 CFU ml^{-1}	Sections with bacteria present in the intestine	Sections with bacteria in the mouth cavity	Sections with bacteria present in gall bladder	Sections with bacteria around the gill arches	Sections with pathology present in the g.i tract	Sections of dph 10^4 CFU ml^{-1}	Sections with bacteria present in the intestine	Sections with bacteria around the gill arches	Sections with pathology present in the g.i tract
Negative control	**1 larva 3dph**	0/1	0/1										
	3 larvae 4 dph	0/7	0/7										
	1 larva 5 dph	0/2	0/2										
	3 larvae 6 dph	1/7	0/7										
	2 larvae 7dph	0/9	0/9										
	3 larvae 8 dph	0/4	0/4										
	3 larvae 9 dph	0/4	0/4										
	3 larvae 13 dph	0/3	0/3										
LT 06				**3 larvae 4 dph**	7/7	1/7	0/7	2/7	2/7	**3 larvae 4 dph**	1/6	0/6	3/6
				3 larvae 7 dph	6/6	2/6	0/6	2/6	2/6	**3 larvae 7 dph**	4/6	2/6	2/6
				1 larva 9 dph	2/3	1/3	0/3	0/3	1/3				
HI 22094										**3 larvae 4 dph**	0/6	0/6	2/6
				3 larvae 6 dph	4/5	0/5	0/5	1/5	0/5				
				3 larvae 7 dph	5/6	2/6	0/6	3/6	2/6	**3 larvae 7 dph**	0/4	0/4	2/4

Table 7.9[b]: Overviewed of section stained, presenting positively stained bacteria and pathology.

Challenge	Sections of dph	Sections with bacteria present in the g.i tract	Sections with pathology	Sections of dph 10^6 CFU ml^{-1}	Sections with bacteria present in the intestine	Sections with bacteria in the mouth cavity	Sections with bacteria present in gall bladder	Sections with bacteria around the gill arches	Sections with pathology present in the g.i tract	Sections of dph 10^4 CFU ml^{-1}	Sections with bacteria present in the intestine	Sections with bacteria around the gill arches	Sections with pathology present in the g.i tract
HI 22095				**3 larvae 4 dph**	2/6	0/6	0/6	0/6	0/6				
				3 larvae 5 dph	2/3	0/3	0/3	0/3	1/3				
				3 larvae 7 dph	3/9	0/9	0/9	0/9	2/9	**1 larva 7 dph**	1/3	1/3	0/3
				1 larva 9 dph	3/3	0/3	0/3	3/3	1/3				
HI 22099				**3 larvae 5 dph**	5/6	0/6	0/6	0/6	4/6				
				3 larvae 7 dph	3/9	0/9	0/9	0/9	3/9				
				3 larvae 8 dph	2/6	1/6	0/6	3/6	2/6				
HI 22107				**2 larvae 5 dph**	0/2	0/2	0/2	0/2	2/2				
				2 larvae 7 dph	3/4	2/4	0/4	1/4	1/4				
				3 larvae 9 dph	3/9	0/9	0/9	2/9	1/9				
HI 22109				**3 larvae 4 dph**	5/7	0/7	1/7	0/7	3/7				
				3 larvae 6 dph	1/3	0/3	0/3	0/3	2/3				
				3 larvae 7 dph	3/9	0/9	0/9	0/9	3/9				

7.8 Blood agar (15‰ NaCl)

Table 7.10: Procedure for making 15‰ blood agar.

Step	Procedure
Step 1	28 g of Oxoid nutrient agar[a] were added to a bottle.
Step 2	10 g of NaCl were added.
Step 3	Then 1000 ml of dH_2O were added to the bottle.
Step 4	The solution was heated and kept boiling until the powders were dissolved.
Step 5	The solution was autoclaved (Sanoy Labo MLS-3020U Autoclave, Tega Sanoy Industry, Tottor City, Japan) at 121°C for 15 min.
Step 6	The solution was cooled to 50°C in a Lauda water bath ecoline 019 (Lauda DR. R. WOBSER GMBH & CO. KG, Lauda-Köninghofer, Germany)
Step 7	Lamb blood (50°C) was added to the solution.
Step 8	Petri dishes were prepared. (The pH of the agar should be between 7.4 ± 0.2 at 25°C).

[a] Oxoid nutrient agar (Oxoid LtD, Hampshire, England) contains 5‰ NaCl.

7.9 BLAST results.

Table 7.11: Similarity of amplified 16S rDNA isolated from bacterial sampled from water taken from challenge wells associated with challenge experiment and other sequences in the GenBank. This table shows well samples related to analysis of bacterial isolates, isolated from water samples in the larvae wells.

Well samples	**Closest relative**	**Similarity[a] (%)**	**GenBank accession number**
Unchallenged	*Vibrio splendidus*	99%	AJ874364.1
	Vibrio splendidus	99%	AF242271.1
	Vibrio splendidus	99%	FJ748512.1
	Vibrio splendidus	99%	EU091331.1
LT 06 10^6 CFU ml^{-1}	*Vibrio splendidus*	99%	FM954972.2
LT 06 10^4 CFU ml^{-1}	*Vibrio splendidus*	99%	FM954972.2
HI 22094 10^6 CFU ml^{-1}	*Vibrio splendidus*	99%	EU091332.1
HI 22094 10^4 CFU ml^{-1}	*Vibrio splendidus*	99%	FM954972.2
HI 22095 10^6 CFU ml^{-1}	*Vibrio splendidus*	99%	FM954972.2
HI 22095 10^4 CFU ml^{-1}	*Vibrio splendidus*	99%	EU091331.1
HI 22099 10^6 CFU ml^{-1}	*Vibrio splendidus*	99%	FM954972.2
HI 22099 10^4 CFU ml^{-1}	*Vibrio splendidus*	99%	FM954972.2
HI 22107 10^6 CFU ml^{-1}	*Vibrio splendidus*	99%	FM954972.2
HI 22109 10^4 CFU ml^{-1}	*Vibrio splendidus*	99%	EU091334.1
HI 21413 10^6 CFU ml^{-1}	*Listonella anguillarum*[b]	99%	EF091702.1
HI 21413 10^4 CFU ml^{-1}	*Listonella anguillarum*[b]	99%	AY963631.1
	Vibrio splendidus	99%	EU091331.1

HI 21429 10^6 CFU ml^{-1}	*Listonella anguillarum* [b]	99%	AY662305.1
	Listonella anguillarum [b]	99%	EF091702.1
	Listonella anguillarum [b]	99%	AY963631.1
	Vibrio splendidus	99%	EU091331.1
HI 21429 10^4 CFU ml^{-1}	*Listonella anguillarum* [b]	99%	AY963631.1
	Vibrio splendidus	99%	FM954972.2
Control from stock LT 06	*Vibrio splendidus*	99%	FM954972.2
Control from stock 610	*Listonella anguillarum* [b]	99%	AM162655.1
Control from stock HI 22095	*Vibrio splendidus*	99%	EU091332.1
Control from stock HI 22099	*Vibrio splendidus*	99%	FM954972.2
Control from stock HI 22107	*Vibrio splendidus*	99%	EU091332.1
Control from stock HI 22109	*Vibrio splendidus*	99%	FM954972.2
Control from stock HI 21413	*Listonella anguillarum* [b]	99%	AY963631.1
Control from stock HI 21429	*Listonella anguillarum* [b]	99%	AY963631.1

[a] Sequences were aligned to the closest relative based upon BLAST search in the GenBank database. The similarity was calculated with gaps not taken into account.

[b] In GenBank, they use *Listonella anguillarum*, not *Vibrio anguillarum*, as used in this thesis. To make the correlation between the names and the accession number in the GenBank correct, *V. anguillarum* is referred to as *Listonella anguillarum* in this table.

7.10 Light mesurements

The light samples were taken in front and in the back of the wells, and from several different places (figure 2.1, black arrows). Both the light intensity and the light wave lengths were measured. There was made a modification when light wave lengths were taken, as it measured 195 points in a 360 ° area. The measurement points in the middle were fused together, and instead of four different measure points in this area, there were only two, one in front in the middle and one in back (figure 2.1, white arrows). The light measurements are presented in the following chapters (7.10.1 and 7.10.2).

7.10.1 Light intensity

Measurements 1 and 2 represent light intensity in front of the wells. Measurements 3 and 4 represent light intensity in the back of the wells.

Table 7.12: Lights intensity in the left corner

Mesurements	**µE m^{-2} sec^{-1}**	**Placement**
1	0,6476 µE m^{-2} sec^{-1}	In front of the Nunc wells, in the left corner.
2	0,6974 µE m^{-2} sec^{-1}	In front of the Nunc wells, in the left corner.
3	0,5313 µE m^{-2} sec^{-1}	In the back of the Nunc wells, in the left corner.
4	0,3321 µE m^{-2} sec^{-1}	In the back of the Nunc wells, in left corner.

Table 7.13: Lights intensity to the left, in the middle of the shelf.

Mesurements	**µE m^{-2} sec^{-1}**	**Placement**
1	0,6642 µE m^{-2} sec^{-1}	In front of the Nunc wells, in the middle of the shelf, to the left.
2	0,6974 µE m^{-2} sec^{-1}	In front of the Nunc wells, in the middle of the shelf, to the left.
3	0,4981 µE m^{-2} sec^{-1}	In the back of the Nunc wells, in the middle of the shelf, to the left.
4	0,3321 µE m^{-2} sec^{-1}	In the back of the Nunc wells, in the middle of the shelf, to the left.

Table 7.14: Lights intensity to the right, in the middle of the shelf.

Mesurements	**µE m^{-2} sec^{-1}**	**Placement**
1	0,6642 µE m^{-2} sec^{-1}	In front of the Nunc wells, in the middle of the shelf, to the right.
2	0,7638 µE m^{-2} sec^{-1}	In front of the Nunc wells, in the middle of the shelf, to the right.
3	0,6476 µE m^{-2} sec^{-1}	In the back of the Nunc wells, in the middle of the shelf, to the right.
4	0,3321 µE m^{-2} sec^{-1}	In the back of the Nunc wells, in the middle of the shelf, to the right.

Table 7.15: Lights intensity in the right corner.

Mesurements	**µE m^{-2} sec^{-1}**	**Placement**
1	0,6642 µE m^{-2} sec^{-1}	In front of the Nunc wells, in the right corner.
2	0,7638 µE m^{-2} sec^{-1}	In front of the Nunc wells, in the right corner.
3	0,6642 µE m^{-2} sec^{-1}	In the back of the Nunc wells, in the right corner
4	0,3321 µE m^{-2} sec^{-1}	In the back of the Nunc wells, in the right corner.

Table 7.16: Lights intensity on the top shelf.

Mesurements	**µE m^{-2} sec^{-1}**	**Placement**
1	0,7638 µE m^{-2} sec^{-1}	In front of the Nunc wells, on the top shelf.
2	0,7970 µE m^{-2} sec^{-1}	In the back of the Nunc wells, on the top shelf

7.10.2 Light wave length

Table 7.17: Average nanometre of all the mesurements of the light.

Wavelength (nm)							
1	318,2889323	**50**	479,4994122	**99**	640,6752361	**148**	800,6394519
2	321,5715254	**51**	482,7930628	**100**	643,9559245	**149**	803,8831588
3	324,8545844	**52**	486,0866888	**101**	647,2360983	**150**	807,1258609
4	328,138099	**53**	489,3802805	**102**	650,5157475	**151**	810,3675482
5	331,4220594	**54**	492,6738277	**103**	653,794862	**152**	813,6082107
6	334,7064556	**55**	495,9673204	**104**	657,0734319	**153**	816,8478383
7	337,9912775	**56**	499,2607487	**105**	660,3514472	**154**	820,0864211
8	341,2765151	**57**	502,5541025	**106**	663,6288978	**155**	823,323949
9	344,5621585	**58**	505,8473719	**107**	666,9057737	**156**	826,5604121
10	347,8481976	**59**	509,1405468	**108**	670,182065	**157**	829,7958003
11	351,1346224	**60**	512,4336172	**109**	673,4577616	**158**	833,0301037
12	354,4214229	**61**	515,7265732	**110**	676,7328536	**159**	836,2633122
13	357,7085892	**62**	519,0194047	**111**	680,0073309	**160**	839,4954159
14	360,9961111	**63**	522,3121017	**112**	683,2811835	**161**	842,7264047
15	364,2839788	**64**	525,6046542	**113**	686,5544014	**162**	845,9562686
16	367,5721822	**65**	528,8970522	**114**	689,8269747	**163**	849,1849977
17	370,8607113	**66**	532,1892857	**115**	693,0988932	**164**	852,4125819
18	374,149556	**67**	535,4813448	**116**	696,3701471	**165**	855,6390112
19	377,4387065	**68**	538,7732193	**117**	699,6407263	**166**	858,8642756
20	380,7281526	**69**	542,0648993	**118**	702,9106208	**167**	862,0883651
21	384,0178845	**70**	545,3563749	**119**	706,1798206	**168**	865,3112697
22	387,307892	**71**	548,6476359	**120**	709,4483157	**169**	868,5329795
23	390,5981651	**72**	551,9386724	**121**	712,716096	**170**	871,7534843
24	393,888694	**73**	555,2294743	**122**	715,9831517	**171**	874,9727742
25	397,1794685	**74**	558,5200318	**123**	719,2494727	**172**	878,1908392
26	400,4704787	**75**	561,8103347	**124**	722,5150489	**173**	881,4076694
27	403,7617146	**76**	565,1003731	**125**	725,7798704	**174**	884,6232545
28	407,0531661	**77**	568,3901369	**126**	729,0439272	**175**	887,8375848
29	410,3448232	**78**	571,6796162	**127**	732,3072092	**176**	891,0506501
30	413,636676	**79**	574,968801	**128**	735,5697065	**177**	894,2624406
31	416,9287145	**80**	578,2576812	**129**	738,8314091	**178**	897,472946
32	420,2209286	**81**	581,5462469	**130**	742,0923069	**179**	900,6821566
33	423,5133083	**82**	584,834488	**131**	745,35239	**180**	903,8900622
34	426,8058437	**83**	588,1223946	**132**	748,6116483	**181**	907,0966528
35	430,0985246	**84**	591,4099566	**133**	751,8700718	**182**	910,3019186
36	433,3913413	**85**	594,697164	**134**	755,1276506	**183**	913,5058493
37	436,6842835	**86**	597,9840068	**135**	758,3843747	**184**	916,7084351
38	439,9773413	**87**	601,2704751	**136**	761,6402339	**185**	919,909666
39	443,2705048	**88**	604,5565588	**137**	764,8952184	**186**	923,1095318
40	446,5637639	**89**	607,8422479	**138**	768,1493182	**187**	926,3080227
41	449,8571086	**90**	611,1275324	**139**	771,4025231	**188**	929,5051287
42	453,1505288	**91**	614,4124024	**140**	774,6548233	**189**	932,7008396
43	456,4440147	**92**	617,6968477	**141**	777,9062086	**190**	935,8951456
44	459,7375562	**93**	620,9808584	**142**	781,1566692	**191**	939,0880366
45	463,0311432	**94**	624,2644246	**143**	784,406195	**192**	942,2795026
46	466,3247659	**95**	627,5475361	**144**	787,654776	**193**	945,4695336
47	469,6184141	**96**	630,830183	**145**	790,9024022	**194**	948,6581197
48	472,9120779	**97**	634,1123553	**146**	794,1490636	**195**	951,8452507
49	476,2057473	**98**	637,394043	**147**	797,3947501		

Table 7.18: Average irradians values of all the mesurements of the light (mW / (m^2nm)).

Irradians values							
1	0,001108886	**50**	0,024449636	**99**	0,123899289	**148**	0,223338693
2	0,002202595	**51**	0,025730007	**100**	0,126105601	**149**	0,224190722
3	0,00223282	**52**	0,027659945	**101**	0,128423801	**150**	0,227317282
4	0,002269348	**53**	0,029041494	**102**	0,131054141	**151**	0,22832435
5	0,002343468	**54**	0,030000522	**103**	0,133706572	**152**	0,228648699
6	0,001750738	**55**	0,031418983	**104**	0,13533962	**153**	0,227805234
7	0,138458672	**56**	0,032382037	**105**	0,138661521	**154**	0,228495874
8	0,074670746	**57**	0,033757895	**106**	0,140771454	**155**	0,229423776
9	0,001920203	**58**	0,035346686	**107**	0,143096913	**156**	0,230064287
10	0,001395147	**59**	0,037028326	**108**	0,145834826	**157**	0,229659785
11	0,001044069	**60**	0,038702888	**109**	0,148864879	**158**	0,231988034
12	0,001353879	**61**	0,040120302	**110**	0,151594536	**159**	0,232789096
13	0,001078185	**62**	0,042227338	**111**	0,154357795	**160**	0,233140725
14	0,001344212	**63**	0,043819507	**112**	0,157096677	**161**	0,23481214
15	0,001324491	**64**	0,045729503	**113**	0,160208226	**162**	0,234405716
16	0,351712481	**65**	0,047352712	**114**	0,163570877	**163**	0,2348322
17	0,083500277	**66**	0,049663285	**115**	0,165636587	**164**	0,23528639
18	0,231511796	**67**	0,051851647	**116**	0,167922456	**165**	0,234696767
19	0,03170316	**68**	0,054902934	**117**	0,169833515	**166**	0,234218123
20	0,111227399	**69**	0,057693637	**118**	0,171809428	**167**	0,233646661
21	0,001637532	**70**	0,060526345	**119**	0,17421607	**168**	0,234287864
22	0,002159255	**71**	0,061575082	**120**	0,17559401	**169**	0,230701459
23	0,002253181	**72**	0,062454493	**121**	0,177290178	**170**	0,231201203
24	0,002501035	**73**	0,063617743	**122**	0,179520959	**171**	0,229911461
25	0,003217602	**74**	0,065431846	**123**	0,180992124	**172**	0,233446947
26	0,003608809	**75**	0,067135021	**124**	0,183324082	**173**	0,234475289
27	0,00405546	**76**	0,069474972	**125**	0,186369428	**174**	0,237027105
28	0,004416672	**77**	0,071518793	**126**	0,187885352	**175**	0,23833068
29	0,005233737	**78**	0,073681342	**127**	0,189903387	**176**	0,242391203
30	0,005723093	**79**	0,076156679	**128**	0,19164411	**177**	0,243057871
31	0,006691742	**80**	0,078628268	**129**	0,193580487	**178**	0,243682117
32	0,007615679	**81**	0,081473577	**130**	0,195446428	**179**	0,245750899
33	0,008070563	**82**	0,083936123	**131**	0,197632043	**180**	0,247405256
34	0,00880097	**83**	0,086210499	**132**	0,199540207	**181**	0,247823085
35	0,009735844	**84**	0,088856401	**133**	0,200644374	**182**	0,248446111
36	0,010717206	**85**	0,091230411	**134**	0,202659137	**183**	0,246650743
37	0,011569481	**86**	0,093351268	**135**	0,203943237	**184**	0,243610652
38	0,012298478	**87**	0,095819277	**136**	0,205431438	**185**	0,245678923
39	0,012889138	**88**	0,098477381	**137**	0,207672814	**186**	0,247231888
40	0,013651726	**89**	0,101692964	**138**	0,209166022	**187**	0,243920916
41	0,014736537	**90**	0,104615037	**139**	0,210493218	**188**	0,246748698
42	0,015828951	**91**	0,106588657	**140**	0,212033439	**189**	0,243416005
43	0,016937234	**92**	0,10912649	**141**	0,214436163	**190**	0,243710351
44	0,0176433	**93**	0,110667238	**142**	0,215226766	**191**	0,240560966
45	0,018524228	**94**	0,112553868	**143**	0,215763092	**192**	0,23919401
46	0,0198627	**95**	0,114300137	**144**	0,217711508	**193**	0,244390778
47	0,020800855	**96**	0,117144116	**145**	0,219874808	**194**	0,243419972
48	0,021732321	**97**	0,119177237	**146**	0,220913368	**195**	0,235957692
49	0,023046782	**98**	0,121668598	**147**	0,222255829		

Table 7.19: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the left corner, at time code 09:52.

	09.03.2009 09:52						
1	0	**50**	0,028746546	**99**	0,141800141	**148**	0,253043003
2	0,001617359	**51**	0,030461841	**100**	0,143743301	**149**	0,254601166
3	0,001497589	**52**	0,032751619	**101**	0,147083983	**150**	0,258506655
4	0,004876124	**53**	0,034362327	**102**	0,149555996	**151**	0,259154969
5	0,002934821	**54**	0,035590029	**103**	0,152747342	**152**	0,260540617
6	0,002613126	**55**	0,036858568	**104**	0,154353316	**153**	0,257431491
7	0,001281379	**56**	0,037376396	**105**	0,158350976	**154**	0,258983336
8	0,003077888	**57**	0,039512415	**106**	0,160465373	**155**	0,259615161
9	0,003121861	**58**	0,040563722	**107**	0,163015602	**156**	0,260318972
10	0,001524184	**59**	0,042499138	**108**	0,166313262	**157**	0,261368355
11	0,001173266	**60**	0,044435073	**109**	0,169418302	**158**	0,26465928
12	0,00109882	**61**	0,045903139	**110**	0,172562975	**159**	0,266461286
13	0,00179348	**62**	0,048346844	**111**	0,175159496	**160**	0,266804367
14	0,001612126	**63**	0,050231898	**112**	0,17875037	**161**	0,27022881
15	0,001756622	**64**	0,052844528	**113**	0,182275223	**162**	0,269624244
16	0,001691393	**65**	0,054325168	**114**	0,185249962	**163**	0,270732613
17	0,002039258	**66**	0,057105865	**115**	0,188700071	**164**	0,270165815
18	0,002643716	**67**	0,059988657	**116**	0,191145228	**165**	0,273216349
19	0,002073998	**68**	0,063914813	**117**	0,193212357	**166**	0,270812307
20	0,003190446	**69**	0,067930997	**118**	0,195563386	**167**	0,270685324
21	0,001702446	**70**	0,070951722	**119**	0,198209408	**168**	0,274652433
22	0,002859563	**71**	0,072373903	**120**	0,200234085	**169**	0,274591443
23	0,002910946	**72**	0,072540115	**121**	0,202076361	**170**	0,277567702
24	0,003367327	**73**	0,07363737	**122**	0,203967002	**171**	0,277371596
25	0,004433358	**74**	0,075536198	**123**	0,207010183	**172**	0,279249167
26	0,004675393	**75**	0,07721902	**124**	0,209306362	**173**	0,28006889
27	0,005764712	**76**	0,079861627	**125**	0,212033004	**174**	0,282171698
28	0,005911252	**77**	0,082559349	**126**	0,213730255	**175**	0,284269648
29	0,007002413	**78**	0,084877136	**127**	0,217027567	**176**	0,286170995
30	0,007017958	**79**	0,087605766	**128**	0,218079896	**177**	0,283224201
31	0,008457164	**80**	0,090922032	**129**	0,220502379	**178**	0,287030725
32	0,009419178	**81**	0,094363285	**130**	0,223220258	**179**	0,289318911
33	0,009868879	**82**	0,096993786	**131**	0,225235789	**180**	0,290965115
34	0,010768467	**83**	0,100092339	**132**	0,227072942	**181**	0,294268399
35	0,011982694	**84**	0,103082762	**133**	0,228647294	**182**	0,294044953
36	0,013069193	**85**	0,105681084	**134**	0,230981384	**183**	0,292776043
37	0,014329924	**86**	0,107821153	**135**	0,233139888	**184**	0,29323736
38	0,01496746	**87**	0,110782885	**136**	0,233283343	**185**	0,295777367
39	0,015932728	**88**	0,113817292	**137**	0,236733058	**186**	0,298399188
40	0,016859201	**89**	0,117345319	**138**	0,237837005	**187**	0,298770669
41	0,01772644	**90**	0,121842212	**139**	0,23907071	**188**	0,299799352
42	0,018729596	**91**	0,123657968	**140**	0,241175451	**189**	0,297063217
43	0,019965396	**92**	0,126174239	**141**	0,243064922	**190**	0,299290683
44	0,020984074	**93**	0,127672321	**142**	0,244699552	**191**	0,292715977
45	0,02176593	**94**	0,129620328	**143**	0,245594326	**192**	0,297615754
46	0,023286828	**95**	0,131705736	**144**	0,247266234	**193**	0,303521121
47	0,024049207	**96**	0,134375824	**145**	0,249680855	**194**	0,309261041
48	0,025359228	**97**	0,136116157	**146**	0,250587073	**195**	0,300070969
49	0,026566949	**98**	0,139028316	**147**	0,252493313		

Table 7.20: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the left corner, at time code 09:53.

	09.03.2009 09:53						
1	0,001656527	**50**	0,026226088	**99**	0,131169438	**148**	0,237027888
2	0,002175071	**51**	0,028102857	**100**	0,133911242	**149**	0,23677899
3	0,003361646	**52**	0,029674887	**101**	0,136394813	**150**	0,241328558
4	0,004336995	**53**	0,031384904	**102**	0,138811544	**151**	0,242180543
5	0,003340891	**54**	0,032321102	**103**	0,141860356	**152**	0,243088389
6	0,001578069	**55**	0,033785726	**104**	0,143223571	**153**	0,240479701
7	0,002146666	**56**	0,034346554	**105**	0,146666632	**154**	0,242837688
8	0,000975875	**57**	0,035752422	**106**	0,148812851	**155**	0,244598274
9	0,001813495	**58**	0,037303524	**107**	0,151750017	**156**	0,244093677
10	0,002023582	**59**	0,038908607	**108**	0,154310887	**157**	0,244144614
11	0,001153186	**60**	0,040248744	**109**	0,157790958	**158**	0,248104096
12	0,001772198	**61**	0,042368878	**110**	0,161174239	**159**	0,248567886
13	0,001999895	**62**	0,044945063	**111**	0,163658147	**160**	0,248399265
14	0,001366358	**63**	0,046540707	**112**	0,165961601	**161**	0,252847616
15	0,001737135	**64**	0,048319893	**113**	0,169618456	**162**	0,251732844
16	0,000946664	**65**	0,049999086	**114**	0,173599123	**163**	0,252632418
17	0,000767393	**66**	0,052636451	**115**	0,175211195	**164**	0,252861381
18	0,001075244	**67**	0,05531288	**116**	0,178201488	**165**	0,253637858
19	0,001921424	**68**	0,059354089	**117**	0,18046021	**166**	0,256364079
20	0,001994797	**69**	0,062826135	**118**	0,182304584	**167**	0,257257704
21	0,002068129	**70**	0,065929048	**119**	0,185635036	**168**	0,262315872
22	0,003465629	**71**	0,066952408	**120**	0,187387018	**169**	0,257094684
23	0,002649331	**72**	0,067006266	**121**	0,188815305	**170**	0,263967826
24	0,003001791	**73**	0,067886781	**122**	0,192291788	**171**	0,26118466
25	0,003539267	**74**	0,069802084	**123**	0,193525767	**172**	0,262941972
26	0,004761171	**75**	0,071278856	**124**	0,195765238	**173**	0,266364417
27	0,00410473	**76**	0,073774093	**125**	0,198292215	**174**	0,264712896
28	0,004809506	**77**	0,075953165	**126**	0,200840021	**175**	0,265739159
29	0,005970214	**78**	0,078250468	**127**	0,202459191	**176**	0,26851901
30	0,006524767	**79**	0,081722197	**128**	0,205321727	**177**	0,266535583
31	0,007308233	**80**	0,083791947	**129**	0,206127803	**178**	0,26706755
32	0,008542144	**81**	0,08737436	**130**	0,209146823	**179**	0,265891977
33	0,008470445	**82**	0,089424268	**131**	0,211458733	**180**	0,271852451
34	0,009277308	**83**	0,092267105	**132**	0,213755983	**181**	0,272053319
35	0,010784855	**84**	0,095508106	**133**	0,215209883	**182**	0,275965402
36	0,011746044	**85**	0,097764654	**134**	0,216793872	**183**	0,274664575
37	0,01260504	**86**	0,09954599	**135**	0,218008848	**184**	0,269110178
38	0,013421307	**87**	0,102133211	**136**	0,220069578	**185**	0,273516152
39	0,013940637	**88**	0,105448808	**137**	0,222235822	**186**	0,276016486
40	0,015166404	**89**	0,109280975	**138**	0,224034265	**187**	0,279229733
41	0,015914741	**90**	0,112640954	**139**	0,224811356	**188**	0,281783756
42	0,017162966	**91**	0,113698661	**140**	0,22661195	**189**	0,278237936
43	0,017753675	**92**	0,116966453	**141**	0,228898807	**190**	0,278713634
44	0,019114788	**93**	0,117916146	**142**	0,229474096	**191**	0,273800424
45	0,019943971	**94**	0,119948081	**143**	0,229984231	**192**	0,275772703
46	0,021762258	**95**	0,121485268	**144**	0,231618589	**193**	0,277531581
47	0,022112484	**96**	0,124238183	**145**	0,234783494	**194**	0,293436727
48	0,022767758	**97**	0,126603171	**146**	0,235470701	**195**	0,282380415
49	0,024856505	**98**	0,128631733	**147**	0,23714076		

Table 7.21: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the left corner, at time code 09:54.

	09.03.2009 09:54						
1	0,000932112	**50**	0,028881329	**99**	0,142647649	**148**	0,256210036
2	0,001820163	**51**	0,030030484	**100**	0,144821296	**149**	0,256972516
3	0,002225026	**52**	0,032644135	**101**	0,147495825	**150**	0,260715812
4	0,002802552	**53**	0,034816283	**102**	0,150308672	**151**	0,261193468
5	0,002418005	**54**	0,035484153	**103**	0,153388863	**152**	0,261911
6	0,001745014	**55**	0,036518594	**104**	0,155109156	**153**	0,26107882
7	0,001937804	**56**	0,037814756	**105**	0,159106022	**154**	0,26247659
8	0,001907147	**57**	0,039333975	**106**	0,161896054	**155**	0,264255948
9	0,002075168	**58**	0,041444856	**107**	0,164440202	**156**	0,265622531
10	0,001220202	**59**	0,042623378	**108**	0,16705991	**157**	0,265154807
11	0,001735522	**60**	0,044703584	**109**	0,169939207	**158**	0,268264421
12	0,00140665	**61**	0,046454244	**110**	0,173640539	**159**	0,26782645
13	0,000967821	**62**	0,048605804	**111**	0,176794583	**160**	0,269713075
14	0,002708631	**63**	0,050486463	**112**	0,179721196	**161**	0,273220232
15	0,002419173	**64**	0,052753352	**113**	0,183365999	**162**	0,272384935
16	0,001771904	**65**	0,05490947	**114**	0,186808475	**163**	0,272919947
17	0,00224776	**66**	0,057083685	**115**	0,1895827	**164**	0,275464241
18	0,001182673	**67**	0,060163862	**116**	0,1920379	**165**	0,274843049
19	0,002553518	**68**	0,064283137	**117**	0,194469888	**166**	0,275008888
20	0,002233927	**69**	0,068360881	**118**	0,197551213	**167**	0,277244438
21	0,002046618	**70**	0,071572863	**119**	0,19997988	**168**	0,280277393
22	0,003319337	**71**	0,072416846	**120**	0,201659275	**169**	0,279213228
23	0,003112189	**72**	0,072908316	**121**	0,204138733	**170**	0,281531485
24	0,003328849	**73**	0,074143158	**122**	0,206556853	**171**	0,28062312
25	0,004834787	**74**	0,07605238	**123**	0,207729917	**172**	0,286123052
26	0,004435215	**75**	0,07760967	**124**	0,210164753	**173**	0,287640422
27	0,005055593	**76**	0,079979374	**125**	0,214341283	**174**	0,285773065
28	0,005699958	**77**	0,082535195	**126**	0,215808612	**175**	0,28507884
29	0,006125751	**78**	0,085372587	**127**	0,218868255	**176**	0,290521248
30	0,006991299	**79**	0,0883428	**128**	0,220499155	**177**	0,287720616
31	0,008053144	**80**	0,090661334	**129**	0,222406603	**178**	0,290074438
32	0,00939515	**81**	0,094737453	**130**	0,225585541	**179**	0,291911615
33	0,009845764	**82**	0,097623439	**131**	0,227648583	**180**	0,297688162
34	0,010611503	**83**	0,100232325	**132**	0,230420644	**181**	0,294666875
35	0,012224459	**84**	0,103483689	**133**	0,23161106	**182**	0,297557551
36	0,013506598	**85**	0,105651818	**134**	0,23416267	**183**	0,294490738
37	0,013846517	**86**	0,108509503	**135**	0,235447568	**184**	0,294349212
38	0,014678251	**87**	0,111487106	**136**	0,236285253	**185**	0,299006974
39	0,01570506	**88**	0,114161416	**137**	0,239802416	**186**	0,303905093
40	0,016135384	**89**	0,118175707	**138**	0,240972719	**187**	0,29852174
41	0,018062384	**90**	0,121418791	**139**	0,242785571	**188**	0,304206044
42	0,019223023	**91**	0,124121962	**140**	0,244444213	**189**	0,302480564
43	0,019864289	**92**	0,12654457	**141**	0,245510441	**190**	0,303264182
44	0,021035641	**93**	0,128048216	**142**	0,247018459	**191**	0,298673632
45	0,022132943	**94**	0,130104805	**143**	0,248910298	**192**	0,301072928
46	0,023578485	**95**	0,132091414	**144**	0,250479303	**193**	0,309149429
47	0,024423194	**96**	0,134979467	**145**	0,250209364	**194**	0,307869893
48	0,025976884	**97**	0,137698657	**146**	0,253372562	**195**	0,30517752
49	0,027509713	**98**	0,139975115	**147**	0,255151158		

Table 7.22: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the left corner, at time code 09:55.

	09.03.2009 09:55						
1	0,001229308	**50**	0,032754119	**99**	0,161759578	**148**	0,283825612
2	0,003611604	**51**	0,034712507	**100**	0,165216469	**149**	0,286515582
3	0,000557983	**52**	0,037230123	**101**	0,168038	**150**	0,289942699
4	0,001530761	**53**	0,038732774	**102**	0,170392581	**151**	0,290098339
5	0,003279366	**54**	0,040398573	**103**	0,173754006	**152**	0,291629499
6	0,003325423	**55**	0,042550953	**104**	0,176184496	**153**	0,290644288
7	0,001201812	**56**	0,043917417	**105**	0,180045978	**154**	0,292865056
8	0,001889408	**57**	0,044984587	**106**	0,183456671	**155**	0,292596855
9	0,002487502	**58**	0,047327477	**107**	0,185459297	**156**	0,293368835
10	0,001726838	**59**	0,049398589	**108**	0,189446921	**157**	0,294769175
11	0,001481168	**60**	0,051652321	**109**	0,193144284	**158**	0,296979049
12	0,001624697	**61**	0,053634582	**110**	0,197148773	**159**	0,298510138
13	0,001293081	**62**	0,056296105	**111**	0,19963625	**160**	0,300070629
14	0,001561712	**63**	0,058254551	**112**	0,202448489	**161**	0,301965392
15	0,001587736	**64**	0,060951642	**113**	0,207388153	**162**	0,302610961
16	0,000792351	**65**	0,063329412	**114**	0,211199844	**163**	0,303724912
17	0,001483251	**66**	0,065926396	**115**	0,213861397	**164**	0,303497047
18	0,001812927	**67**	0,069092005	**116**	0,217058583	**165**	0,303736332
19	0,000969649	**68**	0,073440695	**117**	0,218860743	**166**	0,305544009
20	0,00326291	**69**	0,077510227	**118**	0,221749687	**167**	0,306904835
21	0,002032277	**70**	0,08133263	**119**	0,225074973	**168**	0,305163582
22	0,002427653	**71**	0,082587071	**120**	0,227176956	**169**	0,304523005
23	0,003098773	**72**	0,083492299	**121**	0,228873455	**170**	0,306908809
24	0,004008617	**73**	0,084625428	**122**	0,232483209	**171**	0,30899149
25	0,003289894	**74**	0,087086716	**123**	0,232864135	**172**	0,312838577
26	0,004320845	**75**	0,088976793	**124**	0,236545981	**173**	0,313484583
27	0,005528339	**76**	0,092617582	**125**	0,239674275	**174**	0,313905485
28	0,00596156	**77**	0,094918267	**126**	0,24153012	**175**	0,313184765
29	0,006964707	**78**	0,097701078	**127**	0,245251456	**176**	0,316566989
30	0,008421998	**79**	0,10114348	**128**	0,247460961	**177**	0,318273182
31	0,009408294	**80**	0,10426107	**129**	0,249700493	**178**	0,321168052
32	0,010107991	**81**	0,107797701	**130**	0,252108249	**179**	0,319628857
33	0,01094756	**82**	0,111658302	**131**	0,253980212	**180**	0,322979626
34	0,012218516	**83**	0,114837561	**132**	0,256988922	**181**	0,321497644
35	0,013338046	**84**	0,118079339	**133**	0,258720306	**182**	0,328482194
36	0,014221026	**85**	0,120743275	**134**	0,259698482	**183**	0,326569827
37	0,015684928	**86**	0,12304466	**135**	0,26233554	**184**	0,324295085
38	0,016806529	**87**	0,125989982	**136**	0,264088659	**185**	0,329380652
39	0,01781478	**88**	0,129730445	**137**	0,26642179	**186**	0,331115436
40	0,018299051	**89**	0,134453438	**138**	0,268671524	**187**	0,326816683
41	0,020070049	**90**	0,138409905	**139**	0,270542256	**188**	0,330559794
42	0,021287192	**91**	0,140317575	**140**	0,271567154	**189**	0,328393539
43	0,022282437	**92**	0,143097261	**141**	0,273942083	**190**	0,323604713
44	0,02327019	**93**	0,145362151	**142**	0,275374218	**191**	0,325383783
45	0,025112742	**94**	0,148157359	**143**	0,275917742	**192**	0,325482669
46	0,026512729	**95**	0,149750792	**144**	0,27879715	**193**	0,334863072
47	0,027940461	**96**	0,152970377	**145**	0,28169972	**194**	0,33592472
48	0,029351613	**97**	0,155705594	**146**	0,28188419	**195**	0,326941157
49	0,031056303	**98**	0,158534805	**147**	0,283245047		

Table 7.23: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the left corner, at time code 09:56.

	09.03.2009 09:56						
1	0,001656527	**50**	0,030350473	**99**	0,151620184	**148**	0,268122402
2	0,002175071	**51**	0,031823312	**100**	0,154987906	**149**	0,270570725
3	0,000906546	**52**	0,034672897	**101**	0,157511071	**150**	0,273094706
4	0,002595195	**53**	0,036592056	**102**	0,160488617	**151**	0,274169298
5	0,001347456	**54**	0,037403159	**103**	0,163936221	**152**	0,275977577
6	0,00217907	**55**	0,038649969	**104**	0,165785397	**153**	0,274051705
7	0,000535442	**56**	0,040225737	**105**	0,169997568	**154**	0,275810594
8	0,000816228	**57**	0,042099801	**106**	0,17253204	**155**	0,276383288
9	0,002527149	**58**	0,043798744	**107**	0,174018761	**156**	0,279151101
10	0,001111637	**59**	0,046213909	**108**	0,177942312	**157**	0,277391513
11	0,001755603	**60**	0,047791459	**109**	0,181008438	**158**	0,281404209
12	0,002003071	**61**	0,05034792	**110**	0,18424897	**159**	0,282501964
13	0,000648816	**62**	0,052360711	**111**	0,188072965	**160**	0,284507368
14	0,001026063	**63**	0,054177655	**112**	0,190941708	**161**	0,285650107
15	0,001269451	**64**	0,05679931	**113**	0,193878826	**162**	0,285816758
16	0,002033566	**65**	0,058561358	**114**	0,198003163	**163**	0,28773914
17	0,001518002	**66**	0,06221852	**115**	0,200769065	**164**	0,288710305
18	0,000946328	**67**	0,064576832	**116**	0,203235108	**165**	0,288495706
19	0,001529089	**68**	0,069168853	**117**	0,205335739	**166**	0,288377996
20	0,002516535	**69**	0,073530225	**118**	0,208663163	**167**	0,288815706
21	0,002197193	**70**	0,07704533	**119**	0,211467826	**168**	0,289929314
22	0,003214843	**71**	0,078031583	**120**	0,213651227	**169**	0,291163845
23	0,002890822	**72**	0,078442165	**121**	0,216286108	**170**	0,292671082
24	0,003117224	**73**	0,079563884	**122**	0,218608014	**171**	0,294265384
25	0,004305631	**74**	0,081449854	**123**	0,220198239	**172**	0,297603903
26	0,004555304	**75**	0,083963463	**124**	0,222933325	**173**	0,296801975
27	0,004588219	**76**	0,086773392	**125**	0,225991556	**174**	0,299004176
28	0,005533941	**77**	0,08892399	**126**	0,227637558	**175**	0,29972521
29	0,006903435	**78**	0,091850619	**127**	0,230069518	**176**	0,301145902
30	0,007164583	**79**	0,094912573	**128**	0,23216181	**177**	0,300258698
31	0,008520292	**80**	0,098104256	**129**	0,234551843	**178**	0,303054977
32	0,009839675	**81**	0,101485842	**130**	0,236962552	**179**	0,305893698
33	0,010481416	**82**	0,104618057	**131**	0,24012273	**180**	0,308156907
34	0,010891796	**83**	0,107385624	**132**	0,242408369	**181**	0,312100234
35	0,012565129	**84**	0,110542867	**133**	0,243842872	**182**	0,309438399
36	0,013583144	**85**	0,112865866	**134**	0,246502984	**183**	0,309387152
37	0,014912209	**86**	0,115976603	**135**	0,24727443	**184**	0,307135507
38	0,015957443	**87**	0,119126376	**136**	0,249177385	**185**	0,310887311
39	0,016194546	**88**	0,1225299	**137**	0,252490923	**186**	0,314797209
40	0,01719776	**89**	0,126527492	**138**	0,253599566	**187**	0,31134159
41	0,01850631	**90**	0,13062005	**139**	0,254473098	**188**	0,316778079
42	0,019531414	**91**	0,132788714	**140**	0,256205919	**189**	0,31561763
43	0,021166045	**92**	0,135348357	**141**	0,258602914	**190**	0,316178054
44	0,022440828	**93**	0,13688174	**142**	0,260413199	**191**	0,311333648
45	0,023089799	**94**	0,13832362	**143**	0,261704944	**192**	0,313487324
46	0,024943969	**95**	0,141470402	**144**	0,262271266	**193**	0,320240507
47	0,026279777	**96**	0,144264907	**145**	0,265503107	**194**	0,317434038
48	0,026715385	**97**	0,146564256	**146**	0,265024057	**195**	0,311925463
49	0,029058541	**98**	0,149388483	**147**	0,266726773		

Table 7.24: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the left corner, at time code 09:58.

	09.03.2009 09:58						
1	0,001860849	**50**	0,033877317	**99**	0,164953088	**148**	0,29589393
2	0,00388201	**51**	0,035916712	**100**	0,166988346	**149**	0,296050385
3	0,004073928	**52**	0,038510974	**101**	0,170496571	**150**	0,299515711
4	0,001503113	**53**	0,040245964	**102**	0,173879981	**151**	0,303479256
5	0,003033263	**54**	0,041977893	**103**	0,176345247	**152**	0,302726913
6	0,000498494	**55**	0,043326791	**104**	0,179573179	**153**	0,30106128
7	0,001718996	**56**	0,044527684	**105**	0,183091332	**154**	0,300504774
8	0,00187167	**57**	0,046276155	**106**	0,186380783	**155**	0,302549738
9	0,002471643	**58**	0,048527499	**107**	0,189495663	**156**	0,305474133
10	0,001451807	**59**	0,050284833	**108**	0,192458404	**157**	0,305543633
11	0,001467781	**60**	0,053035559	**109**	0,196703802	**158**	0,308616695
12	0,001842743	**61**	0,054057895	**110**	0,199588774	**159**	0,311349182
13	0,0020687	**62**	0,057418261	**111**	0,203191325	**160**	0,311170527
14	0,00234313	**63**	0,059565946	**112**	0,207812926	**161**	0,314618764
15	0,001808586	**64**	0,061627867	**113**	0,211324978	**162**	0,314680135
16	0,00319427	**65**	0,064333213	**114**	0,215748676	**163**	0,316484364
17	0,00221996	**66**	0,067249845	**115**	0,217993125	**164**	0,319354747
18	0,002185349	**67**	0,070267337	**116**	0,221586628	**165**	0,317989319
19	0,003439904	**68**	0,074993435	**117**	0,223799171	**166**	0,317374371
20	0,003117983	**69**	0,079824431	**118**	0,226745758	**167**	0,319115513
21	0,003566708	**70**	0,083060402	**119**	0,230372975	**168**	0,322762889
22	0,003416865	**71**	0,0843835	**120**	0,232171906	**169**	0,319928957
23	0,004051321	**72**	0,08504452	**121**	0,234056884	**170**	0,327365574
24	0,005380978	**73**	0,085937544	**122**	0,236980639	**171**	0,325484728
25	0,005686303	**74**	0,088223814	**123**	0,240470729	**172**	0,329901412
26	0,00595634	**75**	0,090554709	**124**	0,243484645	**173**	0,327971447
27	0,006581272	**76**	0,093245568	**125**	0,247237879	**174**	0,330294316
28	0,006857043	**77**	0,096359469	**126**	0,249475044	**175**	0,327210754
29	0,007718825	**78**	0,099253494	**127**	0,25237477	**176**	0,333075639
30	0,00873302	**79**	0,102659907	**128**	0,254429645	**177**	0,335336502
31	0,0098544	**80**	0,106129404	**129**	0,257209022	**178**	0,338833522
32	0,011325428	**81**	0,11011398	**130**	0,259472163	**179**	0,337901248
33	0,012188044	**82**	0,112798976	**131**	0,262650186	**180**	0,341355956
34	0,012749204	**83**	0,116508064	**132**	0,265686381	**181**	0,341753547
35	0,014451633	**84**	0,119702138	**133**	0,266841358	**182**	0,343910077
36	0,015919614	**85**	0,122577273	**134**	0,269687038	**183**	0,341287627
37	0,016468634	**86**	0,125458872	**135**	0,271443885	**184**	0,342232959
38	0,018067181	**87**	0,128551714	**136**	0,27355897	**185**	0,345221102
39	0,018626794	**88**	0,132817138	**137**	0,277091463	**186**	0,350426001
40	0,01976225	**89**	0,136838141	**138**	0,277052092	**187**	0,345403391
41	0,021069883	**90**	0,141134998	**139**	0,279610328	**188**	0,35069233
42	0,022463192	**91**	0,143885912	**140**	0,282929992	**189**	0,342930087
43	0,024624755	**92**	0,146318022	**141**	0,283942863	**190**	0,350756957
44	0,024885941	**93**	0,148016195	**142**	0,28377517	**191**	0,345838397
45	0,026126398	**94**	0,150637422	**143**	0,28490632	**192**	0,352721006
46	0,028731089	**95**	0,152789467	**144**	0,289378857	**193**	0,353624099
47	0,029614502	**96**	0,156686921	**145**	0,290001723	**194**	0,356676018
48	0,030631682	**97**	0,158606845	**146**	0,29184854	**195**	0,351987576
49	0,032501875	**98**	0,161909294	**147**	0,294762376		

Table 7.25: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the middle of the shelf, at time code 09:59.

	09.03.2009 09:59						
1	0,003514002	**50**	0,034843268	**99**	0,165389125	**148**	0,296313802
2	0,002952489	**51**	0,036235737	**100**	0,168766419	**149**	0,297371918
3	0,00242204	**52**	0,039232014	**101**	0,171725857	**150**	0,30315955
4	0,003479919	**53**	0,041523274	**102**	0,174889821	**151**	0,303230978
5	0,003906929	**54**	0,04284696	**103**	0,17826352	**152**	0,303680807
6	0,001489032	**55**	0,044185443	**104**	0,18070064	**153**	0,301544828
7	0,001888075	**56**	0,045451678	**105**	0,185010409	**154**	0,303302217
8	0,002022447	**57**	0,046654279	**106**	0,18772989	**155**	0,305162005
9	0,002320982	**58**	0,048598828	**107**	0,190951504	**156**	0,304650134
10	0,002617069	**59**	0,050727955	**108**	0,194244138	**157**	0,307744701
11	0,001461088	**60**	0,053251182	**109**	0,19759058	**158**	0,308885499
12	0,001951766	**61**	0,054988384	**110**	0,20058583	**159**	0,311040394
13	0,002625395	**62**	0,057696838	**111**	0,204634413	**160**	0,312959215
14	0,003017417	**63**	0,059631516	**112**	0,208254777	**161**	0,314292114
15	0,001568249	**64**	0,062444657	**113**	0,211093032	**162**	0,314662438
16	0,001859125	**65**	0,064733984	**114**	0,216084453	**163**	0,315809936
17	0,001962807	**66**	0,06791157	**115**	0,218677482	**164**	0,319674156
18	0,00295168	**67**	0,071183512	**116**	0,221463724	**165**	0,319015689
19	0,003563417	**68**	0,076029799	**117**	0,224499983	**166**	0,319152921
20	0,002849867	**69**	0,080465674	**118**	0,227335479	**167**	0,318723616
21	0,003688602	**70**	0,084149184	**119**	0,230607697	**168**	0,325809743
22	0,003786078	**71**	0,085603784	**120**	0,233142392	**169**	0,322680019
23	0,004648341	**72**	0,085950584	**121**	0,234916206	**170**	0,323652375
24	0,004335675	**73**	0,086989437	**122**	0,238602776	**171**	0,325037054
25	0,00546126	**74**	0,089095339	**123**	0,240590685	**172**	0,332070829
26	0,006568221	**75**	0,091102384	**124**	0,243477491	**173**	0,332034836
27	0,006962692	**76**	0,094866555	**125**	0,246707991	**174**	0,330737963
28	0,006852012	**77**	0,097152533	**126**	0,249732996	**175**	0,334466506
29	0,008562495	**78**	0,100810038	**127**	0,252636657	**176**	0,332043849
30	0,009208439	**79**	0,103494366	**128**	0,255380611	**177**	0,332713593
31	0,010077452	**80**	0,106672524	**129**	0,257897949	**178**	0,335580927
32	0,011249338	**81**	0,110991493	**130**	0,259606196	**179**	0,343981756
33	0,01197616	**82**	0,114847629	**131**	0,263221214	**180**	0,337290113
34	0,013081819	**83**	0,117007349	**132**	0,264939713	**181**	0,34052491
35	0,014579842	**84**	0,120728321	**133**	0,267435786	**182**	0,342635899
36	0,016244023	**85**	0,124240552	**134**	0,269678486	**183**	0,347039
37	0,017651516	**86**	0,126621086	**135**	0,272064511	**184**	0,342195898
38	0,018196955	**87**	0,13001629	**136**	0,274997386	**185**	0,340338245
39	0,019032802	**88**	0,133468889	**137**	0,276753468	**186**	0,347513457
40	0,019968499	**89**	0,137886772	**138**	0,278554622	**187**	0,346855477
41	0,021785764	**90**	0,142888394	**139**	0,279943713	**188**	0,352982082
42	0,022385066	**91**	0,145272372	**140**	0,281869591	**189**	0,347760554
43	0,024544712	**92**	0,147524404	**141**	0,284290802	**190**	0,356669902
44	0,024804294	**93**	0,149548251	**142**	0,285412644	**191**	0,353831584
45	0,026751194	**94**	0,151566004	**143**	0,286772857	**192**	0,347954297
46	0,028328956	**95**	0,153940658	**144**	0,28859701	**193**	0,358535074
47	0,029930611	**96**	0,157959304	**145**	0,291179859	**194**	0,363921582
48	0,030385515	**97**	0,159464032	**146**	0,292244849	**195**	0,357398089
49	0,032174153	**98**	0,163214177	**147**	0,295799868		

Table 7.26: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the middle of the shelf, at time code 09:59.

	09.03.2009 09:59						
1	0,000876387	**50**	0,038572288	**99**	0,187731412	**148**	0,330671321
2	0,004203117	**51**	0,041016612	**100**	0,18963244	**149**	0,332299925
3	0,001361194	**52**	0,043755302	**101**	0,193191556	**150**	0,336779358
4	0,002263423	**53**	0,046018337	**102**	0,197821355	**151**	0,339244461
5	0,003931539	**54**	0,047461398	**103**	0,200804802	**152**	0,339015188
6	0,002913626	**55**	0,049450682	**104**	0,203728567	**153**	0,337382596
7	0,001012842	**56**	0,050488522	**105**	0,208353929	**154**	0,339881978
8	0,001880539	**57**	0,052857206	**106**	0,211800475	**155**	0,341704555
9	0,002907765	**58**	0,055026914	**107**	0,214244959	**156**	0,342164574
10	0,002631545	**59**	0,057147013	**108**	0,217552016	**157**	0,342961786
11	0,001835925	**60**	0,060069732	**109**	0,2224948	**158**	0,343924935
12	0,00265721	**61**	0,062328463	**110**	0,225902389	**159**	0,348517399
13	0,001737185	**62**	0,065402834	**111**	0,229842001	**160**	0,34849895
14	0,002236	**63**	0,067762165	**112**	0,233919441	**161**	0,353318139
15	0,00158124	**64**	0,070589761	**113**	0,238186913	**162**	0,351967158
16	0,002114077	**65**	0,073303747	**114**	0,243238065	**163**	0,354562216
17	0,002352011	**66**	0,076502899	**115**	0,245744776	**164**	0,354884262
18	0,002063596	**67**	0,079666343	**116**	0,249071861	**165**	0,355306583
19	0,002793278	**68**	0,084941807	**117**	0,251510694	**166**	0,355882995
20	0,003777401	**69**	0,089564867	**118**	0,255257815	**167**	0,358862094
21	0,003702943	**70**	0,093666206	**119**	0,258023181	**168**	0,361519718
22	0,005053942	**71**	0,095466254	**120**	0,260886084	**169**	0,360358575
23	0,004661757	**72**	0,096873889	**121**	0,264009409	**170**	0,364702588
24	0,005271959	**73**	0,098146091	**122**	0,267564549	**171**	0,364950691
25	0,005582905	**74**	0,100346621	**123**	0,269690493	**172**	0,370291579
26	0,006579658	**75**	0,103036331	**124**	0,272591265	**173**	0,367974373
27	0,00774702	**76**	0,10631944	**125**	0,276643023	**174**	0,371657846
28	0,00822039	**77**	0,109841559	**126**	0,279463816	**175**	0,370448563
29	0,008996112	**78**	0,113229362	**127**	0,281743478	**176**	0,374765557
30	0,010496956	**79**	0,116693214	**128**	0,284974693	**177**	0,374795428
31	0,011222175	**80**	0,120758896	**129**	0,289263475	**178**	0,37592504
32	0,012482794	**81**	0,125272241	**130**	0,291127535	**179**	0,377378255
33	0,01371746	**82**	0,128900742	**131**	0,29407281	**180**	0,382302516
34	0,014838322	**83**	0,132891126	**132**	0,298039291	**181**	0,381833668
35	0,016499314	**84**	0,135772627	**133**	0,299853018	**182**	0,389195049
36	0,01782597	**85**	0,139614913	**134**	0,302329433	**183**	0,382476033
37	0,019372738	**86**	0,142612751	**135**	0,303865045	**184**	0,384965127
38	0,020540285	**87**	0,146192966	**136**	0,30701776	**185**	0,386091001
39	0,0213626	**88**	0,150748113	**137**	0,309986578	**186**	0,390682946
40	0,022287825	**89**	0,155143935	**138**	0,313010144	**187**	0,392492483
41	0,024097379	**90**	0,15980351	**139**	0,314082339	**188**	0,395061676
42	0,025501879	**91**	0,162782635	**140**	0,314985261	**189**	0,391731353
43	0,027131372	**92**	0,165816531	**141**	0,318846182	**190**	0,398486249
44	0,028912427	**93**	0,167500068	**142**	0,319118162	**191**	0,393251398
45	0,029591179	**94**	0,170887427	**143**	0,320766783	**192**	0,394259471
46	0,032394476	**95**	0,174147848	**144**	0,323319575	**193**	0,399367898
47	0,033145125	**96**	0,177252189	**145**	0,326479888	**194**	0,400555158
48	0,034503222	**97**	0,180300288	**146**	0,328139155	**195**	0,395818811
49	0,036546784	**98**	0,183873819	**147**	0,330445112		

Table 7.27: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the middle of the shelf, at time code 10:00.

	09.03.2009 10:00						
1	0,001935148	**50**	0,024999555	**99**	0,123965616	**148**	0,221660576
2	0,002732784	**51**	0,026633547	**100**	0,1255289	**149**	0,222069211
3	0,002497815	**52**	0,028532869	**101**	0,127727413	**150**	0,227349929
4	0,003300209	**53**	0,030009681	**102**	0,130776726	**151**	0,228028656
5	0,001532033	**54**	0,030719724	**103**	0,13335077	**152**	0,228054483
6	0,002145681	**55**	0,032281994	**104**	0,134928227	**153**	0,227009453
7	0,001221704	**56**	0,033095938	**105**	0,138153482	**154**	0,227203248
8	0,001587853	**57**	0,034057238	**106**	0,139419299	**155**	0,227742585
9	0,00236063	**58**	0,03578042	**107**	0,141834053	**156**	0,229486417
10	0,001220202	**59**	0,038001657	**108**	0,14566843	**157**	0,228029104
11	0,001012622	**60**	0,039064854	**109**	0,147949574	**158**	0,230695062
12	0,001175778	**61**	0,040703583	**110**	0,151123168	**159**	0,232137161
13	0,001193001	**62**	0,042673286	**111**	0,15327163	**160**	0,232401369
14	0,00112059	**63**	0,044376905	**112**	0,156645402	**161**	0,235156964
15	0,001249965	**64**	0,046120259	**113**	0,159556985	**162**	0,235434149
16	0,000926536	**65**	0,047830427	**114**	0,162632511	**163**	0,236828924
17	0,000621441	**66**	0,050296386	**115**	0,164139955	**164**	0,236233343
18	0,000151349	**67**	0,052805261	**116**	0,166771409	**165**	0,237545151
19	0,001114958	**68**	0,056158333	**117**	0,168651211	**166**	0,237239661
20	0,001842623	**69**	0,059849194	**118**	0,170834825	**167**	0,239374836
21	0,000885039	**70**	0,062898308	**119**	0,173664234	**168**	0,238090191
22	0,001438441	**71**	0,063334499	**120**	0,175517225	**169**	0,237221006
23	0,001301006	**72**	0,063876555	**121**	0,1771629	**170**	0,237246461
24	0,000673908	**73**	0,064379253	**122**	0,178862158	**171**	0,240332495
25	0,002535694	**74**	0,066559111	**123**	0,181184456	**172**	0,24268595
26	0,002788284	**75**	0,068096215	**124**	0,18364046	**173**	0,241302647
27	0,003411727	**76**	0,070371197	**125**	0,186772599	**174**	0,244435632
28	0,004069978	**77**	0,07224549	**126**	0,187949788	**175**	0,244295579
29	0,005022853	**78**	0,074522194	**127**	0,190180453	**176**	0,248859216
30	0,005551714	**79**	0,077134792	**128**	0,192152741	**177**	0,245696427
31	0,006841085	**80**	0,079790236	**129**	0,19342523	**178**	0,24656725
32	0,007448853	**81**	0,082470086	**130**	0,195924891	**179**	0,250243155
33	0,007973481	**82**	0,085714793	**131**	0,198550284	**180**	0,253316049
34	0,009131556	**83**	0,087801543	**132**	0,20029133	**181**	0,25342453
35	0,009982633	**84**	0,089909447	**133**	0,201169671	**182**	0,251067277
36	0,010750948	**85**	0,092130965	**134**	0,204299625	**183**	0,253338054
37	0,011868942	**86**	0,094503079	**135**	0,204451226	**184**	0,252321217
38	0,012475817	**87**	0,096974025	**136**	0,20749908	**185**	0,254023171
39	0,01310965	**88**	0,09905122	**137**	0,208396305	**186**	0,250042977
40	0,014104028	**89**	0,103420354	**138**	0,20972757	**187**	0,255954861
41	0,015254851	**90**	0,106566494	**139**	0,211580733	**188**	0,25443634
42	0,016484504	**91**	0,108213584	**140**	0,211698224	**189**	0,253724442
43	0,017286054	**92**	0,110182656	**141**	0,214732692	**190**	0,254730729
44	0,018096349	**93**	0,110927923	**142**	0,214797855	**191**	0,252203926
45	0,019301697	**94**	0,113182699	**143**	0,21474953	**192**	0,25204392
46	0,020317231	**95**	0,114946273	**144**	0,21674208	**193**	0,259487887
47	0,020977164	**96**	0,116870195	**145**	0,218895178	**194**	0,25883191
48	0,022029256	**97**	0,119032345	**146**	0,220558146	**195**	0,251558729
49	0,023307678	**98**	0,121731024	**147**	0,221158718		

Table 7.28: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the middle of the shelf, at time code 10:00.

	09.03.2009 10:00						
1	0,000226271	**50**	0,034290654	**99**	0,164633737	**148**	0,289655833
2	0,001786363	**51**	0,036168337	**100**	0,167223771	**149**	0,290294921
3	0,003831449	**52**	0,038600545	**101**	0,170733692	**150**	0,293827768
4	0,001281932	**53**	0,040014535	**102**	0,173553821	**151**	0,295037779
5	0,002614887	**54**	0,041351459	**103**	0,176471035	**152**	0,296466144
6	0,001522421	**55**	0,043335508	**104**	0,178792144	**153**	0,294374511
7	0,000664738	**56**	0,044381564	**105**	0,182877403	**154**	0,296187907
8	0,001729761	**57**	0,046131704	**106**	0,185941539	**155**	0,29627446
9	0,001916578	**58**	0,049064571	**107**	0,18872088	**156**	0,299571302
10	0,001857116	**59**	0,051187643	**108**	0,191686867	**157**	0,298925037
11	0,001240202	**60**	0,053629538	**109**	0,195488357	**158**	0,302386759
12	0,001740133	**61**	0,054928481	**110**	0,198486438	**159**	0,304945912
13	0,00230639	**62**	0,057920485	**111**	0,20208888	**160**	0,306991348
14	0,002015439	**63**	0,060476208	**112**	0,205472986	**161**	0,308154541
15	0,001470815	**64**	0,062456054	**113**	0,20987061	**162**	0,309618868
16	0,00200002	**65**	0,06481264	**114**	0,213708671	**163**	0,308646415
17	0,000607541	**66**	0,067789576	**115**	0,21662441	**164**	0,308231811
18	0,001168349	**67**	0,070800252	**116**	0,219154421	**165**	0,311753637
19	0,002146653	**68**	0,07532565	**117**	0,2214544	**166**	0,309500786
20	0,002610738	**69**	0,078928841	**118**	0,224492888	**167**	0,312473894
21	0,001645085	**70**	0,082810518	**119**	0,22773068	**168**	0,315902142
22	0,003054618	**71**	0,08426183	**120**	0,229253661	**169**	0,309672995
23	0,003340264	**72**	0,085051739	**121**	0,231719529	**170**	0,314289646
24	0,003893185	**73**	0,087000432	**122**	0,234613571	**171**	0,31365672
25	0,003618336	**74**	0,089039232	**123**	0,236166441	**172**	0,320736232
26	0,004526712	**75**	0,092010068	**124**	0,239121155	**173**	0,31984467
27	0,005818433	**76**	0,094595736	**125**	0,243724651	**174**	0,321421382
28	0,006052114	**77**	0,09716461	**126**	0,244979307	**175**	0,32240955
29	0,007982766	**78**	0,1003022	**127**	0,2483492	**176**	0,325602129
30	0,008262045	**79**	0,103659563	**128**	0,25102138	**177**	0,323461353
31	0,009559802	**80**	0,106450931	**129**	0,253323165	**178**	0,323853681
32	0,010612587	**81**	0,110603962	**130**	0,256081924	**179**	0,327962549
33	0,011849029	**82**	0,113793645	**131**	0,258033706	**180**	0,331047283
34	0,012420327	**83**	0,116601388	**132**	0,261124318	**181**	0,329267941
35	0,014063343	**84**	0,120141249	**133**	0,262638504	**182**	0,330961675
36	0,015205187	**85**	0,123026017	**134**	0,264778278	**183**	0,332356923
37	0,016541877	**86**	0,126276911	**135**	0,26658377	**184**	0,329631973
38	0,017540674	**87**	0,12837821	**136**	0,268269891	**185**	0,336301237
39	0,01781478	**88**	0,132264453	**137**	0,271190257	**186**	0,336142566
40	0,019559893	**89**	0,136657159	**138**	0,272535171	**187**	0,335031344
41	0,020861918	**90**	0,140266442	**139**	0,274828634	**188**	0,340669265
42	0,02217536	**91**	0,143200968	**140**	0,276120072	**189**	0,335706957
43	0,023647385	**92**	0,146228245	**141**	0,278952414	**190**	0,338931067
44	0,024662486	**93**	0,148027586	**142**	0,279218721	**191**	0,339682154
45	0,025741908	**94**	0,149506975	**143**	0,281548637	**192**	0,338682786
46	0,0273877	**95**	0,153221894	**144**	0,282267265	**193**	0,341815688
47	0,029222705	**96**	0,156166131	**145**	0,286059924	**194**	0,347401695
48	0,030076687	**97**	0,158726731	**146**	0,286571964	**195**	0,340072289
49	0,031864387	**98**	0,161593694	**147**	0,287861304		

Table 7.29: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the middle of the shelf, at time code 10:02.

	09.03.2009 10:02						
1	0,001117859	**50**	0,038549824	**99**	0,190022141	**148**	0,338384967
2	0,00168496	**51**	0,040751507	**100**	0,192612415	**149**	0,338018336
3	0,003740519	**52**	0,043410457	**101**	0,196866933	**150**	0,342200679
4	0,002194304	**53**	0,046236414	**102**	0,200386726	**151**	0,343177719
5	0,002541056	**54**	0,047359933	**103**	0,203943223	**152**	0,34402649
6	0,002056644	**55**	0,049036611	**104**	0,206418098	**153**	0,344276601
7	0,002037262	**56**	0,050853823	**105**	0,211720178	**154**	0,344411848
8	0,002315132	**57**	0,053371285	**106**	0,213576276	**155**	0,347673366
9	0,001298078	**58**	0,056289873	**107**	0,217137896	**156**	0,348292133
10	0,001422856	**59**	0,058468096	**108**	0,220768826	**157**	0,348148918
11	0,002525357	**60**	0,060928153	**109**	0,225254356	**158**	0,353522831
12	0,002278835	**61**	0,063674277	**110**	0,229104117	**159**	0,354871913
13	0,00193109	**62**	0,066442594	**111**	0,232932562	**160**	0,356238789
14	0,00356567	**63**	0,069131416	**112**	0,236128693	**161**	0,358183498
15	0,002484129	**64**	0,071596501	**113**	0,240750864	**162**	0,36079783
16	0,002322065	**65**	0,074565989	**114**	0,245601177	**163**	0,359720681
17	0,002567464	**66**	0,077748716	**115**	0,248130433	**164**	0,360877872
18	0,00189887	**67**	0,081290637	**116**	0,252765452	**165**	0,36322706
19	0,002495395	**68**	0,085573737	**117**	0,254307389	**166**	0,364416043
20	0,003871604	**69**	0,089869368	**118**	0,258206424	**167**	0,364328023
21	0,003408963	**70**	0,093776869	**119**	0,261248926	**168**	0,369850625
22	0,004392145	**71**	0,095706017	**120**	0,263417492	**169**	0,365002369
23	0,004024489	**72**	0,097700537	**121**	0,267068594	**170**	0,369509245
24	0,005355327	**73**	0,09938124	**122**	0,270537308	**171**	0,369922225
25	0,006428338	**74**	0,102415092	**123**	0,271560389	**172**	0,374996047
26	0,006859865	**75**	0,10487851	**124**	0,27538819	**173**	0,374662559
27	0,00723667	**76**	0,107995377	**125**	0,280003818	**174**	0,376224798
28	0,008014128	**77**	0,111705461	**126**	0,283008814	**175**	0,374197818
29	0,008633193	**78**	0,115438251	**127**	0,286554708	**176**	0,381151505
30	0,009754948	**79**	0,118501914	**128**	0,289455648	**177**	0,382952387
31	0,011504148	**80**	0,122457776	**129**	0,292150775	**178**	0,383295599
32	0,012534855	**81**	0,126292295	**130**	0,296055208	**179**	0,386113199
33	0,013628854	**82**	0,130109858	**131**	0,297941324	**180**	0,387905055
34	0,014348743	**83**	0,133791704	**132**	0,303905973	**181**	0,389437933
35	0,016151318	**84**	0,137982498	**133**	0,304633555	**182**	0,393361955
36	0,017479691	**85**	0,141170884	**134**	0,307982203	**183**	0,39258559
37	0,018892993	**86**	0,144652861	**135**	0,30995767	**184**	0,391450929
38	0,020054563	**87**	0,148280115	**136**	0,312280037	**185**	0,392819348
39	0,020797225	**88**	0,152223677	**137**	0,3148738	**186**	0,398383233
40	0,022408461	**89**	0,157129414	**138**	0,318171006	**187**	0,40124649
41	0,02378943	**90**	0,160948917	**139**	0,318835457	**188**	0,39873392
42	0,025555334	**91**	0,164544709	**140**	0,321590884	**189**	0,398006446
43	0,027261969	**92**	0,167202468	**141**	0,324343629	**190**	0,39995266
44	0,028349493	**93**	0,170854643	**142**	0,325840958	**191**	0,400152348
45	0,029726624	**94**	0,172727288	**143**	0,327847113	**192**	0,403426219
46	0,031497411	**95**	0,175591219	**144**	0,329435116	**193**	0,406044616
47	0,033122864	**96**	0,179672676	**145**	0,332370566	**194**	0,406525504
48	0,034964226	**97**	0,182644067	**146**	0,333993211	**195**	0,403174677
49	0,037251612	**98**	0,185919148	**147**	0,334583423		

Table 7.30: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the middle of the shelf, at time code 10:02.

	09.03.2009 10:02						
1	0,000932112	**50**	0,039232729	**99**	0,191618896	**148**	0,340640279
2	0,004862232	**51**	0,041191851	**100**	0,195561414	**149**	0,341229539
3	0,002497815	**52**	0,044333029	**101**	0,199275584	**150**	0,345501718
4	0,002802552	**53**	0,046272018	**102**	0,202017525	**151**	0,347986486
5	0,003082483	**54**	0,047712854	**103**	0,20625773	**152**	0,348245119
6	0,003948683	**55**	0,050012946	**104**	0,209076136	**153**	0,348614711
7	0,002295854	**56**	0,051584423	**105**	0,213582626	**154**	0,349637528
8	0,0017475	**57**	0,054093543	**106**	0,216676086	**155**	0,351993092
9	0,003074284	**58**	0,056398966	**107**	0,219774655	**156**	0,351917729
10	0,001871591	**59**	0,059470297	**108**	0,223506538	**157**	0,352982032
11	0,001615039	**60**	0,061326851	**109**	0,227648039	**158**	0,355072409
12	0,001868395	**61**	0,064425058	**110**	0,231606047	**159**	0,357634745
13	0,00254408	**62**	0,06710961	**111**	0,235657707	**160**	0,359682432
14	0,0025952	**63**	0,069925967	**112**	0,239202976	**161**	0,364200726
15	0,003588381	**64**	0,0723791	**113**	0,243057793	**162**	0,364761899
16	0,002375739	**65**	0,075067889	**114**	0,2485028	**163**	0,365444207
17	0,002748166	**66**	0,078776422	**115**	0,251174864	**164**	0,364410156
18	0,00298749	**67**	0,082436769	**116**	0,254097991	**165**	0,366170612
19	0,002945853	**68**	0,0866426	**117**	0,257778698	**166**	0,36601474
20	0,003929575	**69**	0,090284921	**118**	0,259929207	**167**	0,368205738
21	0,003595389	**70**	0,094833523	**119**	0,264199712	**168**	0,375390359
22	0,004573268	**71**	0,09682968	**120**	0,267136558	**169**	0,371913038
23	0,004923373	**72**	0,098639089	**121**	0,269227211	**170**	0,373791953
24	0,00540663	**73**	0,10079598	**122**	0,273600573	**171**	0,375624173
25	0,006039074	**74**	0,103589594	**123**	0,275808227	**172**	0,376068568
26	0,007111479	**75**	0,105736406	**124**	0,278793143	**173**	0,38031597
27	0,007473043	**76**	0,109510392	**125**	0,283197663	**174**	0,381131008
28	0,008688255	**77**	0,113041995	**126**	0,285455674	**175**	0,383638387
29	0,009434443	**78**	0,116586048	**127**	0,289442943	**176**	0,387398021
30	0,010350332	**79**	0,119908209	**128**	0,292118355	**177**	0,386814692
31	0,011537816	**80**	0,124134932	**129**	0,295417372	**178**	0,387831328
32	0,012999403	**81**	0,128252223	**130**	0,298388954	**179**	0,390249179
33	0,013382298	**82**	0,132035317	**131**	0,30263823	**180**	0,391618739
34	0,015185885	**83**	0,135256894	**132**	0,305448542	**181**	0,3903013
35	0,016378431	**84**	0,139653027	**133**	0,308015932	**182**	0,397356675
36	0,017705683	**85**	0,143141456	**134**	0,312052882	**183**	0,396086426
37	0,019251886	**86**	0,14666803	**135**	0,312230386	**184**	0,393081645
38	0,020284447	**87**	0,150158038	**136**	0,316050293	**185**	0,400739573
39	0,021647184	**88**	0,153954728	**137**	0,319057627	**186**	0,40516587
40	0,02271978	**89**	0,158992463	**138**	0,320933421	**187**	0,400831608
41	0,024325341	**90**	0,162751169	**139**	0,323369493	**188**	0,402967801
42	0,025292173	**91**	0,165881454	**140**	0,324820732	**189**	0,406493623
43	0,027371502	**92**	0,169368345	**141**	0,327465145	**190**	0,407142801
44	0,028770619	**93**	0,172232923	**142**	0,328668398	**191**	0,399655877
45	0,030469389	**94**	0,17484976	**143**	0,329995195	**192**	0,405731001
46	0,031930477	**95**	0,178057221	**144**	0,333569265	**193**	0,414431899
47	0,033479043	**96**	0,181850523	**145**	0,335827899	**194**	0,418466195
48	0,035161159	**97**	0,183770999	**146**	0,337752488	**195**	0,410226581
49	0,037449144	**98**	0,188480361	**147**	0,339083108		

Table 7.31: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the right corner, at time code 10:02.

	09.03.2009 10:02						
1	0,000560617	**50**	0,037929818	**99**	0,183757949	**148**	0,329603646
2	0,00209057	**51**	0,040131431	**100**	0,187631334	**149**	0,332089961
3	0,003831449	**52**	0,042147519	**101**	0,190951385	**150**	0,334735254
4	0,002277247	**53**	0,044580807	**102**	0,19489219	**151**	0,336905414
5	0,003722351	**54**	0,046115888	**103**	0,19866011	**152**	0,337335797
6	0,001522421	**55**	0,048278207	**104**	0,200560338	**153**	0,337893775
7	0,001201812	**56**	0,050028674	**105**	0,20541554	**154**	0,337084535
8	0,002049055	**57**	0,052020236	**106**	0,2079665	**155**	0,339092288
9	0,002344771	**58**	0,054200326	**107**	0,212564181	**156**	0,342179556
10	0,002247949	**59**	0,057225698	**108**	0,213974325	**157**	0,341868948
11	0,001481168	**60**	0,059487958	**109**	0,219263949	**158**	0,344509979
12	0,00150926	**61**	0,061469857	**110**	0,223121779	**159**	0,347070975
13	0,00174344	**62**	0,064912381	**111**	0,226838148	**160**	0,349117468
14	0,002696028	**63**	0,066724621	**112**	0,230565112	**161**	0,351169128
15	0,002406182	**64**	0,0700465	**113**	0,234582336	**162**	0,35071069
16	0,00236232	**65**	0,071959103	**114**	0,239481161	**163**	0,351955643
17	0,002484063	**66**	0,07570809	**115**	0,241952029	**164**	0,354564854
18	0,00258642	**67**	0,07881587	**116**	0,245585266	**165**	0,353583056
19	0,002277431	**68**	0,082865468	**117**	0,248687799	**166**	0,355543272
20	0,002871606	**69**	0,08750501	**118**	0,251805623	**167**	0,356655097
21	0,003581049	**70**	0,091356561	**119**	0,255012038	**168**	0,359239905
22	0,005060908	**71**	0,093086522	**120**	0,257594574	**169**	0,361569042
23	0,004668465	**72**	0,094863221	**121**	0,260056528	**170**	0,363085183
24	0,004585778	**73**	0,09656642	**122**	0,26356142	**171**	0,360733135
25	0,005588987	**74**	0,099946393	**123**	0,266776279	**172**	0,369877196
26	0,006173643	**75**	0,102212904	**124**	0,269765727	**173**	0,370271071
27	0,006978808	**76**	0,105899475	**125**	0,273775822	**174**	0,369804969
28	0,007319877	**77**	0,108468793	**126**	0,276154659	**175**	0,370961051
29	0,009085664	**78**	0,1115985	**127**	0,279326639	**176**	0,372283683
30	0,00970163	**79**	0,115020061	**128**	0,282517396	**177**	0,377418337
31	0,01115063	**80**	0,119824729	**129**	0,286763212	**178**	0,374880629
32	0,012630969	**81**	0,123192045	**130**	0,289290499	**179**	0,376853541
33	0,012681155	**82**	0,126769962	**131**	0,292777944	**180**	0,380605747
34	0,014034815	**83**	0,130544023	**132**	0,294798256	**181**	0,38246459
35	0,015645808	**84**	0,134230968	**133**	0,298354391	**182**	0,381791042
36	0,017173508	**85**	0,137600443	**134**	0,300798653	**183**	0,385726809
37	0,018255775	**86**	0,140822044	**135**	0,302772393	**184**	0,383000856
38	0,019542886	**87**	0,144177261	**136**	0,303167096	**185**	0,38543739
39	0,020136989	**88**	0,147937762	**137**	0,308022554	**186**	0,390722843
40	0,021521202	**89**	0,15256228	**138**	0,309491798	**187**	0,388053247
41	0,023237522	**90**	0,156877564	**139**	0,313063134	**188**	0,391994272
42	0,024765851	**91**	0,159805338	**140**	0,314294541	**189**	0,393401701
43	0,026453111	**92**	0,163297155	**141**	0,317782481	**190**	0,392573304
44	0,028375276	**93**	0,165352912	**142**	0,318945261	**191**	0,393301046
45	0,028730445	**94**	0,16767488	**143**	0,318524852	**192**	0,387711794
46	0,031046668	**95**	0,170892959	**144**	0,321016876	**193**	0,400416308
47	0,032508456	**96**	0,174594979	**145**	0,324508988	**194**	0,40582993
48	0,033621495	**97**	0,177500941	**146**	0,3259085	**195**	0,40244517
49	0,035258339	**98**	0,181585721	**147**	0,327099491		

Table 7.32: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the right corner, at time code 10:03.

	09.03.2009 10:03						
1	0,002343793	**50**	0,038927219	**99**	0,189100936	**148**	0,330323427
2	0,002496179	**51**	0,041209824	**100**	0,192017659	**149**	0,33238638
3	0,002558434	**52**	0,044028491	**101**	0,195930928	**150**	0,335497032
4	0,003106676	**53**	0,04580916	**102**	0,198994276	**151**	0,337924664
5	0,003353197	**54**	0,047412871	**103**	0,203565858	**152**	0,339109234
6	0,001789532	**55**	0,049324281	**104**	0,205926802	**153**	0,337479306
7	0,000724413	**56**	0,051214825	**105**	0,2096438	**154**	0,33870336
8	0,001782977	**57**	0,053728165	**106**	0,213651575	**155**	0,342594768
9	0,002392348	**58**	0,055660492	**107**	0,216538065	**156**	0,341190757
10	0,002682208	**59**	0,05866688	**108**	0,22005951	**157**	0,341684243
11	0,001762296	**60**	0,060903743	**109**	0,224212546	**158**	0,345174084
12	0,002471229	**61**	0,0632909	**110**	0,227840766	**159**	0,348923698
13	0,001218021	**62**	0,066136551	**111**	0,231892053	**160**	0,347412364
14	0,001826386	**63**	0,068899994	**112**	0,235419243	**161**	0,349724994
15	0,001392868	**64**	0,072052384	**113**	0,240713251	**162**	0,354002283
16	0,001677975	**65**	0,075015452	**114**	0,244650864	**163**	0,354689811
17	0,001650053	**66**	0,078125788	**115**	0,246825676	**164**	0,354677586
18	0,001340237	**67**	0,081794351	**116**	0,250980108	**165**	0,354047827
19	0,001928689	**68**	0,086267053	**117**	0,253560731	**166**	0,357102002
20	0,002523781	**69**	0,091008558	**118**	0,255900546	**167**	0,355293771
21	0,002462492	**70**	0,095297593	**119**	0,26036369	**168**	0,355916065
22	0,00284563	**71**	0,096457511	**120**	0,262888136	**169**	0,358531869
23	0,003139021	**72**	0,098068738	**121**	0,265047469	**170**	0,35789126
24	0,003354501	**73**	0,100150917	**122**	0,267989229	**171**	0,359178058
25	0,005297039	**74**	0,102594633	**123**	0,26923184	**172**	0,361248277
26	0,005796221	**75**	0,105544911	**124**	0,273800166	**173**	0,364970999
27	0,006914343	**76**	0,108466366	**125**	0,277085806	**174**	0,366203602
28	0,007078398	**77**	0,111391456	**126**	0,279780728	**175**	0,365782224
29	0,008604914	**78**	0,115487796	**127**	0,283142701	**176**	0,371949048
30	0,009568335	**79**	0,118400254	**128**	0,285712644	**177**	0,372403105
31	0,01094862	**80**	0,122900963	**129**	0,288760326	**178**	0,369688413
32	0,012510827	**81**	0,126987178	**130**	0,291608476	**179**	0,373705257
33	0,013605739	**82**	0,131068025	**131**	0,295432018	**180**	0,380221573
34	0,01439359	**83**	0,134015682	**132**	0,297062878	**181**	0,378479822
35	0,015799659	**84**	0,13735247	**133**	0,299158124	**182**	0,379518184
36	0,017523432	**85**	0,140878225	**134**	0,302851096	**183**	0,377582007
37	0,018541424	**86**	0,145251426	**135**	0,305499652	**184**	0,376552116
38	0,019765354	**87**	0,148249496	**136**	0,30659785	**185**	0,383591901
39	0,02104766	**88**	0,152849358	**137**	0,310050523	**186**	0,385216938
40	0,022385112	**89**	0,157384917	**138**	0,312739502	**187**	0,380834302
41	0,02390941	**90**	0,161209484	**139**	0,313120285	**188**	0,388365231
42	0,025530663	**91**	0,164710421	**140**	0,315753809	**189**	0,387171753
43	0,027312523	**92**	0,1673708	**141**	0,318378949	**190**	0,386045413
44	0,027936961	**93**	0,16989782	**142**	0,319738571	**191**	0,383768798
45	0,0298577	**94**	0,173211765	**143**	0,319901293	**192**	0,383311754
46	0,031709525	**95**	0,175556157	**144**	0,322816194	**193**	0,391808307
47	0,033657133	**96**	0,179850218	**145**	0,32616058	**194**	0,392614019
48	0,035662445	**97**	0,182823897	**146**	0,326384071	**195**	0,38858453
49	0,036820634	**98**	0,185882733	**147**	0,329897223		

Table 7.33: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the right corner, at time code 10:04.

	09.03.2009 10:04						
1	0,001377906	**50**	0,038936204	**99**	0,190550299	**148**	0,333802365
2	0,003746807	**51**	0,041623208	**100**	0,194260385	**149**	0,33396728
3	0,001770378	**52**	0,044601739	**101**	0,197178934	**150**	0,337807759
4	0,002885495	**53**	0,046458942	**102**	0,200700342	**151**	0,340538124
5	0,004485271	**54**	0,048612801	**103**	0,204710532	**152**	0,341554427
6	0,002613126	**55**	0,050039098	**104**	0,20764004	**153**	0,34123716
7	0,001997479	**56**	0,051146063	**105**	0,21169501	**154**	0,341543404
8	0,001002482	**57**	0,053430765	**106**	0,214341816	**155**	0,342886642
9	0,002408207	**58**	0,056650719	**107**	0,218012651	**156**	0,345265808
10	0,001524184	**59**	0,05882425	**108**	0,22107993	**157**	0,343100315
11	0,001896167	**60**	0,0612048	**109**	0,225564419	**158**	0,346913406
12	0,001676002	**61**	0,063730186	**110**	0,22985965	**159**	0,349833807
13	0,00145571	**62**	0,066780025	**111**	0,233688171	**160**	0,350454806
14	0,001044969	**63**	0,069740829	**112**	0,237336003	**161**	0,355948527
15	0,001873542	**64**	0,0719916	**113**	0,240725789	**162**	0,353719135
16	0,001087559	**65**	0,074551007	**114**	0,246260061	**163**	0,355054367
17	0,001789055	**66**	0,078133182	**115**	0,248680477	**164**	0,357082546
18	0,002256969	**67**	0,081867353	**116**	0,2521574	**165**	0,356875186
19	0,001550886	**68**	0,086599267	**117**	0,25392751	**166**	0,356782263
20	0,002799143	**69**	0,09069331	**118**	0,256987224	**167**	0,357191376
21	0,003122154	**70**	0,095176221	**119**	0,260980673	**168**	0,362094998
22	0,002608776	**71**	0,097237634	**120**	0,263878982	**169**	0,361348957
23	0,003876911	**72**	0,098595771	**121**	0,266422384	**170**	0,366547798
24	0,004752514	**73**	0,100751998	**122**	0,269882883	**171**	0,364314524
25	0,005090242	**74**	0,103073411	**123**	0,272167223	**172**	0,36700089
26	0,005807658	**75**	0,105207881	**124**	0,274458266	**173**	0,369564395
27	0,007118483	**76**	0,109533941	**125**	0,278929525	**174**	0,370013744
28	0,008084559	**77**	0,112486448	**126**	0,282316029	**175**	0,369234775
29	0,008190149	**78**	0,115347418	**127**	0,285312618	**176**	0,375518486
30	0,009897129	**79**	0,119476155	**128**	0,287371129	**177**	0,372979568
31	0,010654022	**80**	0,123300699	**129**	0,291841145	**178**	0,373507974
32	0,012807176	**81**	0,127637518	**130**	0,292759581	**179**	0,379322783
33	0,013474756	**82**	0,131569922	**131**	0,29689578	**180**	0,37970934
34	0,014602876	**83**	0,134612957	**132**	0,298999293	**181**	0,386316532
35	0,016268538	**84**	0,13865071	**133**	0,301284668	**182**	0,388885114
36	0,0173995	**85**	0,142643935	**134**	0,304407532	**183**	0,386012592
37	0,018812425	**86**	0,145800111	**135**	0,305674476	**184**	0,381963128
38	0,020239953	**87**	0,149361962	**136**	0,307902251	**185**	0,387129089
39	0,021123549	**88**	0,153798308	**137**	0,311384232	**186**	0,391042026
40	0,022392895	**89**	0,158641145	**138**	0,313094136	**187**	0,387638365
41	0,023773433	**90**	0,16239289	**139**	0,315711163	**188**	0,39000694
42	0,025390858	**91**	0,165119178	**140**	0,318750174	**189**	0,391325052
43	0,027245118	**92**	0,168695016	**141**	0,319293533	**190**	0,38614002
44	0,028100255	**93**	0,171446962	**142**	0,320125056	**191**	0,385655389
45	0,029551856	**94**	0,174365283	**143**	0,3225499	**192**	0,386245114
46	0,031718363	**95**	0,176304139	**144**	0,324765456	**193**	0,394898359
47	0,033986598	**96**	0,18060773	**145**	0,326578983	**194**	0,398990116
48	0,034946323	**97**	0,183483272	**146**	0,329463961	**195**	0,390894636
49	0,037314463	**98**	0,186987332	**147**	0,331809006		

Table 7.34: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the right corner, at time code 10:04.

	09.03.2009 10:04						
1	0	**50**	0,027443635	**99**	0,139245333	**148**	0,245893184
2	0,000366731	**51**	0,028835265	**100**	0,140719958	**149**	0,246350845
3	0,002285645	**52**	0,031936532	**101**	0,143477246	**150**	0,250254059
4	0,001116046	**53**	0,033311995	**102**	0,146043507	**151**	0,25183728
5	0,001581254	**54**	0,033834249	**103**	0,149451686	**152**	0,251324121
6	0,000587531	**55**	0,036222206	**104**	0,151506318	**153**	0,251186822
7	0,000187338	**56**	0,036826297	**105**	0,154600912	**154**	0,25077561
8	0,001144391	**57**	0,038050904	**106**	0,157064367	**155**	0,251442706
9	0,001250501	**58**	0,039951123	**107**	0,159291649	**156**	0,253277524
10	0,000988597	**59**	0,041745416	**108**	0,163052897	**157**	0,251917616
11	0,000918913	**60**	0,044060785	**109**	0,165499112	**158**	0,255235317
12	0,000970558	**61**	0,045463852	**110**	0,167980232	**159**	0,257360192
13	0,000880251	**62**	0,04756212	**111**	0,171133714	**160**	0,258044809
14	0,001826386	**63**	0,049807623	**112**	0,17403315	**161**	0,259363415
15	0,001042105	**64**	0,051742812	**113**	0,177636289	**162**	0,260669696
16	0,000470306	**65**	0,053576063	**114**	0,180561751	**163**	0,25921265
17	0,000148836	**66**	0,055967255	**115**	0,183391504	**164**	0,259982315
18	0,00095349	**67**	0,058864427	**116**	0,185426954	**165**	0,260977371
19	0,00114402	**68**	0,063257606	**117**	0,188011944	**166**	0,259261718
20	0,000828133	**69**	0,066247288	**118**	0,189348116	**167**	0,259877224
21	0,000526528	**70**	0,069916487	**119**	0,191918869	**168**	0,263487739
22	0,001340913	**71**	0,071014056	**120**	0,194601193	**169**	0,259097457
23	0,001207092	**72**	0,071168385	**121**	0,195628009	**170**	0,261120281
24	0,001623017	**73**	0,072310593	**122**	0,198940464	**171**	0,259935886
25	0,002560023	**74**	0,073845513	**123**	0,200391459	**172**	0,262966348
26	0,002502358	**75**	0,076728794	**124**	0,203111638	**173**	0,265935364
27	0,003626612	**76**	0,078652755	**125**	0,205877595	**174**	0,26567848
28	0,003999546	**77**	0,081029581	**126**	0,208276411	**175**	0,265280617
29	0,005720412	**78**	0,083233887	**127**	0,209470269	**176**	0,269550801
30	0,005969372	**79**	0,08630113	**128**	0,211491599	**177**	0,268120857
31	0,007312441	**80**	0,089583783	**129**	0,213798888	**178**	0,269245894
32	0,008546148	**81**	0,092510262	**130**	0,216392474	**179**	0,271478637
33	0,009029048	**82**	0,09525996	**131**	0,219428997	**180**	0,274765772
34	0,009415586	**83**	0,098319179	**132**	0,220558053	**181**	0,276270531
35	0,010656646	**84**	0,101097219	**133**	0,221999752	**182**	0,272900487
36	0,011880911	**85**	0,103212992	**134**	0,224037285	**183**	0,275343309
37	0,013070136	**86**	0,105476773	**135**	0,225412656	**184**	0,271148572
38	0,013691976	**87**	0,108017031	**136**	0,226350361	**185**	0,2735546
39	0,014217632	**88**	0,111929821	**137**	0,229479872	**186**	0,2739019
40	0,014960155	**89**	0,115035137	**138**	0,230930969	**187**	0,277777647
41	0,016638621	**90**	0,118509131	**139**	0,232879273	**188**	0,276383397
42	0,018277288	**91**	0,1206641	**140**	0,235027066	**189**	0,275032673
43	0,018971175	**92**	0,123234032	**141**	0,236961067	**190**	0,267691905
44	0,019583184	**93**	0,124995495	**142**	0,236990203	**191**	0,275637367
45	0,02104938	**94**	0,127324828	**143**	0,238816396	**192**	0,26828216
46	0,022323476	**95**	0,128433316	**144**	0,239533448	**193**	0,285532607
47	0,0232389	**96**	0,132233485	**145**	0,241929383	**194**	0,294538053
48	0,02438351	**97**	0,133514622	**146**	0,243227042	**195**	0,275875641
49	0,026153928	**98**	0,136285026	**147**	0,243866973		

Table 7.35: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the right corner, at time code 10:06.

	09.03.2009 10:06						
1	0,000672065	**50**	0,012320887	**99**	0,072918588	**148**	0,13576678
2	0,003104592	**51**	0,013549046	**100**	0,073921431	**149**	0,136972335
3	0,003104012	**52**	0,013959819	**101**	0,07496173	**150**	0,137587073
4	0,00236019	**53**	0,015046907	**102**	0,076834934	**151**	0,139171003
5	0,003131704	**54**	0,015808826	**103**	0,078808918	**152**	0,138872117
6	0,002390533	**55**	0,016608321	**104**	0,079399178	**153**	0,138285416
7	0,001798562	**56**	0,017254805	**105**	0,081663421	**154**	0,137798675
8	0,001304037	**57**	0,017938124	**106**	0,082292448	**155**	0,139538444
9	0,002106886	**58**	0,018954948	**107**	0,08393782	**156**	0,139745404
10	0,00137943	**59**	0,0199786	**108**	0,085774776	**157**	0,138601102
11	0,000196013	**60**	0,020920025	**109**	0,08814472	**158**	0,142527241
12	0,000162504	**61**	0,02181426	**110**	0,089726796	**159**	0,142978945
13	0,000655071	**62**	0,023125796	**111**	0,091534717	**160**	0,141295276
14	0,00137266	**63**	0,023911427	**112**	0,09192365	**161**	0,144864154
15	0,000691343	**64**	0,025415589	**113**	0,094248319	**162**	0,143446514
16	0,000711839	**65**	0,026473439	**114**	0,095945875	**163**	0,144705676
17	0,000774343	**66**	0,027420677	**115**	0,097507851	**164**	0,147024385
18	5,108134522	**67**	0,028838709	**116**	0,099031856	**165**	0,144900735
19	0,000228573	**68**	0,030563392	**117**	0,100181286	**166**	0,14559433
20	0,001219436	**69**	0,031684683	**118**	0,101446429	**167**	0,147010958
21	0,001171849	**70**	0,032969308	**119**	0,103676957	**168**	0,149198773
22	0,000839341	**71**	0,034104943	**120**	0,104814246	**169**	0,145401536
23	0	**72**	0,034911386	**121**	0,106038545	**170**	0,149587626
24	0,001392153	**73**	0,035498032	**122**	0,107460248	**171**	0,148818583
25	0,001684178	**74**	0,036949687	**123**	0,108180911	**172**	0,148889108
26	0,001473026	**75**	0,038261346	**124**	0,110662888	**173**	0,149636637
27	0,002079444	**76**	0,040008099	**125**	0,112718964	**174**	0,152000538
28	0,001464022	**77**	0,040667852	**126**	0,113158424	**175**	0,149242529
29	0,002835911	**78**	0,041690258	**127**	0,114652367	**176**	0,150588131
30	0,002370408	**79**	0,043146488	**128**	0,115360283	**177**	0,153981084
31	0,003145986	**80**	0,045160877	**129**	0,118076754	**178**	0,154300978
32	0,003860619	**81**	0,046728125	**130**	0,119037421	**179**	0,157029268
33	0,003828263	**82**	0,048364536	**131**	0,119973616	**180**	0,155479702
34	0,004908475	**83**	0,04951996	**132**	0,122342399	**181**	0,150750349
35	0,00439272	**84**	0,051181813	**133**	0,122989889	**182**	0,157604606
36	0,005385451	**85**	0,053080479	**134**	0,12351889	**183**	0,151242247
37	0,005753111	**86**	0,054299454	**135**	0,125500588	**184**	0,155071252
38	0,005683126	**87**	0,056027132	**136**	0,126161611	**185**	0,157980831
39	0,006977803	**88**	0,058058687	**137**	0,128026625	**186**	0,158277891
40	0,006414451	**89**	0,059654656	**138**	0,128460321	**187**	0,153810945
41	0,00720819	**90**	0,060761056	**139**	0,12863454	**188**	0,16284626
42	0,008359408	**91**	0,06259852	**140**	0,129784608	**189**	0,157205379
43	0,008430744	**92**	0,064250341	**141**	0,132638813	**190**	0,157853037
44	0,009140962	**93**	0,064203079	**142**	0,132456313	**191**	0,160356751
45	0,009567105	**94**	0,065761583	**143**	0,131453985	**192**	0,155138296
46	0,009994345	**95**	0,066374218	**144**	0,134466096	**193**	0,163365213
47	0,01065688	**96**	0,068531458	**145**	0,13411345	**194**	0,155770995
48	0,011251607	**97**	0,070070741	**146**	0,134185349	**195**	0,152224142
49	0,011931654	**98**	0,071611364	**147**	0,135384928		

Table 7.36: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the right corner, at time code 10:06.

	09.03.2009 10:06						
1	0,001229308	**50**	0,013992207	**99**	0,075866443	**148**	0,142172826
2	0,000265329	**51**	0,01449264	**100**	0,077229761	**149**	0,141566825
3	0,001376349	**52**	0,015464596	**101**	0,079192469	**150**	0,144366898
4	0,002526076	**53**	0,016061634	**102**	0,081652061	**151**	0,14567852
5	0,001950409	**54**	0,016417614	**103**	0,082733516	**152**	0,14556281
6	0,000721087	**55**	0,017915913	**104**	0,08321617	**153**	0,144668242
7	0,001201812	**56**	0,018002595	**105**	0,085249892	**154**	0,145381592
8	0,001250822	**57**	0,01905975	**106**	0,0859821	**155**	0,146018033
9	0,002487502	**58**	0,019760557	**107**	0,086936977	**156**	0,145588308
10	0,001466282	**59**	0,020848279	**108**	0,090217334	**157**	0,146266359
11	0,000396818	**60**	0,022506681	**109**	0,0920143	**158**	0,14784008
12	0,001047515	**61**	0,022437249	**110**	0,093591163	**159**	0,149902277
13	0,001180491	**62**	0,024514758	**111**	0,095065018	**160**	0,149018398
14	0,000994555	**63**	0,024999113	**112**	0,097263194	**161**	0,151569065
15	0,000535449	**64**	0,026418531	**113**	0,099288458	**162**	0,148118452
16	0,001033884	**65**	0,027529678	**114**	0,101381665	**163**	0,150830214
17	0,000857744	**66**	0,029195134	**115**	0,102650126	**164**	0,150293627
18	0,000523772	**67**	0,030262247	**116**	0,103999768	**165**	0,151058955
19	0	**68**	0,031841695	**117**	0,106036663	**166**	0,150870031
20	0,000915089	**69**	0,033468698	**118**	0,106415996	**167**	0,150599908
21	0,000225378	**70**	0,035453872	**119**	0,108706705	**168**	0,151755573
22	0,00067215	**71**	0,036144714	**120**	0,109904209	**169**	0,151607934
23	0,000925353	**72**	0,036579121	**121**	0,110575765	**170**	0,15232127
24	0,000891947	**73**	0,0377191	**122**	0,11218046	**171**	0,152070108
25	0,001209762	**74**	0,038677776	**123**	0,113473068	**172**	0,157079269
26	0,001953381	**75**	0,03989288	**124**	0,115126523	**173**	0,154028125
27	0,002047211	**76**	0,041468165	**125**	0,117771045	**174**	0,154662418
28	0,001977164	**77**	0,042600191	**126**	0,118022664	**175**	0,152964811
29	0,002213764	**78**	0,044043654	**127**	0,119456115	**176**	0,156946192
30	0,002343749	**79**	0,045713402	**128**	0,122161596	**177**	0,156921048
31	0,003802519	**80**	0,04724646	**129**	0,12276765	**178**	0,157344691
32	0,004269101	**81**	0,048625692	**130**	0,124524878	**179**	0,160733131
33	0,003943836	**82**	0,050308246	**131**	0,126584673	**180**	0,16220275
34	0,00475151	**83**	0,051423773	**132**	0,127462413	**181**	0,160712269
35	0,005096038	**84**	0,053988302	**133**	0,127309954	**182**	0,164836426
36	0,005757245	**85**	0,056124134	**134**	0,129778841	**183**	0,159387049
37	0,006126653	**86**	0,056603929	**135**	0,130483079	**184**	0,158184437
38	0,006661985	**87**	0,058476598	**136**	0,131736587	**185**	0,160518379
39	0,006955037	**88**	0,059998298	**137**	0,132575852	**186**	0,164501958
40	0,00730171	**89**	0,062209695	**138**	0,134451774	**187**	0,160283102
41	0,007904075	**90**	0,063855285	**139**	0,134749774	**188**	0,164919997
42	0,008778821	**91**	0,065051062	**140**	0,135680054	**189**	0,161810124
43	0,009163772	**92**	0,066842661	**141**	0,137052676	**190**	0,159272144
44	0,009424578	**93**	0,067756992	**142**	0,136789008	**191**	0,162739812
45	0,01009141	**94**	0,068737659	**143**	0,135896136	**192**	0,162366932
46	0,010842801	**95**	0,070441367	**144**	0,138835869	**193**	0,164027367
47	0,011511709	**96**	0,072117804	**145**	0,140785882	**194**	0,167943544
48	0,011949827	**97**	0,073271708	**146**	0,140028081	**195**	0,157330693
49	0,012631993	**98**	0,075398561	**147**	0,141819711		

Table 7.37: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the middle of the top shelf, at time code 10:07.

	09.03.2009 10:07						
1	0	**50**	0,012141176	**99**	0,069798774	**148**	0,130320441
2	0,00121175	**51**	0,012398761	**100**	0,071331764	**149**	0,130698139
3	0,001406659	**52**	0,01353884	**101**	0,07280268	**150**	0,134793886
4	0,000563094	**53**	0,014628555	**102**	0,074438915	**151**	0,13512014
5	0,000867555	**54**	0,014600073	**103**	0,075727102	**152**	0,13494906
6	0,000142345	**55**	0,015963242	**104**	0,076312831	**153**	0,134251249
7	0,001221704	**56**	0,015999891	**105**	0,078127287	**154**	0,134930231
8	0,000629974	**57**	0,017003437	**106**	0,079782481	**155**	0,134489034
9	0,002646091	**58**	0,017729752	**107**	0,080763711	**156**	0,135910062
10	0,00135048	**59**	0,018694789	**108**	0,082277972	**157**	0,135214844
11	0	**60**	0,019951759	**109**	0,084659618	**158**	0,139902446
12	0,000136851	**61**	0,020791921	**110**	0,085689027	**159**	0,137063234
13	0,000517461	**62**	0,022050723	**111**	0,087608031	**160**	0,137617599
14	0,000326569	**63**	0,023340584	**112**	0,089210315	**161**	0,137987321
15	0	**64**	0,023827598	**113**	0,091740787	**162**	0,140827397
16	8,116772413	**65**	0,024435873	**114**	0,093639781	**163**	0,140695563
17	0	**66**	0,026341216	**115**	0,094489004	**164**	0,13917069
18	0	**67**	0,027378669	**116**	0,095862224	**165**	0,139943175
19	0,000199511	**68**	0,029118983	**117**	0,096618282	**166**	0,139759084
20	0,000799148	**69**	0,030316221	**118**	0,098557455	**167**	0,142473206
21	0,000368782	**70**	0,032183957	**119**	0,100028712	**168**	0,142593706
22	0,000560689	**71**	0,032609112	**120**	0,100633689	**169**	0,144521196
23	0,000455787	**72**	0,032947646	**121**	0,102917488	**170**	0,146216133
24	0,000327611	**73**	0,034163925	**122**	0,104048886	**171**	0,144483218
25	0,000784004	**74**	0,035184193	**123**	0,104977392	**172**	0,148352848
26	0,000729619	**75**	0,03631576	**124**	0,106642755	**173**	0,147718515
27	0,001187674	**76**	0,037307761	**125**	0,108378239	**174**	0,146259228
28	0,000900572	**77**	0,038912644	**126**	0,109016451	**175**	0,145736032
29	0,001883837	**78**	0,040410341	**127**	0,110312533	**176**	0,148970729
30	0,001872774	**79**	0,041604646	**128**	0,112043311	**177**	0,147639986
31	0,003129152	**80**	0,043031845	**129**	0,11442312	**178**	0,146661856
32	0,00355626	**81**	0,045186909	**130**	0,115599877	**179**	0,146349797
33	0,003674165	**82**	0,046128814	**131**	0,116322254	**180**	0,149012771
34	0,0038172	**83**	0,047317509	**132**	0,11861726	**181**	0,151812954
35	0,004509939	**84**	0,049444463	**133**	0,118887501	**182**	0,150648283
36	0,004911595	**85**	0,051129418	**134**	0,119944218	**183**	0,149813335
37	0,005408867	**86**	0,052573591	**135**	0,121846761	**184**	0,150920339
38	0,005801775	**87**	0,053985911	**136**	0,121623009	**185**	0,14883028
39	0,006006422	**88**	0,055222266	**137**	0,123386048	**186**	0,152373008
40	0,005978604	**89**	0,057525456	**138**	0,12405539	**187**	0,149911056
41	0,006616289	**90**	0,058882805	**139**	0,124995881	**188**	0,154896932
42	0,00723275	**91**	0,059991314	**140**	0,126768786	**189**	0,149711382
43	0,008262232	**92**	0,061298912	**141**	0,128304479	**190**	0,157663823
44	0,008350275	**93**	0,062027446	**142**	0,128571126	**191**	0,149434384
45	0,008763171	**94**	0,063350731	**143**	0,128221433	**192**	0,152100174
46	0,009817583	**95**	0,06435233	**144**	0,129603651	**193**	0,156191879
47	0,009917809	**96**	0,066377283	**145**	0,131294733	**194**	0,158669221
48	0,010266938	**97**	0,067025627	**146**	0,129452283	**195**	0,147603928
49	0,011348038	**98**	0,068637444	**147**	0,130931871		

Table 7.38: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the middle of the top shelf, at time code 10:07.

	09.03.2009 10:07						
1	0,000449168	**50**	0,011862622	**99**	0,069528554	**148**	0,130656339
2	0,002293374	**51**	0,012848091	**100**	0,069944	**149**	0,131266274
3	0,000194264	**52**	0,013341786	**101**	0,071404913	**150**	0,132864048
4	0,002691961	**53**	0,0141924	**102**	0,073485525	**151**	0,131957853
5	0,003205535	**54**	0,014485374	**103**	0,07488432	**152**	0,132665089
6	0,002056644	**55**	0,015693006	**104**	0,075015305	**153**	0,132648635
7	0,000426038	**56**	0,016042868	**105**	0,077623923	**154**	0,132771798
8	0,00103796	**57**	0,017045923	**106**	0,0783769	**155**	0,133846913
9	0,001440809	**58**	0,018224865	**107**	0,079476573	**156**	0,134441845
10	0,000901745	**59**	0,01851257	**108**	0,081444214	**157**	0,13370642
11	0,001200041	**60**	0,019919212	**109**	0,08427514	**158**	0,136075937
12	0,0008936	**61**	0,020184907	**110**	0,084524763	**159**	0,136055613
13	0,001030371	**62**	0,021666208	**111**	0,086220685	**160**	0,137483865
14	0,000503018	**63**	0,022407179	**112**	0,088152363	**161**	0,138159242
15	0,000730317	**64**	0,023865588	**113**	0,089772375	**162**	0,136544787
16	0,000631328	**65**	0,024608168	**114**	0,091992572	**163**	0,13923734
17	0,000690942	**66**	0,025845846	**115**	0,092595828	**164**	0,13902038
18	0	**67**	0,027218065	**116**	0,094063943	**165**	0,136651045
19	0,001187613	**68**	0,028700104	**117**	0,095622737	**166**	0,138160386
20	0,00113248	**69**	0,02970722	**118**	0,096953942	**167**	0,140451844
21	0,000827677	**70**	0,031834119	**119**	0,098888636	**168**	0,142039732
22	0,000379566	**71**	0,032194	**120**	0,098991328	**169**	0,142760516
23	0,00100585	**72**	0,032398954	**121**	0,101377583	**170**	0,142753517
24	0,00039174	**73**	0,033540853	**122**	0,103115983	**171**	0,143022388
25	0,001720672	**74**	0,034884957	**123**	0,102761742	**172**	0,14640281
26	0,00130147	**75**	0,03594043	**124**	0,104911666	**173**	0,143427981
27	0,001821583	**76**	0,037417659	**125**	0,107013597	**174**	0,143701735
28	0,001131989	**77**	0,038155812	**126**	0,107896202	**175**	0,145034732
29	0,002100646	**78**	0,039708451	**127**	0,109713935	**176**	0,146237878
30	0,002237113	**79**	0,041265779	**128**	0,110476118	**177**	0,144815315
31	0,002943977	**80**	0,041980364	**129**	0,111574523	**178**	0,145886008
32	0,003668392	**81**	0,044349485	**130**	0,113549965	**179**	0,147769611
33	0,003920721	**82**	0,046092312	**131**	0,114375933	**180**	0,148180394
34	0,004123654	**83**	0,046608245	**132**	0,115745458	**181**	0,152145018
35	0,004480635	**84**	0,048890802	**133**	0,117012124	**182**	0,149133044
36	0,005210489	**85**	0,050212419	**134**	0,118336471	**183**	0,145669488
37	0,005643246	**86**	0,051456269	**135**	0,118944678	**184**	0,144619846
38	0,005638632	**87**	0,053210247	**136**	0,119943369	**185**	0,152675049
39	0,005839465	**88**	0,053866624	**137**	0,121175379	**186**	0,152053825
40	0,006507846	**89**	0,05623729	**138**	0,121796929	**187**	0,148832363
41	0,006656282	**90**	0,05815539	**139**	0,123033672	**188**	0,153773657
42	0,007939996	**91**	0,058356286	**140**	0,123889163	**189**	0,151788032
43	0,008911004	**92**	0,060749026	**141**	0,125540844	**190**	0,153879538
44	0,008315898	**93**	0,061469299	**142**	0,125560616	**191**	0,149037207
45	0,008728218	**94**	0,062785507	**143**	0,124759475	**192**	0,146966795
46	0,009861774	**95**	0,063674471	**144**	0,127011776	**193**	0,154757212
47	0,009962331	**96**	0,065264687	**145**	0,127639209	**194**	0,151945337
48	0,010633951	**97**	0,066546081	**146**	0,128954065	**195**	0,151494634
49	0,011473739	**98**	0,06804266	**147**	0,130838614		

Table 7.39: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the middle of the top shelf, at time code 10:07.

	09.03.2009 10:07						
1	0,00108071	**50**	0,017676299	**99**	0,093283355	**148**	0,170148291
2	0,000738539	**51**	0,018177149	**100**	0,09558046	**149**	0,171925043
3	0,003164632	**52**	0,019540034	**101**	0,097675435	**150**	0,173517608
4	0,002664314	**53**	0,020432082	**102**	0,099214505	**151**	0,174034564
5	0,001408982	**54**	0,020987937	**103**	0,101815617	**152**	0,173991536
6	0,00123305	**55**	0,022509921	**104**	0,102326326	**153**	0,17315609
7	0,000406146	**56**	0,023537967	**105**	0,105132783	**154**	0,173895629
8	0,000221988	**57**	0,0239966	**106**	0,106940325	**155**	0,176635553
9	0,001139488	**58**	0,025618003	**107**	0,107918582	**156**	0,175132428
10	0,000626714	**59**	0,026555028	**108**	0,110103073	**157**	0,174126029
11	0,000825203	**60**	0,028479015	**109**	0,11205674	**158**	0,177313684
12	0,001457955	**61**	0,028946677	**110**	0,114721325	**159**	0,177855637
13	0,000567501	**62**	0,031051514	**111**	0,116977658	**160**	0,178372948
14	0,000830709	**63**	0,032049791	**112**	0,118608926	**161**	0,180829988
15	0,000249642	**64**	0,034115349	**113**	0,120790543	**162**	0,179512463
16	1,407499884	**65**	0,035050693	**114**	0,124024458	**163**	0,18021341
17	0,000426839	**66**	0,03661828	**115**	0,125048439	**164**	0,181933872
18	0,000724307	**67**	0,038511472	**116**	0,126420059	**165**	0,182276095
19	0,000911526	**68**	0,040132607	**117**	0,127794563	**166**	0,182004664
20	0,000465815	**69**	0,041758278	**118**	0,128904939	**167**	0,1819929
21	0,000426144	**70**	0,043778589	**119**	0,131709423	**168**	0,182266721
22	0,00061642	**71**	0,045069605	**120**	0,133060147	**169**	0,183916415
23	0,001596161	**72**	0,046816561	**121**	0,1342793	**170**	0,183712609
24	0,000725211	**73**	0,047585629	**122**	0,136059999	**171**	0,183690002
25	0,001708507	**74**	0,049151044	**123**	0,138183914	**172**	0,188036127
26	0,001598833	**75**	0,050134015	**124**	0,138760898	**173**	0,186535235
27	0,001617443	**76**	0,052245966	**125**	0,141492598	**174**	0,187805436
28	0,003295234	**77**	0,053872168	**126**	0,142771323	**175**	0,186249562
29	0,003363794	**78**	0,055381241	**127**	0,144178207	**176**	0,190353899
30	0,003427881	**79**	0,057116257	**128**	0,146202033	**177**	0,191970029
31	0,004450634	**80**	0,058708473	**129**	0,147089091	**178**	0,188259263
32	0,005462509	**81**	0,061418677	**130**	0,149013443	**179**	0,192709816
33	0,005091861	**82**	0,063248062	**131**	0,151854672	**180**	0,194793522
34	0,005932478	**83**	0,064657143	**132**	0,152504533	**181**	0,193320951
35	0,006517326	**84**	0,066837056	**133**	0,153916866	**182**	0,196794185
36	0,007105909	**85**	0,069166977	**134**	0,155417274	**183**	0,197038897
37	0,007745334	**86**	0,070750019	**135**	0,156689237	**184**	0,191243495
38	0,008167352	**87**	0,07212216	**136**	0,157717404	**185**	0,196889898
39	0,008427287	**88**	0,074691373	**137**	0,159304846	**186**	0,198654529
40	0,009021747	**89**	0,076826651	**138**	0,161086677	**187**	0,195050203
41	0,009959732	**90**	0,079055003	**139**	0,161420576	**188**	0,199568698
42	0,011188389	**91**	0,079821549	**140**	0,162044175	**189**	0,195578252
43	0,011632474	**92**	0,082553689	**141**	0,165961492	**190**	0,193803743
44	0,012329492	**93**	0,083191454	**142**	0,163802241	**191**	0,19451397
45	0,012651765	**94**	0,084886908	**143**	0,165468766	**192**	0,188348116
46	0,013591446	**95**	0,08711902	**144**	0,166896671	**193**	0,198349011
47	0,014521421	**96**	0,088581855	**145**	0,168642735	**194**	0,198780668
48	0,015700521	**97**	0,090487395	**146**	0,168471771	**195**	0,19295497
49	0,016555689	**98**	0,092392391	**147**	0,170053486		

Table 7.40: Mesurements (irradians values, mW / (m^2nm)), in front of the Nunc wells in the middle of the top shelf, at time code 10:08.

	09.03.2009 10:08						
1	0,000374869	**50**	0,016454259	**99**	0,088517656	**148**	0,161055065
2	0,001617359	**51**	0,016631453	**100**	0,089992232	**149**	0,161673895
3	0,001497589	**52**	0,018080042	**101**	0,091709967	**150**	0,162751144
4	0,002139009	**53**	0,01866076	**102**	0,092992382	**151**	0,165070395
5	0,002270343	**54**	0,019867414	**103**	0,095802931	**152**	0,164291375
6	0,001210791	**55**	0,021089004	**104**	0,096531552	**153**	0,163181198
7	0	**56**	0,021672787	**105**	0,098777808	**154**	0,16415428
8	0,000204249	**57**	0,022458614	**106**	0,100150864	**155**	0,166098923
9	0,00126636	**58**	0,023872518	**107**	0,102507602	**156**	0,165394254
10	0,00113335	**59**	0,024757692	**108**	0,10426677	**157**	0,166060578
11	0,000329883	**60**	0,026493661	**109**	0,106239967	**158**	0,168743569
12	0,001445129	**61**	0,027644791	**110**	0,108020611	**159**	0,168169472
13	0	**62**	0,029136786	**111**	0,109272931	**160**	0,169312489
14	0,000364379	**63**	0,030098126	**112**	0,111651338	**161**	0,16903622
15	0,000470493	**64**	0,031714367	**113**	0,114233347	**162**	0,170876455
16	0	**65**	0,032953199	**114**	0,115801082	**163**	0,169021548
17	0,000663142	**66**	0,034481537	**115**	0,117897864	**164**	0,169721188
18	0	**67**	0,035941802	**116**	0,11930456	**165**	0,169688539
19	0	**68**	0,037460449	**117**	0,121061535	**166**	0,171892903
20	0,000712191	**69**	0,039558709	**118**	0,122331859	**167**	0,172669883
21	0	**70**	0,041651003	**119**	0,123849602	**168**	0,172636107
22	0	**71**	0,042679137	**120**	0,125594868	**169**	0,170403195
23	0,00037529	**72**	0,043755437	**121**	0,12684101	**170**	0,174235978
24	0,000481521	**73**	0,044147737	**122**	0,129279046	**171**	0,173464194
25	0,001586862	**74**	0,04597914	**123**	0,129533001	**172**	0,177018411
26	0,00138153	**75**	0,047299894	**124**	0,131278587	**173**	0,176490336
27	0,001800094	**76**	0,049341533	**125**	0,133116015	**174**	0,17553991
28	0,002198519	**77**	0,050530832	**126**	0,13492958	**175**	0,175999801
29	0,002590823	**78**	0,052251638	**127**	0,136620909	**176**	0,177247369
30	0,002779179	**79**	0,053676763	**128**	0,13714883	**177**	0,175310234
31	0,003154404	**80**	0,05557141	**129**	0,139688933	**178**	0,177457067
32	0,004517394	**81**	0,056759393	**130**	0,140766489	**179**	0,179869757
33	0,005084156	**82**	0,059214635	**131**	0,142862991	**180**	0,17859418
34	0,005454112	**83**	0,061456124	**132**	0,144512716	**181**	0,18309338
35	0,005586895	**84**	0,063476906	**133**	0,145159525	**182**	0,181848423
36	0,006311291	**85**	0,064855132	**134**	0,146625977	**183**	0,181535195
37	0,007012899	**86**	0,066520158	**135**	0,14770327	**184**	0,179161373
38	0,007359052	**87**	0,068529611	**136**	0,148050539	**185**	0,183663891
39	0,008146497	**88**	0,070176042	**137**	0,150571791	**186**	0,185647826
40	0,008733777	**89**	0,072504375	**138**	0,152500794	**187**	0,181525054
41	0,009447818	**90**	0,074158523	**139**	0,151457126	**188**	0,187039866
42	0,009847913	**91**	0,075435698	**140**	0,154144667	**189**	0,184924137
43	0,010486592	**92**	0,077593493	**141**	0,155563067	**190**	0,181788639
44	0,011083301	**93**	0,079489461	**142**	0,155360606	**191**	0,181009953
45	0,011699278	**94**	0,080307443	**143**	0,156438477	**192**	0,183529025
46	0,012866723	**95**	0,081532532	**144**	0,156657691	**193**	0,188306343
47	0,013390553	**96**	0,083350287	**145**	0,158909353	**194**	0,18405768
48	0,01424142	**97**	0,085296314	**146**	0,158054496	**195**	0,18736208
49	0,014930542	**98**	0,086590212	**147**	0,161427147		

Table 7.41: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the middle of the top shelf, at time code 10:08.

	09.03.2009 10:08						
1	0,002659563	**50**	0,014014671	**99**	0,078881853	**148**	0,141369071
2	0,001870865	**51**	0,015000383	**100**	0,079825623	**149**	0,142740149
3	0,001724913	**52**	0,01605128	**101**	0,080459195	**150**	0,144887446
4	0,001848709	**53**	0,016724767	**102**	0,082925338	**151**	0,145979067
5	0,001790442	**54**	0,017392558	**103**	0,084349897	**152**	0,145629985
6	0,001377736	**55**	0,018486895	**104**	0,086082063	**153**	0,145483364
7	0,001072517	**56**	0,01879766	**105**	0,088112777	**154**	0,146986216
8	0,001454815	**57**	0,019845737	**106**	0,089063084	**155**	0,14556563
9	0,001956226	**58**	0,021141001	**107**	0,090117333	**156**	0,148090269
10	0,001241915	**59**	0,0219126	**108**	0,092264396	**157**	0,147174492
11	0,000671252	**60**	0,023698707	**109**	0,093608021	**158**	0,149911454
12	0,000964145	**61**	0,024182414	**110**	0,095517154	**159**	0,149983537
13	0	**62**	0,025946881	**111**	0,0969912	**160**	0,150907387
14	0,000458905	**63**	0,026337508	**112**	0,099086605	**161**	0,150107739
15	0,000801768	**64**	0,027941938	**113**	0,101576581	**162**	0,151392349
16	0	**65**	0,028964214	**114**	0,102667756	**163**	0,151577553
17	0,001017596	**66**	0,030477919	**115**	0,10486949	**164**	0,152754952
18	0,000688497	**67**	0,031725937	**116**	0,105662207	**165**	0,153247254
19	0	**68**	0,033159719	**117**	0,107484133	**166**	0,153847605
20	3,827983672	**69**	0,034905224	**118**	0,107999631	**167**	0,152930662
21	0,000132164	**70**	0,036692584	**119**	0,110550947	**168**	0,157231386
22	0,001208554	**71**	0,037579711	**120**	0,110793256	**169**	0,15211413
23	0,000355165	**72**	0,038416518	**121**	0,113456212	**170**	0,158175823
24	0,001039443	**73**	0,039122845	**122**	0,114220316	**171**	0,153460252
25	0,001787577	**74**	0,040716323	**123**	0,114778467	**172**	0,158517422
26	0,001570241	**75**	0,041842296	**124**	0,116578635	**173**	0,158242944
27	0,001493884	**76**	0,043112702	**125**	0,118852597	**174**	0,156671877
28	0,002002318	**77**	0,044794201	**126**	0,11885548	**175**	0,157954826
29	0,00274636	**78**	0,045847924	**127**	0,121783164	**176**	0,160097336
30	0,003005781	**79**	0,04710699	**128**	0,122062696	**177**	0,157583981
31	0,003520547	**80**	0,04898879	**129**	0,123921022	**178**	0,158031018
32	0,00407287	**81**	0,050812793	**130**	0,124848134	**179**	0,161998618
33	0,004101786	**82**	0,05205576	**131**	0,127059189	**180**	0,164667867
34	0,004568386	**83**	0,054050849	**132**	0,127946517	**181**	0,163866876
35	0,004652801	**84**	0,055816338	**133**	0,128708114	**182**	0,165008612
36	0,005709859	**85**	0,057641084	**134**	0,130745199	**183**	0,162780717
37	0,006079045	**86**	0,058604134	**135**	0,131470837	**184**	0,157702635
38	0,006814005	**87**	0,059971792	**136**	0,132424525	**185**	0,162786793
39	0,006632507	**88**	0,062182967	**137**	0,133608107	**186**	0,166137771
40	0,007181074	**89**	0,063481892	**138**	0,133994483	**187**	0,16123733
41	0,007852083	**90**	0,065250402	**139**	0,136683407	**188**	0,171357225
42	0,008725367	**91**	0,067166655	**140**	0,135378471	**189**	0,166098857
43	0,009563988	**92**	0,069092704	**141**	0,138176025	**190**	0,169726231
44	0,009678113	**93**	0,070040837	**142**	0,138487505	**191**	0,164775344
45	0,010585131	**94**	0,071361912	**143**	0,138200632	**192**	0,163571705
46	0,011342153	**95**	0,07141725	**144**	0,139660557	**193**	0,165296495
47	0,011774391	**96**	0,073638746	**145**	0,141039126	**194**	0,168233367
48	0,012455589	**97**	0,074704351	**146**	0,142938124	**195**	0,158728916
49	0,013220098	**98**	0,076849106	**147**	0,140409188		

Table 7.42: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the middle of the top shelf, at time code 10:09.

	09.03.2009 10:09						
1	0,00108071	**50**	0,024873756	**99**	0,128657619	**148**	0,23967908
2	0,002259573	**51**	0,026103337	**100**	0,131377334	**149**	0,241287025
3	0,002891843	**52**	0,027198275	**101**	0,134741206	**150**	0,24207764
4	0,000922513	**53**	0,029164075	**102**	0,137262285	**151**	0,245774051
5	0,001630475	**54**	0,030516795	**103**	0,140420079	**152**	0,24484839
6	0,000832383	**55**	0,031453853	**104**	0,142461433	**153**	0,245273728
7	4,809614542	**56**	0,033207677	**105**	0,146584835	**154**	0,244442313
8	0,000700928	**57**	0,034550074	**106**	0,149860762	**155**	0,243357812
9	0,002138604	**58**	0,036418194	**107**	0,152456069	**156**	0,244438259
10	0,001538659	**59**	0,038407507	**108**	0,15546197	**157**	0,242282172
11	0,000463753	**60**	0,039976164	**109**	0,159719547	**158**	0,243344678
12	0,001111647	**61**	0,041526247	**110**	0,163100229	**159**	0,241628302
13	0,000567501	**62**	0,043481552	**111**	0,166922127	**160**	0,240659426
14	0,00094414	**63**	0,044616042	**112**	0,170697491	**161**	0,239317448
15	0,001301929	**64**	0,046834475	**113**	0,174276196	**162**	0,240035301
16	0,000859443	**65**	0,048399747	**114**	0,177622115	**163**	0,235334246
17	0,000301738	**66**	0,050725213	**115**	0,181229702	**164**	0,236045455
18	0,000724307	**67**	0,052308848	**116**	0,182774814	**165**	0,232122819
19	0,001957751	**68**	0,054497261	**117**	0,185090805	**166**	0,226608323
20	0,001639725	**69**	0,056653729	**118**	0,187347037	**167**	0,221718856
21	0,002362108	**70**	0,059585556	**119**	0,187479278	**168**	0,208729603
22	0,002497316	**71**	0,060786575	**120**	0,188520384	**169**	0,198574077
23	0,002682871	**72**	0,061956132	**121**	0,18946839	**170**	0,1906834
24	0,002802991	**73**	0,06401274	**122**	0,190822813	**171**	0,182417666
25	0,002912794	**74**	0,065781097	**123**	0,192417942	**172**	0,185842334
26	0,003966297	**75**	0,067851101	**124**	0,195414728	**173**	0,193349613
27	0,004034892	**76**	0,070190651	**125**	0,19924311	**174**	0,20283723
28	0,004562996	**77**	0,072205233	**126**	0,200744211	**175**	0,213438403
29	0,005145397	**78**	0,073663411	**127**	0,201149758	**176**	0,223482744
30	0,005907167	**79**	0,077244924	**128**	0,202347104	**177**	0,227768412
31	0,006420231	**80**	0,078808274	**129**	0,203797837	**178**	0,231229325
32	0,006976296	**81**	0,081383216	**130**	0,20421915	**179**	0,231044799
33	0,008142988	**82**	0,08369808	**131**	0,206721614	**180**	0,229369195
34	0,00842148	**83**	0,086159037	**132**	0,208036993	**181**	0,229781575
35	0,009484449	**84**	0,088315286	**133**	0,208319546	**182**	0,225928091
36	0,010320834	**85**	0,09085302	**134**	0,210679302	**183**	0,218258249
37	0,01110721	**86**	0,093285996	**135**	0,211601539	**184**	0,211923937
38	0,012171778	**87**	0,096371865	**136**	0,214003218	**185**	0,206578717
39	0,012457003	**88**	0,098342115	**137**	0,216362021	**186**	0,201527175
40	0,01371488	**89**	0,101259216	**138**	0,218537433	**187**	0,197290565
41	0,014422989	**90**	0,103678548	**139**	0,219715328	**188**	0,194125136
42	0,015777259	**91**	0,106368655	**140**	0,221932561	**189**	0,188264834
43	0,017319757	**92**	0,109621548	**141**	0,225369705	**190**	0,184437638
44	0,017976027	**93**	0,112818787	**142**	0,227511162	**191**	0,177534655
45	0,019022068	**94**	0,114786089	**143**	0,229097887	**192**	0,170433671
46	0,020034412	**95**	0,116991535	**144**	0,231286572	**193**	0,164579162
47	0,021092922	**96**	0,120539393	**145**	0,234442165	**194**	0,152872769
48	0,021984499	**97**	0,123288312	**146**	0,234712052	**195**	0,140430439
49	0,023424401	**98**	0,126477158	**147**	0,238038366		

Table 7.43: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the middle of the top shelf, at time code 10:09.

	09.03.2009 10:09						
1	0,001173583	**50**	0,02481535	**99**	0,129130504	**148**	0,239091259
2	0,003256696	**51**	0,026206683	**100**	0,132300445	**149**	0,241571093
3	0,000785307	**52**	0,027784959	**101**	0,135334009	**150**	0,245569123
4	0,00323109	**53**	0,029586878	**102**	0,138196858	**151**	0,243487274
5	0,001913493	**54**	0,030538852	**103**	0,141130783	**152**	0,245641063
6	0,001689366	**55**	0,031711012	**104**	0,143399934	**153**	0,245840169
7	0,000813925	**56**	0,033229165	**105**	0,147522351	**154**	0,245280126
8	0,000585627	**57**	0,034724265	**106**	0,150118034	**155**	0,245269583
9	0,00189279	**58**	0,036212596	**107**	0,153387057	**156**	0,24586153
10	0,000532625	**59**	0,038353669	**108**	0,157397034	**157**	0,243467363
11	0,001099638	**60**	0,039850045	**109**	0,159973798	**158**	0,243708354
12	0,001720893	**61**	0,041474331	**110**	0,163800027	**159**	0,242879702
13	0,001499495	**62**	0,04364242	**111**	0,167176061	**160**	0,240442109
14	0,001315944	**63**	0,045260168	**112**	0,170056496	**161**	0,241260153
15	0,00168517	**64**	0,046921853	**113**	0,173856185	**162**	0,239168161
16	0,001134524	**65**	0,048553313	**114**	0,17822398	**163**	0,238050186
17	0,000711792	**66**	0,050677155	**115**	0,181146556	**164**	0,237153991
18	0,00037337	**67**	0,052458502	**116**	0,183622205	**165**	0,232916803
19	0,001340187	**68**	0,054970306	**117**	0,185477234	**166**	0,228147069
20	0,002328129	**69**	0,056929571	**118**	0,187141628	**167**	0,219223092
21	0,001752638	**70**	0,059603405	**119**	0,188719949	**168**	0,211904296
22	0,002155968	**71**	0,061126537	**120**	0,188432157	**169**	0,199080273
23	0,002474921	**72**	0,062169112	**121**	0,189131536	**170**	0,190797302
24	0,002835056	**73**	0,06416301	**122**	0,190732307	**171**	0,181687251
25	0,00370957	**74**	0,066405753	**123**	0,192580234	**172**	0,186841728
26	0,00399489	**75**	0,067939189	**124**	0,195965529	**173**	0,193930097
27	0,005318826	**76**	0,070563517	**125**	0,199802033	**174**	0,206255919
28	0,00458815	**77**	0,072297824	**126**	0,200781061	**175**	0,213573268
29	0,00533864	**78**	0,074352915	**127**	0,201321855	**176**	0,22261827
30	0,005849406	**79**	0,076884878	**128**	0,203480656	**177**	0,229987797
31	0,006744288	**80**	0,079221045	**129**	0,203139873	**178**	0,229230024
32	0,00728466	**81**	0,082207277	**130**	0,205535824	**179**	0,231199126
33	0,007954219	**82**	0,084295794	**131**	0,206906595	**180**	0,229529267
34	0,008507437	**83**	0,087022286	**132**	0,208078018	**181**	0,232936183
35	0,008975276	**84**	0,089370105	**133**	0,208964207	**182**	0,224860537
36	0,010142227	**85**	0,091404195	**134**	0,210106328	**183**	0,223580949
37	0,011257359	**86**	0,093490506	**135**	0,211802586	**184**	0,210775024
38	0,011856615	**87**	0,096213671	**136**	0,213243807	**185**	0,209539189
39	0,012544276	**88**	0,098649741	**137**	0,216407695	**186**	0,207471957
40	0,013524197	**89**	0,101669087	**138**	0,218080141	**187**	0,197498006
41	0,014730938	**90**	0,104585103	**139**	0,22062023	**188**	0,192008196
42	0,015871832	**91**	0,107092265	**140**	0,223732326	**189**	0,183614945
43	0,01718916	**92**	0,110558598	**141**	0,22506153	**190**	0,1812683
44	0,017610764	**93**	0,112539714	**142**	0,227562015	**191**	0,175101946
45	0,018886623	**94**	0,115853093	**143**	0,228023846	**192**	0,169752712
46	0,01957925	**95**	0,117967417	**144**	0,231340123	**193**	0,173794137
47	0,021115183	**96**	0,120995084	**145**	0,2348936	**194**	0,157336037
48	0,021926314	**97**	0,123857773	**146**	0,23680683	**195**	0,142922923
49	0,023285231	**98**	0,126725997	**147**	0,239145801		

Table 7.44: Mesurements (irradians values, mW / (m^2nm)), in back of the Nunc wells in the middle of the top shelf, at time code 10:09.

	09.03.2009 10:09						
1	0,000950686	**50**	0,019747477	**99**	0,104515912	**148**	0,198135753
2	0,001532857	**51**	0,020652959	**100**	0,106688766	**149**	0,198516273
3	0,000330658	**52**	0,022410755	**101**	0,108189883	**150**	0,201309813
4	0,002318718	**53**	0,023284889	**102**	0,11113815	**151**	0,202638888
5	0	**54**	0,024371564	**103**	0,113318967	**152**	0,203642859
6	0,000754476	**55**	0,02530381	**104**	0,116000732	**153**	0,201657754
7	0	**56**	0,026524833	**105**	0,119019346	**154**	0,202935075
8	2,566203125	**57**	0,027637633	**106**	0,120902017	**155**	0,202276631
9	0,001083982	**58**	0,028534138	**107**	0,124182763	**156**	0,20145546
10	0,000966884	**59**	0,030551409	**108**	0,126971107	**157**	0,199784631
11	0	**60**	0,031745898	**109**	0,130877533	**158**	0,201680006
12	0,000489573	**61**	0,032800418	**110**	0,132959404	**159**	0,19909694
13	0,000185946	**62**	0,03455531	**111**	0,135886446	**160**	0,198115388
14	0,000219439	**63**	0,035910692	**112**	0,138728679	**161**	0,199277091
15	0,001139539	**64**	0,037781406	**113**	0,141621863	**162**	0,197226896
16	0,000329411	**65**	0,038732545	**114**	0,146331474	**163**	0,195506526
17	2,884244665	**66**	0,040518388	**115**	0,148028776	**164**	0,194653852
18	2,959542586	**67**	0,042296625	**116**	0,150593351	**165**	0,192249313
19	0,000991446	**68**	0,043877239	**117**	0,152152671	**166**	0,187260382
20	0,001197697	**69**	0,04560215	**118**	0,153666631	**167**	0,179992164
21	0,00179566	**70**	0,04805875	**119**	0,154598133	**168**	0,173296614
22	0,001445407	**71**	0,048587315	**120**	0,154634803	**169**	0,162766244
23	0,002032187	**72**	0,050105104	**121**	0,155638605	**170**	0,151569518
24	0,002411804	**73**	0,051188451	**122**	0,157565508	**171**	0,147475563
25	0,002979699	**74**	0,053097222	**123**	0,158329393	**172**	0,150132258
26	0,002485203	**75**	0,05424349	**124**	0,160986081	**173**	0,156829592
27	0,003127006	**76**	0,056316097	**125**	0,164437466	**174**	0,169772503
28	0,002897801	**77**	0,058119288	**126**	0,165272115	**175**	0,178778026
29	0,003585316	**78**	0,05966277	**127**	0,165136614	**176**	0,185641126
30	0,004356503	**79**	0,061890038	**128**	0,16641578	**177**	0,183986009
31	0,005330219	**80**	0,063448828	**129**	0,167656268	**178**	0,189124633
32	0,005506561	**81**	0,06539644	**130**	0,169252382	**179**	0,18916028
33	0,005758332	**82**	0,067486809	**131**	0,170473401	**180**	0,186501764
34	0,006848102	**83**	0,069160036	**132**	0,171204071	**181**	0,189502215
35	0,007282917	**84**	0,071786595	**133**	0,172997154	**182**	0,18849481
36	0,007998944	**85**	0,073434923	**134**	0,174137265	**183**	0,181356581
37	0,00837889	**86**	0,075024771	**135**	0,173935651	**184**	0,16963651
38	0,009275985	**87**	0,077414025	**136**	0,176952858	**185**	0,168938424
39	0,009971632	**88**	0,079159778	**137**	0,178479199	**186**	0,169648783
40	0,010325395	**89**	0,082154973	**138**	0,180171601	**187**	0,158913992
41	0,011371497	**90**	0,084098053	**139**	0,182099972	**188**	0,154162483
42	0,012269816	**91**	0,086543943	**140**	0,183164657	**189**	0,153819537
43	0,013195423	**92**	0,089483375	**141**	0,187543693	**190**	0,151750878
44	0,013923757	**93**	0,090840341	**142**	0,188994929	**191**	0,141441197
45	0,014901907	**94**	0,092528963	**143**	0,188857838	**192**	0,1427239
46	0,015549083	**95**	0,094756613	**144**	0,190919716	**193**	0,136382442
47	0,016814323	**96**	0,097275489	**145**	0,193339543	**194**	0,127426345
48	0,017683286	**97**	0,10026413	**146**	0,196315335	**195**	0,111554106
49	0,017736389	**98**	0,102400543	**147**	0,197669429		

Table 7.45: Mesurements (irradians values, mW / (m^2nm)), in between the Nunc wells on the lower shelf, at time code 10:11.

	09.03.2009 10:11						
1	0,000430593	**50**	0,013718147	**99**	0,071733304	**148**	0,134963025
2	0,002884887	**51**	0,014218549	**100**	0,07317179	**149**	0,13547789
3	0,003452576	**52**	0,015272021	**101**	0,074431327	**150**	0,137879088
4	0,002678138	**53**	0,0161907	**102**	0,076753394	**151**	0,139941974
5	0,001421287	**54**	0,01678377	**103**	0,078161108	**152**	0,137971963
6	0,003047182	**55**	0,017650036	**104**	0,078863791	**153**	0,137857131
7	0,001311217	**56**	0,0183593	**105**	0,080449055	**154**	0,137869676
8	0,00150803	**57**	0,01903001	**106**	0,08254972	**155**	0,137509924
9	0,002003803	**58**	0,01965566	**107**	0,083969061	**156**	0,13739326
10	0,000894508	**59**	0,020968377	**108**	0,086253875	**157**	0,135076315
11	0,00167528	**60**	0,0217459	**109**	0,087505991	**158**	0,136344741
12	0,001464368	**61**	0,022624944	**110**	0,0892004	**159**	0,136916966
13	0,000573756	**62**	0,023710416	**111**	0,091900134	**160**	0,135962644
14	0,000723579	**63**	0,024694407	**112**	0,093523024	**161**	0,137832593
15	0,001074583	**64**	0,025708113	**113**	0,096423603	**162**	0,133341677
16	0,001107686	**65**	0,026357328	**114**	0,098030228	**163**	0,134625709
17	0,000433789	**66**	0,027838414	**115**	0,099266714	**164**	0,134943223
18	0,000602553	**67**	0,028725556	**116**	0,101043601	**165**	0,13175158
19	0,001311126	**68**	0,030321454	**117**	0,101864543	**166**	0,129867143
20	0,001386103	**69**	0,03183156	**118**	0,103387873	**167**	0,127436747
21	0,0012077	**70**	0,033950996	**119**	0,10407263	**168**	0,125527065
22	0,001626531	**71**	0,033994009	**120**	0,104603861	**169**	0,116196254
23	0,001602869	**72**	0,034799482	**121**	0,105577949	**170**	0,110747108
24	0,001077921	**73**	0,035186496	**122**	0,106116589	**171**	0,112886886
25	0,002152512	**74**	0,03622778	**123**	0,106692051	**172**	0,114787814
26	0,003045617	**75**	0,036832795	**124**	0,108767274	**173**	0,115690936
27	0,002589795	**76**	0,038402811	**125**	0,111709999	**174**	0,119248973
28	0,00239472	**77**	0,03960104	**126**	0,112531969	**175**	0,123645099
29	0,002859477	**78**	0,040967724	**127**	0,112938881	**176**	0,129143618
30	0,002632555	**79**	0,042252728	**128**	0,113618112	**177**	0,128184343
31	0,003318537	**80**	0,043540206	**129**	0,11505012	**178**	0,129205269
32	0,004385238	**81**	0,04514682	**130**	0,114819333	**179**	0,130515782
33	0,004263588	**82**	0,047155421	**131**	0,116684173	**180**	0,132013065
34	0,00472535	**83**	0,047863455	**132**	0,117657258	**181**	0,131191781
35	0,005268204	**84**	0,049143768	**133**	0,117907952	**182**	0,129262757
36	0,005862951	**85**	0,051173317	**134**	0,119097585	**183**	0,126986455
37	0,006101018	**86**	0,05198999	**135**	0,12003733	**184**	0,117898343
38	0,006702771	**87**	0,053480709	**136**	0,120899334	**185**	0,120801911
39	0,006928475	**88**	0,054987636	**137**	0,121988394	**186**	0,116824011
40	0,006854189	**89**	0,056998479	**138**	0,122459535	**187**	0,115185443
41	0,008379995	**90**	0,059322511	**139**	0,124395788	**188**	0,119513783
42	0,009046094	**91**	0,060538165	**140**	0,125630557	**189**	0,110300184
43	0,009134282	**92**	0,062460406	**141**	0,126962426	**190**	0,11125903
44	0,010013296	**93**	0,063206388	**142**	0,128662662	**191**	0,10430515
45	0,0105327	**94**	0,064856072	**143**	0,128878371	**192**	0,102599734
46	0,011130039	**95**	0,064510107	**144**	0,130085612	**193**	0,105040491
47	0,011961385	**96**	0,067495797	**145**	0,131592019	**194**	0,100762667
48	0,012240752	**97**	0,06880594	**146**	0,132203802	**195**	0,089060962
49	0,012923801	**98**	0,07054925	**147**	0,133974405		

Table 7.46: Mesurements (irradians values, mW / (m^2nm)), in between the Nunc wells on the lower shelf, at time code 10:11.

	09.03.2009 10:11						
1	0,000207696	**50**	0,012370308	**99**	0,066685102	**148**	0,128772914
2	0,002073669	**51**	0,012951437	**100**	0,068748293	**149**	0,127993318
3	0,002725139	**52**	0,014653987	**101**	0,069638985	**150**	0,130870729
4	0,000521622	**53**	0,015095863	**102**	0,070807252	**151**	0,131082343
5	0,002381089	**54**	0,015301503	**103**	0,073557252	**152**	0,130797606
6	0,001711625	**55**	0,016420899	**104**	0,073913039	**153**	0,128987491
7	0,000475767	**56**	0,016760575	**105**	0,076069785	**154**	0,130031156
8	0,001720892	**57**	0,017984859	**106**	0,077278789	**155**	0,129454218
9	0,000624071	**58**	0,018396897	**107**	0,079170409	**156**	0,129392976
10	0,000807656	**59**	0,01898054	**108**	0,080803341	**157**	0,128796345
11	0,000269641	**60**	0,019939554	**109**	0,083078299	**158**	0,127901123
12	0,001387411	**61**	0,020708057	**110**	0,08522456	**159**	0,130286169
13	0,001286826	**62**	0,021685826	**111**	0,086474619	**160**	0,128540423
14	0,000534526	**63**	0,022981879	**112**	0,089639719	**161**	0,129270936
15	0,000996636	**64**	0,023747818	**113**	0,091044947	**162**	0,127077033
16	0,000423341	**65**	0,024424637	**114**	0,093506738	**163**	0,12554827
17	0,000225287	**66**	0,025997415	**115**	0,094354691	**164**	0,125248231
18	0,000258779	**67**	0,027104911	**116**	0,096192125	**165**	0,121758997
19	0,000962384	**68**	0,028198172	**117**	0,09683442	**166**	0,120634666
20	0,000646974	**69**	0,029789615	**118**	0,09758342	**167**	0,116051115
21	0,0006054	**70**	0,031273664	**119**	0,099405023	**168**	0,114149304
22	0,00091597	**71**	0,031954238	**120**	0,099391738	**169**	0,10642448
23	0,000918645	**72**	0,031962166	**121**	0,100174533	**170**	0,101042674
24	0,001578127	**73**	0,03276751	**122**	0,100268539	**171**	0,100304901
25	0,001313161	**74**	0,033557096	**123**	0,102543	**172**	0,099577516
26	0,001741796	**75**	0,034649756	**124**	0,10314481	**173**	0,104939361
27	0,001268255	**76**	0,035812371	**125**	0,105743318	**174**	0,109540939
28	0,002334351	**77**	0,036581761	**126**	0,105943136	**175**	0,111183547
29	0,002887757	**78**	0,037648197	**127**	0,106384234	**176**	0,1212797
30	0,002419283	**79**	0,039228345	**128**	0,107775373	**177**	0,120575024
31	0,002737758	**80**	0,040516111	**129**	0,108269222	**178**	0,12186455
32	0,003327991	**81**	0,041806033	**130**	0,108622292	**179**	0,124589601
33	0,004009327	**82**	0,043240625	**131**	0,111231258	**180**	0,121832451
34	0,003805989	**83**	0,044699765	**132**	0,111503395	**181**	0,121827577
35	0,004762694	**84**	0,045392237	**133**	0,111628787	**182**	0,117071973
36	0,005163103	**85**	0,047427279	**134**	0,113299434	**183**	0,116912621
37	0,005727476	**86**	0,048338742	**135**	0,113324078	**184**	0,114785158
38	0,006124354	**87**	0,050112695	**136**	0,114198642	**185**	0,109959661
39	0,005926738	**88**	0,051452538	**137**	0,116123727	**186**	0,109163622
40	0,006807491	**89**	0,0534853	**138**	0,116636067	**187**	0,099751838
41	0,007324171	**90**	0,055348871	**139**	0,117423278	**188**	0,103442316
42	0,008108583	**91**	0,055599939	**140**	0,118684438	**189**	0,099194623
43	0,008704577	**92**	0,057545098	**141**	0,120938099	**190**	0,097919426
44	0,009033532	**93**	0,059139892	**142**	0,122133108	**191**	0,095666551
45	0,009536521	**94**	0,05990748	**143**	0,121433076	**192**	0,089713905
46	0,010520211	**95**	0,060548142	**144**	0,12301686	**193**	0,089479874
47	0,010625714	**96**	0,06305725	**145**	0,123730441	**194**	0,08232995
48	0,011300841	**97**	0,064525996	**146**	0,125749621	**195**	0,070823278
49	0,012061845	**98**	0,065341855	**147**	0,125441323		

Table 7.47: Mesurements (irradians values, mW / (m^2nm)), in between the Nunc wells on the lower shelf, at time code 10:11.

	09.03.2009 10:11						
1	0	**50**	0,018323261	**99**	0,09460989	**148**	0,176194447
2	0,001955366	**51**	0,018500667	**100**	0,096361077	**149**	0,17503744
3	0,001800687	**52**	0,020507391	**101**	0,097900076	**150**	0,178545344
4	0,001668999	**53**	0,021713842	**102**	0,100569322	**151**	0,179679639
5	0,001630475	**54**	0,022337858	**103**	0,102042036	**152**	0,180279175
6	0,002234718	**55**	0,023922121	**104**	0,10334671	**153**	0,179373128
7	0,000764196	**56**	0,024311544	**105**	0,106718381	**154**	0,179518916
8	0,001978101	**57**	0,024990768	**106**	0,107956862	**155**	0,179262414
9	0,001139488	**58**	0,026448787	**107**	0,110617824	**156**	0,178368498
10	0,000496437	**59**	0,02774773	**108**	0,11267901	**157**	0,179113064
11	0,000463753	**60**	0,028991627	**109**	0,11562866	**158**	0,179305999
12	0,001111647	**61**	0,029953043	**110**	0,118176961	**159**	0,179318312
13	0,000117141	**62**	0,031122139	**111**	0,120210671	**160**	0,17897475
14	0,001057572	**63**	0,032813485	**112**	0,122865626	**161**	0,180211073
15	0,001185009	**64**	0,034046967	**113**	0,125416939	**162**	0,17887538
16	0,000497143	**65**	0,035252952	**114**	0,128243848	**163**	0,17922911
17	0,000802143	**66**	0,03695099	**115**	0,130113963	**164**	0,177537306
18	0,000724307	**67**	0,038248665	**116**	0,132008961	**165**	0,176001683
19	0,000780747	**68**	0,04084759	**117**	0,134042919	**166**	0,172292577
20	0,002291898	**69**	0,042467585	**118**	0,135584036	**167**	0,1693697
21	0,00120053	**70**	0,044485405	**119**	0,136417268	**168**	0,16769296
22	0,001619564	**71**	0,045456088	**120**	0,137091398	**169**	0,160939539
23	0,001716907	**72**	0,046426701	**121**	0,138734025	**170**	0,158289725
24	0,001994966	**73**	0,046925906	**122**	0,140947298	**171**	0,154002173
25	0,002584352	**74**	0,048006465	**123**	0,141232197	**172**	0,157323024
26	0,002731099	**75**	0,049306758	**124**	0,14352497	**173**	0,160186304
27	0,003261308	**76**	0,051892724	**125**	0,145151001	**174**	0,165257745
28	0,003566897	**77**	0,053002616	**126**	0,146485833	**175**	0,168285507
29	0,004212176	**78**	0,054489428	**127**	0,147275951	**176**	0,172785572
30	0,004147674	**79**	0,056353808	**128**	0,148666938	**177**	0,173811429
31	0,00498091	**80**	0,058082798	**129**	0,149457761	**178**	0,176442496
32	0,005678765	**81**	0,060616888	**130**	0,151851782	**179**	0,176042432
33	0,005785299	**82**	0,062426776	**131**	0,15315758	**180**	0,176929425
34	0,006739722	**83**	0,06356525	**132**	0,154129153	**181**	0,174194066
35	0,007572303	**84**	0,065892014	**133**	0,153314066	**182**	0,175098724
36	0,008221291	**85**	0,06749882	**134**	0,155725141	**183**	0,173890512
37	0,008602283	**86**	0,069403247	**135**	0,15779063	**184**	0,167894609
38	0,008701276	**87**	0,071111755	**136**	0,157717404	**185**	0,169207558
39	0,009793292	**88**	0,073377443	**137**	0,159304846	**186**	0,162746452
40	0,010282588	**89**	0,075389441	**138**	0,160582723	**187**	0,156964047
41	0,011183529	**90**	0,077980166	**139**	0,162277851	**188**	0,159130813
42	0,011780501	**91**	0,080119831	**140**	0,164320634	**189**	0,150885141
43	0,01261827	**92**	0,082250691	**141**	0,166498313	**190**	0,153784931
44	0,01325769	**93**	0,083499004	**142**	0,167280602	**191**	0,146256968
45	0,013202285	**94**	0,084990725	**143**	0,167158034	**192**	0,140261974
46	0,015102759	**95**	0,085856801	**144**	0,169402865	**193**	0,140741622
47	0,015483104	**96**	0,088794905	**145**	0,17141741	**194**	0,128875458
48	0,016425595	**97**	0,090379497	**146**	0,174178626	**195**	0,121828001
49	0,017525389	**98**	0,092064653	**147**	0,173410764		

Table 7.48: Mesurements (irradians values, mW / (m^2nm)), underneath the Nunc wells in the left corner, at time code 10:12.

	09.03.2009 10:12						
1	0,003123932	**50**	0,015097435	**99**	0,07958811	**148**	0,145987662
2	0,000468133	**51**	0,015517113	**100**	0,081207191	**149**	0,147272886
3	0,002376575	**52**	0,017211213	**101**	0,082412324	**150**	0,149775523
4	0,001945475	**53**	0,017877462	**102**	0,084775667	**151**	0,149363499
5	0,001876578	**54**	0,018296917	**103**	0,086205276	**152**	0,150560676
6	0,00185631	**55**	0,019458872	**104**	0,087033162	**153**	0,148564252
7	0,000784088	**56**	0,020452255	**105**	0,089742419	**154**	0,147596826
8	0,000718666	**57**	0,021099068	**106**	0,091365979	**155**	0,149608076
9	0,002011732	**58**	0,022303259	**107**	0,093197718	**156**	0,149813177
10	0,001422856	**59**	0,023283379	**108**	0,095331877	**157**	0,148944582
11	0,000597624	**60**	0,023727185	**109**	0,096665237	**158**	0,14831444
12	0,001355345	**61**	0,025216735	**110**	0,099239084	**159**	0,147757019
13	0,000692601	**62**	0,026609973	**111**	0,101828331	**160**	0,148918098
14	0,001070176	**63**	0,027544763	**112**	0,103498886	**161**	0,147752423
15	0,000613396	**64**	0,028515591	**113**	0,105569825	**162**	0,146101024
16	0,000389794	**65**	0,029462369	**114**	0,108299944	**163**	0,147439845
17	0,001316449	**66**	0,030836507	**115**	0,109519283	**164**	0,145107933
18	0,000738631	**67**	0,032474208	**116**	0,110481341	**165**	0,145016928
19	0,000795278	**68**	0,034484965	**117**	0,112009933	**166**	0,143915697
20	0,001523784	**69**	0,035575125	**118**	0,113413145	**167**	0,140823115
21	0,001989256	**70**	0,037681412	**119**	0,11482288	**168**	0,138971572
22	0,001884283	**71**	0,037862416	**120**	0,115116331	**169**	0,130083619
23	0,001488832	**72**	0,03857174	**121**	0,116350408	**170**	0,128401889
24	0,001892359	**73**	0,03941239	**122**	0,117652565	**171**	0,127754362
25	0,001720672	**74**	0,040809834	**123**	0,118511202	**172**	0,1306075
26	0,002227869	**75**	0,041869105	**124**	0,118688847	**173**	0,129799223
27	0,002498469	**76**	0,04299888	**125**	0,122039182	**174**	0,136185838
28	0,003033632	**77**	0,044749918	**126**	0,122356259	**175**	0,135809947
29	0,002779352	**78**	0,046025461	**127**	0,123317071	**176**	0,143728117
30	0,003356791	**79**	0,047365375	**128**	0,124991673	**177**	0,147928217
31	0,004080282	**80**	0,049410251	**129**	0,124253874	**178**	0,143737505
32	0,004028818	**81**	0,05044308	**130**	0,127599746	**179**	0,144436134
33	0,004683503	**82**	0,052005571	**131**	0,126681184	**180**	0,145875349
34	0,004930898	**83**	0,054167504	**132**	0,12785626	**181**	0,143179291
35	0,005601548	**84**	0,055506096	**133**	0,12936952	**182**	0,143554212
36	0,006391481	**85**	0,05679725	**134**	0,130035396	**183**	0,139239381
37	0,006697952	**86**	0,058728836	**135**	0,130902658	**184**	0,134613181
38	0,007240402	**87**	0,059823803	**136**	0,131522165	**185**	0,136065645
39	0,007342071	**88**	0,0615625	**137**	0,133178762	**186**	0,134817948
40	0,008048875	**89**	0,063806595	**138**	0,134731749	**187**	0,122694805
41	0,008743935	**90**	0,065483826	**139**	0,136235719	**188**	0,131999412
42	0,00986436	**91**	0,067404176	**140**	0,136847469	**189**	0,127409971
43	0,010503443	**92**	0,069232981	**141**	0,138961374	**190**	0,119820975
44	0,010868441	**93**	0,070285738	**142**	0,13965713	**191**	0,116865872
45	0,010851652	**94**	0,071921368	**143**	0,14015059	**192**	0,11019504
46	0,012009429	**95**	0,072825559	**144**	0,141277802	**193**	0,115027979
47	0,012526819	**96**	0,075064999	**145**	0,143296302	**194**	0,113340967
48	0,013534249	**97**	0,075609493	**146**	0,1444441	**195**	0,090216015
49	0,013817182	**98**	0,077656313	**147**	0,144687386		

Table 7.49: Mesurements (irradians values, mW / (m^2nm)), underneath the Nunc wells in the middle of the shelf, at time code 10:15.

	09.03.2009 10:15						
1	0,000393444	**50**	0,017671806	**99**	0,096151373	**148**	0,172295636
2	0,001330052	**51**	0,018900571	**100**	0,097023982	**149**	0,173246577
3	0,002058321	**52**	0,020261073	**101**	0,098680079	**150**	0,175333179
4	0,002152832	**53**	0,021629282	**102**	0,101127557	**151**	0,175903189
5	0,002725634	**54**	0,022095225	**103**	0,103507471	**152**	0,17494543
6	0,001822921	**55**	0,023133207	**104**	0,104700923	**153**	0,175877771
7	0,00147035	**56**	0,024384604	**105**	0,10739163	**154**	0,176693072
8	0,001011352	**57**	0,02552184	**106**	0,109644814	**155**	0,174782157
9	0,00141702	**58**	0,026369065	**107**	0,110724044	**156**	0,175656791
10	0,000880032	**59**	0,02796722	**108**	0,113456769	**157**	0,175218867
11	0,00117996	**60**	0,029207249	**109**	0,116292193	**158**	0,177297872
12	0,00029718	**61**	0,030308465	**110**	0,118505184	**159**	0,17754685
13	0,000673836	**62**	0,031895093	**111**	0,120984859	**160**	0,175949025
14	0,000257249	**63**	0,033226189	**112**	0,122859403	**161**	0,177408764
15	0,00071083	**64**	0,034316698	**113**	0,125072154	**162**	0,175035188
16	0,000369666	**65**	0,035451464	**114**	0,128465588	**163**	0,173633178
17	0,000419889	**66**	0,038344678	**115**	0,130452943	**164**	0,176503925
18	0,000201483	**67**	0,038639226	**116**	0,13153675	**165**	0,171799375
19	0,000250369	**68**	0,041038974	**117**	0,133329008	**166**	0,171553179
20	0,000458569	**69**	0,042270555	**118**	0,134146175	**167**	0,168977803
21	0,001064295	**70**	0,044931627	**119**	0,135686278	**168**	0,164987013
22	0,000107881	**71**	0,045838992	**120**	0,136229497	**169**	0,159332918
23	0,000744234	**72**	0,046488068	**121**	0,137737212	**170**	0,158266944
24	0,00083423	**73**	0,048109743	**122**	0,138559345	**171**	0,153978611
25	0,001592945	**74**	0,04928196	**123**	0,14046307	**172**	0,154227338
26	0,00241658	**75**	0,050819566	**124**	0,143002782	**173**	0,160161066
27	0,001708768	**76**	0,052524634	**125**	0,144621113	**174**	0,165231648
28	0,002746876	**77**	0,054157993	**126**	0,145947819	**175**	0,166316474
29	0,003274242	**78**	0,055823019	**127**	0,146460361	**176**	0,171251829
30	0,003743346	**79**	0,057874471	**128**	0,147700756	**177**	0,17482024
31	0,004446425	**80**	0,059016966	**129**	0,148614019	**178**	0,17587553
32	0,004953909	**81**	0,060772791	**130**	0,149573226	**179**	0,174900408
33	0,005434728	**82**	0,062668599	**131**	0,151846629	**180**	0,176897411
34	0,006265093	**83**	0,06431651	**132**	0,153234791	**181**	0,178942581
35	0,006447727	**84**	0,066832283	**133**	0,153757794	**182**	0,175684157
36	0,007036653	**85**	0,068547515	**134**	0,154946923	**183**	0,173211779
37	0,008005348	**86**	0,070385892	**135**	0,155579103	**184**	0,174528658
38	0,008564087	**87**	0,072668186	**136**	0,156582754	**185**	0,1643247
39	0,009243096	**88**	0,074216898	**137**	0,158144702	**186**	0,166297362
40	0,009368089	**89**	0,076246444	**138**	0,160741375	**187**	0,16513722
41	0,010243685	**90**	0,079049575	**139**	0,161753961	**188**	0,162975868
42	0,011036249	**91**	0,080512017	**140**	0,160983773	**189**	0,163029027
43	0,012083244	**92**	0,083457074	**141**	0,165235789	**190**	0,157143484
44	0,012557244	**93**	0,083698342	**142**	0,166538145	**191**	0,154250155
45	0,013355207	**94**	0,085711673	**143**	0,166021428	**192**	0,150581113
46	0,014143827	**95**	0,086797621	**144**	0,167849881	**193**	0,152605212
47	0,015238231	**96**	0,089534663	**145**	0,169424489	**194**	0,148641359
48	0,015534917	**97**	0,091776173	**146**	0,170702427	**195**	0,140369647
49	0,016470391	**98**	0,09380652	**147**	0,171930298		

Table 7.50: Mesurements (irradians values, mW / (m^2nm)), underneath the Nunc wells in the right corner, at time code 10:15.

	09.03.2009 10:15						
1	0,001897999	**50**	0,018763555	**99**	0,099522982	**148**	0,180393166
2	0,002698983	**51**	0,019507167	**100**	0,10154041	**149**	0,180471783
3	0,001921927	**52**	0,021188124	**101**	0,102667458	**150**	0,183217583
4	0,001530761	**53**	0,022470437	**102**	0,105135558	**151**	0,182136292
5	0	**54**	0,022849593	**103**	0,107299992	**152**	0,182563146
6	0,001522421	**55**	0,024270812	**104**	0,108612396	**153**	0,182965194
7	0,000664738	**56**	0,025351575	**105**	0,11152551	**154**	0,183210972
8	0,001410468	**57**	0,026477771	**106**	0,114106281	**155**	0,185420942
9	0,000632001	**58**	0,027690767	**107**	0,11629123	**156**	0,183072785
10	0,000814893	**59**	0,02986809	**108**	0,11754467	**157**	0,183115006
11	0,000637785	**60**	0,030562009	**109**	0,120366415	**158**	0,182278658
12	0,001047515	**61**	0,031422656	**110**	0,12324275	**159**	0,18354382
13	0,000279771	**62**	0,033625411	**111**	0,125834378	**160**	0,183922898
14	0,00065426	**63**	0,034649439	**112**	0,127844222	**161**	0,184062099
15	0,000886211	**64**	0,036333978	**113**	0,13077052	**162**	0,184113614
16	0,000309283	**65**	0,037507758	**114**	0,133312185	**163**	0,182984034
17	0,000357338	**66**	0,039309539	**115**	0,135460904	**164**	0,180393195
18	0,000137025	**67**	0,040708832	**116**	0,137183869	**165**	0,181036705
19	0,00018498	**68**	0,042761432	**117**	0,138693163	**166**	0,178567465
20	0,001045524	**69**	0,044559683	**118**	0,140288559	**167**	0,175846309
21	0	**70**	0,046248874	**119**	0,141420191	**168**	0,172465654
22	0,000922936	**71**	0,047095062	**120**	0,141787737	**169**	0,167850208
23	0,001166844	**72**	0,048404881	**121**	0,142748777	**170**	0,162572433
24	0,001238243	**73**	0,049858009	**122**	0,144386509	**171**	0,160552344
25	0,001757166	**74**	0,050864171	**123**	0,146242106	**172**	0,165415683
26	0,00257098	**75**	0,052577487	**124**	0,147058682	**173**	0,163568255
27	0,002337305	**76**	0,054396816	**125**	0,150174047	**174**	0,168754725
28	0,002882708	**77**	0,056802882	**126**	0,151320592	**175**	0,173841956
29	0,003995367	**78**	0,05779244	**127**	0,15299256	**176**	0,176522327
30	0,003623381	**79**	0,059742472	**128**	0,154068429	**177**	0,180786637
31	0,004863071	**80**	0,061949816	**129**	0,155371695	**178**	0,180441099
32	0,005566632	**81**	0,064180393	**130**	0,155888532	**179**	0,178511674
33	0,005954806	**82**	0,065419907	**131**	0,156696345	**180**	0,185829459
34	0,006298728	**83**	0,067046243	**132**	0,158920961	**181**	0,182230014
35	0,006942248	**84**	0,069710366	**133**	0,159409042	**182**	0,182812666
36	0,007922398	**85**	0,071576537	**134**	0,161027285	**183**	0,17867737
37	0,008301985	**86**	0,073214112	**135**	0,161794105	**184**	0,17286088
38	0,008931159	**87**	0,075929037	**136**	0,164060726	**185**	0,175051607
39	0,009550447	**88**	0,077642502	**137**	0,164968542	**186**	0,176710704
40	0,010033533	**89**	0,07964784	**138**	0,166368861	**187**	0,171484913
41	0,010711607	**90**	0,081834381	**139**	0,166297522	**188**	0,17114121
42	0,011739382	**91**	0,083445124	**140**	0,169826941	**189**	0,162622726
43	0,013106955	**92**	0,08613356	**141**	0,171051353	**190**	0,167786785
44	0,013601467	**93**	0,087645236	**142**	0,1723049	**191**	0,157377923
45	0,01394505	**94**	0,089500979	**143**	0,173247744	**192**	0,161424067
46	0,015535825	**95**	0,090742056	**144**	0,174693718	**193**	0,16800029
47	0,015919423	**96**	0,09320978	**145**	0,176460271	**194**	0,156466569
48	0,016944784	**97**	0,095822339	**146**	0,177734087	**195**	0,15404791
49	0,017561304	**98**	0,097247771	**147**	0,178120279		

Table 7.51: Mesurements (irradians values, mW / (m^2nm)), underneath the Nunc wells in the middle of the top shelf, at time code 10:15.

	09.03.2009 10:15						
1	0,002083746	**50**	0,016705855	**99**	0,086319047	**148**	0,155248837
2	0,003476401	**51**	0,016721319	**100**	0,088220355	**149**	0,157252316
3	0,00125511	**52**	0,018733904	**101**	0,089812998	**150**	0,158434401
4	0,002415485	**53**	0,019230431	**102**	0,092214617	**151**	0,158981033
5	0,001851968	**54**	0,02035268	**103**	0,094004157	**152**	0,158997936
6	0,002234718	**55**	0,021333088	**104**	0,095523765	**153**	0,158483881
7	0,001122246	**56**	0,022222887	**105**	0,097997594	**154**	0,159070602
8	0,000860574	**57**	0,023231856	**106**	0,099372774	**155**	0,157196785
9	0,001282219	**58**	0,024107487	**107**	0,101395415	**156**	0,160030768
10	0,00088727	**59**	0,025287782	**108**	0,10405522	**157**	0,157779637
11	0,00070472	**60**	0,026282107	**109**	0,105471012	**158**	0,160521319
12	0,000880774	**61**	0,027652778	**110**	0,107921525	**159**	0,158255781
13	0,000117141	**62**	0,029074008	**111**	0,110177183	**160**	0,160017996
14	0,001057572	**63**	0,030244694	**112**	0,111887821	**161**	0,157001763
15	0,00141885	**64**	0,03185873	**113**	0,114133046	**162**	0,154347704
16	0,000134842	**65**	0,032556173	**114**	0,117182204	**163**	0,157246396
17	0,000802143	**66**	0,03415622	**115**	0,118486283	**164**	0,157245462
18	0,000208645	**67**	0,035292084	**116**	0,119666804	**165**	0,154041238
19	0,001696195	**68**	0,037272676	**117**	0,121428314	**166**	0,15322811
20	0,000857118	**69**	0,038598637	**118**	0,122106572	**167**	0,150434898
21	0,000813337	**70**	0,040501535	**119**	0,124345871	**168**	0,150051039
22	0,001744957	**71**	0,041140363	**120**	0,124142532	**169**	0,142320346
23	0,001837653	**72**	0,042398146	**121**	0,124998624	**170**	0,139427585
24	0,000725211	**73**	0,043165483	**122**	0,126160085	**171**	0,135341251
25	0,001927469	**74**	0,044842042	**123**	0,128022973	**172**	0,13977268
26	0,002525232	**75**	0,045928792	**124**	0,129747789	**173**	0,14019746
27	0,00268112	**76**	0,04730058	**125**	0,130778702	**174**	0,145528516
28	0,002842462	**77**	0,049017167	**126**	0,132025777	**175**	0,150321451
29	0,003024441	**78**	0,050550587	**127**	0,133672814	**176**	0,150699676
30	0,003507858	**79**	0,052922785	**128**	0,133466688	**177**	0,156690463
31	0,003996112	**80**	0,053859494	**129**	0,134131073	**178**	0,154957465
32	0,004741659	**81**	0,055806155	**130**	0,135531329	**179**	0,157152731
33	0,005091861	**82**	0,057006289	**131**	0,136654067	**180**	0,156760283
34	0,005528856	**83**	0,058609736	**132**	0,137587569	**181**	0,156262611
35	0,006055774	**84**	0,060823152	**133**	0,138093372	**182**	0,155262873
36	0,006646634	**85**	0,062406551	**134**	0,139408219	**183**	0,150742128
37	0,007547577	**86**	0,063657022	**135**	0,140797711	**184**	0,145212834
38	0,008100612	**87**	0,065967879	**136**	0,141957376	**185**	0,148445803
39	0,008495587	**88**	0,067934018	**137**	0,142861856	**186**	0,149101383
40	0,008811607	**89**	0,070023858	**138**	0,144624179	**187**	0,1420283
41	0,009887744	**90**	0,071726568	**139**	0,144617971	**188**	0,137356568
42	0,010300221	**91**	0,072662779	**140**	0,146459185	**189**	0,137070907
43	0,011177491	**92**	0,075281728	**141**	0,148783214	**190**	0,136755649
44	0,011633344	**93**	0,077245484	**142**	0,149156512	**191**	0,134639541
45	0,012337182	**94**	0,077931196	**143**	0,149326865	**192**	0,12423326
46	0,013034647	**95**	0,079230151	**144**	0,15051002	**193**	0,12683639
47	0,013800159	**96**	0,081551196	**145**	0,154769362	**194**	0,116355122
48	0,014492063	**97**	0,083366143	**146**	0,154816082	**195**	0,118545218
49	0,01550518	**98**	0,085072905	**147**	0,154316245		

Table 7.52: Mesurements (irradians values, mW / (m^2nm)), in the middle of the room, at time code 10:16.

	09.03.2009 10:16						
1	0,000783514	**50**	0,017038322	**99**	0,090532023	**148**	0,171251954
2	0,000468133	**51**	0,017862618	**100**	0,093027966	**149**	0,171505116
3	0,004013308	**52**	0,019468378	**101**	0,09443062	**150**	0,173771534
4	0,001945475	**53**	0,020040433	**102**	0,096630317	**151**	0,174295911
5	0,001876578	**54**	0,020679131	**103**	0,098771538	**152**	0,174260239
6	0,000854642	**55**	0,022047905	**104**	0,099391147	**153**	0,174427129
7	0,000605063	**56**	0,02261827	**105**	0,1024272	**154**	0,174946446
8	0,001516899	**57**	0,023622725	**106**	0,103112625	**155**	0,176927426
9	0,001869001	**58**	0,024720085	**107**	0,105456774	**156**	0,175432064
10	0,001553134	**59**	0,02656331	**108**	0,107763574	**157**	0,178312676
11	0,00083859	**60**	0,027461928	**109**	0,110394805	**158**	0,181045321
12	0,00181709	**61**	0,028235831	**110**	0,112169851	**159**	0,178765746
13	0,000692601	**62**	0,029646857	**111**	0,114314448	**160**	0,178707283
14	0,001637333	**63**	0,030599542	**112**	0,116268986	**161**	0,179935999
15	0,001665683	**64**	0,032071475	**113**	0,118433463	**162**	0,179866397
16	0,000752095	**65**	0,033440117	**114**	0,120730039	**163**	0,183202768
17	0,000941145	**66**	0,03496212	**115**	0,122873845	**164**	0,181971449
18	0,001125377	**67**	0,037007631	**116**	0,124570029	**165**	0,182314826
19	0,001449169	**68**	0,038774862	**117**	0,12568558	**166**	0,183483459
20	0,001393349	**69**	0,040604758	**118**	0,127009878	**167**	0,183519235
21	0,000956742	**70**	0,042436353	**119**	0,130153554	**168**	0,183843415
22	0,002762035	**71**	0,043659659	**120**	0,131241333	**169**	0,183564279
23	0,001851069	**72**	0,04467955	**121**	0,132808141	**170**	0,185808402
24	0,001892359	**73**	0,045217955	**122**	0,134695454	**171**	0,184585349
25	0,002924959	**74**	0,046936696	**123**	0,13553078	**172**	0,187646119
26	0,002639602	**75**	0,048349285	**124**	0,136972583	**173**	0,183405668
27	0,002885261	**76**	0,04992242	**125**	0,140200542	**174**	0,18785763
28	0,003124187	**77**	0,051344025	**126**	0,141459453	**175**	0,186789023
29	0,003458058	**78**	0,053234284	**127**	0,143519749	**176**	0,186896006
30	0,00415656	**79**	0,054684891	**128**	0,144847856	**177**	0,190990041
31	0,004913573	**80**	0,05676193	**129**	0,148358574	**178**	0,188318944
32	0,005182179	**81**	0,059342935	**130**	0,147893875	**179**	0,193882706
33	0,005446285	**82**	0,060711201	**131**	0,150278313	**180**	0,195433813
34	0,006074493	**83**	0,062146723	**132**	0,153111714	**181**	0,193387364
35	0,006524653	**84**	0,064784692	**133**	0,152275911	**182**	0,193763708
36	0,007244421	**85**	0,066893991	**134**	0,154202912	**183**	0,193252278
37	0,008082254	**86**	0,068515376	**135**	0,156392036	**184**	0,194653174
38	0,008708691	**87**	0,070478977	**136**	0,15741364	**185**	0,197658851
39	0,008912978	**88**	0,072355497	**137**	0,158500966	**186**	0,197298002
40	0,009659951	**89**	0,074058691	**138**	0,159761464	**187**	0,194386392
41	0,009967731	**90**	0,076329911	**139**	0,16058235	**188**	0,198877452
42	0,011122599	**91**	0,078042904	**140**	0,161888519	**189**	0,19485594
43	0,011944221	**92**	0,080140924	**141**	0,165623494	**190**	0,198155671
44	0,012338087	**93**	0,08084496	**142**	0,166385585	**191**	0,195506913
45	0,012896441	**94**	0,082199212	**143**	0,165114228	**192**	0,191281475
46	0,013441199	**95**	0,08355442	**144**	0,165375818	**193**	0,196472908
47	0,014129624	**96**	0,085824037	**145**	0,168070184	**194**	0,199939958
48	0,01482327	**97**	0,087801939	**146**	0,170124947	**195**	0,201830643
49	0,015756584	**98**	0,089564132	**147**	0,169237481		

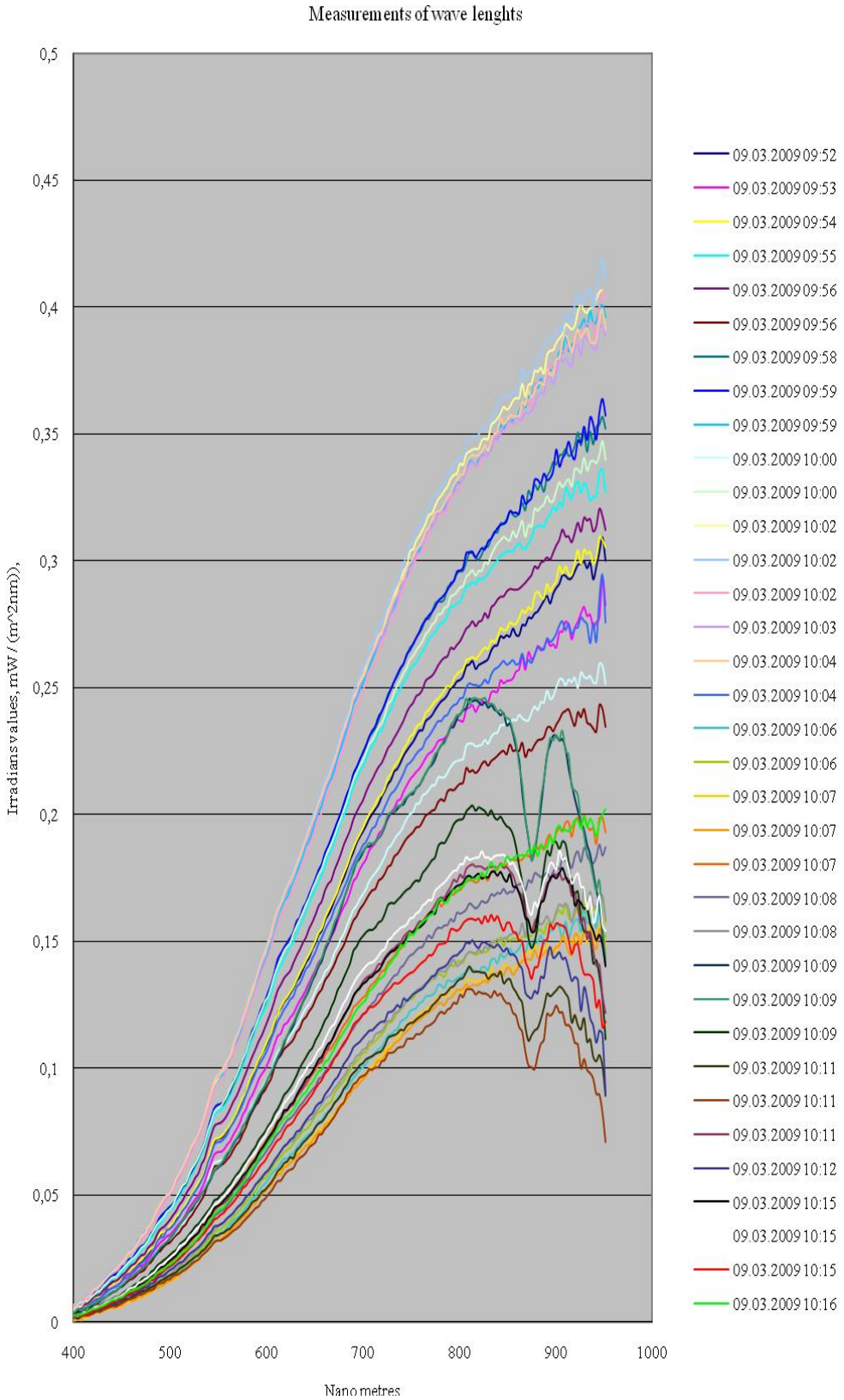

Figure 7.1: The graph shows the different measurements taken from all the different sample points described above in tables 7.17-7.52. All 195 measure points are registered for each mesurement and expressed in the graph.

Table 7.53: Mesurements (irradians values, mW / (m^2nm)), in front of light source, at time code 10:17.

	09.03.2009 10:17						
1	0,529888879	**50**	28,6989808	**99**	129,3300786	**148**	218,617847
2	0,550371131	**51**	30,07584615	**100**	131,4671369	**149**	219,7965175
3	0,562206689	**52**	31,4658894	**101**	133,6840854	**150**	220,8622438
4	0,668919111	**53**	32,87420941	**102**	135,8814225	**151**	221,9989014
5	0,742325639	**54**	34,37789615	**103**	138,1529907	**152**	223,0960746
6	0,831061617	**55**	35,8798888	**104**	140,3634987	**153**	224,2791572
7	0,945802358	**56**	37,37348349	**105**	142,6115951	**154**	225,4923052
8	1,114163838	**57**	39,12523593	**106**	144,8103492	**155**	226,6658984
9	1,267972561	**58**	40,90707693	**107**	146,9383022	**156**	227,8272986
10	1,437969822	**59**	42,78577704	**108**	149,0758599	**157**	229,1783134
11	1,564275725	**60**	44,53657954	**109**	151,3142509	**158**	230,3650694
12	1,803108462	**61**	46,23832604	**110**	153,5477948	**159**	231,7135037
13	2,007081509	**62**	48,04414488	**111**	155,6539983	**160**	233,1131106
14	2,220623464	**63**	49,88890092	**112**	158,1940109	**161**	234,4623043
15	2,489020243	**64**	51,73125046	**113**	160,6123202	**162**	235,7755235
16	2,743098642	**65**	53,60489875	**114**	163,126046	**163**	237,1812093
17	3,015010653	**66**	55,5245343	**115**	165,0722516	**164**	238,6665375
18	3,352196186	**67**	57,43767735	**116**	167,0049851	**165**	239,986821
19	3,669252785	**68**	59,43601225	**117**	168,9445433	**166**	241,5713962
20	4,017428667	**69**	61,46475323	**118**	170,6051157	**167**	242,9682946
21	4,43212667	**70**	63,57287633	**119**	172,3090134	**168**	244,5020044
22	4,850098914	**71**	65,67723855	**120**	173,931056	**169**	245,7498951
23	5,292133617	**72**	67,784421	**121**	175,7395134	**170**	247,6694151
24	5,780471668	**73**	69,91239054	**122**	177,5974209	**171**	249,4698868
25	6,296195165	**74**	72,07776771	**123**	179,4373711	**172**	251,0861427
26	6,779008146	**75**	74,2550152	**124**	181,2706033	**173**	252,9948521
27	7,326687136	**76**	76,47945902	**125**	183,2142028	**174**	254,6709856
28	7,922013535	**77**	78,6920343	**126**	185,1183912	**175**	256,283367
29	8,486789394	**78**	80,93377436	**127**	186,9132189	**176**	257,7751403
30	9,145454175	**79**	83,19110237	**128**	188,6852703	**177**	259,239049
31	9,809983028	**80**	85,48630417	**129**	190,4436725	**178**	260,900133
32	10,49865739	**81**	87,77997166	**130**	192,1420121	**179**	262,0590733
33	11,20789289	**82**	90,06105194	**131**	193,9201664	**180**	263,9245054
34	11,95164753	**83**	92,3925973	**132**	195,6572279	**181**	265,5873234
35	12,70826218	**84**	94,78764486	**133**	197,2660245	**182**	267,2978633
36	13,5180052	**85**	97,19002035	**134**	198,8227525	**183**	268,8665682
37	14,39661808	**86**	99,51262985	**135**	200,4508518	**184**	270,2862471
38	15,25797503	**87**	101,831526	**136**	202,0004608	**185**	271,8015016
39	16,20870735	**88**	104,0627528	**137**	203,6295945	**186**	273,1700741
40	17,19472391	**89**	106,3062968	**138**	205,1178938	**187**	274,6699639
41	18,21174762	**90**	108,5697719	**139**	206,4513713	**188**	275,9909782
42	19,26428049	**91**	110,9338448	**140**	207,7989923	**189**	277,3429524
43	20,32664335	**92**	113,2533295	**141**	209,0958613	**190**	278,1419472
44	21,41223237	**93**	115,6472249	**142**	210,3922814	**191**	278,5165965
45	22,56495043	**94**	117,8017735	**143**	211,7913264	**192**	280,9763345
46	23,72690681	**95**	120,021703	**144**	213,2919409	**193**	283,3073752
47	24,90664545	**96**	122,279959	**145**	214,6413334	**194**	285,1114644
48	26,16326642	**97**	124,616265	**146**	215,9268017	**195**	286,6423594
49	27,40953075	**98**	126,9249205	**147**	217,3175607		

Table 7.54: Mesurements (irradians values, mW / (m^2nm)), in front of the light source, at time code 10:17.

	09.03.2009 10:17						
1	0,482931912	**50**	29,38893033	**99**	131,7376903	**148**	221,9595475
2	0,52711621	**51**	30,7891671	**100**	133,903059	**149**	223,116012
3	0,602458204	**52**	32,18201999	**101**	136,1447534	**150**	224,1722206
4	0,64989754	**53**	33,64995938	**102**	138,3620424	**151**	225,3679654
5	0,746657055	**54**	35,14938071	**103**	140,6729853	**152**	226,5522338
6	0,854211275	**55**	36,70489239	**104**	142,9234785	**153**	227,6262998
7	1,012320069	**56**	38,26120581	**105**	145,2377475	**154**	228,9653378
8	1,122394508	**57**	40,01261141	**106**	147,4257349	**155**	230,1595062
9	1,284465902	**58**	41,85111598	**107**	149,5785604	**156**	231,3016392
10	1,436348587	**59**	43,75809443	**108**	151,7444813	**157**	232,6059455
11	1,605186518	**60**	45,52691291	**109**	153,9918018	**158**	233,8771087
12	1,823835683	**61**	47,28865224	**110**	156,2716783	**159**	235,1734796
13	2,030900533	**62**	49,13032928	**111**	158,4602036	**160**	236,5468574
14	2,273659022	**63**	50,99442244	**112**	160,9419969	**161**	237,9243768
15	2,524979892	**64**	52,87922377	**113**	163,4273757	**162**	239,3392215
16	2,811157503	**65**	54,78848486	**114**	165,960057	**163**	240,6628629
17	3,117538231	**66**	56,75021095	**115**	167,9111963	**164**	242,0821809
18	3,424847241	**67**	58,73617832	**116**	169,8501498	**165**	243,5630813
19	3,772247871	**68**	60,74557187	**117**	171,8404269	**166**	245,0891701
20	4,115979158	**69**	62,82994749	**118**	173,5157177	**167**	246,4922302
21	4,525511843	**70**	64,91682552	**119**	175,1853322	**168**	248,007207
22	4,956878095	**71**	67,08014269	**120**	176,9199908	**169**	249,2944964
23	5,429729899	**72**	69,24116973	**121**	178,723629	**170**	250,9971705
24	5,908319287	**73**	71,38723867	**122**	180,5673394	**171**	252,9253616
25	6,434967929	**74**	73,59585291	**123**	182,3987212	**172**	254,562671
26	6,955595819	**75**	75,81822445	**124**	184,2644435	**173**	256,4345485
27	7,520426915	**76**	78,05884249	**125**	186,2145582	**174**	258,1525161
28	8,07736474	**77**	80,31661601	**126**	188,1477804	**175**	259,8507155
29	8,721923381	**78**	82,57854205	**127**	190,0103642	**176**	261,3026372
30	9,361996251	**79**	84,89316074	**128**	191,8035888	**177**	262,6858396
31	10,06114871	**80**	87,23221475	**129**	193,5407162	**178**	264,3826178
32	10,74688631	**81**	89,58011211	**130**	195,2828558	**179**	265,6612036
33	11,49106217	**82**	91,88919781	**131**	197,1518952	**180**	267,3472409
34	12,25433409	**83**	94,27834324	**132**	198,8171955	**181**	269,1757396
35	13,01127503	**84**	96,6917806	**133**	200,42282	**182**	270,7812591
36	13,86571279	**85**	99,11345436	**134**	202,0669807	**183**	272,2742391
37	14,73752257	**86**	101,4681022	**135**	203,6913944	**184**	273,8643342
38	15,64584069	**87**	103,8026923	**136**	205,2559608	**185**	274,9818949
39	16,62530866	**88**	106,130837	**137**	206,8845757	**186**	276,6772559
40	17,61301203	**89**	108,3961488	**138**	208,4271171	**187**	278,0779695
41	18,63932445	**90**	110,7260475	**139**	209,7302034	**188**	279,5896043
42	19,75599678	**91**	113,0866019	**140**	211,0076712	**189**	280,765271
43	20,82800049	**92**	115,472445	**141**	212,3746857	**190**	281,5917012
44	21,93353557	**93**	117,876713	**142**	213,6882214	**191**	281,9084878
45	23,11512091	**94**	120,0528866	**143**	215,104462	**192**	284,1929726
46	24,2884435	**95**	122,3428769	**144**	216,645528	**193**	286,505137
47	25,50573837	**96**	124,6034378	**145**	218,0001872	**194**	288,5373993
48	26,77325988	**97**	126,9800411	**146**	219,3222899	**195**	290,0603446
49	28,07567912	**98**	129,328722	**147**	220,6722275		

Table 7.55: Mesurements (irradians values, mW / (m^2nm)), in front of the light source, at time code 10:17.

	09.03.2009 10:17						
1	0,498980496	**50**	29,78616528	**99**	133,7664044	**148**	225,8049024
2	0,522248901	**51**	31,19421147	**100**	136,0209849	**149**	227,0678665
3	0,571905849	**52**	32,65022064	**101**	138,3210757	**150**	228,124935
4	0,685728871	**53**	34,09985734	**102**	140,5712975	**151**	229,3383344
5	0,76437648	**54**	35,63598771	**103**	142,9100063	**152**	230,4641126
6	0,889469986	**55**	37,19571025	**104**	145,1891846	**153**	231,6569297
7	1,015184468	**56**	38,78723802	**105**	147,4902021	**154**	232,903683
8	1,099405397	**57**	40,59626438	**106**	149,7804857	**155**	234,1061016
9	1,295884369	**58**	42,42994578	**107**	151,9520935	**156**	235,3186807
10	1,467615257	**59**	44,36279449	**108**	154,2155892	**157**	236,6797989
11	1,622536121	**60**	46,17016744	**109**	156,4903598	**158**	238,0529998
12	1,866316225	**61**	47,95227847	**110**	158,7240652	**159**	239,3064164
13	2,079539382	**62**	49,8298014	**111**	160,9592107	**160**	240,7498406
14	2,282733547	**63**	51,70202039	**112**	163,521109	**161**	242,1478523
15	2,579231154	**64**	53,6199419	**113**	166,0759311	**162**	243,5235794
16	2,847870642	**65**	55,57486546	**114**	168,6549928	**163**	244,9622881
17	3,135552838	**66**	57,56042805	**115**	170,6539471	**164**	246,4922749
18	3,468162855	**67**	59,54247068	**116**	172,6725449	**165**	247,851991
19	3,820374243	**68**	61,57443195	**117**	174,6189409	**166**	249,2617704
20	4,193196366	**69**	63,69349677	**118**	176,3419299	**167**	250,8346113
21	4,58126761	**70**	65,88220713	**119**	178,0805361	**168**	252,431494
22	5,019073067	**71**	68,05407949	**120**	179,7834004	**169**	253,7884564
23	5,493483558	**72**	70,26728177	**121**	181,6677071	**170**	255,6749812
24	5,995124333	**73**	72,44596265	**122**	183,5328021	**171**	257,3971969
25	6,524304112	**74**	74,67633506	**123**	185,4124565	**172**	259,2170224
26	7,039589334	**75**	76,93777887	**124**	187,3237503	**173**	261,0065422
27	7,611709809	**76**	79,19260747	**125**	189,3231559	**174**	262,8499517
28	8,197621062	**77**	81,50964204	**126**	191,2955623	**175**	264,5815738
29	8,810155185	**78**	83,8092442	**127**	193,1242703	**176**	265,8563475
30	9,504035341	**79**	86,14113808	**128**	194,9871512	**177**	267,525366
31	10,20295969	**80**	88,52235605	**129**	196,7442727	**178**	269,2554228
32	10,87952283	**81**	90,9001771	**130**	198,491315	**179**	270,5591921
33	11,64084478	**82**	93,29918141	**131**	200,4248024	**180**	272,3537982
34	12,39963799	**83**	95,69612436	**132**	202,1656847	**181**	274,1965468
35	13,17690643	**84**	98,17223202	**133**	203,8828907	**182**	275,571617
36	14,03472597	**85**	100,5982898	**134**	205,4338082	**183**	277,1405439
37	14,93475264	**86**	103,0181465	**135**	207,1680196	**184**	278,8276403
38	15,83912095	**87**	105,388476	**136**	208,7270266	**185**	280,1751019
39	16,83840551	**88**	107,700045	**137**	210,3652278	**186**	281,6986414
40	17,8450069	**89**	110,0656116	**138**	211,945388	**187**	283,2517123
41	18,9099994	**90**	112,4098289	**139**	213,2717811	**188**	284,8029808
42	19,99165744	**91**	114,8094792	**140**	214,6976364	**189**	285,6928897
43	21,11069635	**92**	117,2484197	**141**	216,0078916	**190**	286,5914983
44	22,24169713	**93**	119,6596839	**142**	217,3408661	**191**	287,2989737
45	23,41334546	**94**	121,8916862	**143**	218,7833139	**192**	289,6993073
46	24,62825027	**95**	124,2059121	**144**	220,3747443	**193**	291,6699374
47	25,84809753	**96**	126,5515693	**145**	221,7071527	**194**	293,829328
48	27,14578699	**97**	128,9222007	**146**	223,1214247	**195**	295,4703713
49	28,43640772	**98**	131,2846633	**147**	224,5095963		

Table 7.56: Mesurements (irradians values, mW / (m^2nm)), in front of the light source, at time code 10:18.

	09.03.2009 10:18						
1	0,021327186	**50**	0,297855975	**99**	0,404306659	**148**	0,436083163
2	0,024939881	**51**	0,553158876	**100**	0,381905888	**149**	0,894124568
3	0,026503236	**52**	0,842482932	**101**	0,423242698	**150**	1,987971552
4	0,030422536	**53**	0,959846857	**102**	0,447126518	**151**	2,775368472
5	0,034091478	**54**	0,856236437	**103**	0,417733196	**152**	2,566330669
6	0,038205726	**55**	0,654355975	**104**	0,373357971	**153**	1,686272556
7	0,037563767	**56**	0,439301104	**105**	0,363987886	**154**	1,238116771
8	0,039424098	**57**	0,264933591	**106**	0,359781859	**155**	1,175251204
9	0,038328801	**58**	0,16357009	**107**	0,337754008	**156**	1,369392049
10	0,03496215	**59**	0,124323483	**108**	0,311648394	**157**	1,356761324
11	0,031012978	**60**	0,110903731	**109**	0,295402896	**158**	0,980659153
12	0,028649606	**61**	0,104535915	**110**	0,292692774	**159**	0,577621185
13	0,034632209	**62**	0,098608455	**111**	0,300986856	**160**	0,392179724
14	0,0773466	**63**	0,09526675	**112**	0,32534514	**161**	0,340063044
15	0,120976888	**64**	0,104587209	**113**	0,349352066	**162**	0,363169192
16	0,10732218	**65**	0,155499307	**114**	0,353759476	**163**	0,423189844
17	0,045908162	**66**	0,33143693	**115**	0,327733348	**164**	0,425285687
18	0,021035663	**67**	0,884984129	**116**	0,306959682	**165**	0,365124877
19	0,01680834	**68**	2,10269913	**117**	0,338064172	**166**	0,31457665
20	0,016973022	**69**	3,424222223	**118**	0,485467998	**167**	0,297293051
21	0,015598367	**70**	3,811462758	**119**	0,67667935	**168**	0,302905075
22	0,014228536	**71**	3,019155388	**120**	0,750642322	**169**	0,36557459
23	0,012530343	**72**	1,85833807	**121**	0,634390895	**170**	0,632121263
24	0,015333802	**73**	1,008245401	**122**	0,449543343	**171**	1,09958309
25	0,035160918	**74**	0,515839857	**123**	0,31683303	**172**	1,297461654
26	0,114264971	**75**	0,290145769	**124**	0,260380648	**173**	1,034042019
27	0,191586	**76**	0,207923566	**125**	0,240734051	**174**	0,70196586
28	0,174131252	**77**	0,196374109	**126**	0,233983179	**175**	0,767680762
29	0,089267258	**78**	0,256229124	**127**	0,232606076	**176**	1,028390972
30	0,055537317	**79**	0,442805571	**128**	0,234603892	**177**	1,054013548
31	0,051460029	**80**	0,783596099	**129**	0,239544627	**178**	0,768116376
32	0,056827122	**81**	1,191424098	**130**	0,246589255	**179**	0,490809061
33	0,074404846	**82**	1,512041982	**131**	0,254720135	**180**	0,367415768
34	0,137819685	**83**	1,588314555	**132**	0,286543874	**181**	0,319173197
35	0,358190998	**84**	1,431697412	**133**	0,439124884	**182**	0,309335088
36	0,798538716	**85**	1,176784324	**134**	0,903310395	**183**	0,304135898
37	0,937109983	**86**	0,969814807	**135**	1,381997548	**184**	0,309692766
38	0,615008338	**87**	0,988150693	**136**	1,394325676	**185**	0,305927559
39	0,288632952	**88**	1,753383069	**137**	0,999304116	**186**	0,304623254
40	0,190061488	**89**	3,67574886	**138**	0,722752746	**187**	0,308976763
41	0,172260717	**90**	5,116578387	**139**	0,548833021	**188**	0,308094302
42	0,170433679	**91**	4,701757692	**140**	0,388561588	**189**	0,309793982
43	0,169856891	**92**	3,109866933	**141**	0,3254968	**190**	0,316887608
44	0,170552781	**93**	2,006462131	**142**	0,35503071	**191**	0,306716465
45	0,171638449	**94**	1,505986217	**143**	0,39831673	**192**	0,300130062
46	0,171607603	**95**	1,324467589	**144**	0,390633368	**193**	0,311135891
47	0,167633827	**96**	1,139298386	**145**	0,334836944	**194**	0,32143359
48	0,16374102	**97**	0,831589127	**146**	0,302696094	**195**	0,311743087
49	0,186378987	**98**	0,538504705	**147**	0,308028287		