Universidade de Aveiro
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Departamento de Biologia

Mariana Isabel Teixeira Ribeiro

Efeitos da disponibilidade de alimento e luz na fotossíntese e no investimento maternal em lesmas do mar *Elysia viridis*

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Effects of food availability and irradiance on photosynthesis and reproductive investment in sea slugs *Elysia viridis*

Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Biologia Marinha, realizada sob a orientação científica da Doutora Sónia Cruz, Investigadora auxiliar do Departamento de Biologia & CESAM, e coorientação do Doutor Paulo Cartaxana, Investigador em pós-doutoramento do Departamento de Biologia & CESAM e do Doutor Ricardo Calado, Investigador principal do Departamento de Biologia & CESAM.

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palavras-chave

Lesmas do mar, simbiose, fotossíntese, cleptoplastia, Sacoglossa, investimento maternal.

resumo

Este trabalho pretende investigar o papel das componentes heterotrófica e autotrófica no investimento maternal da lesma do mar *Elysia viridis*. Foram efetuadas duas experiências para testar a importância da disponibilidade de alimento – *Codium tomentosum* – e para testar a importância da componente autotrófica, com três regimes diferentes de comida e de luz. Os resultados sugerem que o investimento maternal é maior quando a comida existe em abundância e menor quando os animais não têm acesso ao alimento; foi notado também uma relação positiva entre a abundância de alimento e o comprimento do animal, o tamanho das suas posturas e dos seus ovos. O estudo que investigou o investimento maternal em três diferentes regimes de luz teve algumas limitações experimentais, no entanto, pode-se observar que as lesmas do mar expostas a uma intensidade média de luz têm um maior investimento na reprodução. Logo concluímos que ambas as componentes heterotrófica e autotrófica influenciam o investimento destes animais na sua reprodução.

keywords

Sea alugs, symbiosis, phothosynthesis, kleptoplasty, Sacoglossa, maternal investment.

abstract

This work aims to investigate the role of food and light availability in the photosynthesis and maternal investment of the sea slug *Elysia viridis*. Two experiments were conducted to test the importance of food – *Codium tomentosum* – and to test the importance of the autotrophic component with three different food and light regimes, respectively. The results suggest that maternal investment is greater when food exists in abundance and less when animals are starving. A positive relationship was also observed between the abundance of food and the length of the animal, the egg mass area and egg volume. The study investigating the maternal investment in three different light regimes had some experimental limitations; however, it was observed that sea slugs exposed to an average light intensity had a greater investment in reproduction. It can be concluded that both heterotrophic and autotrophic components influence the investment of these sea slugs in their reproduction.

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Abbreviations

ASW – Artificial Sea Water

LSS – Life Supporting System

Chl – Chlorophyll

PS – Photosystem

RC – Reaction Centre

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1. INTRODUCTION

1.1. Photosynthesis, symbiosis and kleptoplasty

Photoautotrophic organisms need inputs of carbon dioxide, water and light to survive and grow. The chemical process by which these organisms use these inputs to produce glucose is called photosynthesis and occurs within the chloroplasts. The main products of photosynthesis are glucose, fatty acids and glycerol and the by-product is oxygen (Berry and Downton, 1982; Baker, 2008).

Chloroplasts are relatively well-known organelles when occurring in plants, algae and in some protists. However, they are also found in organisms phylogenetic distant from those where these plastids evolved. Some marine organisms like dinoflagellates, ciliates and foraminiferans have chloroplasts living intra-cellularly (Pierce and Curtis, 2012). These organisms eat algae by piercing its cell wall and sucking the cell content. The majority of cell organelles are digested, but functional chloroplasts are retained intracellularly in the animal host (Rumpho *et al.*, 2000; Rumpho *et al.*, 2011; Pierce and Curtis, 2012; Dionísio *et al.*, 2013). These organisms keep the chloroplasts in their animal tissues functioning and continuing to photosynthesize without the support of the whole native algal cell (Rumpho *et al.*, 2011; Pierce and Curtis, 2012).

There are two types of functional photosynthetic systems in sea slugs:

- The incorporation of unicellular dinoflagellate algae, commonly called zooxanthellae. An example of this type of symbiosis is the coral reefs that depend energetically on the association between the cnidarian host and the dinoflagellate algae of the genus *Symbiodinium*. Also, nudibranchs mollusc exhibits this type of association with zooxanthellae (Rudman, 1982; Hoegh-Guldberg and Hinde, 1986).
- The intracellularly incorporation and maintenance of functional chloroplasts or kleptoplasty (Rudman, 1987; Jones *et al.*, 1994). In metazoans, only sacoglossan sea slugs (Heterobranchia) are capable of displaying this type of association (Pierce and Curtis, 2012).

1.2. Sacoglossan sea slugs

Opisthobranchia is a infraclass of gastropod molluscs. Opisthobranchia means "rewarded gills" and most opisthobranch species have gills at the rear end of their body. These animals usually have on their head a pair of rhinophores, a pair of oral tentacles and one eye at the base of each tentacle. Opistobranchs are usually hermaphrodites and constitute a very wide group ranging from sea butterflies, sea hares and a great diversity of sea slugs (Ansell *et al.*, 1999). The species of this subclass have a wide range of feeding habits, and while some show a large variety of prey species, others feed exclusively on one species. Opisthobranchs are used as model organisms for scientific studies and as ornamental species in aquariums (Dionísio *et al.*, 2013).

The distribution pattern of sacoglossan fossils indicates that these animals originated as part of the Tethys sea fauna (sea that originated the Mediterranean Sea). The first definitive sacoglossan fossils are bivalve's shells from the Eocene (*Berthelinia*). Sacoglossa is an order of small sea snails and sea slugs with about 300 species described (Jensen, 2007).

Sacoglossan sea slugs are one of the few specialized herbivore groups in the sea. These animals use their radula to pierce into the algae wall and feed on the cell sap; they feed on siphonous green algae with voluminous cells (Marín and Ros, 2004). Most genera of Sacoglossa feed strictly on one green algae order, eating all or some species from a certain algal genus (Clarck and Busacca, 1978; Jensen, 1997).

1.2.1. *Elysia viridis* and *Codium tomentosum*

Elysia viridis (Montagu, 1804) (Figure 1) is geographically distributed in the northern Europe, British Isles, Mediterranean, Iberian Peninsula and northern Africa. This sea slug has a life span of over a year (12-15 months) and can grow up to 5 centimetres in length or more depending on their food source and availability. When sexually mature produce egg masses from April to October (Trowbridge, 2000; Trowbridge and Todd, 2001). On European coasts *E. viridis* feeds on several species: *Codium tomentosum, C. fragile* ssp. *tomentosoides, C. fragile* ssp. *atlanticum, C. vermilara, Bryopsis plumose,* *Cladophora rupestris*, *Chaetomorpha linum* and *Griffithsia devoniensis* (Trowbridge and Todd, 2001).

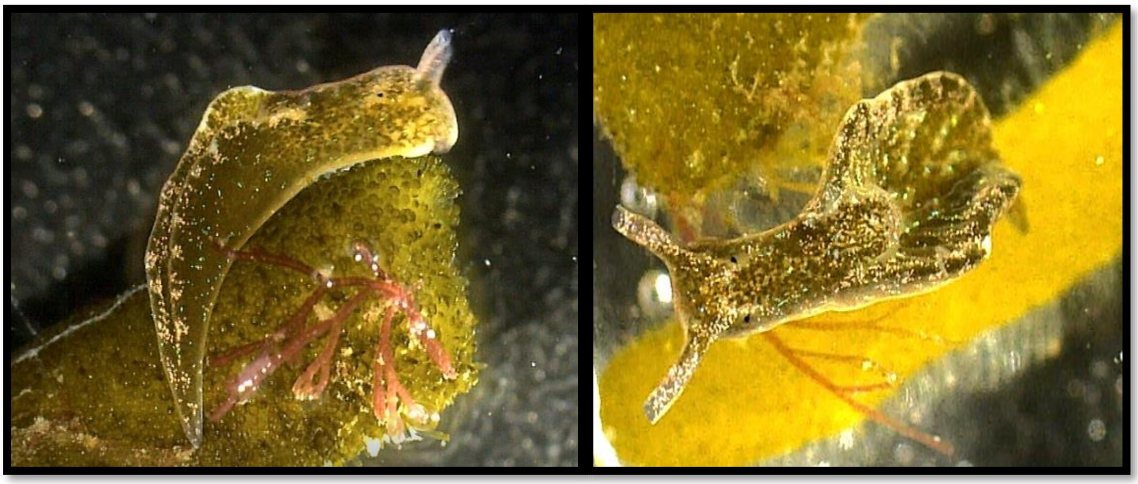

Figure 1 – Photographs of *Elysia viridis* feeding on *Codium tomentosum.* Photographs taken with a binocular Leica LAS EZ DMS 300 and the software Leica Application Suite.

The green macroalgae genus *Codium* (Chlorophyta: Codiaceae) contains around 100 described species, making it one of the most diverse genera of marine algae (Ansell *et al.*, 1998). It is worldwide distributed and has various species and subspecies recognized (Rojo *et al.*, 2014). *Codium tomentosum* (Stackhouse, 1797) (Figure 2) is found in the intertidal zone. It is presumed to have originated from north western Pacific shores, particularly Japan. This macroalgae usually grows up to 30 centimeters in length and has a dichotomus struture with thin branches (Ansell *et al.*, 1998; Rojo *et al.*, 2014).

Figure 2. Photographs of *Codium tomentosum* collected in Aguda beach, Portugal.

1.3. Autotrophy significance in Sacoglossa

Sacoglossan sea slug species are mixotrophic organisms, which means they acquire carbon from both heterotrophic and autotrophic metabolisms (Anthony *et al.*, 2000; Cartaxana *et al.*, 2017).

The photoautotrophic component may be important for the Sacoglossan sea slugs nutrition. It has been shown, in laboratory conditions, that photosynthesis is not enough for the survival and growth of these animals, nevertheless is a nutritional benefit particularly in times of food scarcity (Cartaxana *et al.*, 2017).

In the animal cells, the chloroplasts are densely packed occupying most of the cell cytoplasm (Trench *et al.*, 1973; Rumpho *et al.*, 2000; Hawes, 1979). The photosynthesis products such as carbohydrates, lipids and aminoacids are translocated from the "foreign" organelle to the host tissues (Trench *et al.*, 1973). Also kleptoplastic sea slugs are probably more capable of maintaining big populations under low food sources conditions when compared to animals that require continuous feeding (Middlebrooks *et al.*, 2012). Although sacoglossan sea slugs have the chloroplasts in their digestive cells, their number, anatomy and distribution are distinct in different species (Pierce *et al.*, 2015). The kleptoplasts provide some metabolites to the sea slugs, however eventually the animals need to ingest food again, at least to replace the chloroplasts (Casalduero and Muniain, 2008).

1.3.1. Kleptoplasty

A few species of sacoglossan sea slugs, such as *E. viridis*, perform kleptoplasty. These sea slugs, when feeding, digest the cellular organelles of the algae except for the chloroplasts, that are kept intracellularly in the animal's body. The mechanism performed by the animals to "steel" the chloroplasts is not yet fully known (Rumpho *et al.*, 2007; Rumpho *et al.*, 2011; Dionísio *et al.*, 2013; Schmitt *et al.*, 2014). This ability was first called chloroplast symbiosis, however according to Clark *et al.* (1990), Ghilarov (1983) termed the ability of Sacoglossa to maintain chloroplasts in their cells as kleptoplasty, and these organelles were called kleptoplasts.

The kleptoplasts do not divide but remain structurally intact and photosynthetically competent inside the slug's cells for periods ranging from a few days (e.g. *Thuridilla sp.*, *Elysia atroviridis*) to several months (*E. viridis*, *E. crispata*, *E. timida*) (Clark and Busacca, 1978; Jensen, 2007; Rumpho *et al.*, 2011; Schmitt *et al.*, 2014). The chloroplasts are harboured inside digestive cells in the sea slugs; in most cases, the digestive system occupies most of the animal's body conferring them a green coloration and because of this, sea slugs are often called 'leaves that crawl' or 'solar-powered slugs' (Trench, 1974; Rumpho *et al.*, 2000). Even though there is a small number of species that can perform kleptoplasty, these organisms form large populations, which means this adaptation became an effective and well-adapted life form (Serôdio *et al.*, 2014).

The most studied cases of kleptoplasty involve Sacoglossa of the genus *Elysia* (Serôdio *et al.*, 2014); *E. viridis* can retain a large number of functional chloroplasts in their digestive cells for up to 3 months (Gallop *et al.*, 1980; Evertsen and Johnsen, 2009).

Kleptoplasty is clearly beneficial to the animal host. For the *Oxynoe viridis/Caulerpa longifolia* association it was calculated that up to 60% of the sea slug carbon input derives from the kleptoplast (Raven *et al.*, 2001). In the association *E. viridis/Codium fragile* the assimilation of nitrogen by the sea slug is mediated by the kleptoplast (Teugels *et al.*, 2008). Recent studies show that this symbiosis can be beneficial for both the sea slug and the plastid since the photosynthetic performance of kleptoplasts seem to be improved in relation to the corresponding chloroplasts in the algae and it is possible that the animal is supplying the plastid with carbon dioxide and nutrients (Serôdio *et al.*, 2014; Evertsen and Johnsen, 2009).

1.3.2. Long-term kleptoplasty

When sea slugs retain chloroplasts for a long period of time, a chloroplast maintenance mechanism is required (Pierce *et al.*, 2015). Light exposure causes damage to the photosynthetic system mostly by inactivating the photosystem II (PSII) reaction centre (Tyystjarvi and Aro, 1996) and has been shown to affect the retention of photosynthetic activity in *E. viridis* (Vieira *et al.*, 2009). Sacoglossan sea slugs are known to display some mechanical or behavioural adaptations with the apparent purpose of minimizing light exposure to slow the damage of the plastids. These behavioural adaptations include: crawling away from the light source, contraction of the parapodia, and rolling over on their side (Serôdio *et al.*, 2014; Pierce *et al.*, 2015).

Kleptoplasty is one of the most puzzling photosynthetic systems due to the absence of the original nuclear genes. Some chloroplast proteins in plants have a turnover rate of 30-120 min and it is expected that sacoglossan kleptoplasts also need these proteins in order to remain functional (Greenberg *et al.*, 1987). It has been shown that chloroplast proteins, pigments and gene expression continues for months after the chloroplast is incorporated into the sea slugs cells (Pierce and Curtis, 2012). The sea slugs keep the kleptoplasts active and functional continuing to photosynthesize without the native algal cell nucleus, which are digested during feeding (Rumpho *et al.*, 2011; Pierce and Curtis, 2012). One explanation exploited by several scientists over time was the presence and function of several horizontally-transferred nuclear genes from its algal food source in the slugs' genome (Rumpho *et al.*, 2007; Pierce *et al.*, 2012), however recent studies refute this theory (Rumpho *et al.*, 2011; Bhattacharya *et al.*, 2013).

1.4. Variable chlorophyll *a* fluorescence

An innovative method to explore kleptoplast functionality has been introduced by Wägele and Johnsen (2001), by in vivo analyses of the animal's photosynthetic activity through Pulse Amplitude Modulated (PAM) fluorometry. This is a non-destructive and virtually non-invasive technique that allows the quantification of the photosynthetic activity. Indices based on fluorescence parameters are determined, the most common are the maximum and the effective quantum yield of PSII (Vieira *et al.*, 2009).

Chl *a* variable fluorescence can be used to assess the functioning of Photosystem II (PSII). The minimum fluorescence is the fluorescence measured when only a measuring light is applied; this measurement can be made with dark-adapted organisms, when virtually all the PSII reaction centres (RC) are open (F_o), or with light-adapted material (F_s) when RC are partially closed. The maximum fluorescence is achieved when a saturating light pulse is applied to light-adapted material ($F_m{}'$) or to dark-adapted material when virtually all PSII centres are closed (F_m). It is called the variable fluorescence to the difference between the maximum and the minimum fluorescence:

$F_v = F_m - F_o$ or $\Delta F = F_m{}' - F_s$

The PSII maximum efficiency (dark-adapted) is calculated as F_v/F_m and the PSII effective efficiency (the operating photon efficiency, light-adapted state) as $\Delta F/F_{m'}$ (Oxborough, 2004; Ralph and Gademann, 2005).

1.5. Maternal investment

Marine invertebrates in general have been model organisms in the study of maternal investment (Vance, 1973). When these animals do not know the environment conditions their offspring will endure they can control their development mode controlling maternal investment (Crean and Marshall, 2009). Opisthobranchs, in particularly, have a wide range of specializations, including patterns of development, egg number, size and energy content that made possible the adaptation of this group to highly variable environment conditions (DeFreese and Clark, 1983).

Sea slugs are simultaneous hermaphrodites and have intricate reproductive systems for internal cross-fertilization, usually the male gametes mature at a younger age so sea slugs can function as males before functioning as females (Jensen, 1999). Sea slugs donate and receive sperm mutually in a head to tail position, the pair face opposite directions with their penis inserted. In the case of *E. viridis*, the slugs wind around each other inserting their penis through the dorsal vaginal opening (Jensen, 1999).

After the fertilization, the slug functioning as female lays egg masses that consist of gelatinous ribbons coiled in spirals with multiple embryos developing inside capsules and the eggs have an albumen (intra-capsular fluid) layer around them; many opisthobranchs species include nutritive material in the eggs this way. The filament of egg capsules is typically irregular set in the egg mass coating (Klussmann-Kolb and Wägele, 2001). In every *Elysia* spp., the eggs are inside capsules surrounded by a jelly string placed in a spiral and with an outer membrane (Krug, 2009). Sea slugs allocate a great amount of energy to egg masses, using extra-embryonic resources to improve the offspring size and performance (Jensen, 1999).

The number and size of the eggs laid in the egg masses are good indicators of the maternal reproductive investment and a reliable predictable of development pattern (Gianguzza *et al.*, 2005). The production of albumen and its ingestion represents a longer embryonic development without increased amount of yolk (Miles and Clark, 2002).

Also an important trait in sea slugs reproduction is the maternal body size, that usually is reflected in maternal provisioning (Marshall and Keough, 2007) and the amount of maternal investment is related to offspring size.

Most clades have one of two provisioning strategies: lecithotrophy in which the mothers give enough energy resources to the offspring so they will not have to feed to go through metamorphosis; and planktotrophy in which the offspring has to feed on plankton to grow and be able to go to the metamorphosis into the juvenile stage, which is the case for *E. viridis* (Levin and Bridges, 1995); the majority of the temperate waters species of sacoglossan sea slugs have planktotrophic larvae (Gianguzza *et al.*, 2005).

1.6. Objectives

The aim of this study was to investigate the influence of the heterotrophic and autotrophic components on the maternal investment of the sacoglossan sea slug *E. viridis.* To fulfil these objectives, two different experiments were performed, each with three distinct treatments: the first tested the effects of food availability and the second tested the effects of different irradiances. Four biometric egg masses parameters were measured and studied: egg mass area, number of eggs per egg mass, eggs volume and total volume of eggs. The animal's photosynthetic efficiency and length was also measured to keep track of kleptoplast and sea slug health in the different treatments.

2. MATERIALS AND METHODS

2.1. Biological Material: collection and maintenance

Individuals of the sea slug *Elysia viridis* (Montagu, 1804) and its food source, the macroalgae *Codium tomentosum* (Stackhouse, 1797), were collected in August (Experiment 1) and September (Experiment 2) of 2016 on an intertidal rocky shore in the northwest of Portugal: Aguda beach, Vila Nova de Gaia (41° 02' 39.99'' N, 8° 39' 09.20'' W). All sea slugs collected were found on the macroalgae *C. tomentosum*. According to previous studies, the green macroalgae *C. tomentosum* appears to be the main food source of the sea slug *E. viridis* along the Portuguese Atlantic coast (Cruz *et al.*, 2014). Sea slugs and macroalgae were maintained in a re-circulated life support system (LSS), as described in Figure 3, containing ASW (Red Sea Salt from Red Sea®) at a salinity of 30 and temperature of 17 °C. Individuals were acclimated to the laboratorial conditions for two weeks before the beginning of the experiments, exposed to a light:dark photoperiod of 14:10 hours and to irradiance levels of 80 µmol photons m^{-2} s^{-1} measured close to the water surface.

Figure 3. Schematic drawing of the Life Support System in which the studies described were conducted. The items used are: A – Lights; B –Aquarium where the trays were placed; C – Illustration of *Codium tomentosum*; D – UV light; E – Protein skimmer; F – Level measurer; G and H – Water pumps; I – Osmose water reservoir; J – Refrigerator.

2.2. Experiment 1: Effects of food availability

Thirty sea slugs with approximately 18 mm were selected and pairs of individuals were placed inside 15 wells of 5.6 cm in diameter, 6 cm of depth and a bottom made of a net with a 1.5 mm mesh. Trays with wells were placed directly in the LSS. The sea slugs were exposed to irradiance levels of 80 µmol photons m^{-2} s^{-1}, measured inside the wells with a ULM – 500 Universal Light Meter and a Spherical Micro Quantum Sensor (Heinz Walz GmbH, Germany). Fifteen wells were numbered and used in this experiment as shown in Figure 4. Three treatments were performed simultaneously, consisting of:

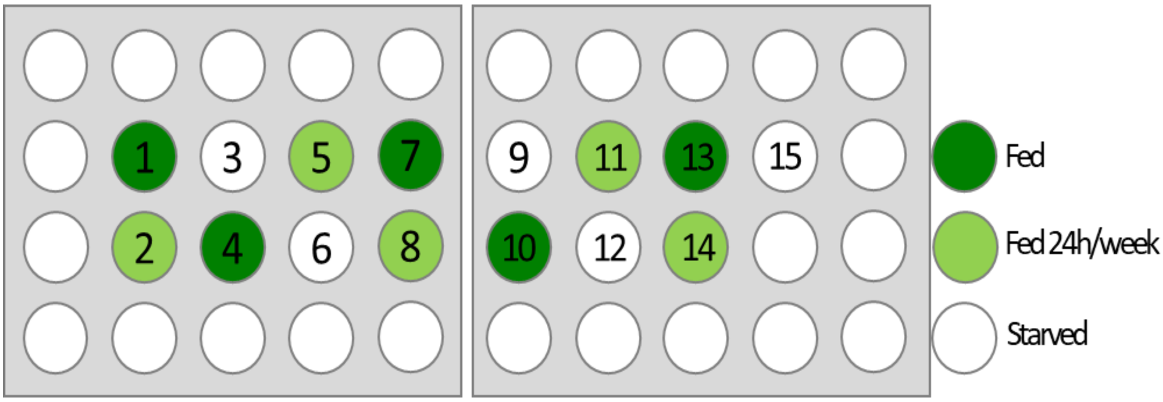

Figure 4. Schematic drawing of trays with the wells used in an experiment testing differences in food availability on the sacoglossan sea slug *Elysia viridis*. Dark-green wells (numbers 1, 4, 7, 10 and 13) represent the individuals continuously fed ("Fed"; food source was changed twice a week); Light-green wells (numbers 2, 5, 8, 11 and 14) represent the individuals fed 24 hours per week ("Fed 24h/week"; sea slugs could feed for 24 hours on freshly collected macroalgae); White wells (numbers 3, 6, 9, 12 and 15) represent the individuals deprived from feeding ("Starved"; sea slugs were deprived from their food source for the entire duration of the experiment). Each treatment had 5 pairs of sea slugs (10 animals per treatment). The macroalgae food source, *Codium tomentosum*, was freshly collected every week. This schematic drawing has a scale of 1/7.

1) "Fed" treatment in which the sea slug specimens could feed on fresh *C. tomentosum* during the entire experiment; the macroalgae was changed in these wells twice a week; 2) "Fed 24h/week" in which the stocked sea slug specimens were able to feed on freshly collected *C. tomentosum* for 24 hours each week; 3) "Starved" treatment in which the stocked sea slug specimens were deprived of feeding during the entire experiment. A re-circulating water pump was placed below the experimental trays to increase water renewal inside the wells. Sea slugs were measured weekly and egg masses collected daily for 35 days. After collection of egg mass biometric data, egg masses were washed in ultrapure water and frozen at −20 °C until freeze-dried and stored at −80 °C for chemical analysis.

2.3. Experiment 2: Effects of irradiance

Thirty sea slugs with approximately 15 mm were selected and pairs of individuals were placed inside 15 wells as described above. Sea slugs were fed continuously on fresh *C. tomentosum*, changed twice a week, under different irradiance treatments (Figure 5):

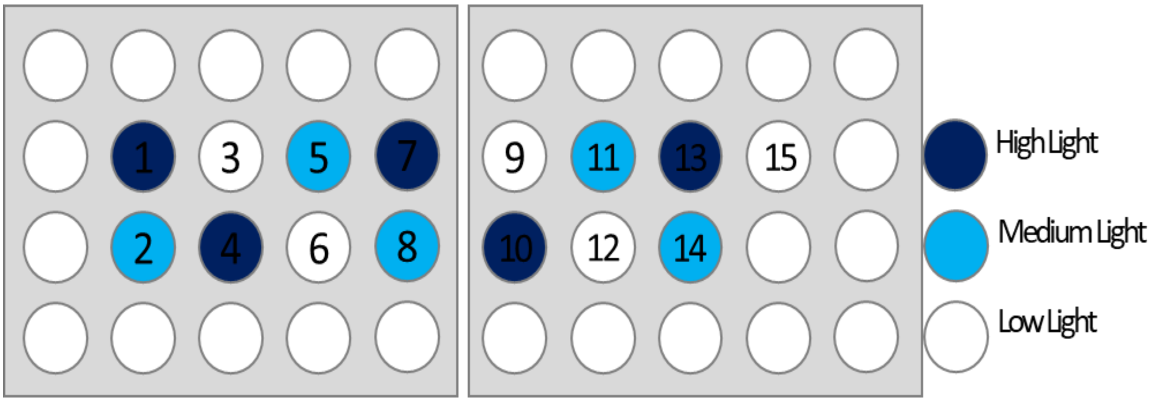

Figure 5. Schematic drawing of trays with the wells used in an experiment testing differences in light regimes in the sacoglossan sea slug *Elysia viridis*. Dark-blue wells (numbers 1, 4, 7, 10 and 13) represent the individuals exposed to an irradiance of 60-190 µmol photon m^{-2} s^{-1} ("High Light"); Light-blue wells (numbers 2, 5, 8, 11 and 14) represent the individuals exposed to an irradiance of 30-110 µmol photon m^{-2} s^{-1} ("Medium Light"; the wells were covered with a neutral filter); White wells (numbers 3, 6, 9, 12 and 15) represent the individuals exposed to an irradiance of 3-8 µmol photon m^{-2} s^{-1} ("Low Light"; the wells were covered with an aluminium foil). Each treatment had 5 pairs of sea slugs (10 animals per treatment). The macroalgae food source, *Codium tomentosum*, was freshly collected every week. This schematic drawing has a scale of 1/7.

1) "High Light" treatment in which the stocked sea slug specimens were exposed to an irradiance of 60-190 µmol photons m^{-2} s^{-1}; 2) "Medium Light" treatment in which the stocked sea slug specimens were exposed to an irradiance of 30-110 µmol photons m^{-2} s^{-1} (achieved by covering the wells with neutral filters); 3) "Low Light" treatment in which the stocked sea slug specimens were exposed to an irradiance of 3-8 µmol photons m^{-2} s^{-1} (achieved by covering the wells with aluminium foil). Irradiance levels were measured inside the wells with a ULM – 500 Universal Light Meter and a Spherical Micro Quantum Sensor (Heinz Walz GmbH, Germany). A re-circulating water pump was placed below the experimental trays to increase water renewal inside the wells. Sea slugs were measured weekly for 35 days and egg masses collected daily. After collection of egg mass biometric data, egg masses were washed in ultrapure water and frozen at −20 °C until freeze-dried and stored at −80 °C for further chemical analysis.

2.4. *Elysia viridis* length

Once a week, pictures of each sea slug were taken (4 photographs per animal) to assess their length from the beginning to the end of both experiences. Photographs were taken with a Canon G9 camera with the sea slug placed in a Petri dish containing a thin layer of ASW and a millimetric paper below. Photographs were taken when the slug was fully stretched. Images were analysed with the ImageJ software (Image Processing and Analysis in Java). Scale was set using the millimetric paper. Animal length was determined by drawing a line from the head of the slug to the tip of the tail.

2.5. Chlorophyll *a* fluorescence measurements

Once a week the photosynthetic activity of individual animals was measured non-destructively using PAM fluorometry, that assess the Chl *a* variable fluorescence. The JUNIOR-PAM fluorometer (Heinz Walz GmbH, Germany) was used to measure the variable Chl *a* fluorescence in the sample and WinControl-3 System Control and Data Acquisition Program was used to operate the measuring system via PC and the data acquisition. The chart record within the software was used to determine when the fluorescence emitted by the sea slug was stable. The sea slug was placed on a Petri dish with a thin layer of ASW, the optical fibre was placed in direct contact with the animal and when the fluorescence signal was stable, a saturating pulse was applied. For each animal three saturating pulses were made on three different locations of the slug's parapodia, this way none of the pulses affected the others and the whole animal body was represented. After a thirty-minute period in darkness, three more saturating light pulses were given to each slug following the same methodology.

2.6. Egg mass biometric data

The sea slugs egg masses found in the walls of the wells, in the net at the bottom of the wells and on the macroalgae (when present), were collected daily with a scalpel and placed in a Petri dish containing a thin layer of ASW. The egg masses were then photographed, with the Petri dish placed on top of a millimetric paper, using a binocular Leica LAS EZ DMS 300 and the software Leica Application Suite. The egg masses were photographed with a magnification of 1.2x (two photographs were taken with this magnification) and 9.6x (at least five photographs were taken with this magnification in five different places of the egg mass). Image J software was used to determine egg mass biometric data. Photographs were also taken of the millimetric paper for calibration.

2.6.1. Area

The egg masses areas were determined using the photographs with the 1.2x magnification; a circle was made around the egg masses using the drawing tools of the ImageJ software, which automatically calculated the area of the circle; from the total area of each egg mass (full circle), the area of large empty spaces was removed (often the middle area and occasionally some spaces with no eggs between the masses tubules)

2.6.2. Number of eggs

The number of eggs in each egg mass was counted using the egg mass photographs with the 9.6x magnification. In each egg mass, 10 rectangles with a known area were defined and eggs inside that area were counted. The number of eggs per mm^2 in each egg mass was then extrapolated using the formula: number of eggs in the rectangle/area of the rectangle. The average number from the 10 rectangles was multiplied by the area of the egg mass to estimate the total number of eggs per egg mass.

2.6.3. Eggs area and volume

The area of the eggs was estimated by drawing a circle around 10 random located eggs in each egg mass and calculating the average value. The volume of the eggs was calculated applying the sphere volume formula as $V = (4\ \pi\ r^3)/3$, where V is the volume, π is a mathematical constant approximated as 3.14159 and r is the radius of the sphere. The radius of the sphere ($r = \sqrt{(A/\pi)}$, where A is the area of the egg) was calculated from the egg area value, automatically determined by the software. The total volume of eggs in an egg mass was calculated by multiplying the eggs volume with the number of eggs for each egg mass.

2.7. Statistical Analysis

Two-way repeated measurements ANOVA analyses were performed to assess the significant differences on the sea slug's length and photosynthetic efficiency. A one-way ANOVA analyse was conducted on the last 10 egg masses of each treatment in both experiments to test differences in the egg masses biometric data after four weeks exposed to the respective treatment. All statistical analyses were performed using the software IBM SPSS Statistics, USA.

3. RESULTS

3.1. *Elysia viridis* length

The sea slug's length when exposed to the different feeding treatments decreased over time, as shown in Figure 6. There was a statistically significant decrease in length over time when sea slugs were fed continuously (12%; $p = 0.020$), when fed 24h per week (23%; $p = 0.009$) and during continuous starvation (54%; $p < 0.001$). Hence, starved animals decreased size 4.5 and 2.3 times more than those being continuously fed and fed once a week, respectively.

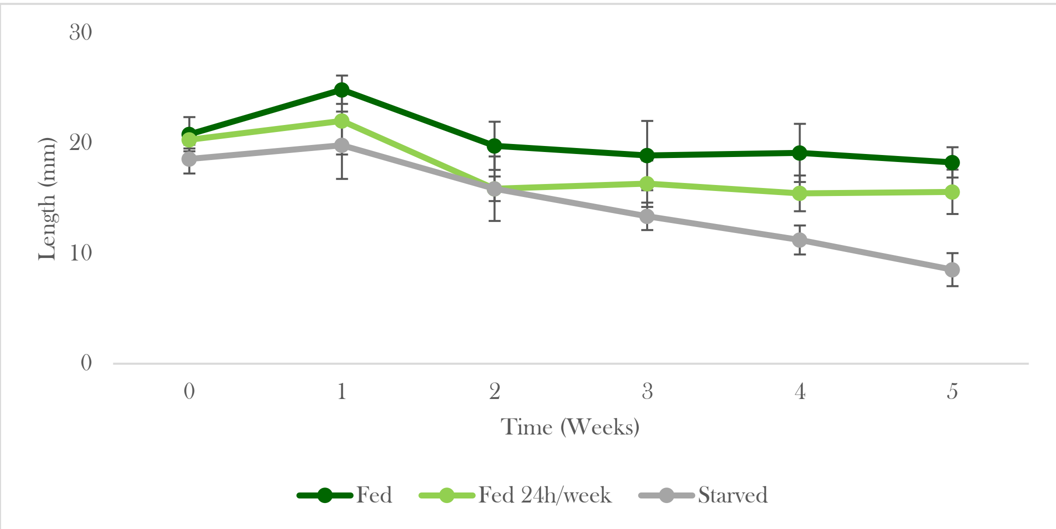

Figure 6. *Elysia viridis* length over time (average ± standard deviation) when exposed to the following treatments: continuously fed ("Fed"; food source was changed twice a week), fed 24

hours per week ("Fed 24h/week"; sea slugs could feed for 24 hours on freshly collected macroalgae) and deprived from feeding ("Starved"; sea slugs were deprived from their food source for the entire duration of the experiment). The macroalgal food source *Codium tomentosum* was freshly collected every week. Each treatment had 5 pairs of sea slugs (10 animals per treatment).

When sea slugs could feed continuously but exposed to different light regimes, there was a statistically significant increase in length over time in sea slugs exposed to a higher light intensity (140 µmol photons m^{-2} s^{-1} irradiance; 12% increase; p = 0.049). When individuals were exposed to a medium and low light intensity the trend was not statistically significant. The medium light treatment (intensity of 80 µmol photons m^{-2} s^{-1}) is here considered the control treatment since the irradiance applied was the one used during the acclimation to the laboratorial conditions. By the end of the experiment (week 5) the length of the animals exposed to a low and high light irradiance were not statistically different from the ones in the control treatment (p = 0.382 and p = 0.087 respectively) (Figure 7).

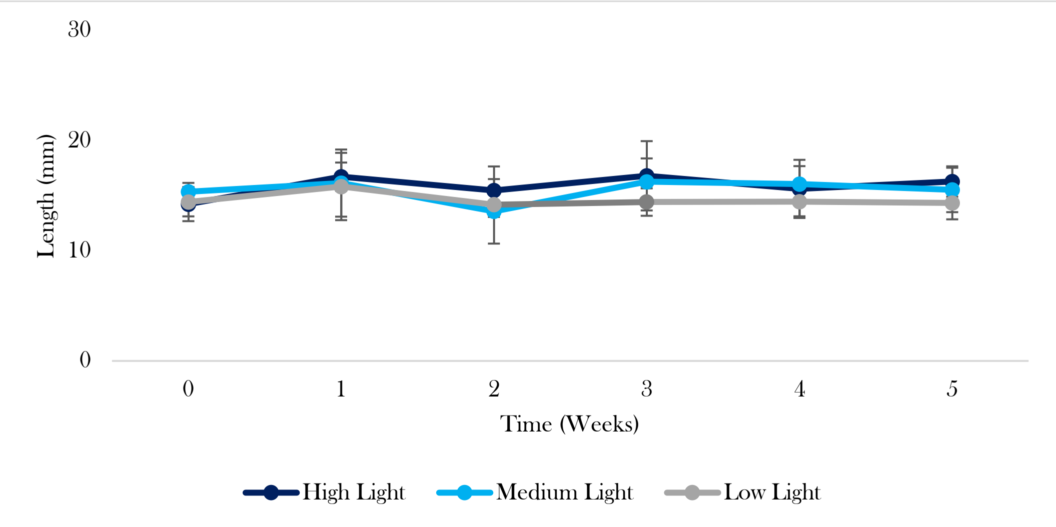

Figure 7. *Elysia viridis* length over time (average ± standard deviation) when exposed to the following treatments: exposed to 60-190 µmol photons m^{-2} s^{-1} irradiance ("High Light"), exposed to 30-110 µmol photons m^{-2} s^{-1} irradiance ("Medium Light"; Sea slugs were in wells covered with a neutral filter) and exposed to 3-8 µmol photons m^{-2} s^{-1} irradiance ("Low Light"; sea slugs were in wells covered with an aluminium foil). The macroalgal food source *Codium tomentosum* was freshly collected every week. Each treatment had 5 pairs of sea slugs (10 animals per treatment).

3.2. *Elysia viridis* photosynthetic efficiency

Measurements of the maximum (F_v/F_m) and effective ($\Delta F/F_m'$) quantum yield of PSII indicated a similar pattern over time for both the feeding treatments experiment and the light treatments experiment (Figures 8 and 9, respectively).

In sea slugs exposed to different feeding treatments (Figure 8), the maximum quantum yield was statistically different between week 0 and week 5. Sea slugs fed continuously had a decrease of 6% ($p = 0.004$), sea slugs fed 24h per week decreased F_v/F_m by 20% ($p < 0.001$), and sea slugs deprived of a food source showed a decrease of 81% ($p = 0.002$). The maximum quantum yield of the sea slug's fed 24 hours per week and the sea slugs starved became statistically different from the control treatment (continuously fed) in week 2 ($p = 0.003$ and $p = 0.016$, respectively); by week 3 all treatments were statistically different from each other. By the end of the experiment (week 5) the animals that were continuously fed had the highest value of maximum quantum yield (0.725 ± 0.027) followed from the ones that were fed once a week (0.613 ± 0.114; 15% lower than the control treatment). Sea slugs deprived of food had the smallest value of F_v/F_m (0.144 ± 0.137), which represent an 80% difference from sea slugs in the control treatment.

Measurements of the maximum (F_v/F_m) and effective ($\Delta F/F_m'$) quantum yield of PSII indicated a similar pattern over time for both the feeding treatments experiment and the light treatments experiment (Figures 7 and 8 respectively).

The effective quantum yield of the sea slugs deprived from food became statistically different from those fed continuously at week 2 ($p = 0.019$) and from those fed once a week at week 3 ($p = 0.007$); by week 5 all treatments were statistically different from each other ($p < 0.005$). By the end of the experiment (week 5) the animals that were continuously fed had the highest value of effective quantum yield (0.707 ± 0.017) followed by the ones fed once a week (0.644 ± 0.032; 9% lower than the continuously fed animals). Sea slugs deprived of food had the smallest value of $\Delta F/F_m'$ (0.201 ± 0.157), which represented a 72% difference from continuously fed sea slugs.

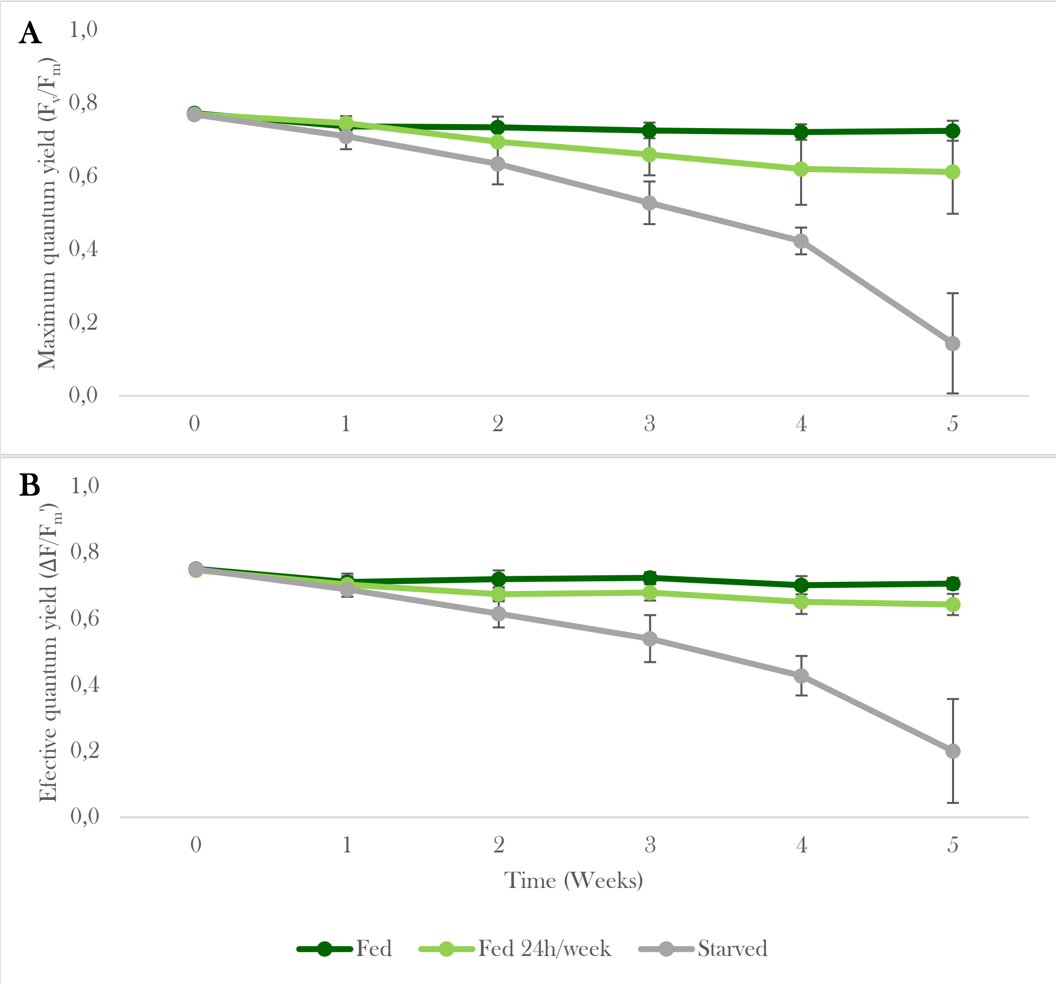

Figure 8. *Elysia viridis* maximum (A) and effective (B) quantum yield of PSII when exposed to different feeding treatments: continuously fed ("Fed"; food source was changed twice a week), fed 24 hours per week ("Fed 24h/week"; sea slugs could feed for 24h on freshly collected macroalgae) and deprived from feeding ("Starved"; sea slugs were deprived from their food source for the entire duration of the experiment). The maximum and effective quantum yield measurements were performed once a week; average ± standard deviation is displayed.

When sea slugs were fed continuously but exposed to different light treatments, the F_v/F_m was statistically different between weeks 0 and 5 in animals exposed to medium and low irradiance, with an increase of 4% ($p = 0.004$ and $p = 0.019$, respectively) (Figure 9). The maximum quantum yield of sea slugs exposed to a medium and a low irradiance became statistically different from the ones exposed to the high light irradiance by week 1 and 2 respectively ($p = 0.017$ and $p = 0.046$). By the end of the experiment (week 5) the animals exposed to high light had the lowest value of maximum quantum yield (0.720 ± 0.027), with a 7% difference from the animals in the medium light treatment.

The effective quantum yield ($\Delta F/F_{m'}$) was statistically different between the first and the last week of the experiment in sea slugs exposed to high irradiance with a decrease of 5% ($p = 0.039$) and in sea slugs exposed to medium light with an increase of 3% ($p < 0.001$). The effective quantum yield of the sea slugs exposed to a medium and low light became statistically different from the ones exposed to the high irradiance by week 1 ($p = 0.041$ and $p = 0.003$ respectively). By the end of the experiment (week 5) the animals that were exposed to the high light had the lowest value of effective quantum yield (0.691 ± 0.031), with an 8% difference from the animals in the medium light treatment.

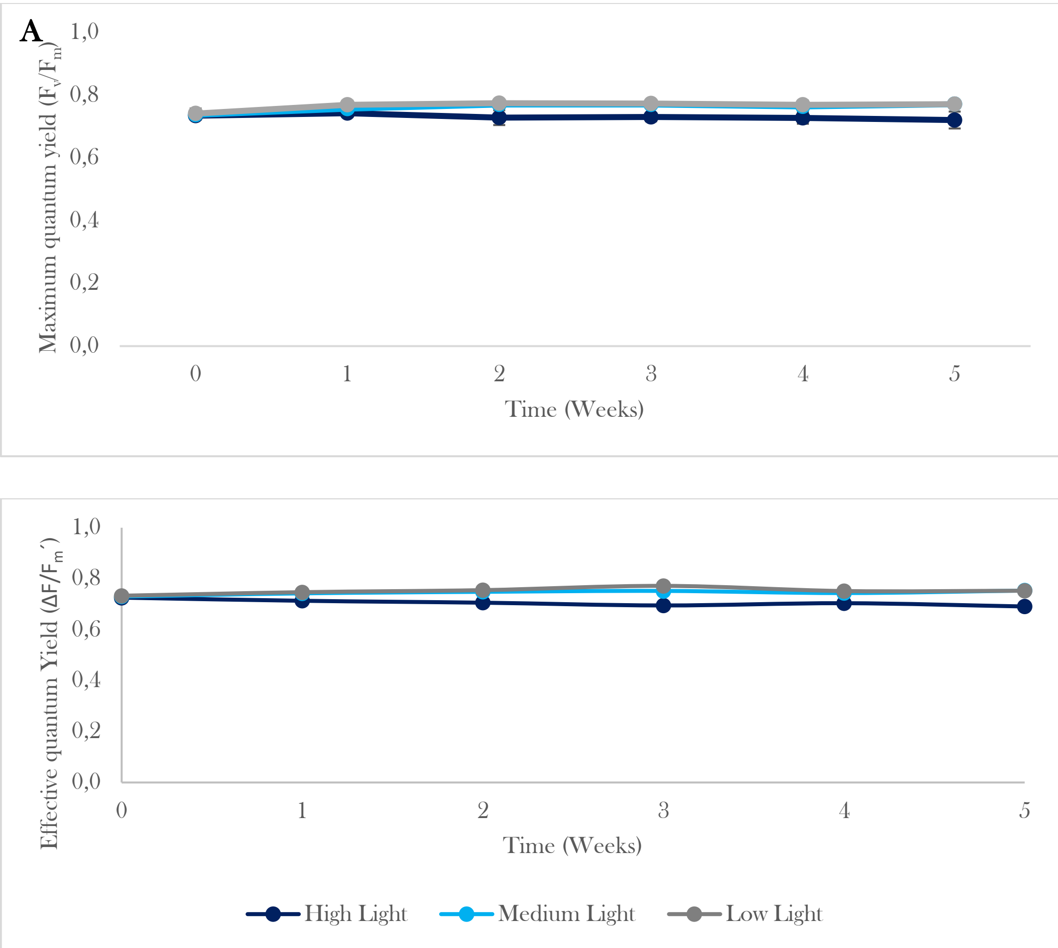

Figure 9. *Elysia viridis* maximum (A) and effective (B) quantum yield of PSII when exposed to different light treatments: exposed to 60-190 µmol photons m^{-2} s^{-1} irradiance ("High Light"), exposed to 30-110 µmol photons m^{-2} s^{-1} irradiance ("Medium Light"; Sea slugs were in wells covered with a neutral filter) and exposed to 3-8 µmol photons m^{-2} s^{-1} irradiance ("Low Light"; sea slugs were in wells covered with an aluminium foil). The maximum and effective quantum yield measurements were performed once a week; average ± standard deviation is displayed.

3.3. Egg masses area

When sea slugs were exposed to different diet treatments, the trend of the animal's egg mass areas was to decrease; the sharpest decrease happened in the animals in continuous starvation (slope = -0.526) (Figure 10A). However, the percentage of the variability (R^2) in the egg masses area (dependent variable) explained by time (independent variable) was low. In the sea slugs fed continuously, fed once a week and kept in starvation R^2 was 4%, 19% and 45% respectively. A one-way ANOVA was conducted with the last ten egg masses of the experiment and there was a statistically difference between treatments ($p < 0.001$). A Tukey post-hoc test revealed that egg mass areas of the animals allowed to feed only once a week (15.0 ± 3.4) and not allowed to feed (11.212 ± 3.007) were significantly lower than the ones fed continuously (26.746 ± 8.608). There was not a statistically significant difference between the egg mass areas of the slugs allowed to feed one day per week and the ones exposed to starvation ($p = 0.334$) (Figure 10B).

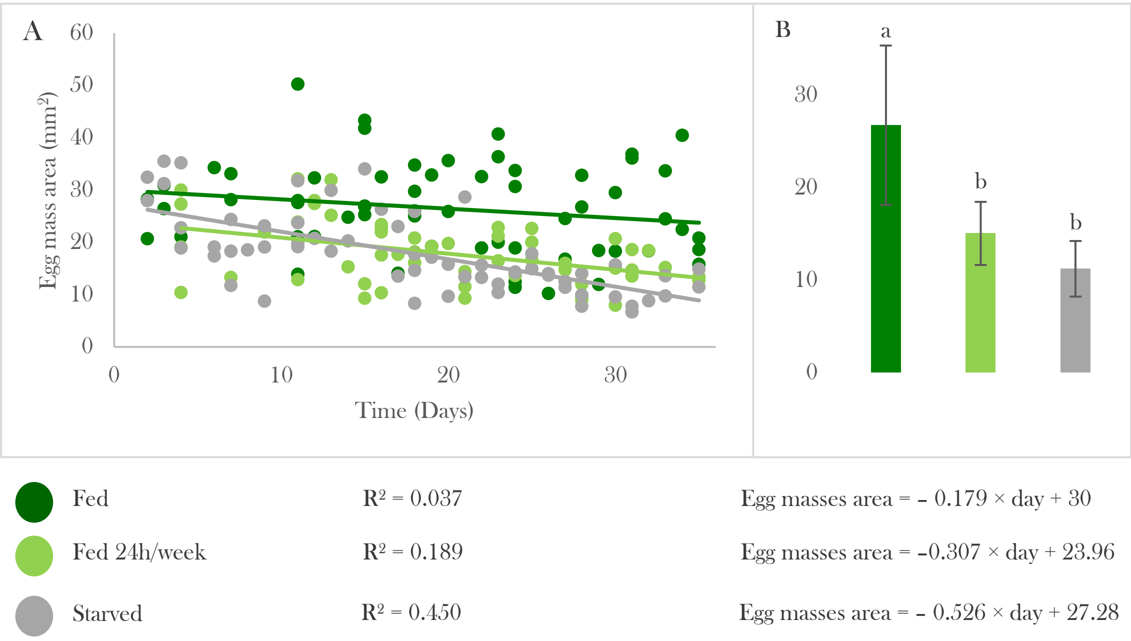

Figure 10. *Elysia viridis* egg mass areas when exposed to different feeding treatments: continuously fed ("Fed"; food source was changed twice a week), fed 24 hours per week ("Fed 24h/week"; sea slugs could feed for 24h on freshly collected macroalgae) and deprived from feeding ("Starved"; sea slugs were deprived from their food source for the entire duration of the experiment). These measurements were performed daily. **A** – plot showing the trend of the egg mass areas of each treatment during the entire time of the experiment. **B** – plot showing egg mass areas (average ± standard deviation) of the last ten egg masses of the experiment (different letters indicate statistical significant differences, $p<0.05$).

When sea slugs were exposed to different light regimes, there was no clear trend of the animal's egg mass areas over time. The percentage of the variability (R^2) in the egg masses area (dependent variable) explained by time (independent variable) was also low. In the sea slugs exposed to a high, medium and low light regime R^2 was 16%, 21% and 2% respectively (Figure 11A). A one-way ANOVA was conducted with the last ten egg masses and there was not a statistically difference between treatments ($p = 0.235$) (Figure 11B).

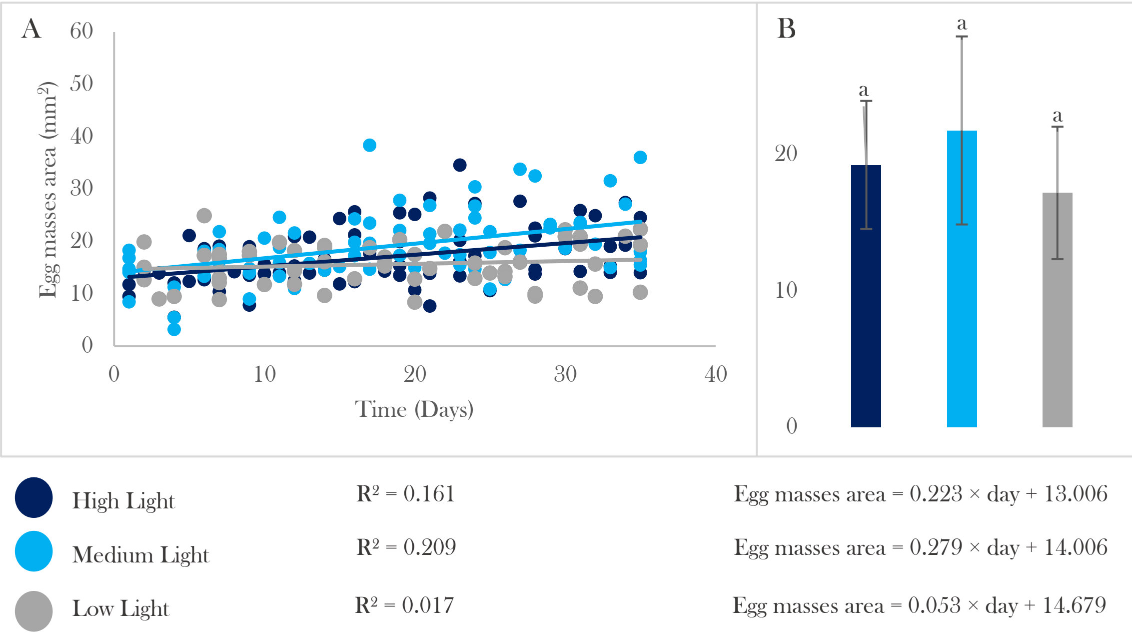

Figure 11. *Elysia viridis* egg mass areas when exposed to different light regimes: exposed to a 60-190 µmol photons m^{-2} s^{-1} irradiance ("High Light"), exposed to an 30-110 µmol photons m^{-2} s^{-1} irradiance ("Medium Light"; sea slugs were in wells covered with a neutral filter) and exposed to an 3-8 µmol photons m^{-2} s^{-1} irradiance ("Low Light"; sea slugs were in wells covered with an aluminium foil). These measurements were performed daily. A – plot showing the trend of the egg mass areas of each treatment during the entire time of the experiment. B – plot showing egg mass areas (average ± standard deviation) of the last ten egg masses of the experiment (same letter indicates no statistical difference between treatments, $p > 0.05$).

3.4. Number of eggs per egg mass

When sea slugs were exposed to different diet treatments, the percentage of the variability (R^2) in the number of eggs per egg mass (dependent variable) explained by time (independent variable) in the sea slugs fed continuously, fed once a week and kept in starvation was 1%, 17% and 27% respectively (Figure 12A). A one-way ANOVA was conducted with the last ten egg masses and there was a statistically difference between treatments ($p < 0.001$). A Tukey post-hoc test revealed that the number of eggs per egg mass of the animals allowed to feed only once a week (2256 ± 527) and not allowed to feed (1917 ± 859) was significantly lower than the ones fed continuously (5091 ± 2379). There was not a statistically significant difference between the number of eggs per egg mass of the slugs fed for 24 hours per week and the ones exposed to starvation ($p = 0.923$) (Figure 12B).

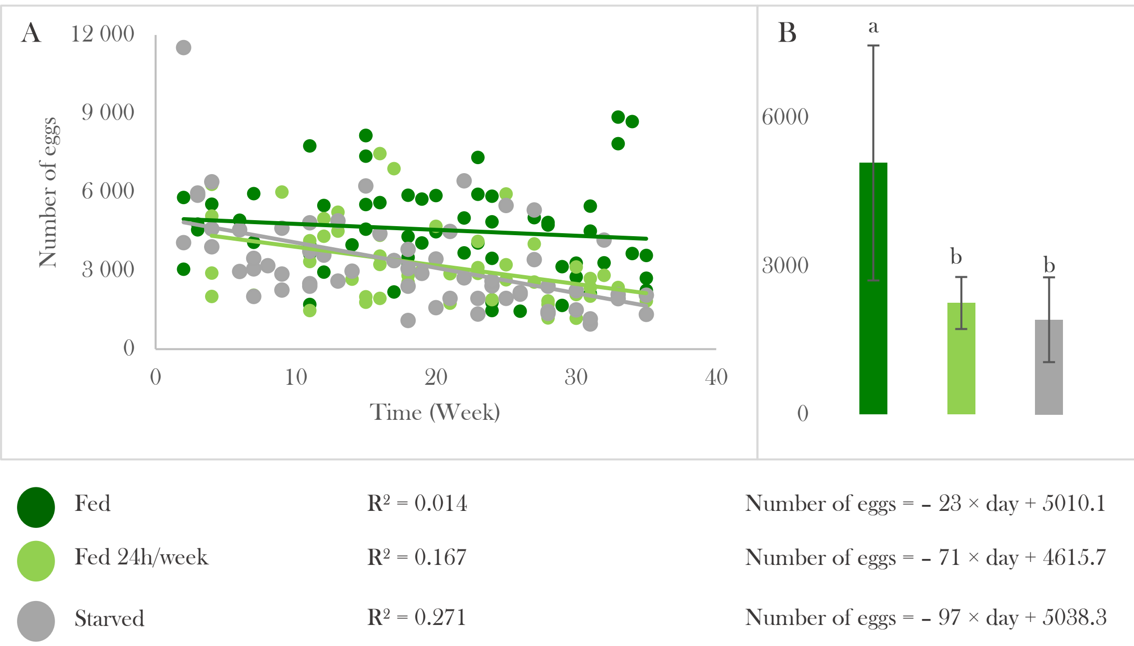

Figure 12. *Elysia viridis* number of eggs per egg mass when exposed to different feeding treatments: continuously fed ("Fed"; food source was changed twice a week), fed 24 hours per week ("Fed 24h/week"; sea slugs could feed for 24h on freshly collected macroalgae) and deprived from feeding ("Starved"; sea slugs were deprived from their food source for the entire duration of the experiment). These measurements were performed daily. A – plot showing the trend of the number of eggs of each treatment during the entire time of the experiment. B – plot showing number of eggs (average ± standard deviation) of the last ten egg masses of the experiment (different letters indicate statistical significant differences, $p < 0.05$).

When sea slugs were exposed to different light regimes, the percentage of the variability (R^2) in the egg mass areas (dependent variable) explained by time (independent variable) was again very low. In the sea slugs exposed to a high, medium and low light regime R^2 was 7%, 2% and 0.2% respectively (Figure 13A). A one-way ANOVA was conducted with the last ten egg masses and there was no statistically difference between treatments ($p = 0.681$) (Figure 13B).

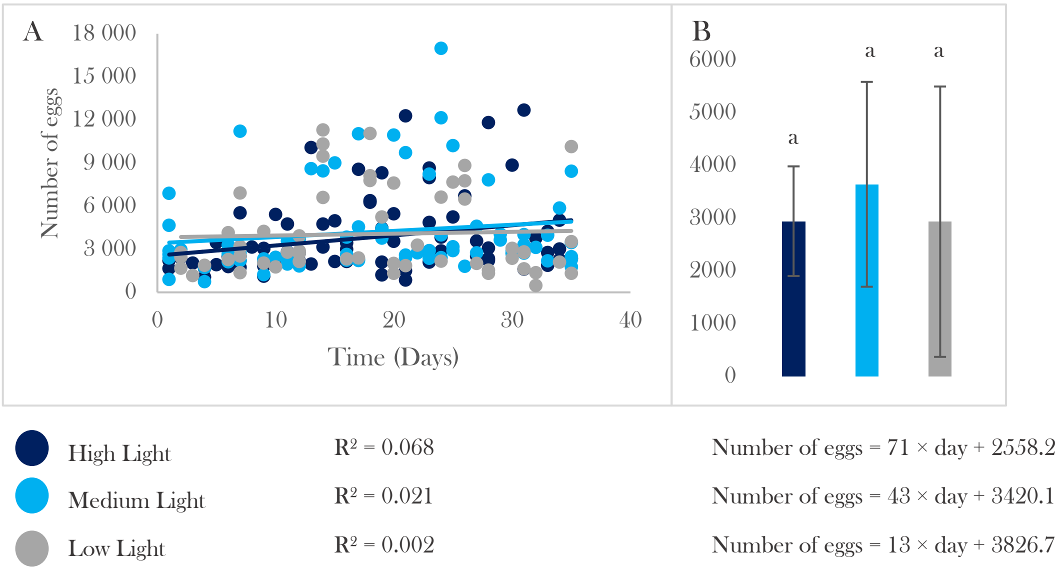

Figure 13. *Elysia viridis* number of eggs per egg mass when exposed to different light regimes: exposed to a 60-190 µmol photons m^{-2} s^{-1} irradiance ("High Light"), exposed to an 30-110 µmol photons m^{-2} s^{-1} irradiance ("Medium Light"; sea slugs were in wells covered with a neutral filter) and exposed to an 3-8 µmol photons m^{-2} s^{-1} irradiance ("Low Light"; sea slugs were in wells covered with an aluminium foil). These measurements were performed daily. A – plot showing the trend of the number of eggs of each treatment during the entire time of the experiment. B – plot showing number of eggs (average ± standard deviation) of the last ten egg masses of the experiment (same letter indicates no statistical difference between treatments, $p > 0.05$).

3.5. Eggs volume

When sea slugs were exposed to different diet treatments, the percentage of the variability (R^2) in the volume of eggs (dependent variable) explained by time (independent variable) was extremely low. In the sea slugs fed continuously, fed once a week and kept in starvation R^2 was 1%, 5% and 2% respectively (Figure 14A). A one-way ANOVA was conducted with the last ten egg masses and there was no statistically difference between treatments ($p < 0.639$) (Figure 14B).

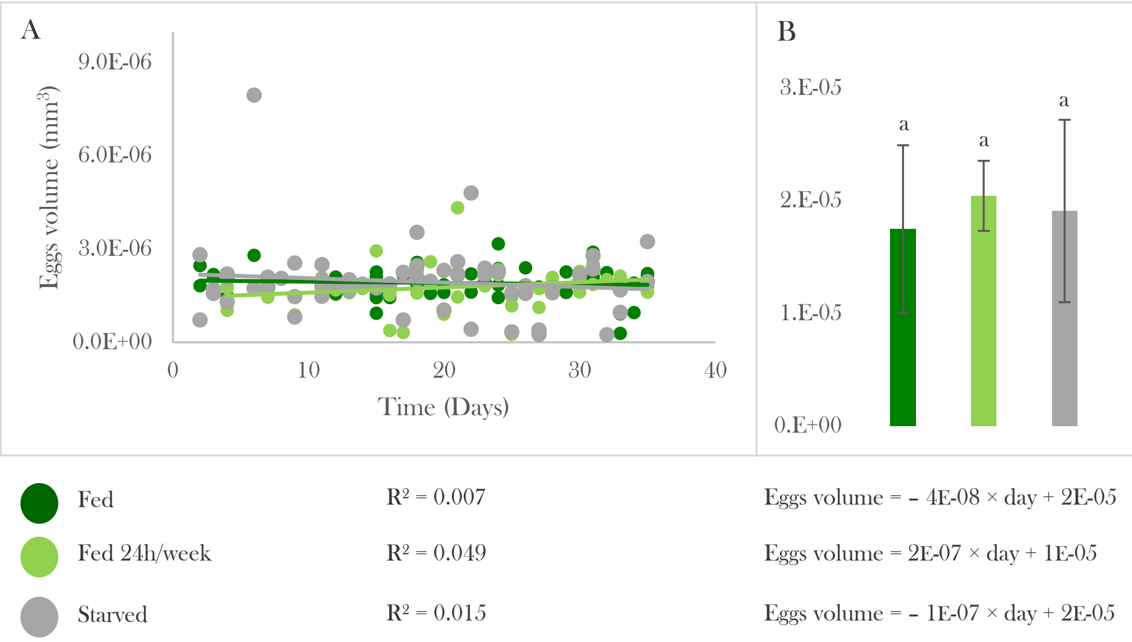

Figure 14. *Elysia viridis* eggs volume when exposed to different feeding treatments: continuously fed ("Fed"; food source was changed twice a week), fed 24 hours per week ("Fed 24h/week"; sea slugs could feed for 24h on freshly collected macroalgae) and deprived from feeding ("Starved"; sea slugs were deprived from their food source for the entire duration of the experiment). These measurements were performed daily. A – plot showing the trend of the volume of eggs of each treatment during the entire time of the experiment. B – plot showing volume of eggs (average ± standard deviation) of the last ten egg masses of the experiment (same letter indicates no statistical difference between treatments, $p > 0.05$).

When sea slugs were exposed to different light regimes, the percentage of the variability (R^2) in the egg masses area (dependent variable) explained by time (independent variable) was again extremely low. In the sea slugs exposed to a high, medium and low light regime R^2 was 1%, 2% and 1% respectively (Figure 15A). A one-way ANOVA was conducted with the last ten egg masses and there was not a statistically difference between treatments ($p = 0.953$) (Figure 15B).

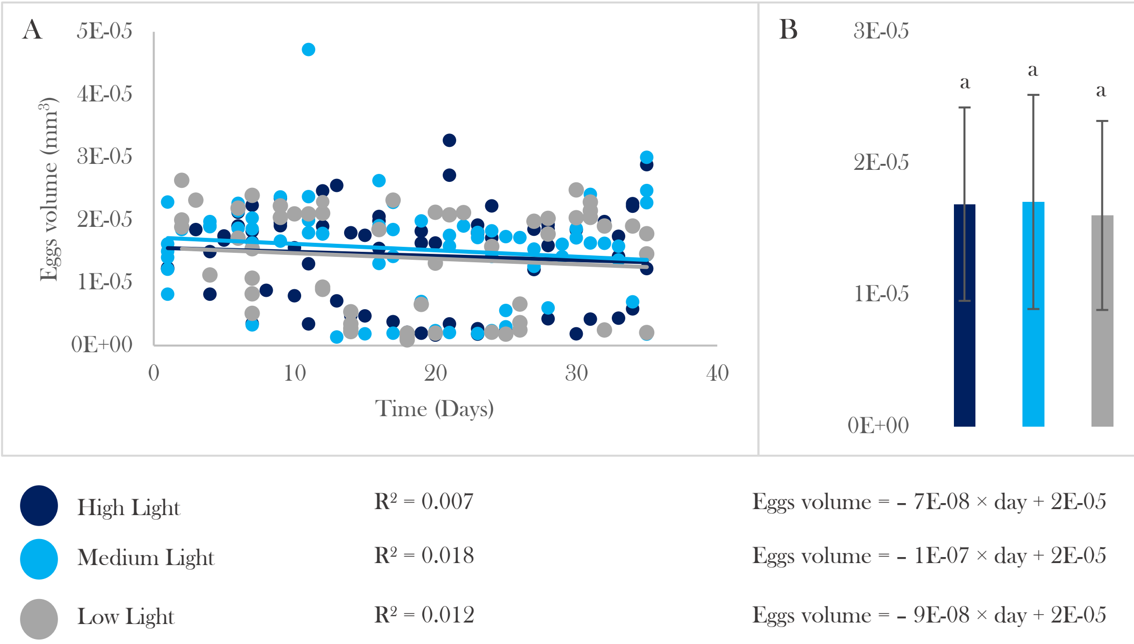

Figure 15. *Elysia viridis* eggs volume when exposed to different light regimes: exposed to a 60-190 µmol photons m^{-2} s^{-1} irradiance ("High Light"), exposed to an 30-110 µmol photons m^{-2} s^{-1} irradiance ("Medium Light"; sea slugs were in wells covered with a neutral filter) and exposed to an 3-8 µmol photons m^{-2} s^{-1} irradiance ("Low Light"; sea slugs were in wells covered with an aluminium foil). These measurements were performed daily. A – plot showing the trend of the volume of eggs of each treatment during the entire time of the experiment. B – plot showing volume of eggs (average ± standard deviation) of the last ten egg masses of the experiment (same letter indicates no statistical difference between treatments, $p > 0.05$).

3.6. Total Volume of eggs

When sea slugs were exposed to different diet treatments, the percentage of the variability (R^2) in the total volume of eggs (dependent variable) explained by time (independent variable) in the sea slugs fed continuously, fed once a week and kept in starvation was 9%, 8% and 34% respectively (Figure 16A). A one-way ANOVA was conducted with the last ten egg masses, showing a statistically difference between treatments ($p < 0.001$). A Tukey post-hoc test revealed that total volume of eggs of the animals allowed to feed only once a week (0.047 ± 0.014) and not allowed to feed (0.032 ± 0.011) was significantly lower than the ones fed continuously (0.074 ± 0.029). There was no statistically significant difference between the egg mass areas of the slugs fed for 24 hours per week and the ones exposed to starvation (p = 0.27) (Figure 16B).

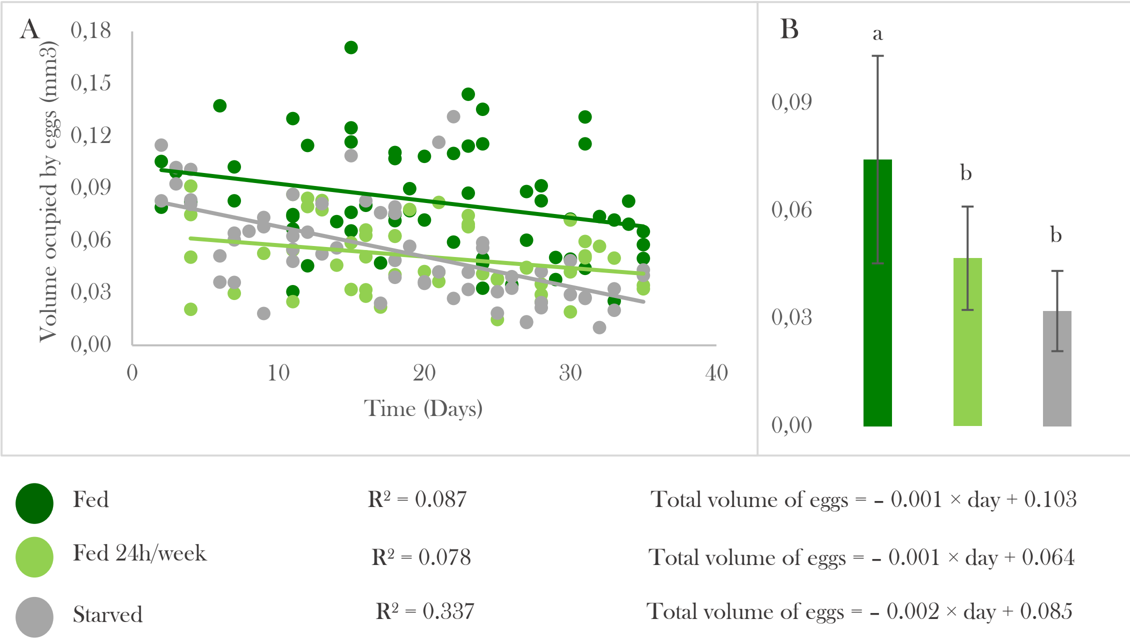

Figure 16. *Elysia viridis* total volume of eggs in the egg masses when exposed to different feeding treatments: continuously fed ("Fed"; food source was changed twice a week), fed 24 hours per week ("Fed 24h/week"; sea slugs could feed for 24h on freshly collected macroalgae) and deprived from feeding ("Starved"; sea slugs were deprived from their food source for the entire duration of the experiment). These measurements were performed daily. A – plot showing the trend of the volume of eggs of each treatment during the entire time of the experiment. B – plot showing volume of eggs (average ± standard deviation) of the last ten egg masses of the experiment (different letters indicate statistical significant differences, $p < 0.05$).

When sea slugs were exposed to different light regimes, the percentage of the variability (R^2) in the total volume of eggs (dependent variable) explained by time (independent variable) in the sea slugs exposed to a high, medium and low light regime was 2%, 0.2% and 3% respectively (Figure 17A). A one-way ANOVA was conducted with the last ten egg masses within each treatment and there was no statistically difference between treatments (p = 0.488) (Figure 17B).

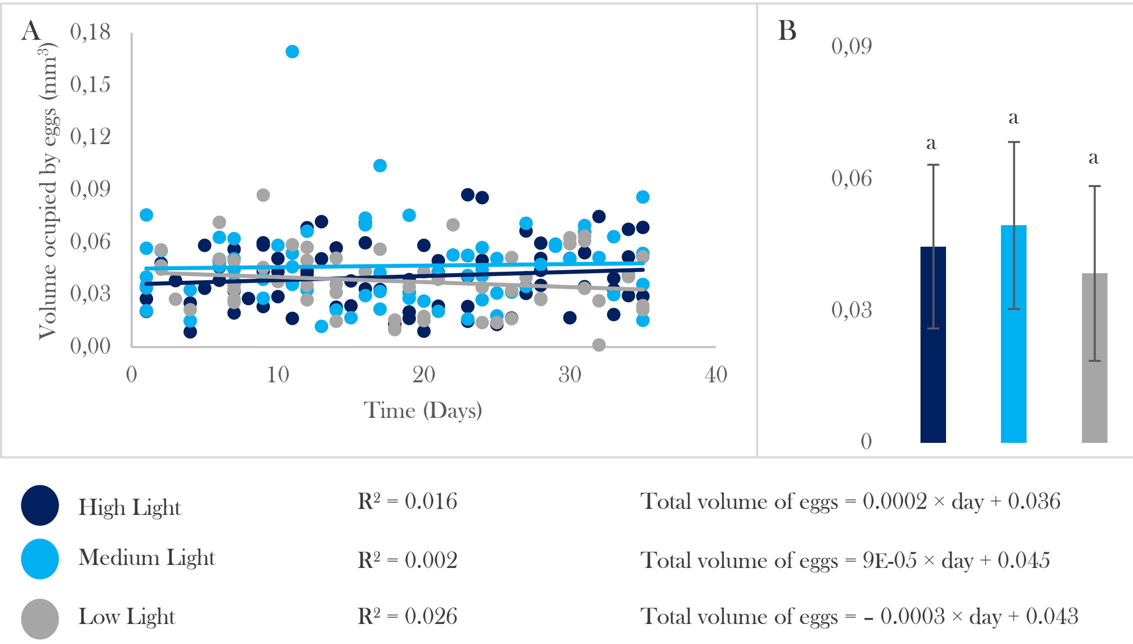

Figure 17. *Elysia viridis* total volume of eggs in the egg masses when exposed to different light regimes: exposed to a 60-190 µmol photons m^{-2} s^{-1} irradiance ("High Light"), exposed to an 30-110 µmol photons m^{-2} s^{-1} irradiance ("Medium Light"; sea slugs were in wells covered with a neutral filter) and exposed to an 3-8 µmol photons m^{-2} s^{-1} irradiance ("Low Light"; sea slugs were in wells covered with an aluminium foil). These measurements were performed daily. A – plot showing the trend of the volume of eggs of each treatment during the entire time of the experiment. B – plot showing volume of eggs (average ± standard deviation) of the last ten egg masses of the experiment (same letter indicates no statistical difference between treatments, $p > 0.05$).

4. DISCUSSION

The heterotrophic component is unequivocally important to the growth and survival of the sea slugs and so, the maternal investment of marine invertebrates are limited when nutritional input is limited or has poor quality (Chester, 1996; Bertram and Strathmann, 1998; Ross *et al.*, 2013; Rey *et al.*, 2017). In general, the sea slugs exposed to different diet regimes had their maternal investment reduced when no food was provided. The egg masses area and the number of eggs per egg mass decreased in all treatments but more intensely in the starved treatment in which the sea slugs had no access to food during the entire experiment time. Often there is a negative correlation between number and size of the eggs in an egg mass; organisms have a set of energy resources for reproduction, so an animal that produces small eggs can produce more eggs than the ones that produce larger eggs (Chester, 1996). In the present work, the eggs individual volume had no changes throughout the treatments, however, when extrapolating to the total eggs volume a decrease was observed, because the number of eggs decreased. There was an inferior number of eggs in each egg mass, which we attributed to the treatments and/or animal size decrease, but with the same volume.

Nutrition is known to affect the survival and growth of virtually every animal, so these results were expected and in agreement with several other studies. The effects of poor nutrition are visible in number of eggs or egg size, growth rate and survival (Bertram and Strathmann, 1998). Schwab (2012) found that small snails suppressed laying eggs due to threats to their productivity and survival such as lack of food (Schwab, 2012). Starvation has a critical negative impact on growth and reproduction, as well as in offspring traits by modelling the development type and juvenile size. In this study it is assumed that the animals used were adults because of it's size and the time of yeazr in which tey were collected. In the present work, the shown decrease of the egg masses biometric data in starved animals may not be a direct result of the experiment treatments but an effect from the sharpest decrease of the animal's length in the same treatment in which case it is only an indirect effect of the experimental treatment.

The method used to assess the sea slug's length had some limitations. The animals were placed in a Petri dish and photographs were taken when the slug was fully stretched, however there is the human error associated because knowing when the sea slug is fully stretched may be relative. Besides, when taking the pictures, the same animal may not stretch as much as it did the week before.

Periods of starvation cause shrinkage of the body wall and muscle bands in these animals (Ross et al., 2013). Various studies suggest that the decreased in maternal investment can be a result of a decrease in size (Marshall and Keough, 2007; Kindsvater *et al.*, 2011; Ross *et al.*, 2013; Allen *et al.*, 2009; Avaca *et al.*, 2012).

Generally, animals with a larger body size have larger energetic reserves (Stearns, 1992; Schwab, 2012), adult larger females need less energy to grow and consequently may possess more energy for reproduction, which might explain the lower investment in reproduction by smaller females (Rey *et al.*, 2017). Maternal size, availability and quality of food affect offspring (Rey and Calado, 2016), larger mothers not only produce more offspring, to enhance the next generation, but also the offspring has higher quality (Marshall and Keough, 2007). This trend was shown in the opisthobranch species

Tenellia adspersa: the larger animals produced more eggs per egg mass and per day (Stearns, 1992) and starved *Tenellia adspersa* and *Olea hansineensis* produced less eggs and had a lower growth rate (Chester, 1996).

Also, body size may also influence the gender roles of the organisms (DeWitt, 1996). Most opisthobranch species became sexually mature at a small size, which may be a survival mechanism against the unstable habitat conditions they are subjected to (Gianguzza *et al.*, 2005). Many studies conducted with hermaphrodite species shows that larger individuals tend to function more often as female and smaller organisms tend to be more male biased (Tan *et al.*, 2004). The differences in time invested in each reproductive role means that there are differences in the energy allocated to reproductive structures and gamete production (Avaca *et al.*, 2012). The predominance of large sperm receivers may be explained because the volume of reproductive tissues is larger in bigger animals; also, larger mothers tend to be more fecund (Allen *et al.*, 2009), so there are more resources available for maternal reproduction, such as vitellogenesis, a wider ventral area for eggs and more energetic investment in the gelatinous matrix that surrounds and protects the egg masses. Larger eggs are a clear advantage since that larger eggs grow to larger larvae and larger planktotrophic larvae have a shorter planktonic period that reduces larval mortality (Allen *et al.*, 2009). On the other hand, larger body size seems not to be an advantage for male reproduction in simultaneously hermaphroditic snails or sea slugs (Tan *et al.*, 2004).

In the study performed by Gianguzza *et al.* (2005) with the sacoglossan sea slug *Oxynoe olivacea,* it was found that animals with small body size act more frequently as females (Gianguzza *et al.*, 2005), which clearly contradicts the results described with the information mentioned above. Some studies deny this trend of larger maternal body size being correlated with larger egg masses and eggs. And so, the concept that smaller females produce poorer offspring may not be accurate (Rey *et al.*, 2017). In several studies, there was no correlation between parental body size and egg size and offspring size. The most significant factor in determining egg and offspring size was genetic (Jones *et al.*, 1996; Gianguzza *et al.*, 2005; Trickey *et al.*, 2013; Rey *et al.,* 2017).

The photosynthetic activity also decreased, mostly in the starved treatment. With no kleptoplasts replacement from the lack of food, the chloroplasts ceased to function and there is a decrease of Chl *a* concentration inside the sea slugs which is supported by the observed change in animal's coloration from a bright green to a brownish green.

Photosynthesis is essential in periods of food scarcity, but even so, after some time the chloroplasts need to be replaced through ingested algal material.

Photosynthesis is therefore important to *E. viridis* and other similar sea slugs. Thus, we expected to see a difference in the individuals exposed to different light treatments. In previous studies conducted with *E. viridis* specimens, weight, length and photosynthetic capacity decreased when sea slugs were kept in the dark (Hinde and Smith, 1975; Cartaxana *et al.*, 2017). In the present study, the photosynthetic activity showed that sea slug's kleptoplasts remained healthy through the medium and low light treatments with only a small tendency to decrease in F_v/F_m (2%) and $\Delta F/F_m'$ (3%) in the high light exposed individuals.

Despite the small decrease in photosynthetic activity, probably due to a difficulty coping with high light irradiance or photoinhibition, there was a small tendency to increase the animal's length in the high light treatment. This increased in length if accompanied by a total increase in size (not measured) could indicate that the relatively small increase in light irradiance was beneficial for the animals. Furthermore, although that was no significant differences in all measured egg masses parameters (egg masses area, number of eggs, eggs volume and total volume of eggs) there was an overall increase tendency in the egg masses area and number of eggs, mainly on the animals exposed to a high and medium light. In all treatments the eggs volume decreased and when extrapolating to total volume of eggs in an egg mass there was a dramatic change over time, the total volume has the tendency to increase. Looking at the gross tendency, over time the sea slugs produced more eggs but slithly smaller.

It is important to notice that the differences in the light treatments were very small because the limitations of the experimental design, the studied sea slugs had the capability to crawl into the shadow part of the wells where the irradiance was inferior to the intended. In other studies, such as Miles and Clark (2002), it was shown that a continued exposure to light affected the chloroplasts ability to photosynthesize in *Costasiella ocellifera*; and in the study conducted by Vieira *et al.*, 2009, *E. viridis* exposed to high irradiances had a decrease in their maximum quantum yield (F_v/F_m) while animals exposed to low light showed no decrease in this parameter, these results are similar to the tendencies shown in the sea slugs exposed to the high light irradiances.

5. FINAL REMARKS

The maternal investment of the sea slug *E. viridis* in its egg masses is clearly influenced by the amount of food available, but also by the intensity of the irradiance. More studies are necessary to evaluate the importance of maternal length in the maternal investment to realize if the results here presented are a direct or an indirect result of the food availability. An additional experiment should be conducted to test the influence of different irradiances in the maternal investment of these sea slug species with a different experimental procedure, considering more extreme light intensities. The egg masses were stored and will be analysed regarding fatty acids composition in order to further assess the animal maternal investment.

6. REFERENCES

Allen, R. M., Krug, P. J., & Marshall, D. J. (2009). Larval size in Elysia stylifera is determined by extra-embryonic provisioning but not egg size. Marine Ecology Progress Series, 389, 127-137.

Ansell, A., Gibson, R. & Barnes, M. (1999). Mesoherbivore-macroalgal interactions: feeding ecology of sacoglossan sea slugs (Mollusca, Opisthobranchia) and their effects on their food algae. *Oceanography and Marine Biology, An Annual Review* 37: 87-128.

Ansell, A., Gibson, R., Barnes, M. & Press, U. (1998). Ecology of the green macroalga *Codium fragile* (Suringar) Hariot 1889: invasive and non-invasive subspecies. *Oceanography and Marine Biology: An Annual Review* 36: 1-64.

Anthony, K. R., & Fabricius, K. E. (2000). Shifting roles of heterotrophy and autotrophy in coral energetics under varying turbidity. *Journal of experimental marine biology and ecology*, *252*(2), 221-253.

Avaca, M. S., Narvarte, M. & Martín, P. (2012). Size-assortative mating and effect of maternal body size on the reproductive output of the nassariid *Buccinanops globulosus*. *Journal of Sea Research* 69: 16-22.

Baker, N. R. (2008). Chlorophyll fluorescence: a probe of photosynthesis *in vivo*. *Annual Review Plant Biology* 59: 89-113.

Berry, J. A. & Downton, W. J. S. (1982). Environmental regulation of photosynthesis. *Photosynthesis* 2: 263-343.

Bertram, D. F. & Strathmann, R. R. (1998). Effects of maternal and larval nutrition on growth and form of planktotrophic larvae. *Ecology* 79(1): 315-327.

Bhattacharya, D., Pelletreau, K. N., Price, D. C., Sarver, K. E. & Rumpho, M. E. (2013). Genome analysis of *Elysia chlorotica* egg DNA provides no evidence for horizontal gene transfer into the germ line of this kleptoplastic mollusc. *Molecular Biology and Evolution* 30(8): 1843-1852.

Cartaxana, P., Trampe, E., Kühl, M., Cruz, S. (2017). Kleptoplast photosynthesis is nutritionally relevant in the sea slug *Elysia viridis*. *Scientific Reports* 7: 7714.

Casalduero, F. G. & Muniain, C. (2008). The role of kleptoplasts in the survival rates of *Elysia timida* (Risso, 1818):(Sacoglossa: Opisthobranchia) during periods of food shortage. *Journal of Experimental Marine Biology and Ecology* 357(2): 181-187.

Chester, C. M. (1996). The effect of adult nutrition on the reproduction and development of the estuarine nudibranch, *Tenellia adspersa* (Nordmann, 1845). *Journal of Experimental Marine Biology and Ecology* 198(1): 113-130.

Clark, K., Jensen, K. & Stirts, H. (1990). Survey for functional kleptoplasty among west Atlantic Ascoglossa. *The Veliger* 33(4): 339-345.

Clark, K. B. & Busacca, M. (1978). Feeding specificity and chloroplast retention in four tropical Ascoglossa, with a discussion of the extent of chloroplast symbiosis and the evolution of the order. *Journal of Molluscan Studies* 44(3): 272-282.

Crean, A. J. & Marshall, D. J. (2009). Coping with environmental uncertainty: dynamic bet hedging as a maternal effect. *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 364(1520): 1087-1096.

Cruz, S., Cartaxana, P., Newcomer, R., Dionísio, G., Calado, R., Serôdio, J., Pelletreau, K. N. & Rumpho, M. E. (2015). Photoprotection in sequestered plastids of sea slugs and respective algal sources. *Scientific reports* 5: 7904.

DeFreese, D. E. & Clark, K. B. (1983). Analysis of reproductive energetics of Florida Opisthobranchia (Mollusca: Gastropoda). *International Journal of Invertebrate Reproduction* 6(1): 1-10.

DeWitt, T. J. (1996). Gender contests in a simultaneous hermaphrodite snail: a size-advantage model for behaviour. *Animal Behaviour* 51(2): 345-351.

Dionísio, G., Rosa, R., Leal, M. C., Cruz, S., Brandão, C., Calado, G., Serôdio, J. & Calado, R. (2013). Beauties and beasts: a portrait of sea slugs aquaculture. *Aquaculture* 408: 1-14.

Evertsen, J. & Johnsen, G. (2009). In vivo and in vitro differences in chloroplast functionality in the two north Atlantic sacoglossans (Gastropoda, Opisthobranchia) *Placida dendritica* and *Elysia viridis*. *Marine Biology* 156(5): 847-859.

Gallop, A., Bartrop, J. & Smith, D. (1980). The biology of chloroplast acquisition by *Elysia viridis*. *Proceedings of the Royal Society of London B: Biological Sciences* 207(1168): 335-349.

Gianguzza, P., Jensen, K. R., Badalamenti, F. & Riggio, S. (2005). Relationship between egg features and maternal body size in the simultaneous hermaphrodite *Oxynoe olivacea* (Mollusca, Opisthobranchia, Sacoglossa). *Marine Biology* 148(1): 117-122.

Greenberg, B., Gaba, V., Mattoo, A. & Edelman, M. (1987). Identification of a primary *in vivo* degradation product of the rapidly-turning-over 32 kd protein of photosystem II. *The EMBO journal* 6(10): 2865.

Harrison, P., Dubinsky, Z. & Stambler, N. (2011). Coral reefs: an ecosystem in transition. *Sexual Reproduction of Scleractinian Corals*: 59-85.

Hawes, C. (1979). Ultrastructural aspects of the symbiosis between algal chloroplasts and *Elysia viridis*. *New Phytologist* 83(2): 445-450.

Hinde, R. & Smith, D.C. The role of photosynthesis in the nutrition of the mollusc, *Elysia viridis*. *Biol. J. Linnean Soc.* **7**, 161-171 (1975).

Hoegh-Guldberg, O., & Hinde, R. (1986). Studies on a nudibranch that contains zooxanthellae I. Photosynthesis, respiration and the translocation of newly fixed carbon by zooxanthellae in Pteraeolidia ianthina. *Proceedings of the Royal Society of London B: Biological Sciences*, 228(1253), 493-509.

Jensen, K. (1997). Evolution of the Sacoglossa (Mollusca, Opisthobranchia) and the ecological associations with their food plants. *Evolutionary Ecology* 11(3): 301-335.

Jensen, K. R. (1999). Copulatory behaviour in three shelled and five non-shelled sacoglossans (Mollusca, Opisthobranchia), with a discussion of the phylogenetic significance of copulatory behaviour. *Ophelia* 51(2): 93-106.

Jensen, K. R. (2007). Biogeography of the Sacoglossa (Mollusca, Opisthobranchia). *Bonner zoologische Beiträge* 55(3/4): 255-281.

Jones, H., Leadbeater, B. & Green, J. (1994). Mixotrophy in haptophytes. S*ystematics association special volume* 51: 247-247.

Jones, H. L., Todd, C. D. & Lambert, W. J. (1996). Intraspecific variation in embryonic and larval traits of the dorid nudibranch mollusc Adalaria proxima (Alder and Hancock) around the northern coasts of the British Isles. *Journal of Experimental Marine Biology and Ecology* 202(1): 29-47.

Kindsvater, H. K., Bonsall, M. B., & Alonzo, S. H. (2011). Survival costs of reproduction predict age-dependent variation in maternal investment. Journal of evolutionary biology, 24(10), 2230-2240.

Klussmann-Kolb, A. & Wägele, H. (2001). On the fine structure of opisthobranch egg masses (Mollusca, Gastropoda). *Zoologischer Anzeiger-A Journal of Comparative Zoology* 240(2): 101-118.

Krug, P. J. (2009). Not my “type”: larval dispersal dimorphisms and bet-hedging in opisthobranch life histories. *The Biological Bulletin* 216(3): 355-372.

Levin, L. & Bridges, T. (1995). Pattern and diversity in reproduction and development. *Ecology of marine invertebrate larvae*: 1-48.

Marshall, D. J. & Keough, M. J. (2007). The evolutionary ecology of offspring size in marine invertebrates. *Advances in marine biology* 53: 1-60.

Marín, A. & Ros, J. (2004). Chemical defenses in Sacoglossan Opisthobranchs: Taxonomic trends and evolutionary implications. *Scientia Marina* 68(S1): 227-241.

Middlebrooks, M. L., Bell, S. S. & Pierce, S. K. (2012). The kleptoplastic sea slug *Elysia clarki* prolongs photosynthesis by synthesizing chlorophyll *a* and *b*. *Symbiosis* 57(3): 127-132.

Miles, C. M. & Clark, K. B. (2002). Comparison of biochemical composition and developmental mode in two populations of Costasiella [Opisthobranchia: Ascoglossa (= Sacoglossa)]. *Journal of molluscan studies* 68(2): 101-109.

Oxborough, K. (2004). Imaging of chlorophyll *a* fluorescence: theoretical and practical aspects of an emerging technique for the monitoring of photosynthetic performance. *Journal of Experimental Botany* 55(400): 1195-1205.

Pierce, S. K. & Curtis, N. E. (2012). Cell Biology of the Chloroplast Symbiosis in Sacoglossan Sea Slugs. *International review of cell and molecular biology* 293: 123.

Pierce, S. K., Curtis, N. E. & Middlebrooks, M. L. (2015). Sacoglossan sea slugs make routine use of photosynthesis by a variety of species–specific adaptations. *Invertebrate Biology* 134(2): 103-115.

Pierce, S. K., Fang, X., Schwartz, J. A., Jiang, X., Zhao, W., Curtis, N. E., Kocot, K. M., Yang, B. & Wang, J. (2012). Transcriptomic evidence for the expression of horizontally transferred algal nuclear genes in the photosynthetic sea slug, *Elysia chlorotica. Molecular biology and evolution* 29(6): 1545-1556.

Ralph, P. J. & Gademann, R. (2005). Rapid light curves: a powerful tool to assess photosynthetic activity. *Aquatic Botany* 82(3): 222-237.

Raven, J., Walker, D., Jensen, K., Handley, L., Scrimgeour, C. & McInroy, S. (2001). What fraction of the organic carbon in sacoglossans is obtained from photosynthesis by kleptoplastids? An investigation using the natural abundance of stable carbon isotopes. *Marine Biology* 138(3): 537-545.

Rey, F. & Calado, R. (2016). A Influência dos Efeitos Maternais em Invertebrados Bentónicos Marinhos com Ciclos de Vida Bifásicos, com Ênfase nos Crustáceos Decápodes. *Revista Captar: Ciência e Ambiente para Todos* 6(2).

Rey, F., Domingues, M. R. M., Domingues, P., Rosa, R., Orgaz, M. D., Queiroga, H. & Calado, R. (2017). Effect of Maternal Size, Reproductive Season and Interannual Variability in Offspring Provisioning of *Carcinus maenas* in a Coastal Lagoon. *Estuaries and Coasts* 40(6): 1732–1743.

Rojo, I., Olabarria, C., Santamaria, M., Provan, J., Gallardo, T. & Viejo, R. M. (2014). Coexistence of congeneric native and invasive species: The case of the green algae *Codium* spp. in northwestern Spain. *Marine environmental research* 101: 135-144.

Ross, D. A., Hamel, J.-F. & Mercier, A. (2013). Bathymetric and interspecific variability in maternal reproductive investment and diet of eurybathic echinoderms. *Deep Sea Research Part II: Topical Studies in Oceanography* 94: 333-342.

Rudman, W. (1987). Solar-powered animals. *Natural History* 96(10): 50-53.

Rudman, W. B. (1982). The taxonomy and biology of further aeolidacean and arminacean nudibranch molluscs with symbiotic zooxanthellae. *Zoological Journal of the Linnean Society* 74(2): 147-196.

Rumpho, M. E., Dastoor, F. P., Manhart, J. R. & Lee, J. (2007).The kleptoplast. In *The structure and function of plastids*, 451-473: Springer.

Rumpho, M. E., Pelletreau, K. N., Moustafa, A. & Bhattacharya, D. (2011). The making of a photosynthetic animal. *Journal of Experimental Biology* 214(2): 303-311.

Rumpho, M. E., Summer, E. J. & Manhart, J. R. (2000). Solar-powered sea slugs. Mollusc/algal chloroplast symbiosis. *Plant Physiology* 123(1): 29-38.

Schmitt, V., Händeler, K., Gunkel, S., Escande, M.-L., Menzel, D., Gould, S. B., Martin, W. F. & Wägele, H. (2014). Chloroplast incorporation and long-term photosynthetic performance through the life cycle in laboratory cultures of Elysia timida (Sacoglossa, Heterobranchia). *Frontiers in zoology* 11(1): 5.

Schwab, Daniel Bryan. "Maternal effects on reproduction and development in the mud snail, *Ilyanassa obsoleta*." (2012).

Serôdio, J., Cruz, S., Cartaxana, P. & Calado, R. (2014). Photophysiology of kleptoplasts: photosynthetic use of light by chloroplasts living in animal cells. *Philosophical Transactions of the Royal Society of London. B* 369(1640): 20130242.

Stearns, S. C. (1992). The Evolution of Life Histories Oxford University Press Oxford. UK Google Scholar.

Tan, G., Govedich, F. & Burd, M. (2004). Social group size, potential sperm competition and reproductive investment in a hermaphroditic leech, *Helobdella papillornata* (Euhirudinea: Glossiphoniidae). *Journal of evolutionary biology* 17(3): 574-580.

Thompson, T. E. (1967). Direct development in a nudibranch, *Cadlina laevis*, with a discussion of developmental processes in Opisthobranchia. Journal of the Marine Biological Association of the United Kingdom 47(1): 1–22.

Trench, R. (1974).Of'leaves that crawl': functional chloroplasts in animal cells. In *Symposia of the Society for Experimental Biology*, 229-265.

Trench, R., Boyle, J. E. & Smith, D. (1973). The association between chloroplasts of *Codium fragile* and the mollusc *Elysia viridis*. II. Chloroplast ultrastructure and photosynthetic carbon fixation in E. viridis. *Proceedings of the Royal Society of London B: Biological Sciences* 184(1074): 63-81.

Trickey, J. S., Vanner, J. & Wilson, N. G. (2013). Reproductive variance in planar spawning Chromodoris species (Mollusca: Nudibranchia). *Molluscan research* 33(4): 265-271.

Trowbridge, C. D. (2000). The missing links: larval and post-larval development of the ascoglossan opisthobranch *Elysia viridis*. *Journal of the Marine Biological Association of the UK* 80(06): 1087-1094.

Trowbridge, C. D. & Todd, C. D. (2001). Host–plant change in marine specialist herbivores: ascoglossan sea slugs on introduced macroalgae. *Ecological Monographs* 71(2): 219-243.

Vance, R. R. (1973). On reproductive strategies in marine benthic invertebrates. *The American Naturalist* 107(955): 339-352.

Vieira, S., Calado, R., Coelho, H. & Serôdio, J. (2009). Effects of light exposure on the retention of kleptoplastic photosynthetic activity in the sacoglossan mollusc *Elysia viridis*. *Marine Biology* 156(5): 1007.

Supplementary Material

7. **SUPPLEMENTARY MATERIAL:**

7.1. *Elysia viridis* length when exposed to different feeding regimes

Lab Data						
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
1	21,744	18,380	26,123	25,266	20,642	17,596
1’	22,015	28,890	17,567	17,035	23,626	21,299
4	22,285	26,390	18,580	20,527	18,602	17,892
4’	23,304	25,020	22,783	22,751	19,998	18,594
7	18,677	25,570	21,584	20,318	21,696	21,273
7’	22,991	27,660	21,428	20,496	20,834	17,399
10	17,012	23,690	18,186	18,141	16,869	16,359
10’	21,117	23,770	16,882	15,716	16,827	20,289
13	22,695	29,420	20,630	9,821	13,457	12,821
13’	16,490	19,910	14,025	18,852	18,786	19,220
2	22,110	18,280	16,470	16,165	16,458	16,789
2’	17,941	17,110	19,652	17,586	16,813	20,099
5	20,169	18,150	20,400	22,812	17,147	16,402
5’	22,103	24,470	16,375	16,087	18,019	10,255
8	18,759	24,100	10,486	17,587	12,069	13,494
8’	20,041	24,100	11,658	12,055	15,748	16,524
11	19,916	26,540	15,271	15,532	14,919	17,904
11’	22,515	24,790	17,093	17,561	13,071	15,625
14	17,946	21,450	12,815	11,073	19,084	17,909
14’	21,882	21,400	18,642	16,928	11,297	11,027
3	19,236	17,380	13,145	14,015	12,638	6,811
3’	17,204	14,990	16,183	13,676	13,248	
6	19,550	16,700	16,969	16,843	9,806	9,144
6’	17,886	24,730	16,218	11,755	13,436	12,387
9	20,367	23,080	17,927	15,566	12,485	10,691
9’	20,497	25,410	16,866	12,984	10,581	7,191
12	16,189	14,140	14,118	9,076	8,169	7,206
12’	17,378	21,670	16,041	13,541	10,565	8,003
15	18,751	20,200	13,541	12,016	10,024	10,247
15’	18,675	20,000	17,769	14,288	11,372	6,893

Means per treatment

	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
Fed	20,833	24,870	19,779	18,892	19,134	18,274
Fed 24h/week	20,338	22,039	15,886	16,339	15,463	15,603
Starved	18,573	19,830	15,878	13,376	11,232	8,538

Standard Deviation of Means per treatment						
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
Fed	1,550	1,285	2,186	3,144	2,640	1,377
Fed 24h/week	0,801	3,049	2,927	2,108	1,621	2,015
Starved	1,306	3,055	1,116	1,246	1,317	1,498

7.2. *Elysia viridis* length when exposed to different light regimes

Lab Data						
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
1	13,274	14,332	15,049	16,361	15,687	18,089
1’	14,475	15,513	20,269	19,243	13,707	19,135
4	15,799	18,428	18,731	17,976	15,651	17,254
4’	16,245	18,621	16,299	19,646	17,538	16,292
7	14,362	14,599	14,133	15,626	15,201	16,572
7’	14,647	15,888	15,766	16,581	17,063	15,269
10	13,531	16,062	14,419	15,912	17,266	14,482
10’	12,138	17,338	13,215	13,357	15,548	16,009
13	13,634	17,487	13,641	16,559	13,737	14,483
13’	14,278	18,951	13,150	16,795	14,746	15,289
2	16,075	12,031	13,814	14,886	17,984	15,773
2’	17,553	17,483	11,441	18,418	13,989	14,414
5	15,130	12,310	13,731	15,027	14,031	16,509
5’	14,676	15,694	16,547	15,917	15,289	14,851
8	16,566	18,609	14,675	18,626	19,746	14,617
8’	14,935	17,669	16,654	20,289	18,191	16,471
11	14,669	16,201	13,399	14,357	14,521	15,963
11’	15,518	18,147	11,242	15,387	16,971	14,395
14	12,529	17,583	11,327	16,315	13,380	15,473
14’	15,946	15,692	12,945	13,505	16,518	16,728
3	14,188	16,573	11,977	14,607	15,284	15,089
3’	13,112	15,733	15,004	14,755	13,146	15,974
6	17,516	17,374	15,899	17,417	14,763	14,778
6’	14,139	16,748	15,635	14,814	14,556	14,339
9	15,928	17,073	15,604	14,791	16,367	16,381
9’	15,264	16,796	13,331	13,426	14,834	13,491
12	13,540	14,438	14,681	14,727	16,532	11,704
12’	13,998	14,354	13,907	12,311	12,269	14,321
15	13,050	13,568	12,563	14,518	14,556	13,164
15’	13,547	15,661	13,216	12,845	12,137	14,276

Means per treatment

	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	14,238	16,722	15,467	16,806	15,614	16,287
Medium Light	15,360	16,142	13,578	16,273	16,062	15,519
Low Light	14,428	15,832	14,182	14,421	14,444	14,352

Standard Deviation of Means per treatment						
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	1,166	1,652	2,017	1,600	1,070	1,485
Medium Light	0,976	1,717	1,685	1,920	1,714	0,407
Low Light	1,187	1,262	1,090	1,048	0,813	0,996

7.3. *Elysia viridis* photosynthetic efficiency when exposed to different feeding regimes

7.3.1. Effective quantum yield

All data									
	Week 0			Week 1			Week 2		
	Fs	Fm'	Yield	Fs	Fm'	Yield	Fs	Fm'	Yield
1	275,00	1010,50	0,77	322,33	1116,67	0,71	317,83	1124,17	0,72
4	279,17	1081,67	0,74	289,33	1089,33	0,73	305,17	1187,17	0,74
7	267,00	1112,33	0,76	315,17	1157,00	0,73	283,83	1117,67	0,75
10	278,50	1074,50	0,74	320,17	1127,00	0,72	305,83	1075,33	0,72
13	281,17	1118,17	0,75	318,17	974,50	0,67	270,17	843,83	0,68
2	299,00	1159,67	0,74	292,50	971,00	0,68	280,50	881,33	0,68
5	267,33	1087,67	0,75	307,50	1037,33	0,70	258,33	855,33	0,70
8	255,17	979,00	0,74	297,50	995,67	0,70	299,83	878,17	0,66
11	275,17	1147,17	0,76	267,33	939,50	0,71	275,00	883,00	0,69
14	250,67	967,17	0,74	307,67	1136,83	0,73	275,67	802,17	0,64
3	269,50	1033,00	0,74	317,33	982,33	0,67	270,17	747,17	0,61
6	320,33	1005,50	0,75	299,00	957,50	0,69	198,67	456,17	0,56
9	255,17	1017,50	0,75	279,83	988,83	0,67	254,33	647,50	0,60
12	257,83	1079,67	0,76	272,17	906,50	0,70	282,00	858,67	0,67
15	244,67	1008,67	0,76	297,67	1075,67	0,72	238,67	657,67	0,64

All data									
	Week 3			Week 4			Week 5		
	Fs	Fm'	Yield	Fs	Fm'	Yield	Fs	Fm'	Yield
1	279,33	1069,83	0,74	262,00	981,17	0,73	292,00	1022,67	0,71
4	278,33	1008,00	0,72	232,83	758,33	0,69	281,33	942,00	0,70
7	269,50	1056,50	0,74	259,50	948,33	0,72	280,83	1054,67	0,73
10	306,50	1037,50	0,71	288,67	945,50	0,69	307,00	1021,00	0,70
13	285,17	983,17	0,71	288,67	860,00	0,66	297,17	951,00	0,69
2	239,83	848,00	0,71	221,50	716,67	0,69	239,83	770,00	0,68
5	253,67	780,67	0,67	230,00	573,67	0,59	271,00	744,00	0,63
8	204,00	603,50	0,65	188,33	560,67	0,64	191,50	581,33	0,60
11	290,33	957,17	0,70	269,17	778,00	0,65	229,17	633,50	0,63
14	244,50	752,17	0,66	246,17	756,00	0,67	226,17	709,83	0,67
3	224,33	515,50	0,56	157,67	298,50	0,47	85,00	140,67	0,40
6	154,17	311,33	0,49	134,67	260,00	0,46	79,17	116,50	0,29
9	166,83	306,00	0,44	97,67	148,67	0,33	42,33	51,17	0,09
12	220,50	568,50	0,60	115,50	212,33	0,42	52,00	67,17	0,22
15	192,33	496,67	0,60	124,33	234,17	0,46	38,83	42,67	0,00

Means per treatment						
	F_s					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	276,17	313,03	296,57	283,77	266,33	291,67
Fed 24h/week	269,47	294,50	277,87	246,47	231,03	231,53
Starved	269,50	293,20	248,77	191,63	125,97	59,47

Means per treatment						
	$F_{m'}$					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	1079,433	1092,900	1069,633	1031,000	898,667	998,267
Fed 24h/week	1068,133	1016,067	860,000	788,300	677,000	687,733
Starved	1028,867	982,167	673,433	439,600	230,733	83,633

Means per treatment						
	ΔF/F$_{m'}$					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	0,751	0,711	0,720	0,724	0,702	0,707
Fed 24h/week	0,747	0,704	0,675	0,680	0,651	0,644
Starved	0,750	0,690	0,615	0,540	0,428	0,201

Standard deviation of Means per treatment						
	F$_s$					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	5,59	13,51	19,18	13,89	23,37	11,06
Fed 24h/week	19,15	16,53	14,87	30,93	29,99	28,56
Starved	29,76	17,73	32,42	31,31	52,98	21,30

Standard deviation of Means per treatment						
	F$_{m'}$					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	42,906	70,477	132,395	35,417	80,815	44,030
Fed 24h/week	91,029	76,398	34,207	81,148	91,898	70,263
Starved	30,335	61,483	148,218	122,407	50,068	38,305

Standard deviation of Means per treatment						
	ΔF/F$_{m'}$					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	0,011	0,026	0,027	0,017	0,028	0,017
Fed 24h/week	0,009	0,026	0,021	0,025	0,036	0,032
Starved	0,009	0,023	0,041	0,071	0,060	0,157

7.3.2. Maximum quantum yield

All data									
	Week 0			Week 1			Week 2		
	Fo	Fm	Fv/Fm	Fo	Fm	Fv/Fm	Fo	Fm	Fv/Fm
1	299,17	1321,67	0,77	290,83	1326,33	0,78	300,83	1265,00	0,76
4	281,17	1211,17	0,77	298,17	1093,33	0,73	312,33	1206,83	0,74
7	280,50	1309,50	0,79	308,50	1295,83	0,76	310,83	1298,83	0,76
10	287,33	1249,67	0,77	321,17	1264,50	0,75	304,00	1210,17	0,75
13	298,83	1308,83	0,77	310,67	1162,33	0,72	325,33	1241,00	0,74
2	281,67	1231,17	0,77	342,67	1229,17	0,72	279,83	893,67	0,68
5	286,33	1233,67	0,77	321,33	1103,50	0,75	275,50	877,83	0,70
8	252,67	1157,00	0,78	282,50	1144,33	0,74	268,67	842,17	0,68
11	287,33	1290,67	0,78	304,83	1169,00	0,72	320,67	1056,00	0,70
14	269,83	1123,17	0,76	299,33	1330,33	0,78	315,17	1058,50	0,70
3	288,50	1227,00	0,76	294,50	1196,00	0,75	316,17	1076,83	0,70
6	282,67	1217,83	0,77	302,83	961,17	0,68	227,33	540,33	0,57
9	274,50	1196,50	0,77	294,67	946,33	0,68	251,83	666,17	0,62
12	289,83	1254,00	0,77	311,83	1125,17	0,72	269,33	764,17	0,65
15	281,17	1230,83	0,77	279,67	1151,67	0,76	248,33	852,33	0,70

All data									
	Week 3			**Week 4**			**Week 5**		
	Fo	**Fm**	**Fv/Fm**	**Fo**	**Fm**	**Fv/Fm**	**Fo**	**Fm**	**Fv/Fm**
1	319,17	1286,33	0,75	275,00	1061,50	0,74	295,17	1107,00	0,73
4	317,67	1171,83	0,73	260,00	952,83	0,73	299,33	1063,83	0,72
7	301,17	1255,00	0,76	281,83	1109,00	0,75	282,67	1212,00	0,77
10	326,17	1204,17	0,73	290,00	1056,33	0,72	310,33	1170,00	0,73
13	305,00	1100,33	0,71	280,67	969,00	0,73	302,50	1059,33	0,71
2	249,17	868,17	0,71	244,17	780,17	0,69	281,00	919,00	0,69
5	289,33	940,50	0,69	213,83	595,17	0,64	234,00	704,33	0,67
8	259,50	819,00	0,68	206,17	646,83	0,67	234,00	704,33	0,67
11	306,50	987,17	0,68	258,50	774,67	0,66	256,00	763,50	0,66
14	308,50	1029,83	0,69	289,67	905,33	0,68	278,50	818,67	0,66
3	228,67	521,00	0,56	165,67	299,67	0,45	83,67	141,67	0,41
6	145,50	284,17	0,47	112,00	228,33	0,42	80,33	125,33	0,30
9	188,67	356,67	0,52	86,67	141,33	0,37	39,67	47,33	0,07
12	163,17	345,00	0,52	133,00	239,17	0,45	70,33	91,33	0,21
15	209,50	555,67	0,61	133,00	239,17	0,45	28,83	35,17	0,00

Treatment means						
	Fo					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	285,900	316,233	306,467	299,833	271,333	295,167
Fed 24h/week	276,933	300,500	299,233	278,500	226,767	217,233
Starved	283,333	296,700	262,600	187,100	126,067	60,567

Treatment means						
	Fm					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	1262,067	1209,033	1170,100	1119,900	973,467	1084,833
Fed 24h/week	1206,300	1188,633	982,267	859,500	644,333	626,500
Starved	1225,233	1076,067	779,967	412,500	229,533	88,167

Means per treatment						
	Fv/Fm					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	0,773	0,737	0,735	0,726	0,722	0,725
Fed 24h/week	0,770	0,746	0,695	0,661	0,620	0,613
Starved	0,769	0,718	0,648	0,534	0,429	0,197

Treatment standard deviation						
	Fo					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	7,727	16,884	16,769	30,029	18,790	12,827
Fed 24h/week	15,569	14,267	24,988	34,080	48,188	76,907
Starved	5,516	10,637	29,926	30,118	26,132	22,197

Treatment standard deviation						
	Fm					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	45,101	81,522	158,878	151,495	125,546	114,036
Fed 24h/week	66,402	86,210	112,611	158,988	227,116	275,171
Starved	18,667	102,511	181,103	106,219	50,764	41,785

Means per treatment						
	Fv/Fm					
	Semana 0	Semana 1	Semana 2	Semana 3	Semana 4	Semana 5
Fed	0,007	0,019	0,029	0,021	0,021	0,027
Fed 24h/week	0,010	0,019	0,009	0,057	0,098	0,114
Starved	0,003	0,031	0,051	0,047	0,030	0,150

7.4. *Elysia viridis* photosynthetic efficiency when exposed to different light regimes

7.4.1. Effective quantum yield

All data									
	Week 0			Week 1			Week 2		
	Fs	Fm'	Yield	Fs	Fm'	Yield	Fs	Fm'	Yield
1	281,33	1028,33	0,73	298,50	1132,83	0,74	276,00	997,33	0,72
4	284,83	1071,83	0,73	333,83	1185,67	0,72	292,83	1018,33	0,71
7	302,00	1028,00	0,71	321,83	1101,17	0,71	301,17	944,17	0,68
10	282,00	1052,50	0,73	311,50	1046,50	0,70	279,33	1027,67	0,73
13	301,83	1117,33	0,73	292,33	1021,33	0,70	283,67	905,83	0,69
2	264,33	1011,33	0,74	292,33	1136,50	0,74	270,33	1098,00	0,75
5	277,50	1019,83	0,73	306,83	1104,67	0,72	266,00	1023,33	0,74
8	284,00	1051,67	0,73	283,50	1099,50	0,74	272,17	1127,33	0,75
11	301,83	1088,83	0,72	303,50	1243,67	0,76	257,17	996,50	0,74
14	285,83	1069,17	0,73	292,83	1164,17	0,75	268,67	1088,83	0,75
3	259,50	1011,17	0,74	324,00	1329,83	0,76	263,83	1095,67	0,76
6	276,17	1050,67	0,74	324,50	1266,50	0,74	284,83	1146,17	0,75
9	293,67	1061,33	0,66	312,00	1286,83	0,76	254,00	1034,67	0,75
12	296,17	1048,83	0,72	324,67	1257,83	0,74	266,33	1112,83	0,76
15	303,50	1147,17	0,74	358,50	1357,83	0,74	284,00	1134,33	0,75

All data									
	Week 3			Week 4			Week 5		
	Fs	Fm'	Yield	Fs	Fm'	Yield	Fs	Fm'	Yield
1	284,00	928,33	0,69	286,67	892,83	0,68	287,67	914,83	0,69
4	282,33	958,17	0,71	297,67	1032,50	0,71	299,00	1032,83	0,71
7	285,67	878,33	0,67	302,83	999,83	0,70	293,17	850,33	0,66
10	270,83	964,83	0,72	276,17	1039,00	0,73	267,33	1004,33	0,73
13	289,50	925,00	0,68	285,67	968,67	0,70	306,00	917,67	0,66
2	256,33	1056,33	0,76	275,33	1139,67	0,76	234,50	993,67	0,76
5	251,67	994,83	0,75	265,17	969,50	0,73	268,33	1083,67	0,75
8	261,50	1099,00	0,76	280,50	1119,33	0,75	267,83	1103,67	0,76
11	289,17	1084,83	0,73	279,83	1077,17	0,74	283,83	1160,33	0,76
14	286,83	1155,17	0,75	280,50	1177,00	0,76	267,83	1084,50	0,75
3	230,83	997,67	0,77	282,33	1087,83	0,74	258,50	1030,83	0,75
6	252,83	1117,50	0,77	275,67	1098,33	0,75	259,17	1089,67	0,76
9	220,17	940,83	0,77	265,33	1143,67	0,77	250,17	1042,17	0,76
12	258,83	1119,17	0,77	277,83	1089,33	0,75	273,50	894,33	0,74
15	236,33	1085,33	0,78	283,83	1164,83	0,76	258,50	1041,17	0,75

Treatment means						
	F_s					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	290,400	311,600	286,600	282,467	289,800	290,633
Low Light	282,700	295,800	266,867	269,100	276,267	264,467
Very Low Light	285,800	328,733	270,600	239,800	277,000	259,967

Treatment means						
	$F_{m'}$					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	1059,600	1097,500	978,667	930,933	986,567	944,000
Low Light	1048,167	1149,700	1066,800	1078,033	1096,533	1085,167
Very Low Light	1063,833	1299,767	1104,733	1052,100	1116,800	1019,633

Treatment means

	$\Delta F/F_{m'}$					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	0,7255	0,7131	0,7056	0,6949	0,7036	0,6908
Low Light	0,7298	0,7422	0,7483	0,7519	0,7435	0,7533
Very Low Light	0,7330	0,7469	0,7549	0,7717	0,7514	0,7526

Treatment standard deviation						
	F_s					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	10,595	16,896	10,305	7,025	10,542	14,699
Low Light	13,620	9,396	5,878	17,620	6,570	18,102
Very Low Light	17,798	17,485	13,432	15,890	7,310	8,428

Treatment standard deviation						
	$F_{m'}$					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	37,113	66,026	52,004	34,277	59,459	73,907
Low Light	32,659	58,654	54,669	58,797	79,636	46,559
Very Low Light	50,306	42,744	43,732	79,408	35,226	73,657

Treatment standard deviation						
	$\Delta F/F_{m'}$					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	0,011	0,014	0,022	0,018	0,021	0,031
Low Light	0,006	0,012	0,008	0,012	0,014	0,005
Very Low Light	0,036	0,010	0,005	0,006	0,011	0,009

7.4.2. Maximum quantum yield

All data									
	Week 0			Week 1			Week 2		
	F0	Fm	Fv/Fm	F0	Fm	Fv/Fm	F0	Fm	Fv/Fm
1	296,00	1122,50	0,73	323,67	1311,33	0,75	289,67	1150,67	0,75
4	300,83	1228,67	0,75	339,33	1392,33	0,76	291,83	1165,67	0,75
7	341,17	1237,33	0,72	331,00	1256,67	0,74	260,00	1013,33	0,71
10	313,67	1136,83	0,72	315,17	1216,83	0,74	321,83	1222,67	0,74
13	308,00	1157,83	0,73	327,17	1203,83	0,73	316,17	1033,83	0,69
2	279,17	1074,00	0,74	304,00	1274,67	0,76	293,67	1318,50	0,78
5	294,17	1155,83	0,75	320,67	1234,00	0,74	287,50	1166,00	0,75
8	306,33	1141,50	0,73	290,00	1198,33	0,76	274,67	1237,50	0,78
11	314,83	1158,17	0,73	329,17	1389,00	0,76	303,67	1273,33	0,76
14	323,67	1263,50	0,74	321,17	1334,17	0,76	279,67	1277,83	0,78
3	273,83	1146,67	0,76	281,00	1323,00	0,79	263,67	1158,83	0,77
6	309,33	1133,83	0,73	294,33	1246,33	0,76	289,83	1291,00	0,78
9	320,17	1250,83	0,74	293,83	1318,17	0,78	243,50	1065,17	0,77
12	307,00	1105,50	0,72	312,50	1286,17	0,76	260,33	1175,00	0,78
15	294,17	1185,67	0,75	312,33	1335,83	0,77	278,17	1227,50	0,77

All data									
	Week 3			Week 4			Week 5		
	F0	Fm	Fv/Fm	F0	Fm	Fv/Fm	F0	Fm	Fv/Fm
1	278,67	1040,00	0,73	311,33	1092,83	0,71	315,00	1101,33	0,71
4	306,50	1146,50	0,73	335,50	1305,33	0,74	334,00	1276,17	0,74
7	305,83	1081,83	0,72	321,33	1106,17	0,71	305,33	980,83	0,69
10	288,17	1152,17	0,75	314,83	1262,00	0,75	283,33	1164,67	0,76
13	289,00	1032,83	0,72	312,00	1154,33	0,72	306,50	1079,17	0,70
2	290,50	1297,50	0,78	296,50	1359,83	0,78	265,83	1154,17	0,77
5	264,50	1190,83	0,76	307,83	1164,33	0,74	286,33	1235,00	0,77
8	282,17	1227,50	0,77	315,33	1381,00	0,77	292,00	1311,67	0,78
11	306,50	1286,17	0,76	319,00	1321,67	0,76	290,17	1292,67	0,77
14	283,50	1273,00	0,78	291,50	1282,17	0,77	291,83	1248,00	0,77
3	245,67	1055,83	0,77	275,50	1217,50	0,77	242,83	1112,33	0,78
6	252,00	1168,50	0,78	279,50	1201,67	0,77	257,00	1169,33	0,78
9	224,83	967,50	0,77	269,00	1212,83	0,78	237,17	1026,00	0,77
12	273,17	1216,17	0,78	288,17	1199,17	0,76	246,33	1053,17	0,77
15	281,00	1220,00	0,77	282,33	1219,33	0,77	272,83	1137,00	0,76

Treatment means						
	F0					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	311,933	327,267	295,900	293,633	319,000	308,833
Low Light	303,633	313,000	287,833	285,433	306,033	285,233
Very Low Light	300,900	298,800	267,100	255,333	278,900	251,233

Treatment means						
	Fm					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	1176,633	1276,200	1117,233	1090,667	1184,133	1131,000
Low Light	1158,600	1286,033	1254,633	1255,000	1301,800	1239,933
Very Low Light	1164,500	1301,900	1183,500	1125,600	1210,100	1099,567

Treatment means						
	Fv/Fm					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	0,734	0,742	0,728	0,730	0,727	0,720
Low Light	0,737	0,756	0,770	0,770	0,764	0,771
Very Low Light	0,741	0,769	0,774	0,773	0,769	0,771

Treatment standard deviation						
	F0					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	17,679	8,929	24,635	12,142	10,035	18,298
Low Light	17,481	15,786	11,455	15,183	11,832	11,082
Very Low Light	17,730	13,531	17,705	22,425	8,245	14,074

Treatment standard deviation						
	Fm					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	53,056	77,240	89,903	56,766	94,941	109,276
Low Light	67,936	76,562	57,263	44,652	85,612	61,282
Very Low Light	56,216	36,043	83,928	110,473	9,194	59,154

Treatment standard deviation						
	Fv/Fm					
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5
High Light	0,013	0,012	0,024	0,013	0,019	0,027
Low Light	0,008	0,009	0,012	0,007	0,018	0,005
Very Low Light	0,016	0,013	0,003	0,007	0,007	0,010

7.5. *Elysia viridis* egg masses biometric data when exposed to different feeding regimes

Day 25

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P2_6	16,631	0,273	96	351,648	5848,264	5929,649	0,00088	0,000891	0,00842	5,970E-07	2,501E-06	0,0148
		0,186	60	322,581	5364,839		0,00085					
		0,179	52	290,503	4831,352		0,00121					
		0,211	64	303,318	5044,474		0,00055					
		0,204	62	303,922	5054,520		0,00078					
		0,137	52	379,562	6312,496		0,00117					
		0,191	68	356,021	5920,984		0,00085					
		0,136	63	463,235	7704,066		0,00083					
		0,139	56	402,878	6700,259		0,00078					
		0,194	76	391,753	6515,237		0,00101					
P8_6	22,618	0,169	16	94,675	2141,349	2652,779	0,00329	0,002870	0,01511	3,452E-06	1,446E-05	0,0384
		0,170	17	100,000	2261,800		0,00205					
		0,171	18	105,263	2380,842		0,00357					
		0,151	18	119,205	2696,185		0,00309					
		0,141	15	106,383	2406,170		0,00289					
		0,156	20	128,205	2899,744		0,00309					
		0,159	22	138,365	3129,535		0,00223					
		0,151	23	152,318	3445,126		0,00309					
		0,174	18	103,448	2339,793		0,00264					
		0,128	16	125,000	2827,250		0,00276					
P9_8	17,82	0,157	39	248,408	4426,624	5496,511	0,00094	0,001083	0,00928	8,001E-07	3,351E-06	0,0184
		0,134	33	246,269	4388,507		0,00070					
		0,123	36	292,683	5215,610		0,00197					
		0,120	27	225,000	4009,500		0,00101					
		0,163	64	392,638	6996,810		0,00101					
		0,121	35	289,256	5154,545		0,00121					
		0,168	68	404,762	7212,857		0,00101					
		0,123	40	325,203	5795,122		0,00070					
		0,154	52	337,662	6017,143		0,00077					
		0,093	30	322,581	5748,387		0,00151					

P11_9	20,041	0,172	26,000	151,163	3029,453	3228,763	0,002	0,002	0,014	2,786E-	1,167E-05	0,038

		0,166	22,000	132,530	2656,036		0,002			06		
		0,101	12,000	118,812	2381,109		0,002					
		0,123	19,000	154,472	3095,764		0,002					
		0,150	33,000	220,000	4409,020		0,003					
		0,107	20,000	186,916	3745,981		0,002					
		0,116	21,000	181,034	3628,112		0,002					
		0,143	22,000	153,846	3083,231		0,004					
		0,135	23,000	170,370	3414,393		0,003					
		0,155	22,000	141,935	2844,529		0,002					
P15_11	14,935	0,164	14,000	85,366	1274,939	1943,092	0,003	0,003	0,016	3,783E-06	1,585E-05	0,031
		0,109	15,000	137,615	2055,275		0,002					
		0,151	18,000	119,205	1780,331		0,003					
		0,163	17,000	104,294	1557,638		0,003					
		0,117	15,000	128,205	1914,744		0,003					
		0,106	18,000	169,811	2536,132		0,003					
		0,111	18,000	162,162	2421,892		0,003					
		0,105	14,000	133,333	1991,333		0,003					
		0,114	16,000	140,351	2096,140		0,003					
		0,116	14,000	120,690	1802,500		0,004					

Day 26

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P1_9	10,224	0,118	21,000	177,966	1819,525	1456,084	0,003	0,0040	0,0179	5,707E-06	2,390E-05	0,035
		0,123	16,000	130,081	1329,951		0,005					
		0,145	20,000	137,931	1410,207		0,004					
		0,150	21,000	140,000	1431,360		0,004					
		0,132	18,000	136,364	1394,182		0,004					
		0,117	15,000	128,205	1310,769		0,004					
		0,113	21,000	185,841	1900,035		0,004					
		0,128	16,000	125,000	1278,000		0,005					
		0,135	14,000	103,704	1060,267		0,004					
		0,132	21,000	159,091	1626,545		0,004					

P9_10	13,713	0,118	22,000	186,441	2556,661	2098,562	0,003	0,0030	0,0155	3,739E-06	1,566E-05	0,033
		0,131	15,000	114,504	1570,191		0,003					

		0,129	18,000	139,535	1913,442		0,003					
		0,142	21,000	147,887	2027,979		0,003					
		0,143	20,000	139,860	1917,902		0,003					
		0,117	23,000	196,581	2695,718		0,003					
		0,132	16,000	121,212	1662,182		0,003					
		0,132	22,000	166,667	2285,500		0,004					
		0,108	19,000	175,926	2412,472		0,003					
		0,127	18,000	141,732	1943,575		0,003					
P12_8	13,992	0,117	15,000	128,205	1793,846	2168,961	0,003	0,0033	0,0163	4,341E-06	1,818E-05	0,039
		0,136	19,000	139,706	1954,765		0,004					
		0,129	18,000	139,535	1952,372		0,003					
		0,141	23,000	163,121	2282,383		0,003					
		0,137	22,000	160,584	2246,891		0,003					
		0,135	24,000	177,778	2487,467		0,004					
		0,127	21,000	165,354	2313,638		0,003					
		0,131	23,000	175,573	2456,611		0,003					
		0,119	19,000	159,664	2234,017		0,003					
		0,128	18,000	140,625	1967,625		0,003					

Day 27

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P1_10	24,538	0,160	33,000	206,250	5060,963	5028,476	0,004	0,003	0,016	4,192E-06	1,756E-05	0,088
		0,106	25,000	235,849	5787,264		0,003					
		0,127	24,000	188,976	4637,102		0,003					
		0,128	22,000	171,875	4217,469		0,004					
		0,098	18,000	183,673	4506,980		0,004					
		0,095	21,000	221,053	5424,189		0,003					
		0,126	25,000	198,413	4868,651		0,004					
		0,116	24,000	206,897	5076,828		0,003					
		0,097	21,000	216,495	5312,351		0,003					
		0,091	20,000	219,780	5392,967		0,003					
P1_11	16,750	0,098	23,000	234,694	3931,122	3405,982	0,004	0,003	0,016	4,229E-06	1,771E-05	0,060
		0,084	18,000	214,286	3589,286		0,003					

		0,078	17,000	217,949	3650,641		0,003					
		0,103	21,000	203,883	3415,049		0,004					
		0,105	25,000	238,095	3988,095		0,003					
		0,114	23,000	201,754	3379,386		0,003					
		0,095	20,000	210,526	3526,316		0,004					
		0,105	17,000	161,905	2711,905		0,003					
		0,103	18,000	174,757	2927,184		0,004					
		0,131	23,000	175,573	2940,840		0,003					
P3_11	12,472	0,134	61,000	455,224	5677,552	5322,574	0,001	0,001	0,008	5,940E-07	2,488E-06	0,013
		0,114	50,000	438,596	5470,175		0,001					
		0,108	43,000	398,148	4965,704		0,001					
		0,129	45,000	348,837	4350,698		0,001					
		0,138	52,000	376,812	4699,594		0,001					
		0,117	48,000	410,256	5116,718		0,001					
		0,103	46,000	446,602	5570,019		0,001					
		0,107	44,000	411,215	5128,673		0,001					
		0,100	50,000	500,000	6236,000		0,001					
		0,083	40,000	481,928	6010,602		0,001					
P6_10	11,372	0,133	40,000	300,752	3420,150	3427,949	0,001	0,001	0,010	9,460E-07	3,963E-06	0,014
		0,189	46,000	243,386	2767,788		0,001					
		0,099	48,000	484,848	5513,697		0,001					
		0,150	36,000	240,000	2729,280		0,001					
		0,126	44,000	349,206	3971,175		0,002					
		0,137	30,000	218,978	2490,219		0,002					
		0,147	33,000	224,490	2552,898		0,001					
		0,140	44,000	314,286	3574,057		0,002					
		0,121	36,000	297,521	3383,405		0,001					
		0,088	30,000	340,909	3876,818		0,001					
P11_10	15,968	0,137	23,000	167,883	2680,759	2568,876	0,003	0,003	0,016	4,119E-06	1,725E-05	0,044
		0,123	18,000	146,341	2336,780		0,002					
		0,107	16,000	149,533	2387,738		0,003					
		0,147	17,000	115,646	1846,639		0,003					
		0,103	19,000	184,466	2945,553		0,004					
		0,097	18,000	185,567	2963,134		0,004					
		0,131	20,000	152,672	2437,863		0,004					
		0,109	17,000	155,963	2490,422		0,003					
		0,118	21,000	177,966	2841,763		0,004					
		0,110	19,000	172,727	2758,109		0,003					
P14_9	14,783	0,143	40,000	279,720	4135,105	4019,517	0,002	0,002	0,014	2,658E-06	1,113E-05	0,045
		0,096	28,000	291,667	4311,708		0,002					
		0,132	32,000	242,424	3583,758		0,003					

		0,149	34,000	228,188	3373,302		0,003					
		0,106	30,000	283,019	4183,868		0,002					
		0,118	33,000	279,661	4134,229		0,003					
		0,101	28,000	277,228	4098,257		0,002					
		0,082	28,000	341,463	5047,854		0,002					
		0,102	26,000	254,902	3768,216		0,003					
		0,108	26,000	240,741	3558,870		0,002					

Day 28

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P3_12	9,912	0,130	21,000	161,538	1601,169	1445,565	0,005	0,003	0,016	4,050E-06	1,697E-05	0,025
		0,143	19,000	132,867	1316,979		0,003					
		0,159	21,000	132,075	1309,132		0,003					
		0,132	14,000	106,061	1051,273		0,004					
		0,118	20,000	169,492	1680,000		0,003					
		0,091	18,000	197,802	1960,615		0,004					
		0,118	20,000	169,492	1680,000		0,003					
		0,153	18,000	117,647	1166,118		0,002					
		0,134	18,000	134,328	1331,463		0,003					
		0,124	17,000	137,097	1358,903		0,004					
P8_7	12,020	0,128	21,000	164,063	1972,031	1841,427	0,003	0,003	0,017	4,551E-06	1,906E-05	0,035
		0,123	19,000	154,472	1856,748		0,003					
		0,130	18,000	138,462	1664,308		0,002					
		0,110	14,000	127,273	1529,818		0,004					
		0,118	21,000	177,966	2139,153		0,004					
		0,123	18,000	146,341	1759,024		0,002					
		0,101	15,000	148,515	1785,149		0,004					
		0,117	19,000	162,393	1951,966		0,004					
		0,109	17,000	155,963	1874,679		0,005					
		0,115	18,000	156,522	1881,391		0,004					

P10_6	32,798	0,123	22,000	178,862	5866,309	4838,923	0,004	0,003	0,017	4,519E-06	1,893E-05	0,092
		0,104	19,000	182,692	5991,942		0,003					
		0,101	19,000	188,119	6169,921		0,004					

		0,118	13,000	110,169	3613,339		0,003					
		0,131	17,000	129,771	4256,229		0,004					
		0,123	14,000	113,821	3733,106		0,003					
		0,101	12,000	118,812	3896,792		0,004					
		0,125	15,000	120,000	3935,760		0,003					
		0,117	19,000	162,393	5326,171		0,003					
		0,123	21,000	170,732	5599,659		0,004					
P12_9	7,785	0,159	29,000	182,390	1419,906	1366,352	0,003	0,003	0,016	3,789E-06	1,587E-05	0,022
		0,123	20,000	162,602	1265,854		0,003					
		0,122	19,000	155,738	1212,418		0,003					
		0,088	14,000	159,091	1238,523		0,003					
		0,092	18,000	195,652	1523,152		0,003					
		0,125	23,000	184,000	1432,440		0,003					
		0,122	21,000	172,131	1340,041		0,004					
		0,116	21,000	181,034	1409,353		0,003					
		0,132	22,000	166,667	1297,500		0,003					
		0,143	28,000	195,804	1524,336		0,002					
P12_10	13,993	0,151	23,000	152,318	2131,384	2404,184	0,003	0,003	0,016	4,213E-06	1,765E-05	0,042
		0,132	21,000	159,091	2226,159		0,003					
		0,116	19,000	163,793	2291,957		0,003					
		0,090	15,000	166,667	2332,167		0,003					
		0,106	18,000	169,811	2376,170		0,004					
		0,109	20,000	183,486	2567,523		0,003					
		0,116	22,000	189,655	2653,845		0,003					
		0,102	20,000	196,078	2743,725		0,004					
		0,107	19,000	177,570	2484,738		0,004					
		0,119	19,000	159,664	2234,176		0,004					
P13_10	26,771	0,123	20,000	162,602	4353,008	4749,356	0,004	0,003	0,016	4,169E-06	1,746E-05	0,083
		0,120	18,000	150,000	4015,650		0,004					
		0,098	17,000	173,469	4643,949		0,003					
		0,091	18,000	197,802	5295,363		0,003					
		0,117	19,000	162,393	4347,427		0,004					
		0,108	21,000	194,444	5205,472		0,003					
		0,111	18,000	162,162	4341,243		0,003					
		0,131	23,000	175,573	4700,252		0,004					
		0,114	20,000	175,439	4696,667		0,004					
		0,109	24,000	220,183	5894,532		0,003					

P14_10	9,673	0,110	23,000	209,091	2022,536	1705,253	0,003	0,003	0,016	4,071E-06	1,705E-05	0,029
		0,141	22,000	156,028	1509,262		0,003					
		0,101	16,000	158,416	1532,356		0,003					

		0,098	19,000	193,878	1875,378		0,004					
		0,117	22,000	188,034	1818,855		0,003					
		0,117	19,000	162,393	1570,829		0,004					
		0,099	18,000	181,818	1758,727		0,003					
		0,092	15,000	163,043	1577,120		0,003					
		0,110	17,000	154,545	1494,918		0,003					
		0,092	18,000	195,652	1892,543		0,003					
P14_11	8,938	0,115	12,000	104,348	932,661	1194,481	0,004	0,004	0,017	4,987E-06	2,089E-05	0,025
		0,125	14,000	112,000	1001,056		0,004					
		0,098	13,000	132,653	1185,653		0,004					
		0,113	16,000	141,593	1265,558		0,004					
		0,123	15,000	121,951	1090,000		0,004					
		0,095	16,000	168,421	1505,347		0,003					
		0,109	14,000	128,440	1148,000		0,003					
		0,118	15,000	127,119	1136,186		0,003					
		0,126	18,000	142,857	1276,857		0,004					
		0,121	19,000	157,025	1403,488		0,003					

Day 29

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P4_13	18,404	0,129	19,000	147,287	2710,667	3153,944	0,003	0,003	0,016	3,817E-06	1,599E-05	0,050
		0,101	16,000	158,416	2915,485		0,002					
		0,090	17,000	188,889	3476,311		0,003					
		0,115	23,000	200,000	3680,800		0,003					
		0,100	19,000	190,000	3496,760		0,003					
		0,126	17,000	134,921	2483,079		0,003					
		0,112	19,000	169,643	3122,107		0,003					
		0,108	21,000	194,444	3578,556		0,003					
		0,096	16,000	166,667	3067,333		0,004					
		0,104	17,000	163,462	3008,346		0,003					

P13_11	11,947	0,126	17,000	134,921	1611,897	1669,109	0,006	0,004	0,018	5,396E-06	2,260E-05	0,038
		0,123	18,000	146,341	1748,341		0,003					
		0,161	17,000	105,590	1261,484		0,004					
		0,126	13,000	103,175	1232,627		0,003					

		0,117	18,000	153,846	1838,000		0,003					
		0,111	17,000	153,153	1829,721		0,004					
		0,143	15,000	104,895	1253,182		0,003					
		0,114	21,000	184,211	2200,763		0,004					
		0,103	20,000	194,175	2319,806		0,005					
		0,137	16,000	116,788	1395,270		0,004					

Day 30

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P1_12	18,315	0,110	17,000	154,545	2830,500	2760,181	0,003	0,003	0,016	4,275E-06	1,791E-05	0,049
		0,123	18,000	146,341	2680,244		0,003					
		0,161	21,000	130,435	2388,913		0,003					
		0,126	18,000	142,857	2616,429		0,003					
		0,117	23,000	196,581	3600,385		0,003					
		0,111	15,000	135,135	2475,000		0,003					
		0,143	18,000	125,874	2305,385		0,003					
		0,114	19,000	166,667	3052,500		0,004					
		0,103	16,000	155,340	2845,049		0,003					
		0,137	21,000	153,285	2807,409		0,004					
P2_7	15,072	0,191	25,000	130,890	1972,775	2089,435	0,003	0,004	0,017	4,815E-06	2,017E-05	0,042
		0,099	15,000	151,515	2283,636		0,004					
		0,122	18,000	147,541	2223,738		0,003					
		0,109	16,000	146,789	2212,404		0,005					
		0,121	17,000	140,496	2117,554		0,003					
		0,136	19,000	139,706	2105,647		0,003					
		0,152	21,000	138,158	2082,316		0,004					
		0,139	20,000	143,885	2168,633		0,003					
		0,141	15,000	106,383	1603,404		0,003					
		0,149	21,000	140,940	2124,242		0,004					

P5_9	20,708	0,107	21,000	196,262	4064,187	3145,533	0,004	0,004	0,018	5,453E-06	2,284E-05	0,072
		0,113	20,000	176,991	3665,133		0,003					
		0,128	16,000	125,000	2588,500		0,004					
		0,106	18,000	169,811	3516,453		0,003					
		0,134	21,000	156,716	3245,284		0,005					
		0,130	20,000	153,846	3185,846		0,005					

		0,133	17,000	127,820	2646,887		0,004					
		0,127	17,000	133,858	2771,937		0,004					
		0,113	16,000	141,593	2932,106		0,004					
		0,124	17,000	137,097	2839,000		0,003					
P6_11	9,529	0,104	21,000	201,923	1924,125	1507,456	0,004	0,003	0,017	4,601E-06	1,927E-05	0,029
		0,100	19,000	190,000	1810,510		0,003					
		0,105	18,000	171,429	1633,543		0,004					
		0,128	18,000	140,625	1340,016		0,003					
		0,122	19,000	155,738	1484,025		0,004					
		0,117	15,000	128,205	1221,667		0,003					
		0,116	18,000	155,172	1478,638		0,003					
		0,113	20,000	176,991	1686,549		0,004					
		0,128	20,000	156,250	1488,906		0,004					
		0,142	15,000	105,634	1006,585		0,003					
P7_8	29,473	0,164	22,000	134,146	3953,695	3285,543	0,004	0,004	0,017	5,265E-06	2,205E-05	0,072
		0,180	18,000	100,000	2947,300		0,004					
		0,183	19,000	103,825	3060,038		0,004					
		0,155	12,000	77,419	2281,781		0,005					
		0,168	19,000	113,095	3333,256		0,003					
		0,169	17,000	100,592	2964,740		0,003					
		0,136	15,000	110,294	3250,699		0,004					
		0,148	14,000	94,595	2787,986		0,003					
		0,120	17,000	141,667	4175,342		0,004					
		0,115	16,000	139,130	4100,591		0,004					
P8_8	7,979	0,111	16,000	144,144	1150,126	1189,851	0,003	0,003	0,016	3,843E-06	1,610E-05	0,019
		0,116	17,000	146,552	1169,336		0,002					
		0,132	20,000	151,515	1208,939		0,002					
		0,121	21,000	173,554	1384,785		0,003					
		0,119	17,000	142,857	1139,857		0,003					
		0,136	16,000	117,647	938,706		0,004					
		0,130	19,000	146,154	1166,162		0,003					
		0,141	23,000	163,121	1301,539		0,003					
		0,148	21,000	141,892	1132,155		0,004					
		0,116	19,000	163,793	1306,905		0,004					
P15_12	15,698	0,119	20,000	168,067	2638,319	2236,264	0,003	0,004	0,017	5,196E-06	2,177E-05	0,049
		0,122	16,000	131,148	2058,754		0,003					
		0,132	19,000	143,939	2259,561		0,005					
		0,117	19,000	162,393	2549,248		0,003					
		0,182	21,000	115,385	1811,308		0,004					
		0,135	16,000	118,519	1860,504		0,003					

		0,125	19,000	152,000	2386,096		0,003					
		0,127	19,000	149,606	2348,520		0,005					
		0,144	22,000	152,778	2398,306		0,004					
		0,153	20,000	130,719	2052,026		0,003					

Day 31

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
		0,131	18,000	137,405	915,939		0,004					
		0,126	18,000	142,857	952,286		0,004					
		0,206	24,000	116,505	776,621		0,005					
		0,156	20,000	128,205	854,615		0,005					
P3_13	6,666	0,133	21,000	157,895	1052,526	967,586	0,004	0,004	0,019	6,648E-06	2,785E-05	0,027
		0,195	25,000	128,205	854,615		0,005					
		0,099	16,000	161,616	1077,333		0,004					
		0,168	24,000	142,857	952,286		0,005					
		0,135	25,000	185,185	1234,444		0,004					
		0,126	19,000	150,794	1005,190		0,004					
		0,109	18,000	165,138	2406,220		0,003					
		0,110	20,000	181,818	2649,273		0,005					
		0,111	14,000	126,126	1837,784		0,004					
		0,140	16,000	114,286	1665,257		0,003					
P4_14	14,571	0,134	21,000	156,716	2283,515	2122,489	0,003	0,004	0,017	4,971E-06	2,082E-05	0,044
		0,135	19,000	140,741	2050,733		0,003					
		0,141	18,000	127,660	1860,128		0,004					
		0,123	18,000	146,341	2132,341		0,005					
		0,111	20,000	180,180	2625,405		0,004					
		0,119	14,000	117,647	1714,235		0,003					

		0,133	22,000	165,414	3076,692		0,003					
		0,137	17,000	124,088	2308,029		0,003					
P5_10	18,600	0,159	22,000	138,365	2573,585	2706,245	0,004	0,003	0,016	4,427E-06	1,854E-05	0,050
		0,138	18,000	130,435	2426,087		0,003					
		0,110	17,000	154,545	2874,545		0,003					
		0,152	19,000	125,000	2325,000		0,005					

		0,121	20,000	165,289	3074,380		0,003					
		0,103	18,000	174,757	3250,485		0,003					
		0,115	17,000	147,826	2749,565		0,003					
		0,147	19,000	129,252	2404,082		0,003					
P7_9	36,093	0,134	26,000	194,030	7003,119	5463,071	0,004	0,004	0,017	5,054E-06	2,117E-05	0,116
		0,112	13,000	116,071	4189,366		0,003					
		0,125	21,000	168,000	6063,624		0,003					
		0,128	20,000	156,250	5639,531		0,004					
		0,122	15,000	122,951	4437,664		0,004					
		0,133	21,000	157,895	5698,895		0,003					
		0,126	21,000	166,667	6015,500		0,003					
		0,140	16,000	114,286	4124,914		0,005					
		0,119	17,000	142,857	5156,143		0,004					
		0,126	22,000	174,603	6301,952		0,004					
P8_9	13,518	0,189	23,000	121,693	1645,048	2034,764	0,004	0,004	0,018	6,017E-06	2,520E-05	0,051
		0,133	19,000	142,857	1931,143		0,004					
		0,121	18,000	148,760	2010,942		0,004					
		0,119	21,000	176,471	2385,529		0,003					
		0,159	23,000	144,654	1955,434		0,004					
		0,147	21,000	142,857	1931,143		0,004					
		0,126	22,000	174,603	2360,286		0,004					
		0,138	18,000	130,435	1763,217		0,004					
		0,145	22,000	151,724	2051,007		0,005					
		0,111	19,000	171,171	2313,892		0,005					
P10_7	36,836	0,159	19,000	119,497	4401,786	4515,335	0,004	0,005	0,019	6,924E-06	2,900E-05	0,131
		0,134	18,000	134,328	4948,119		0,004					
		0,150	19,000	126,667	4665,893		0,004					
		0,154	18,000	116,883	4305,506		0,005					
		0,120	19,000	158,333	5832,367		0,004					
		0,153	19,000	124,183	4574,405		0,004					
		0,123	13,000	105,691	3893,236		0,005					
		0,126	14,000	111,111	4092,889		0,005					
		0,126	13,000	103,175	3800,540		0,005					
		0,135	17,000	125,926	4638,607		0,006					
P11_11	14,722	0,147	24,000	163,265	2403,592	2354,580	0,004	0,004	0,018	6,038E-06	2,529E-05	0,060
		0,151	25,000	165,563	2437,417		0,005					
		0,119	21,000	176,471	2598,000		0,004					
		0,125	17,000	136,000	2002,192		0,004					
		0,099	19,000	191,919	2825,434		0,004					
		0,111	18,000	162,162	2387,351		0,004					

		0,130	21,000	161,538	2378,169		0,004					
		0,119	17,000	142,857	2103,143		0,004					
		0,138	19,000	137,681	2026,942		0,004					
		0,105	17,000	161,905	2383,562		0,004					
P15_13	7,784	0,132	19,000	143,939	1120,424	1165,424	0,003	0,004	0,018	5,615E-06	2,352E-05	0,027
		0,112	16,000	142,857	1112,000		0,009					
		0,114	17,000	149,123	1160,772		0,004					
		0,120	16,000	133,333	1037,867		0,004					
		0,117	17,000	145,299	1131,009		0,003					
		0,133	19,000	142,857	1112,000		0,003					
		0,110	17,000	154,545	1202,982		0,003					
		0,108	19,000	175,926	1369,407		0,004					
		0,147	22,000	149,660	1164,952		0,003					
		0,119	19,000	159,664	1242,824		0,004					

Day 32

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P4_15	18,344	0,140	24,000	171,429	3144,686	3305,726	0,003	0,004	0,017	5,340E-06	2,237E-05	0,074
		0,108	20,000	185,185	3397,037		0,003					
		0,093	18,000	193,548	3550,452		0,004					
		0,109	20,000	183,486	3365,872		0,003					
		0,098	18,000	183,673	3369,306		0,003					
		0,110	23,000	209,091	3835,564		0,004					
		0,146	25,000	171,233	3141,096		0,004					
		0,106	19,000	179,245	3288,075		0,004					
		0,129	21,000	162,791	2986,233		0,003					
		0,117	19,000	162,393	2978,940		0,006					

P6_12	8,800	0,112	42,000	375,000	3300,000	4164,697	0,001	0,001	0,008	5,860E-07	2,455E-06	0,010
		0,098	32,000	326,531	2873,469		0,001					
		0,110	50,000	454,545	4000,000		0,000					
		0,118	55,000	466,102	4101,695		0,001					

		0,092	60,000	652,174	5739,130		0,001					
		0,100	58,000	580,000	5104,000		0,001					
		0,096	43,000	447,917	3941,667		0,001					
		0,103	56,000	543,689	4784,466		0,001					
		0,118	53,000	449,153	3952,542		0,001					
		0,096	42,000	437,500	3850,000		0,001					
P11_12	18,426	0,126	19,000	150,794	2778,524	2821,357	0,004	0,004	0,017	4,802E-06	2,012E-05	0,057
		0,136	22,000	161,765	2980,676		0,003					
		0,124	18,000	145,161	2674,742		0,004					
		0,111	18,000	162,162	2988,000		0,004					
		0,127	20,000	157,480	2901,732		0,003					
		0,108	18,000	166,667	3071,000		0,003					
		0,133	21,000	157,895	2909,368		0,004					
		0,100	17,000	170,000	3132,420		0,004					
		0,135	17,000	125,926	2320,311		0,003					
		0,135	18,000	133,333	2456,800		0,003					

Day 33

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P6_13	9,708	0,129	28,000	217,054	2107,163	2091,810	0,002	0,002	0,013	2,302E-06	9,644E-06	0,020
		0,126	21,000	166,667	1618,000		0,002					
		0,104	23,000	221,154	2146,962		0,003					
		0,115	26,000	226,087	2194,852		0,002					
		0,104	22,000	211,538	2053,615		0,002					
		0,093	20,000	215,054	2087,742		0,003					
		0,087	20,000	229,885	2231,724		0,002					
		0,116	24,000	206,897	2008,552		0,002					
		0,118	27,000	228,814	2221,322		0,002					
		0,095	22,000	231,579	2248,168		0,002					

		0,108	35,000	324,074	7933,333		0,001					
		0,097	32,000	329,897	8075,876		0,001					
P7_10	24,480	0,112	40,000	357,143	8742,857	8873,903	0,001	0,001	0,009	6,834E-07	2,863E-06	0,025
		0,121	44,000	363,636	8901,818		0,001					
		0,102	38,000	372,549	9120,000		0,001					

		0,127	43,000	338,583	8288,504		0,001					
		0,138	48,000	347,826	8514,783		0,001					
		0,125	44,000	352,000	8616,960		0,001					
		0,107	47,000	439,252	10752,897		0,001					
		0,125	50,000	400,000	9792,000		0,001					
P9_11	13,622	0,116	19,000	163,793	2231,190	1933,407	0,003	0,003	0,016	4,012E-06	1,681E-05	0,032
		0,125	16,000	128,000	1743,616		0,004					
		0,134	15,000	111,940	1524,851		0,002					
		0,139	22,000	158,273	2156,000		0,002					
		0,124	14,000	112,903	1537,968		0,003					
		0,110	16,000	145,455	1981,382		0,004					
		0,128	23,000	179,688	2447,703		0,003					
		0,111	16,000	144,665	1970,633		0,003					
		0,117	17,000	145,299	1979,265		0,004					
		0,116	15,000	129,310	1761,466		0,003					
P13_12	33,667	0,101	26,000	257,426	8666,752	7851,389	0,002	0,002	0,013	2,185E-06	9,153E-06	0,072
		0,090	27,000	300,000	10100,100		0,002					
		0,100	24,000	240,000	8080,080		0,002					
		0,114	26,000	228,070	7678,439		0,003					
		0,147	32,000	217,687	7328,871		0,002					
		0,140	28,000	200,000	6733,400		0,002					
		0,128	24,000	187,500	6312,563		0,002					
		0,141	29,000	205,674	6924,418		0,003					
		0,129	30,000	232,558	7829,535		0,002					
		0,114	30,000	263,158	8859,737		0,002					
P14_12	15,184	0,156	26,000	166,667	2530,667	2356,079	0,004	0,004	0,017	5,065E-06	2,121E-05	0,050
		0,124	18,000	145,161	2204,129		0,004					
		0,135	16,000	118,519	1799,585		0,004					
		0,138	21,000	152,174	2310,609		0,003					
		0,133	18,000	135,338	2054,977		0,003					
		0,141	21,000	148,936	2261,447		0,004					
		0,110	22,000	200,000	3036,800		0,003					
		0,130	20,000	153,846	2336,000		0,004					
		0,112	22,000	196,429	2982,571		0,004					
		0,156	21,000	134,615	2044,000		0,004					

Day 34

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P1_13	40,434	0,112	34,000	303,571	12274,607	8695,267	0,002	0,002	0,013	2,269E-	9,505E-	0,083

		0,127	30,000	236,220	9551,339		0,002			06	06	
		0,121	24,000	198,347	8019,967		0,002					
		0,126	28,000	222,222	8985,333		0,002					
		0,137	24,000	175,182	7083,328		0,002					
		0,132	26,000	196,970	7964,273		0,002					
		0,134	26,000	194,030	7845,403		0,002					
		0,126	28,000	222,222	8985,333		0,002					
		0,147	27,000	183,673	7426,653		0,002					
		0,133	29,000	218,045	8816,436		0,003					
P1_14	22,443	0,126	21,000	166,667	3740,500	3660,789	0,004	0,003	0,017	4,527E-06	1,896E-05	0,069
		0,106	18,000	169,811	3811,075		0,003					
		0,096	19,000	197,917	4441,844		0,003					
		0,099	17,000	171,717	3853,848		0,003					
		0,112	16,000	142,857	3206,143		0,004					
		0,132	22,000	166,667	3740,500		0,003					
		0,129	19,000	147,287	3305,558		0,004					
		0,102	18,000	176,471	3960,529		0,003					
		0,121	17,000	140,496	3153,149		0,003					
		0,119	18,000	151,261	3394,739		0,003					

Day 35

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P4_16	20,797	0,136	23,000	169,118	3517,140	3584,375	0,004	0,003	0,016	4,351E-06	1,822E-05	0,065
		0,116	20,000	172,414	3585,690		0,004					
		0,101	17,000	168,317	3500,485		0,003					
		0,115	23,000	200,000	4159,400		0,003					
		0,141	21,000	148,936	3097,426		0,003					
		0,124	23,000	185,484	3857,508		0,004					
		0,114	21,000	184,211	3831,026		0,003					
		0,132	20,000	151,515	3151,061		0,004					
		0,129	23,000	178,295	3707,992		0,003					
		0,115	19,000	165,217	3436,026		0,004					
P4_17	18,599	0,126	22,000	174,603	3247,444	2710,759	0,005	0,004	0,017	5,089E-06	2,132E-05	0,058
		0,117	20,000	170,940	3179,316		0,003					
		0,116	16,000	137,931	2565,379		0,004					
		0,139	20,000	143,885	2676,115		0,004					
		0,142	22,000	154,930	2881,535		0,003					
		0,111	15,000	135,135	2513,378		0,004					

		0,156	22,000	141,026	2622,936		0,003					
		0,152	19,000	125,000	2324,875		0,003					
		0,110	16,000	145,455	2705,309		0,003					
		0,140	18,000	128,571	2391,300		0,004					
P8_10	13,430	0,146	21,000	143,836	1931,712	1846,292	0,004	0,003	0,016	4,460E-06	1,868E-05	0,034
		0,151	18,000	119,205	1600,927		0,002					
		0,134	15,000	111,940	1503,358		0,003					
		0,198	27,000	136,364	1831,364		0,003					
		0,149	19,000	127,517	1712,550		0,005					
		0,141	20,000	141,844	1904,965		0,003					
		0,158	22,000	139,241	1870,000		0,004					
		0,118	20,000	169,492	2276,271		0,003					
		0,130	18,000	138,462	1859,538		0,004					
		0,143	21,000	146,853	1972,238		0,003					
P9_12	11,462	0,153	18,000	117,647	1348,471	1332,615	0,005	0,005	0,020	7,742E-06	3,243E-05	0,043
		0,134	17,000	126,866	1454,134		0,005					
		0,138	15,000	108,696	1245,870		0,005					
		0,127	15,000	118,110	1353,780		0,007					
		0,151	17,000	112,583	1290,424		0,004					
		0,185	19,000	102,703	1177,178		0,005					
		0,142	18,000	126,761	1452,930		0,005					
		0,135	16,000	118,519	1358,459		0,004					
		0,139	16,000	115,108	1319,367		0,005					
		0,147	17,000	115,646	1325,537		0,004					
P9_13	14,866	0,145	17,000	117,241	1742,910	2065,672	0,004	0,004	0,017	4,650E-06	1,948E-05	0,040
		0,163	16,000	98,160	1459,239		0,003					
		0,137	19,000	138,686	2061,708		0,003					
		0,124	16,000	129,032	1918,194		0,004					
		0,137	21,000	153,285	2278,730		0,004					
		0,130	17,000	130,769	1944,015		0,004					
		0,111	16,000	144,144	2142,847		0,003					
		0,112	18,000	160,714	2389,179		0,003					
		0,156	22,000	141,026	2096,487		0,005					
		0,119	21,000	176,471	2623,412		0,003					
P11_13	12,730	0,116	20,000	172,414	2194,828	2012,244	0,002	0,003	0,016	3,858E-06	1,616E-05	0,033
		0,127	22,000	173,228	2205,197		0,003					
		0,136	23,000	169,118	2152,868		0,003					
		0,115	18,000	156,522	1992,522		0,003					
		0,126	21,000	166,667	2121,667		0,004					
		0,135	18,000	133,333	1697,333		0,003					
		0,130	18,000	138,462	1762,615		0,003					

		0,125	19,000	152,000	1934,960		0,003					
		0,127	16,000	125,984	1603,780		0,003					
		0,114	22,000	192,982	2456,667		0,003					
P13_13	15,767	0,125	20,000	160,000	2522,720	2253,626	0,004	0,004	0,017	5,279E-06	2,211E-05	0,050
		0,158	22,000	139,241	2195,405		0,004					
		0,127	18,000	141,732	2234,693		0,003					
		0,120	19,000	158,333	2496,442		0,004					
		0,164	19,000	115,854	1826,665		0,004					
		0,141	17,000	120,567	1900,986		0,004					
		0,133	21,000	157,895	2489,526		0,003					
		0,139	23,000	165,468	2608,928		0,003					
		0,131	15,000	114,504	1805,382		0,004					
		0,122	19,000	155,738	2455,516		0,005					

7.6. *Elysia viridis* egg masses biometric data when exposed to different light regimes

Day 25

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P2-11	17,875	0,163	24,000	147,239	2631,902	2920,435	0,004	0,003	0,016	4,152E-06	1,739E-05	0,051
		0,141	23,000	163,121	2915,780		0,004					
		0,141	22,000	156,028	2789,007		0,004					
		0,140	23,000	164,286	2936,607		0,003					
		0,147	26,000	176,871	3161,565		0,003					
		0,160	25,000	156,250	2792,969		0,003					
		0,130	22,000	169,231	3025,000		0,002					
		0,146	23,000	157,534	2815,925		0,003					
		0,143	20,000	139,860	2500,000		0,003					
		0,118	24,000	203,390	3635,593		0,004					
P7-13	10,585	0,151	64,000	423,841	4486,358	5257,489	0,001	0,001	0,008	5,890E-07	2,467E-06	0,013
		0,141	72,000	510,638	5405,106		0,001					
		0,164	76,000	463,415	4905,244		0,001					
		0,145	78,000	537,931	5694,000		0,001					
		0,145	80,000	551,724	5840,000		0,001					
		0,157	76,000	484,076	5123,949		0,001					
		0,151	74,000	490,066	5187,351		0,001					
		0,137	68,000	496,350	5253,869		0,001					
		0,134	76,000	567,164	6003,433		0,001					
		0,163	72,000	441,718	4675,583		0,001					
P12-7	13,976	0,145	68,000	468,966	6554,262	7684,060	0,001	0,001	0,008	4,382E-07	1,836E-06	0,014
		0,138	64,000	463,768	6481,623		0,001					
		0,128	60,000	468,750	6551,250		0,001					
		0,133	72,000	541,353	7565,955		0,001					
		0,143	68,000	475,524	6645,930		0,001					
		0,137	92,000	671,533	9385,343		0,001					
		0,154	90,000	584,416	8167,792		0,001					
		0,145	72,000	496,552	6939,807		0,001					
		0,173	101,000	583,815	8159,399		0,001					
		0,113	84,000	743,363	10389,239		0,001					
	10,901	0,148	48,000	324,324	3535,459	3185,027	0,001	0,002	0,011	1,341E-06	5,616E-06	0,018

P14-10		0,145	38,000	262,069	2856,814		0,002						
		0,119	32,000	268,908	2931,361		0,001						
		0,119	34,000	285,714	3114,571		0,002						
		0,140	40,000	285,714	3114,571		0,001						
		0,118	42,000	355,932	3880,017		0,002						
		0,139	36,000	258,993	2823,281		0,001						
		0,132	34,000	257,576	2807,833		0,001						
		0,118	36,000	305,085	3325,729		0,002						
		0,126	40,000	317,460	3460,635		0,001						
P14-11	21,880	0,151	64,000	423,841	9273,642	10231,094	0,001	0,001	0,009	7,206E-07	3,018E-06	0,031	
		0,156	65,000	416,667	9116,667		0,001						
		0,147	72,000	489,796	10716,735		0,001						
		0,160	76,000	475,000	10393,000		0,001						
		0,156	84,000	538,462	11781,538		0,001						
		0,167	92,000	550,898	12053,653		0,001						
		0,156	68,000	435,897	9537,436		0,001						
		0,188	76,000	404,255	8845,106		0,001						
		0,159	68,000	427,673	9357,484		0,001						
		0,148	76,000	513,514	11235,676		0,001						

Day 26

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P1-15	13,465	0,114	60,000	526,316	7186,316	6734,820	0,001	0,001	0,008	5,890E-07	2,467E-06	0,017
		0,107	40,000	373,832	5104,299		0,001					
		0,139	68,000	489,209	6679,655		0,001					
		0,120	68,000	566,667	7737,267		0,001					
		0,121	60,000	495,868	6770,579		0,000					
		0,130	72,000	553,846	7562,215		0,001					
		0,134	60,000	447,761	6113,731		0,001					
		0,124	72,000	580,645	7928,129		0,001					
		0,141	64,000	453,901	6197,560		0,001					
		0,144	64,000	444,444	6068,444		0,001					
P3-7	13,282	0,145	52,000	358,621	4763,200	6507,149	0,001	0,001	0,008	5,990E-07	2,509E-06	0,016
		0,124	72,000	580,645	7712,129		0,001					
		0,141	72,000	510,638	6782,298		0,001					
		0,125	48,000	384,000	5100,288		0,001					
		0,111	60,000	540,541	7179,459		0,001					
		0,129	56,000	434,109	5765,829		0,001					
		0,124	56,000	451,613	5998,323		0,001					
		0,116	72,000	620,690	8244,000		0,001					
		0,151	74,000	490,066	6509,060		0,001					
		0,106	56,000	528,302	7016,906		0,001					
P5-11	12,719	0,128	16,000	125,000	1589,875	1832,081	0,003	0,003	0,016	4,107E-06	1,721E-05	0,032
		0,138	18,000	130,435	1659,000		0,003					
		0,131	21,000	160,305	2038,924		0,003					
		0,149	22,000	147,651	1877,973		0,004					
		0,131	19,000	145,038	1844,740		0,003					
		0,140	20,000	142,857	1817,000		0,004					
		0,135	20,000	148,148	1884,296		0,004					
		0,150	24,000	160,000	2035,040		0,003					
		0,158	20,000	126,582	1610,000		0,003					
		0,136	21,000	154,412	1963,963		0,003					

P6-8	14,370	0,135	84,000	622,222	8941,333	7767,989	0,001	0,002	0,012	1,579E-06	6,614E-06	0,051

		0,120	68,000	566,667	8143,000		0,001					
		0,129	64,000	496,124	7129,302		0,001					
		0,135	72,000	533,333	7664,000		0,001					
		0,131	80,000	610,687	8775,573		0,001					
		0,131	72,000	549,618	7898,015		0,010					
		0,146	68,000	465,753	6692,877		0,001					
		0,157	76,000	484,076	6956,178		0,001					
		0,109	72,000	660,550	9492,110		0,001					
		0,120	50,000	416,667	5987,500		0,001					
		0,133	60,000	451,128	8496,090		0,001					
		0,123	64,000	520,325	9799,285		0,001					
		0,151	72,000	476,821	8979,974		0,001					
		0,168	70,000	416,667	7847,083		0,001					
P12-8	18,833	0,142	68,000	478,873	9018,620	8849,714	0,001	0,001	0,010	8,720E-07	3,653E-06	0,032
		0,164	68,000	414,634	7808,805		0,001					
		0,164	76,000	463,415	8727,488		0,001					
		0,178	78,000	438,202	8252,663		0,001					
		0,140	76,000	542,857	10223,629		0,001					
		0,129	64,000	496,124	9343,504		0,001					

Day 27

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P1-16	27,702	0,141	20,000	141,844	3929,362	3590,170	0,004	0,003	0,016	4,423E-06	1,853E-05	0,067
		0,109	16,000	146,789	4066,349		0,004					
		0,181	22,000	121,547	3367,094		0,003					
		0,142	17,000	119,718	3316,437		0,003					
		0,173	16,000	92,486	2562,035		0,003					
		0,168	21,000	125,000	3462,750		0,002					
		0,194	22,000	113,402	3141,464		0,003					
		0,171	26,000	152,047	4212,000		0,003					
		0,161	20,000	124,224	3441,242		0,004					
		0,151	24,000	158,940	4402,967		0,004					
P6-9	16,044	0,149	16,000	107,383	1722,846	2016,435	0,004	0,004	0,017	4,734E-06	1,983E-05	0,040
		0,147	20,000	136,054	2182,857		0,003					
		0,150	15,000	100,000	1604,400		0,003					
		0,156	23,000	147,436	2365,462		0,003					
		0,136	20,000	147,059	2359,412		0,004					
		0,144	19,000	131,944	2116,917		0,003					
		0,169	18,000	106,509	1708,828		0,003					
		0,166	22,000	132,530	2126,313		0,004					
		0,202	25,000	123,762	1985,644		0,004					
		0,145	18,000	124,138	1991,669		0,003					
P7-14	16,355	0,136	21,000	154,412	2525,404	2535,500	0,003	0,003	0,014	2,901E-06	1,215E-05	0,031
		0,138	22,000	159,420	2607,319		0,002					
		0,135	22,000	162,963	2665,259		0,002					
		0,159	25,000	157,233	2571,541		0,002					
		0,151	26,000	172,185	2816,093		0,003					
		0,156	25,000	160,256	2620,994		0,002					
		0,142	20,000	140,845	2303,521		0,003					
		0,172	22,000	127,907	2091,919		0,002					
		0,164	23,000	140,244	2293,689		0,003					
		0,143	25,000	174,825	2859,266		0,003					

P8-	33,775	0,194	27,000	139,175	4700,644	4599,479	0,003	0,003	0,015	3,679E-06	1,541E-05	0,071

12		0,172	23,000	133,721	4516,424		0,003				
		0,172	20,000	116,279	3927,326		0,003				
		0,156	22,000	141,026	4763,141		0,003				
		0,142	20,000	140,845	4757,042		0,003				
		0,142	23,000	161,972	5470,599		0,003				
		0,136	17,000	125,000	4221,875		0,003				
		0,139	19,000	136,691	4616,727		0,003				
		0,135	18,000	133,333	4503,333		0,003				
		0,157	21,000	133,758	4517,675		0,002				
P14-12	18,335	0,142	22,000	154,930	2840,634	2750,695	0,003	0,003	0,014	3,012E-06	1,262E-05	0,035
		0,128	17,000	132,813	2435,117		0,003				
		0,150	18,000	120,000	2200,200		0,003				
		0,097	19,000	195,876	3591,392		0,003				
		0,174	22,000	126,437	2318,218		0,002				
		0,135	23,000	170,370	3123,741		0,003				
		0,113	18,000	159,292	2920,619		0,002				
		0,163	22,000	134,969	2474,663		0,003				
		0,144	21,000	145,833	2673,854		0,002				
		0,144	23,000	159,722	2928,507		0,003				

Day 28

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P4-15	14,639	0,121	17,000	140,496	2056,719	2365,704	0,003	0,003	0,016	4,429E-06	1,855E-05	0,044
		0,128	18,000	140,625	2058,609		0,004					
		0,125	21,000	168,000	2459,352		0,005					
		0,147	23,000	156,463	2290,456		0,004					
		0,115	20,000	173,913	2545,913		0,003					
		0,134	21,000	156,716	2294,172		0,004					
		0,115	18,000	156,522	2291,322		0,002					
		0,117	22,000	188,034	2752,632		0,003					
		0,118	19,000	161,017	2357,127		0,003					
		0,132	23,000	174,242	2550,735		0,003					
P4-16	22,562	0,143	56,000	391,608	8835,469	11822,650	0,001	0,001	0,010	1,023E-06	4,286E-06	0,051
		0,138	60,000	434,783	9809,565		0,001					
		0,159	64,000	402,516	9081,560		0,006					
		0,145	72,000	496,552	11203,200		0,001					
		0,119	72,000	605,042	13650,958		0,001					
		0,105	68,000	647,619	14611,581		0,001					
		0,113	54,000	477,876	10781,841		0,001					
		0,123	76,000	617,886	13940,748		0,001					
		0,091	60,000	659,341	14876,044		0,001					
		0,146	74,000	506,849	11435,534		0,001					
P6-10	9,579	0,133	21,000	157,895	1512,474	1344,226	0,003	0,004	0,017	4,837E-06	2,026E-05	0,027
		0,149	19,000	127,517	1221,483		0,004					
		0,146	20,000	136,986	1312,192		0,004					
		0,172	22,000	127,907	1225,221		0,003					
		0,145	23,000	158,621	1519,428		0,003					
		0,168	18,000	107,143	1026,321		0,004					
		0,156	22,000	141,026	1350,885		0,004					
		0,146	21,000	143,836	1377,801		0,004					
		0,133	20,000	150,376	1440,451		0,003					
		0,125	19,000	152,000	1456,008		0,004					

P7-	13,813	0,144	21,000	145,833	2014,396	2223,025	0,003	0,003	0,016	3,804E-	1,593E-05	0,035

15		0,139	20,000	143,885	1987,482		0,003			06		
		0,132	19,000	143,939	1988,235		0,003					
		0,157	24,000	152,866	2111,541		0,003					
		0,149	26,000	174,497	2410,322		0,003					
		0,117	21,000	179,487	2479,256		0,003					
		0,139	20,000	143,885	1987,482		0,003					
		0,119	21,000	176,471	2437,588		0,002					
		0,118	21,000	177,966	2458,246		0,003					
		0,129	22,000	170,543	2355,705		0,004					
P9-12	10,081	0,129	21,000	162,791	1641,093	1565,741	0,004	0,003	0,016	4,250E-06	1,780E-05	0,028
		0,124	20,000	161,290	1625,968		0,003					
		0,131	22,000	167,939	1692,992		0,005					
		0,133	20,000	150,376	1515,940		0,002					
		0,120	18,000	150,000	1512,150		0,004					
		0,144	22,000	152,778	1540,153		0,003					
		0,137	22,000	160,584	1618,847		0,003					
		0,123	20,000	162,602	1639,187		0,003					
		0,128	19,000	148,438	1496,398		0,003					
		0,154	21,000	136,364	1374,682		0,003					
P10-10	20,061	0,157	28,000	178,344	3577,758	3096,601	0,004	0,003	0,017	4,599E-06	1,926E-05	0,060
		0,146	26,000	178,082	3572,507		0,003					
		0,167	23,000	137,725	2762,892		0,004					
		0,152	25,000	164,474	3299,507		0,004					
		0,178	26,000	146,067	2930,258		0,004					
		0,189	22,000	116,402	2335,143		0,003					
		0,145	23,000	158,621	3182,090		0,003					
		0,131	20,000	152,672	3062,748		0,003					
		0,162	23,000	141,975	2848,167		0,003					
		0,130	22,000	169,231	3394,938		0,003					

P11-15	32,523	0,147	35,000	238,095	7743,571	7849,704	0,002	0,002	0,011	1,439E-06	6,029E-06	0,047
		0,122	30,000	245,902	7997,459		0,002					
		0,128	32,000	250,000	8130,750		0,001					

		0,140	33,000	235,714	7666,136		0,001						
		0,164	38,000	231,707	7535,817		0,001						
		0,196	42,000	214,286	6969,214		0,001						
		0,181	38,000	209,945	6828,033		0,002						
		0,133	38,000	285,714	9292,286		0,002						
		0,171	38,000	222,222	7227,333		0,001						
		0,150	42,000	280,000	9106,440		0,001						

Day 29

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P5-12	23,269	0,152	24,000	157,895	3674,053	3655,650	0,004	0,003	0,016	3,854E-06	1,614E-05	0,059
		0,135	23,000	170,370	3964,348		0,003					
		0,177	26,000	146,893	3418,045		0,003					
		0,156	25,000	160,256	3729,006		0,003					
		0,199	27,000	135,678	3157,101		0,003					
		0,157	26,000	165,605	3853,465		0,003					
		0,138	22,000	159,420	3709,551		0,002					
		0,148	23,000	155,405	3616,128		0,003					
		0,147	24,000	163,265	3799,020		0,003					
		0,160	25,000	156,250	3635,781		0,003					
P8-13	22,590	0,151	22,000	145,695	3291,258	4067,545	0,002	0,003	0,015	3,385E-06	1,418E-05	0,058
		0,150	27,000	180,000	4066,200		0,002					
		0,155	25,000	161,290	3643,548		0,002					
		0,162	29,000	179,012	4043,889		0,003					
		0,119	21,000	176,471	3986,471		0,003					
		0,135	26,000	192,593	4350,667		0,003					
		0,144	28,000	194,444	4392,500		0,004					
		0,130	24,000	184,615	4170,462		0,003					
		0,137	27,000	197,080	4452,044		0,003					
		0,132	25,000	189,394	4278,409		0,003					

Day 30

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P1_17	18,606	0,132	80,000	606,061	11276,364	8858,755	0,001	0,001	0,008	4,503E-07	1,886E-06	0,017
		0,148	72,000	486,486	9051,568		0,001					
		0,136	76,000	558,824	10397,471		0,001					
		0,160	64,000	400,000	7442,400		0,001					
		0,150	68,000	453,333	8434,720		0,001					
		0,152	64,000	421,053	7834,105		0,000					
		0,131	60,000	458,015	8521,832		0,001					
		0,138	60,000	434,783	8089,565		0,001					
		0,149	72,000	483,221	8990,819		0,001					
		0,148	68,000	459,459	8548,703		0,001					
P2_12	18,696	0,160	21,000	131,250	2453,850	2713,150	0,003	0,003	0,016	4,456E-06	1,867E-05	0,051
		0,152	23,000	151,316	2829,000		0,003					
		0,148	18,000	121,622	2273,838		0,003					
		0,156	22,000	141,026	2636,615		0,004					
		0,157	19,000	121,019	2262,573		0,003					
		0,120	19,000	158,333	2960,200		0,003					
		0,139	23,000	165,468	3093,583		0,004					
		0,157	22,000	140,127	2619,822		0,004					
		0,125	24,000	192,000	3589,632		0,003					
		0,155	20,000	129,032	2412,387		0,004					
P5_13	18,775	0,161	20,000	124,224	2332,298	2927,834	0,004	0,003	0,016	4,098E-06	1,717E-05	0,050
		0,156	22,000	141,026	2647,756		0,003					
		0,156	23,000	147,436	2768,109		0,003					
		0,144	24,000	166,667	3129,167		0,003					
		0,150	23,000	153,333	2878,833		0,003					
		0,141	24,000	170,213	3195,745		0,004					
		0,150	23,000	153,333	2878,833		0,003					
		0,130	22,000	169,231	3177,308		0,004					
		0,161	29,000	180,124	3381,832		0,003					
		0,143	22,000	153,846	2888,462		0,003					
P7_16	19,526	0,154	20,000	129,870	2535,844	2746,802	0,003	0,003	0,016	4,407E-06	1,846E-05	0,051

		0,138	19,000	137,681	2688,362		0,004					
		0,168	21,000	125,000	2440,750		0,003					
		0,128	17,000	132,813	2593,297		0,003					
		0,139	18,000	129,496	2528,547		0,004					
		0,148	20,000	135,135	2638,649		0,003					
		0,164	25,000	152,439	2976,524		0,003					
		0,139	21,000	151,079	2949,971		0,003					
		0,135	23,000	170,370	3326,652		0,003					
		0,140	20,000	142,857	2789,429		0,003					
		0,159	19,000	119,497	2503,698		0,005					
		0,159	20,000	125,786	2635,472		0,004					
		0,174	18,000	103,448	2167,448		0,005					
		0,143	19,000	132,867	2783,832		0,004					
P9_13	20,952	0,159	20,000	125,786	2635,472	2387,607	0,004	0,004	0,018	5,924E-06	2,481E-05	0,059
		0,206	23,000	111,650	2339,301		0,004					
		0,185	17,000	91,892	1925,319		0,004					
		0,151	15,000	99,338	2081,325		0,005					
		0,164	20,000	121,951	2555,122		0,004					
		0,177	19,000	107,345	2249,085		0,004					
		0,148	21,000	141,892	3152,412		0,003					
		0,145	22,000	151,724	3370,855		0,004					
		0,193	24,000	124,352	2762,736		0,004					
		0,167	23,000	137,725	3059,826		0,004					
P15_8	22,217	0,150	19,000	126,667	2814,153	3080,312	0,004	0,004	0,017	4,863E-06	2,037E-05	0,063
		0,185	26,000	140,541	3122,389		0,003					
		0,174	23,000	132,184	2936,730		0,004					
		0,160	24,000	150,000	3332,550		0,003					
		0,164	21,000	128,049	2844,860		0,003					
		0,150	23,000	153,333	3406,607		0,003					

Day 31

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P1-18	25,875	0,190	84,000	442,105	11439,474	12706,312	0,002	0,001	0,010	1,015E-06	4,251E-06	0,054
		0,161	88,000	546,584	14142,857		0,001					
		0,181	76,000	419,890	10864,641		0,001					
		0,149	72,000	483,221	12503,356		0,001					
		0,189	92,000	486,772	12595,238		0,001					
		0,162	76,000	469,136	12138,889		0,001					
		0,151	72,000	476,821	12337,748		0,001					
		0,153	88,000	575,163	14882,353		0,001					
		0,134	68,000	507,463	13130,597		0,001					
		0,143	72,000	503,497	13027,972		0,001					
P3-8	19,455	0,165	20,000	121,212	2358,182	2775,411	0,004	0,004	0,018	5,463E-06	2,288E-05	0,064
		0,192	22,000	114,583	2229,219		0,005					
		0,185	24,000	129,730	2523,892		0,004					
		0,164	24,000	146,341	2847,073		0,004					
		0,140	23,000	164,286	3196,179		0,004					
		0,135	21,000	155,556	3026,333		0,004					
		0,156	24,000	153,846	2993,077		0,004					
		0,156	22,000	141,026	2743,654		0,004					
		0,126	21,000	166,667	3242,500		0,004					
		0,165	22,000	133,333	2594,000		0,004					
P9-14	11,074	0,131	20,000	152,672	1690,687	1648,831	0,003	0,004	0,017	4,875E-06	2,042E-05	0,034
		0,153	23,000	150,327	1664,719		0,003					
		0,157	24,000	152,866	1692,841		0,004					
		0,146	19,000	130,137	1441,137		0,004					
		0,159	20,000	125,786	1392,956		0,004					
		0,183	23,000	125,683	1391,814		0,004					
		0,160	26,000	162,500	1799,525		0,004					
		0,123	22,000	178,862	1980,715		0,004					
		0,122	20,000	163,934	1815,410		0,004					
		0,130	19,000	146,154	1618,508		0,003					

P11-	23,410	0,138	25,000	181,159	4240,942	4020,580	0,004	0,003	0,016	3,908E-06	1,637E-05	0,066

16		0,152	26,000	171,053	4004,342		0,003					
		0,140	26,000	185,714	4347,571		0,003					
		0,132	24,000	181,818	4256,364		0,003					
		0,109	20,000	183,486	4295,413		0,003					
		0,134	23,000	171,642	4018,134		0,002					
		0,133	24,000	180,451	4224,361		0,003					
		0,159	25,000	157,233	3680,818		0,003					
		0,135	21,000	155,556	3641,556		0,003					
		0,154	23,000	149,351	3496,299		0,003					
P12-9	20,946	0,175	17,000	97,143	2034,754	2829,604	0,004	0,004	0,017	5,130E-06	2,149E-05	0,061
		0,134	22,000	164,179	3438,896		0,004					
		0,140	19,000	135,714	2842,671		0,004					
		0,132	16,000	121,212	2538,909		0,003					
		0,158	22,000	139,241	2916,532		0,003					
		0,143	20,000	139,860	2929,510		0,004					
		0,137	18,000	131,387	2752,029		0,004					
		0,137	19,000	138,686	2904,920		0,003					
		0,128	18,000	140,625	2945,531		0,004					
		0,154	22,000	142,857	2992,286		0,004					
P13-8	14,271	0,177	18,000	101,695	1451,288	1620,509	0,004	0,004	0,017	5,097E-06	2,135E-05	0,035
		0,159	17,000	106,918	1525,830		0,004					
		0,157	16,000	101,911	1454,369		0,004					
		0,152	19,000	125,000	1783,875		0,004					
		0,166	16,000	96,386	1375,518		0,004					
		0,182	20,000	109,890	1568,242		0,005					
		0,172	20,000	116,279	1659,419		0,004					
		0,157	21,000	133,758	1908,860		0,003					
		0,173	21,000	121,387	1732,318		0,004					
		0,139	17,000	122,302	1745,374		0,003					

P14-13	23,645	0,144	16,000	111,111	2627,222	3311,514	0,004	0,004	0,017	5,022E-06	2,103E-05	0,070
		0,158	24,000	151,899	3591,646		0,004					
		0,138	18,000	130,435	3084,130		0,004					

		0,133	22,000	165,414	3911,203		0,003						
		0,137	19,000	138,686	3279,234		0,004						
		0,148	20,000	135,135	3195,270		0,003						
		0,154	21,000	136,364	3224,318		0,004						
		0,148	23,000	155,405	3674,561		0,003						
		0,171	24,000	140,351	3318,596		0,004						
		0,140	19,000	135,714	3208,964		0,004						
P14-14	20,480	0,155	28,000	180,645	3699,613	2740,311	0,004	0,004	0,018	5,749E-06	2,408E-05	0,066	
		0,156	20,000	128,205	2625,641		0,004						
		0,140	18,000	128,571	2633,143		0,004						
		0,153	20,000	130,719	2677,124		0,004						
		0,177	23,000	129,944	2661,243		0,004						
		0,174	24,000	137,931	2824,828		0,005						
		0,164	20,000	121,951	2497,561		0,004						
		0,170	21,000	123,529	2529,882		0,004						
		0,173	20,000	115,607	2367,630		0,004						
		0,149	21,000	140,940	2886,443		0,004						

Day 32

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume occupied by eggs in the egg mass (mm3)
P5-14	19,497	0,180	30,000	166,667	3249,500	3142,805	0,003	0,003	0,016	3,895E-06	1,632E-05	0,051
		0,172	24,000	139,535	2720,512		0,002					
		0,159	25,000	157,233	3065,566		0,003					
		0,141	26,000	184,397	3595,191		0,003					
		0,137	22,000	160,584	3130,905		0,003					
		0,151	25,000	165,563	3227,980		0,003					
		0,152	22,000	144,737	2821,934		0,004					
		0,120	21,000	175,000	3411,975		0,003					
		0,158	25,000	158,228	3084,968		0,004					
		0,125	20,000	160,000	3119,520		0,003					
P9-15	9,515	0,130	21,000	161,538	1537,038	1387,591	0,003	0,003	0,017	4,553E-06	1,907E-05	0,026
		0,146	23,000	157,534	1498,938		0,003					
		0,168	22,000	130,952	1246,012		0,004					
		0,137	19,000	138,686	1319,599		0,003					
		0,163	25,000	153,374	1459,356		0,003					
		0,143	20,000	139,860	1330,769		0,003					
		0,146	23,000	157,534	1498,938		0,004					
		0,133	18,000	135,338	1287,744		0,004					
		0,142	22,000	154,930	1474,155		0,004					
		0,140	18,000	128,571	1223,357		0,004					
P10-11	24,947	0,158	24,000	151,899	3789,418	3784,606	0,004	0,004	0,017	4,718E-06	1,976E-05	0,075
		0,148	22,000	148,649	3708,338		0,003					
		0,131	21,000	160,305	3999,137		0,003					
		0,135	22,000	162,963	4065,437		0,004					
		0,159	21,000	132,075	3294,887		0,004					
		0,154	24,000	155,844	3887,844		0,003					
		0,192	25,000	130,208	3248,307		0,003					
		0,131	20,000	152,672	3808,702		0,003					
		0,143	26,000	181,818	4535,818		0,004					
		0,192	27,000	140,625	3508,172		0,004					

P12-10	15,676	0,149	56,000	375,839	460,642	485,077	0,001	0,001	0,008	5,910E-07	2,476E-06	0,001
		0,132	72,000	545,455	470,065		0,001					
		0,163	64,000	392,638	460,641		0,001					
		0,138	64,000	463,768	470,355		0,001					
		0,153	54,000	352,941	471,453		0,001					
		0,135	64,000	474,074	495,156		0,001					
		0,135	68,000	503,704	500,426		0,001					
		0,135	68,000	503,704	499,334		0,001					
		0,128	60,000	468,750	497,149		0,001					
		0,137	72,000	525,547	525,547		0,001					

Day 33

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P2-13	14,984	0,105	14,000	133,333	1997,867	2206,936	0,002	0,003	0,015	3,255E-06	1,363E-05	0,030
		0,106	17,000	160,377	2403,094		0,002					
		0,137	15,000	109,489	1640,584		0,003					
		0,118	17,000	144,068	2158,712		0,003					
		0,121	18,000	148,760	2229,025		0,003					
		0,120	21,000	175,000	2622,200		0,002					
		0,116	24,000	206,897	3100,138		0,003					
		0,135	16,000	118,519	1775,881		0,004					
		0,108	14,000	129,630	1942,370		0,003					
		0,109	16,000	146,789	2199,486		0,003					

P4-17	15,344	0,103	22,000	213,592	3277,359	4260,131	0,001	0,001	0,010	1,040E-06	4,357E-06	0,019
		0,100	24,000	240,000	3682,560		0,002					

		0,122	28,000	229,508	3521,574		0,001					
		0,110	34,000	309,091	4742,691		0,001					
		0,123	30,000	243,902	3742,439		0,001					
		0,129	32,000	248,062	3806,264		0,001					
		0,113	30,000	265,487	4073,628		0,001					
		0,102	40,000	392,157	6017,255		0,001					
		0,104	30,000	288,462	4426,154		0,001					
		0,104	36,000	346,154	5311,385		0,001					
P4-18	19,059	0,149	22,000	147,651	2814,081	2775,112	0,003	0,003	0,015	3,392E-06	1,421E-05	0,039
		0,159	26,000	163,522	3116,566		0,002					
		0,130	21,000	161,538	3078,762		0,003					
		0,109	17,000	155,963	2972,505		0,003					
		0,105	18,000	171,429	3267,257		0,002					
		0,110	17,000	154,545	2945,482		0,003					
		0,131	18,000	137,405	2618,794		0,003					
		0,153	16,000	104,575	1993,098		0,004					
		0,147	18,000	122,449	2333,755		0,003					
		0,146	20,000	136,986	2610,822		0,003					
P7-17	14,078	0,191	23,000	120,419	1695,257	1884,427	0,003	0,003	0,016	4,163E-06	1,744E-05	0,033
		0,177	20,000	112,994	1590,734		0,003					
		0,119	20,000	168,067	2366,050		0,003					
		0,113	18,000	159,292	2242,513		0,003					
		0,183	22,000	120,219	1692,437		0,003					
		0,154	18,000	116,883	1645,481		0,003					
		0,133	20,000	150,376	2116,992		0,003					
		0,142	21,000	147,887	2081,958		0,003					
		0,132	15,000	113,636	1599,773		0,005					
		0,132	17,000	128,788	1813,076		0,005					

P11-17	31,560	0,130	15,000	115,385	3756,923	3983,533	0,003	0,003	0,016	3,787E-06	1,586E-05	0,063
		0,119	16,000	134,454	4377,815		0,003					
		0,116	17,000	146,552	4771,724		0,002					
		0,155	15,000	96,774	3150,968		0,004					

		0,122	16,000	131,148	4270,164		0,003					
		0,153	16,000	104,575	3404,967		0,002					
		0,104	13,000	125,000	4070,000		0,003					
		0,146	18,000	123,288	4014,247		0,004					
		0,139	17,000	122,302	3982,158		0,004					
		0,121	15,000	123,967	4036,364		0,003					

Day 34

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P3-9	21,003	0,140	12,000	85,714	1800,257	2112,108	0,003	0,003	0,017	4,553E-06	1,907E-05	0,040
		0,136	11,000	80,882	1698,772		0,003					
		0,127	12,000	94,488	1984,535		0,003					
		0,103	11,000	106,796	2243,039		0,003					
		0,158	13,000	82,278	1728,095		0,003					
		0,157	14,000	89,172	1872,879		0,004					
		0,128	11,000	85,938	1804,945		0,004					
		0,114	14,000	122,807	2579,316		0,004					
		0,097	11,000	113,402	2381,784		0,003					
		0,111	16,000	144,144	3027,459		0,004					

P4-19	27,415	0,194	14,000	72,165	1978,402	3034,544	0,004	0,004	0,017	5,308E-06	2,224E-05	0,067
		0,178	17,000	95,506	2618,287		0,003					
		0,153	16,000	104,575	2866,928		0,003					
		0,182	20,000	109,890	3012,637		0,006					

		0,182	21,000	115,385	3163,269		0,003					
		0,213	23,000	107,981	2960,305		0,004					
		0,147	17,000	115,646	3170,442		0,003					
		0,124	18,000	145,161	3979,597		0,004					
		0,151	17,000	112,583	3086,457		0,004					
		0,125	16,000	128,000	3509,120		0,004					
P7-18	19,405	0,206	17,000	82,524	1601,383	2285,513	0,004	0,004	0,018	5,404E-06	2,264E-05	0,052
		0,202	17,000	84,158	1633,094		0,004					
		0,105	13,000	123,810	2402,524		0,004					
		0,148	19,000	128,378	2491,182		0,003					
		0,148	19,000	128,378	2491,182		0,003					
		0,134	16,000	119,403	2317,015		0,004					
		0,113	17,000	150,442	2919,336		0,006					
		0,118	16,000	135,593	2631,186		0,005					
		0,126	15,000	119,048	2310,119		0,003					
		0,132	14,000	106,061	2058,106		0,003					
P8-14	27,107	0,180	3,000	16,667	451,783	5870,361	0,002	0,002	0,012	1,670E-06	6,996E-06	0,041
		0,190	34,000	178,947	4850,726		0,002					
		0,176	36,000	204,545	5544,614		0,002					
		0,122	30,000	245,902	6665,656		0,002					
		0,128	32,000	250,000	6776,750		0,002					
		0,130	32,000	246,154	6672,492		0,002					
		0,112	34,000	303,571	8228,911		0,002					
		0,150	42,000	280,000	7589,960		0,002					
		0,142	30,000	211,268	5726,831		0,001					
		0,140	32,000	228,571	6195,886		0,001					

P13-9	19,315	0,128	18,000	140,625	2716,172	5041,193	0,002	0,002	0,011	1,396E-06	5,850E-06	0,029
		0,113	26,000	230,088	4444,159		0,001					
		0,107	28,000	261,682	5054,393		0,002					
		0,118	28,000	237,288	4583,220		0,002					
		0,105	30,000	285,714	5518,571		0,002					
		0,118	26,000	220,339	4255,847		0,001					

		0,104	34,000	326,923	6314,519		0,001					
		0,076	30,000	394,737	7624,342		0,001					
		0,091	22,000	241,758	4669,560		0,002					
		0,096	26,000	270,833	5231,146		0,002					

Day 35

	Egg mass total area (mm2)	Rectangle area (mm2)	Number of eggs in each rectangle	Number of eggs in 1 mm2	Number of eggs in the egg mass	Number of eggs in the egg mass (mean)	Area of the eggs (mm2)	Area of the eggs (mean) (mm2)	R (radius) value in the area formula	R to the cube (R3)	Volume of the eggs (mm3)	Volume ocupied by eggs in the egg mass (mm3)
P1-19	14,032	0,129	22,000	170,543	2393,054	2367,770	0,003	0,003	0,014	2,930E-06	1,227E-05	0,029
		0,108	21,000	194,444	2728,444		0,003					
		0,097	17,000	175,258	2459,216		0,003					
		0,133	20,000	150,376	2110,075		0,003					
		0,141	24,000	170,213	2388,426		0,003					
		0,144	21,000	145,833	2046,333		0,003					
		0,150	26,000	173,333	2432,213		0,002					
		0,144	24,000	166,667	2338,667		0,002					
		0,120	22,000	183,333	2572,533		0,003					
		0,108	17,000	157,407	2208,741		0,003					

P2-14	15,477	0,145	17,000	117,241	1814,545	2493,813	0,002	0,003	0,015	3,437E-06	1,440E-05	0,036
		0,095	17,000	178,947	2769,568		0,003					
		0,097	15,000	154,639	2393,351		0,003					
		0,110	22,000	200,000	3095,400		0,002					
		0,127	21,000	165,354	2559,189		0,003					
		0,115	20,000	173,913	2691,652		0,003					
		0,140	24,000	171,429	2653,200		0,003					
		0,127	20,000	157,480	2437,323		0,003					
		0,171	21,000	122,807	1900,684		0,004					
		0,118	20,000	169,492	2623,220		0,003					
P2-15	16,428	0,137	12,000	87,591	1438,949	1791,149	0,004	0,005	0,019	7,166E-06	3,002E-05	0,054
		0,133	11,000	82,707	1358,707		0,004					
		0,137	14,000	102,190	1678,774		0,005					
		0,130	13,000	100,000	1642,800		0,004					
		0,112	18,000	160,285	2633,161		0,005					
		0,113	15,000	132,743	2180,708		0,005					
		0,148	14,000	94,595	1554,000		0,003					
		0,154	12,000	77,922	1280,104		0,004					
		0,140	17,000	121,429	1994,829		0,006					
		0,107	14,000	130,841	2149,458		0,005					
P5-15	17,998	0,136	68,000	500,000	8999,000	8436,331	0,001	0,001	0,008	4,355E-07	1,824E-06	0,015
		0,158	52,000	329,114	5923,392		0,001					
		0,106	44,000	415,094	7470,868		0,001					
		0,116	56,000	482,759	8688,690		0,001					
		0,106	44,000	415,094	7470,868		0,001					
		0,097	40,000	412,371	7421,856		0,001					
		0,110	48,000	436,364	7853,673		0,001					
		0,119	52,000	436,975	7864,672		0,001					
		0,105	60,000	571,429	10284,571		0,001					
		0,093	64,000	688,172	12385,720		0,001					

P8-15	36,048	0,240	20,000	83,333	3004,000	3480,465	0,003	0,004	0,018	5,900E-06	2,471E-05	0,086
		0,233	19,000	81,545	2939,536		0,004					

		0,218	17,000	78,053	2813,664		0,003					
		0,172	18,000	104,651	3772,465		0,004					
		0,200	20,000	100,000	3604,800		0,003					
		0,197	16,000	81,218	2927,756		0,005					
		0,135	17,000	125,926	4539,378		0,005					
		0,180	21,000	116,667	4205,600		0,004					
		0,167	15,000	89,820	3237,844		0,005					
		0,163	17,000	104,294	3759,607		0,004					
		0,210	25,000	119,048	2165,476		0,004					
		0,176	21,000	119,318	2170,398		0,004					
		0,188	20,000	106,383	1935,106		0,003					
		0,162	23,000	141,975	2582,531		0,004					
P8-16	18,190	0,185	23,000	124,324	2261,459	2284,285	0,004	0,004	0,018	5,442E-06	2,280E-05	0,052
		0,173	24,000	138,728	2523,468		0,005					
		0,215	28,000	130,233	2368,930		0,005					
		0,117	17,000	145,923	2654,335		0,004					
		0,130	18,000	138,462	2518,615		0,003					
		0,186	17,000	91,398	1662,527		0,004					
		0,132	13,000	98,485	1014,689		0,003					
		0,133	14,000	105,263	1084,526		0,004					
		0,134	15,000	111,940	1153,321		0,005					
		0,140	16,000	114,286	1177,486		0,004					
P9-16	10,303	0,165	20,000	121,212	1248,848	1328,374	0,003	0,003	0,016	4,259E-06	1,784E-05	0,024
		0,150	17,000	113,333	1167,673		0,002					
		0,107	16,000	149,533	1540,636		0,003					
		0,100	15,000	150,000	1545,450		0,003					
		0,106	16,000	150,943	1555,170		0,003					
		0,109	19,000	174,312	1795,936		0,003					

		0,149	80,000	536,913	10387,114		0,001					
P9-17	19,346	0,112	60,000	535,714	10363,929	10152,752	0,001	0,001	0,008	5,013E-07	2,100E-06	0,021
		0,120	68,000	566,667	10962,733		0,001					
		0,087	60,000	689,655	13342,069		0,001					

		0,109	40,000	366,972	7099,450		0,001					
		0,137	48,000	350,365	6778,161		0,001					
		0,147	84,000	571,429	11054,857		0,001					
		0,128	60,000	468,750	9068,438		0,001					
		0,127	68,000	535,433	10358,488		0,001					
		0,115	72,000	626,087	12112,278		0,001					
		0,148	15,000	101,351	2487,568		0,004					
		0,128	14,000	109,375	2684,500		0,005					
		0,130	13,000	100,000	2454,400		0,004					
		0,160	15,000	93,750	2301,000		0,004					
		0,191	16,000	83,770	2056,042		0,004					
P10-12	24,544	0,151	16,000	105,960	2600,689	2379,974	0,006	0,005	0,019	6,885E-06	2,884E-05	0,069
		0,188	19,000	101,064	2480,511		0,005					
		0,174	14,000	80,460	1974,805		0,006					
		0,166	16,000	96,386	2365,687		0,004					
		0,123	12,000	97,561	2394,537		0,004					
		0,201	23,000	114,428	2558,836		0,003					
		0,147	18,000	122,449	2738,204		0,003					
		0,137	17,000	124,088	2774,847		0,004					
		0,118	20,000	169,492	3790,169		0,004					
		0,123	22,000	178,862	3999,707		0,003					
P15-9	22,362	0,131	21,000	160,305	3584,748	3534,264	0,002	0,003	0,015	3,495E-06	1,464E-05	0,052
		0,136	29,000	213,235	4768,368		0,003					
		0,110	19,000	172,727	3862,527		0,002					
		0,121	16,000	132,231	2956,959		0,002					
		0,109	21,000	192,661	4308,275		0,003					