Daphniids avoid *Utricularia* on a horizontal plane

Marcin Mazurkiewicz[1,2]*, Barbara Płaskonka[1,3]*, Marta Galas[1,4], Marta Kret[1], Barbara Pietrzak[1,5]**

1 Hydrobiological Station, Faculty of Biology, University of Warsaw, Pilchy 5, 12-200 Pisz, Poland

2 Białowieża Geobotanical Station, Faculty of Biology, University of Warsaw, Sportowa 19, 17-230 Białowieża, Poland

3 Botanic Garden, Faculty of Biology, University of Warsaw, Aleje Ujazdowskie 4, 00-478, Warszawa, Poland

4 Department of Biochemistry and Microbiology, Institute of Biology, Warsaw University of Life Sciences (SGGW), Nowoursynowska, 159, 02-776 Warsaw Poland

5 Department of Hydrobiology, Institute of Ecology, Faculty of Biology, University of Warsaw, Biological and Chemical Research Centre, Zwirki i Wigury 101, 02-089 Warsaw, Poland

* these authors contributed equally

** corresponding author: b.pietrzak@uw.edu.pl

Abstract

Besides animal predators, carnivorous plants, such as the littoral bladderwort *Utricularia vulgaris*, also strongly impact cladoceran communities by efficiently capturing passing planktonic animals, including small daphniids, in their bladder traps. Therefore, we hypothesized these animals should avoid direct contact with these carnivorous plants. We measured the distance *Ceriodaphnia* and small-bodied *Daphnia* keep from plants in both a horizontal and a vertical setup. Predatory plant *Utricularia,* non-predatory coontail *Ceratophyllum,* or an artificial plant were placed in either bladderwort conditioned water or control medium. The measurements performed in the horizontal setup showed that the studied daphniids stayed further away from predatory bladderwort than from the non-predatory plant and further from an artificial plant in bladderwort conditioned water than in control water. Thus, our results suggest that by this behavioural avoidance cladocerans navigate through the even more complex than previously thought landscape of fear - that of planktivorous fish, invertebrate predators, and now also evidenced plant predators.

Key words

Behaviour, carnivorous plant, *Ceriodaphnia,* kairomone, predator avoidance, *Utricularia*

Introduction

Predation provides a strong selective pressure across taxa, and antipredatory responses in the face of threat occur even in unintuitive prey-predator systems (e.g. Grzesiuk et al., 2022; Lin et al., 2025). While lifelong consequences are expected depending on the nuances of the system (Gliwicz, 2003; Pietrzak et al., 2020), the fastest and most direct often takes the form of immediate behavioural response, including changes in activity type, time allocation, and spatial position (Gliwicz et al., 2006; Sysiak et al., 2023).

In lentic habitats, predator avoidance involves avoiding surface open waters at day, and thus includes diel vertical migration (DVM) and diel horizontal migration (DHM) – the latter being behaviour in which prey move into littoral macrophyte stands during the day to escape visually-hunting fish (reviewed by Burks et al., 2002). Unlike DVM, where deep, dark hypolimnion offers a well-defined refuge, DHM occurs in a structurally complex littoral habitat that may simultaneously provide refuge and introduce new predation risks. This creates a fundamental predator–refuge paradox: plankters seeking shelter among macrophytes avoid pelagic fish, but may encounter abundant littoral invertebrate predators, habitat complexity, or allelopathic plant exudates (Burks et al., 2002).

Cladocerans serve as a model system for studying predator-induced behaviour in lentic habitats with well-documented responses to fish and invertebrate predators (e.g. Gliwicz and Pijanowska, 1989; Tollrian and Harvell, 1999; Gliwicz, 2003). While diel vertical migration is among the best-known predator-avoidance mechanisms (Gliwicz, 1986; Lampert, 1989; Bandara et al., 2021), horizontal movements toward or away from plants play an equally important role in shallow vegetated systems, where weak light gradients occur and habitats physically structure predator distributions (Burks et al., 2002). Thus, in addition to the classic epilimnion-hypolimnion refuge axis, cladocerans also navigate an inshore-offshore gradient of predation risk, responding not only to fish but also to littoral predator assemblages and habitat cues (Haney, 1988; Gliwicz and Rykowska, 1992). These responses may be mediated by multiple sensory modalities, including both visual and chemical cues, which together inform the detection and spatial assessment of predation risk (Burks et al., 2002; Hathaway and Dudycha, 2018; Weiss, 2019).

Cladoceran responses to plant predators receive little attention. Carnivorous plants of the genus *Utricularia* (bladderworts) not only commonly form the littoral environment, but also directly affect aquatic animals and reduce their densities (Harms, 2002; Kurbatova and Yershov, 2009). Bladderworts use submerged suction traps (bladders) known to be the fastest motile trapping devices in plants, triggered mechanically by prey and extremely effective in sucking in a passing-by daphniid (Poppinga et al., 2017). These traps contain varied taxa, from phytoplankton of different species, through rotifers to small annelids, insects and crustaceans, including small cladocerans often in a high proportion (Alkhalaf et al., 2009; Kurbatova and Yershov 2009). Yet still, hardly any studies have investigated cladoceran anti-*Utricularia* responses (Havel and Dodson, 1985; Kruppert et al., 2022).

In the present study, we hypothesized small cladocerans evolved behavioural avoidance of direct contact with carnivorous plants. As cladocerans may use vision to avoid shores (Schwind 1999) and chemoreception plays a key role in assessing predator presence (Weiss, 2019), we considered these modalities as the most likely contributors to avoidance behaviour in our system. By combining live plant exposure with exposure to *Utricularia*-conditioned water, we examined whether cues associated with the presence of this predatory plant are linked with spatial avoidance by daphniids. We predicted that daphniids would remain at greater distance from *Utricularia* than from a non-predatory plant. Because general plant avoidance has been recorded in some *Daphnia* species (Meerhoff et al., 2006), we tested this prediction using two simplified, quasi-unidimensional systems in which avoidance could be expressed either horizontally or vertically.

Methods

Experimental organisms

Sampling took place near Hydrobiological Field Station of University of Warsaw in Pilchy, Masuria, Poland in July 2019. Depending on abundance, we collected experimental organisms from one of two sites. We collected the cladocerans from among the emergent vegetation at the shore and adjacent patches of open water on a swamp on Czarna Struga stream about 1 km up from its inflow to lake Roś (53.690°N, 21.918°E). On the same dates, we collected common bladderwort (*Utricularia* cf. *vulgaris*) and rigid hornwort (*Ceratophyllum demersum*) from lake Roś littoral about 1 km from where Czarna Struga flows in (53.682°N, 21.894°E), from the edge of disturbed *Phragmites australis* reed bed. The work took place outside protected areas, did not include species under protection and therefore did not require permitting.

In the predation tests and in experiment 1, we used a mixture of small-bodied Daphniidae (sensu Tessier et al., 2001), dominated by *Ceriodaphnia* sp. and small *Daphnia* sp. of *longispina* group, which reflected the actual daphniid community present during early sampling and was used for initial screening of behavioural responses. During later sampling, *Ceriodaphnia pulchella* dominated. Because this species is more characteristically littoral and therefore likely to face higher predation risk from *Utricularia*, experiment 2 focused on this single species to test avoidance in a more ecologically and taxonomically consistent manner. We kept sampled animals in conditioned (150 µm mesh filtration and over 24 hours of aeration) lake Roś water in 100-500 mL containers for at least 24 hours before use in behavioural experiments (see predator cue degradation issue discussed below).

Prior to the behavioural assays, we conducted a pilot test confirming that *Utricularia* readily preyed upon the studied cladocerans under our laboratory conditions (Supplementary Material).

Avoidance tests

To test daphniid avoidance of the predator, we measured the distance of the animals from plants in two setups: horizontal and vertical, running in parallel, both in two subsequent experiments. One week after experiment 1, we collected new organisms at the same locations and performed a similar double (horizontal and vertical running in parallel) experiment 2, introducing a few developments or refinements explained below (Fig. 1).

Overall, we used a partially crossed factorial design with two factors: medium (control vs predator-conditioned) and plant type (live vs artificial). Because live plants inherently carried their biological chemical signature, we tested live *Ceratophyllum* only in control medium, whereas live *Utricularia* only in predator-conditioned medium. We tested artificial plants in both media. The full 2×2 factorial combination was biologically impossible, resulting in an incomplete but structured design.

We used two types of media, control versus predator-conditioned water, in both experiments. To obtain control medium, we filtered lake Roś water through a mesh and aerated it for at least 36 hours, thus cleaning it from other animals and plants and allowing chemical cues of predation to degrade to major extent (Van Buskirk et al., 2014). To obtain predator medium, i.e. *Utricularia* conditioned water, we exposed delicately rinsed live bladderwort (about 140 g wet mass) in 5 L of control aerated medium for at least 24 hours.

In horizontal and vertical experiment 1, we used only live plants, *Ceratophyllum* in control, and *Utricularia* in predator medium (two treatments). In horizontal and vertical experiment 2, we increased the number of levels of the plant type factor. In addition to treatments with live plants, we used artificial ones in each medium (four treatments, Fig. 1). We performed all experiments against white background and under fluorescent lamps providing even lighting over the whole setup. Thus, the tested animals could see the plant as dark at each end of the horizontal and on the upper end of the vertical setup.

The horizontal setup consisted of 16 small (50 x 2 x 0.8 cm) white plastic troughs each with one type of plant added at both ends. The vertical setup used laboratory glass tubes (15 cm x ∅ 1 cm), each with one type of plant floating under the surface (Fig. 1). The width of the vessels corresponded to the width of vessels commonly used in laboratory studies of DVM in *Daphnia*, so called "plankton organs" (e.g. Dawidowicz and Loose, 1992). The length of the vessels, in relation to their width, and thus the width of the presented "littoral", allowed the animals to easily distance themselves from plants enough to lose them from sight (given that e.g. *Daphnia*'s angular field of view is at least 22° (Hathaway & Dudycha, 2018), an object 1.5 cm wide would subtend this angle at a distance of approximately 3.9 cm).

The tested animals differed between experiments 1 and 2. We used the same daphniid mixture in horizontal 1 and vertical 1, whereas *C. pulchella* in horizontal 2 and vertical 2, as explained above. Twenty four hours before each experiment, we distributed the animals randomly between the two treatment media and exposed them in the focal medium before testing, a standard cue-sensitisation in cladoceran research. Each time we placed five individuals in each experimental vessel and at each measurement we considered their mean position as the single data point. In all experiments, we used alternating order of treatment vessels and even distribution among blocks to exclude position-dependent effects.

Horizontal experiment 1. We tested daphniids in one of two treatments, either in control medium with live *Ceratophyllum*, or in predator medium with live *Utricularia* (Fig. 1). We placed 12 cm long respective plant stems at both ends of each trough. Before testing, we pre-exposed 80 daphniids in the focal medium , 40 individuals in each. For the test, we placed five individuals in the middle of each trough, in accordance to their pre-exposure medium, and after three-minute incubation we recorded their horizontal positions , i.e. the shorter distance to plants, five times at three minute intervals (5 individuals x 8 replicate troughs x 2 treatments; 5 repeated measurements).

Horizontal experiment 2. We performed the experiment as before with the following modifications. (i) We used two medium treatments (control vs. predator) and two plant treatments (live stem vs. green aquarium plastic plant) in a biologically constrained factorial design producing four experimental treatments: control medium with live *Ceratophyllum*, control medium with artificial plant, predator medium with live *Utricularia*, and predator medium with artificial plant (Fig. 1). (ii) The micro-"littoral" was shorter in this experiment to allow more space for zooplankton to move, and was about 3 cm on each side. (iii) We used 80 *Ceriodaphnia pulchella*, one of the dominant species in experiment 1. Again, we distributed them randomly between the treatments and vessels, five into each. Five measurements were performed, as before (5 individuals x 4 replicate troughs x 4 treatments; 5 repeated measurements).

As an additional test, this experiment was repeated after 24 hours with the same animals. Between the repeated experiments, we kept the animals in groups of five individuals in plastic containers filled with the same type of medium as used in the test.

Vertical experiment 1. We tested daphniids in one of two treatments, either in control medium with live *Ceratophyllum*, or in predator medium with live *Utricularia.* We placed 3 cm long respective live plant stems in each tube where they floated straight under the surface. This experiment ran in triplicate. We pre-exposed 30 daphniids in the focal medium before testing, 15 individuals in each. For the test, we placed five individuals in the middle of each tube, in accordance with their pre-exposure medium, and after three-minute incubation we recorded their vertical positions five times at three minute intervals (5 individuals x 3 replicate tubes x 2 treatments; 5 repeated measurements).

Vertical experiment 2. The experiment was performed as before with the following modifications. (i) Four treatments and (ii) 80 individuals of *C. pulchella* were used, as in the horizontal experiment 2 (Fig. 1) (5 individuals x 4 replicate tubes x 4 treatments; 5 repeated measurements).

Data analysis

We performed all calculations using the R language and environment, R version 4.5.1 (R Core Team, 2025).

For the predation test, we compared the numbers of daphniids remaining in the control and bladderwort paired cube containers using paired t-test.

For both horizontal and vertical setups, we analysed how treatment and time (repeated observations) affected the distance to the plant. Because measurements taken on the same group of five individuals were not independent, we used generalized least squares (GLS) models with an appropriate repeated-measures correlation structure and allowance for unequal variances, implemented in the nlme package (Pinheiro et al., 2025). Each GLS model included fixed effects of treatment, time, and their interaction. We incorporated repeated measurements within each vessel (and, in horizontal experiment 2, the two experimental rounds) directly into the error structure. As the time × treatment interaction was non-significant in all experiments, we removed only this interaction term from the GLS models, with all inference based on the GLS models with the repeated-measures structure retained. We used type-II ANOVA tables (car package; Fox & Weisberg, 2019) solely to report significance tests for the fixed effects in these GLS models, followed by Tukey post-hoc comparisons (lsmeans package) at $\alpha = 0.05$. As the studied animals and the length of plant stems resulting in length of space available for animals differed between experiments, we did not compare their results with a formal analysis.

Results

In both horizontal experiments 1 and 2 treatment altered daphniids distance from plants (ANOVA on GLS results, treatment effect, exp. 1: $\chi2_1 = 10.6$, $P = 0.0011$, exp. 2: $\chi2_3 = 18.9$, $P = 0.0003$). The animals stayed further from predatory bladderwort than from non-predatory *Ceratophyllum* in both horizontal experiments, and further from artificial plants in bladderwort conditioned water than in control water (Fig. 2). Animal position changed over time of the repeated measurements only in experiment 2 (time effect, exp. 1: $\chi2_1 = 0.59$, $P = 0.44$, exp. 2: $\chi2_1 = 9.9$, $P = 0.0017$) and without a significant interaction (Tab. S1).

In neither of the vertical experiments was the effect of treatment on daphniids distance from plants significant (P > 0.48; Tab. S1, Fig. 3). In vertical experiment 1, under control conditions, the daphniids appeared to disperse through the depth of the water column more than in the presence of bladderwort, yet, this effect was not seen for *Ceriodaphnia* in experiment 2.

Discussion

In our experiments, daphniids stayed further from bladderwort than from non-predatory *Ceratophyllum* in the respective media, and further from artificial plants in bladderwort-conditioned water than in control medium, in agreement with our expectations. Despite being unable to chase its prey, predatory bladderwort may pose a considerable death risk to planktic animals when it constitutes an important part of vegetated littoral, habitat that otherwise may be used as a refuge from vertebrate predation (Burks et al., 2001; González Sagrario et al., 2009). To our knowledge, our results represent one of the few demonstrations that cladocerans may exhibit behavioural avoidance in response to carnivorous plants, in contrast to earlier studies reporting no behavioural response (e.g. Harms, 2002; Englund and Harms, 2001). Our study possibly provides only the second report of aquatic animal behavioural avoidance of a predatory plant at all (Kruppert et al., 2022).

Importantly, our experimental design does not allow us to mechanistically disentangle the relative roles of visual and chemical cues in driving the observed avoidance behaviour. Rather, our results indicate that cladocerans avoid *Utricularia* under conditions where both visual structure and plant-associated chemical cues are present. Indeed, predator-induced responses in cladocerans are often triggered by the presence of kairomones without requiring stable spatial gradients, with behavioural outcomes shaped by interactions between chemical cues and other environmental signals such as light (Ringelberg, 1991; Dawidowicz and Loose, 1992; Weiss 2019).

Interestingly, we found avoidance on a horizontal, but not on a vertical plane. This might reflect the structure of the littoral habitat and opportunities to find refuge therein. In the shallow littoral depths, little heterogeneity exists along the vertical gradient of the water column, while the habitat patchiness is pronounced in the horizontal plane. Distances in the orders of centimetres or tens of centimetres away may signify a different macrophyte patch or a patch of different plant densities. Thus, among vegetation, horizontal movements may play a greater role for daphniids than vertical movements. Also, horizontal migrations between vegetation stands, their edges and open water commonly occur in small-bodied *Daphnia* and *Ceriodaphnia* spp. on a daily basis (Vetti Kvam and Kleiven, 1995; Rybak and Węgleńska, 2003; Antón-Pardo et al., 2021).

Another possible explanation for having evidenced here avoidance on a horizontal, but not on a vertical plane, includes the nuances of the experimental setups used. Our horizontal setup enabled movements between the same plant patches on both ends of a halftube, where the shorter distance to plants was measured. Meanwhile, the vertical setup enabled movements between plants floating under the surface and greater, yet still shallow, depths of the tubes (all of uniform lighting and physical parameters, as in the horizontal setup). While chemical gradients were possible in the live plant treatments - the presence and temporal dynamics of these gradients being linked to the width and length of experimental vessels - uniform concentrations of semiochemicals were expected in artificial plant treatment. Nevertheless, it is worth emphasizing here that the results were consistent across experiments 1 and 2 performed on different days and with different prey assemblage - mixture of small-bodied daphniids dominated by *Ceriodaphnia* sp. and small *Daphnia* sp. of *longispina* group versus *Ceriodaphnia pulchella*, respectively.

Our results are in line with those reported in the other study on daphniid plastic responses to bladderwort (Kruppert et al., 2022). There, *Ceriodaphnia dubia* exposed to *Utricularia x neglecta* showed changes in morphology and behaviour, which the authors interpreted as adaptations improving survival, and in life history, which likely reflected defense trade-offs. In that study, behavioural adjustment was most clearly reflected in reduced number of movements and reduced velocity. Also, their results suggested movement away horizontally and upward in *Utricularia*-conditioned medium, which corroborates our findings of no avoidance of bladderwort through downward displacement below the plant. The two studies also agree in the finding that chemical cues of *Utricularia* presence may contribute to behavioural avoidance of the plant, be it bladderwort itself, harmless commonwort or a plastic aquarium plant. Taken together, these findings point to the need for future studies that explicitly disentangle the visual and chemical components of this response, for example by manipulating cue gradients independently of plant structure and by comparing responses across a broader range of plant types.

Conclusions

We present behavioural experimental data showing avoidance responses by *Ceriodaphnia* and small-bodied *Daphnia* to bladderwort presence. To our knowledge, this study provides one of the few empirical demonstrations of such an antipredator response by zooplankton to a carnivorous plant. In line with the sole previous study reporting such a pattern, our findings add both taxonomic and geographic breadth, suggesting this phenomenon may be more widespread than previously recognized. These results indicate that cladocerans may experience a more complex landscape of fear than previously acknowledged — one that includes not only planktivorous fish and invertebrate predators, but also plant predators.

Funding

The work was performed within statutory research of the Faculty of Biology, University of Warsaw.

Data Availability

The data underlying the analyses are available in the Supplementary Materials accompanying this preprint at the end of the file.

References

Alkhalaf IA, Hübener T and Porembski S (2009) Prey spectra of aquatic *Utricularia* species (Lentibulariaceae) in northeastern Germany: The role of planktonic algae. Flora - Morphology, Distribution, Functional Ecology of Plants 204: 700–708. https://doi.org/10.1016/j.flora.2008.09.008

Antón-Pardo M, Muška M, Jůza T, Vejříková I, Vejřík L, Blabolil P, Čech M et al. (2021) Diel changes in vertical and horizontal distribution of cladocerans in two deep lakes during early and late summer. Science of the Total Environment 751: 141601. https://doi.org/10.1016/j.scitotenv.2020.141601

Bandara K, Varpe Ø, Wijewardene L, Tverberg V and Eiane K (2021) Two hundred years of zooplankton vertical migration research. Biological Reviews 96: 1547–1589. https://doi.org/10.1111/brv.12715

Burks RL, Jeppesen E and Lodge DM (2001) Littoral zone structures as *Daphnia* refugia against fish predators. Limnology and Oceanography 46: 230–237. https://doi.org/10.4319/lo.2001.46.2.0230

Burks RL, Lodge DM, Jeppesen E and Lauridsen TL (2002) Diel horizontal migration of zooplankton: costs and benefits of inhabiting the littoral. Freshwater Biology, 47: 343-365. https://doi.org/10.1046/j.1365-2427.2002.00824.x

Dawidowicz P and Loose CJ (1992) Metabolic costs during predator-induced diel vertical migration of *Daphnia*. Limnology and Oceanography 37: 1589–1595. https://doi.org/10.4319/lo.1992.37.8.1589

Englund G and Harms S (2001) The functional response of a predatory plant preying on swarming zooplankton. Oikos 94: 175-181.

Fox J and Weisberg S (2019) An R companion to applied regression. 3rd edn. Sage Publications, Thousand Oaks, CA

Gliwicz ZM (1986) Predation and the evolution of vertical migration in zooplankton. Nature 320: 746–748

Gliwicz ZM (2003) Between hazards of starvation and risk of predation: The ecology of offshore animals. Excellence in Ecology Series, Vol. 12. International Ecology Institute, Oldendorf/Luhe, Germany

Gliwicz ZM and Pijanowska J (1989) The role of predation in diel vertical migration of zooplankton. Archiv für Hydrobiologie – Beihefte Ergebnisse der Limnologie 33: 81–90

Gliwicz ZM and Rykowska A (1992) 'Shore avoidance' in zooplankton: A predator-induced behavior or predator-induced mortality? Journal of Plankton Research 14: 1331–1342. https://doi.org/10.1093/plankt/14.9.1331

Gliwicz ZM, Dawidowicz P and Maszczyk P (2006) Low-density anti-predation refuge in *Daphnia* and *Chaoborus*? Archiv für Hydrobiologie 167: 101–114. https://doi.org/10.1127/0003-9136/2006/0167-0101

González Sagrario MA, Balseiro E, Ituarte R and Spivak E (2009) Macrophytes as refuge or risky area for zooplankton: A balance set by littoral predacious macroinvertebrates. Freshwater Biology 54: 1042–1053. https://doi.org/10.1111/j.1365-2427.2008.02152.x

Grzesiuk M, Pietrzak B, Wacker A and Pijanowska J (2022) Photosynthetic activity in both algae and cyanobacteria changes in response to cues of predation. Frontiers in Plant Science 13: 907174. https://doi.org/10.3389/fpls.2022.907174

Haney JF (1988) Diel Patterns of Zooplankton Behavior. Bulletin of Marine Science 43: 583-603

Harms S (2002) The effect of bladderwort (*Utricularia*) predation on microcrustacean prey. Freshwater Biology 47: 1608–1617

Hathaway JM and Dudycha JL (2018). Quantitative measurement of the optomotor response in free-swimming *Daphnia* 40: 222–229. doi:10.1093/plankt/fby014

Havel JE and Dodson SI (1985) Environmental Cues for Cyclomorphosis in *Daphnia retrocurva* Forbes. Freshw. Biol. 15, 469–478.

Kruppert S, Horstmann M, Weiss LC, Konopka E, Kubitza N, Poppinga S, Westermeier AS, Speck T and Tollrian R (2022) Facing the green threat: A water flea's defenses against a carnivorous plant. International Journal of Molecular Sciences 23: 6474. https://doi.org/10.3390/ijms23126474

Kurbatova SA and Yershov IYu (2009) Crustaceans and rotifers in the predatory feeding of *Utricularia*. Inland Water Biology 2: 271–275

Lampert W (1989) The adaptive significance of diel vertical migration of zooplankton. Functional Ecology 3: 21–27

Lin T-H, Chang H-W, Tay RJ and Hsueh J-P (2025) Predation by nematode-trapping fungus triggers mechanosensory-dependent quiescence in *Caenorhabditis elegans*. iScience 28: 112792. https://doi.org/10.1016/j.isci.2025.112792

Meerhoff M, Fosalba C, Bruzzone C, Mazzeo N, Noordoven W and Jeppesen E (2006) An experimental study of habitat choice by *Daphnia*: Plants signal danger more than refuge in subtropical lakes. Freshwater Biology 51: 1320–1330. https://doi.org/10.1111/j.1365-2427.2006.01574.x

Pietrzak B, Rabus M, Religa M, Laforsch C and Dańko MJ (2020) Phenotypic plasticity of senescence in *Daphnia* under predation impact: No ageing acceleration when the perceived risk decreases with age. Royal Society Open Science 7: 191382. https://doi.org/10.1098/rsos.191382

Pinheiro J, Bates D, R Core Team (2025) _nlme: Linear and Nonlinear Mixed Effects Models_. doi:10.32614/CRAN.package.nlme

Poppinga, S., Daber, L.E., Westermeier, A.S. et al. Biomechanical analysis of prey capture in the carnivorous Southern bladderwort (*Utricularia australis*). Sci Rep 7, 1776 (2017). https://doi.org/10.1038/s41598-017-01954-3

R Core Team (2025) _R: A Language and Environment for Statistical Computing_. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/.

Ringelberg J (1991) Enhancement of the phototactic reaction in *Daphnia hyalina* by a chemical mediated by juvenile perch (*Perca fluviatilis*). Journal of Plankton Research 13: 17–25. https://doi.org/10.1093/plankt/13.1.17

Rybak JI and Węgleńska T (2003) Temporal and spatial changes in the horizontal distribution of planktonic Crustacea between vegetated littoral zone and the zone of open water. Polish Journal of Ecology 51: 205–208

Schwind R (1999) *Daphnia pulex* swims towards the most strongly polarized light – a response that leads to 'shore flight'. Journal of Experimental Biology 202: 3631–3635. doi: https://doi.org/10.1242/jeb.202.24.3631

Sysiak M, Pietrzak B, Kubiak M, Bednarska A, Mikulski A (2023) Chemical cannibalistic cues make damselfly larvae hide rather than hunt. Scientific Reports 13: 13556. https://doi.org/10.1038/s41598-023-40732-2

Tessier AJ, Bizina EV and Tessier KC (2001) Grazer–resource interactions in the plankton: Are all daphniids alike? Limnology and Oceanography 46: 1585–1595. https://doi.org/10.4319/lo.2001.46.7.1585

Tollrian R and Harvell CD (1999) The ecology and evolution of inducible defenses. Princeton University Press, Princeton, NJ

Van Buskirk J, Krügel A, Kunz J, Miss F and Stamm A (2014) The rate of degradation of chemical cues indicating predation risk: An experiment and review. Ethology 120: 942–949. https://doi.org/10.1111/eth.12266

Vetti Kvam O and Kleiven OT (1995) Diel horizontal migration and swarm formation in *Daphnia* in response to *Chaoborus*. Hydrobiologia 307: 177–184. https://doi.org/10.1007/BF00032010

Weiss LC (2019) Sensory Ecology of Predator-Induced Phenotypic Plasticity. Frontiers in Behavioral Neuroscience 12: 330. doi: 10.3389/fnbeh.2018.00330

Figure legends

Fig. 1 caption: Schematic diagram of the horizontal and vertical setups in experiment 1 and 2. Green - control medium, orange - predator medium. Light colours, diamonds and triangles - live plants, dark colours and circles - artificial plants. Numbers denote distances (cm) to plants in space available to animals.

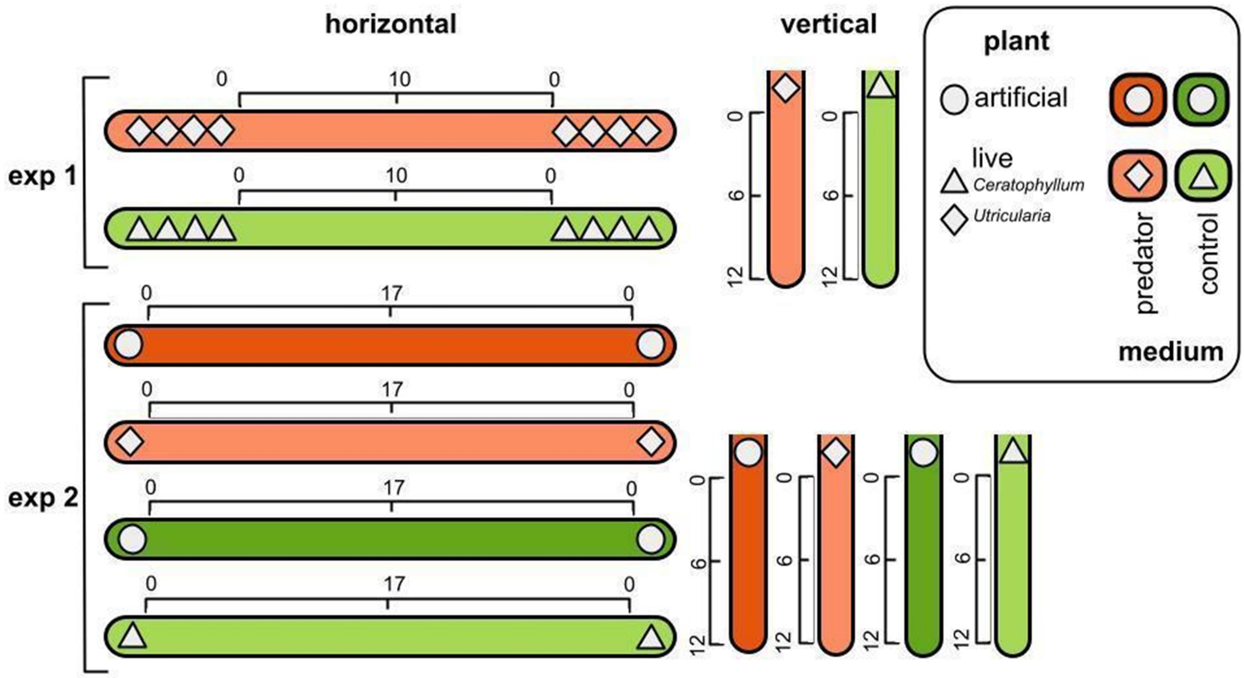
Alt text: Diagram illustrating horizontal and vertical experimental setups in two experiments testing zooplankton response to predatory and non-predatory plants. Orange indicates predator-conditioned water, green indicates control water. Light colours and angular symbols represent live plants, dark colours and circles represent artificial ones. Numbers denote distances (cm) to plants in space available to animals.

Fig. 2 Distance of daphniids from plants through the experiments in the horizontal setup. Green boxes - control medium (cont), orange boxes - predator medium (pred). Light colours - live plants (Cera - *Ceratophyllum*, Utri - *Utricularia*), dark colours - artificial plants (ART). Black lines, boxes and whiskers mark medians, quartiles and extrema. Vertical lines mark homogeneous groups.

Alt text: Boxplot showing the distance of daphniids from plants in horizontal setups in five subsequent measurements and across experimental treatments.

Fig. 3 Distance of daphniids from plants through the experiments in the vertical setup. Labels as in Fig. 2.

Alt text: Boxplot showing the distance of daphniids from plants in vertical setups in five subsequent measurements and across experimental treatments.



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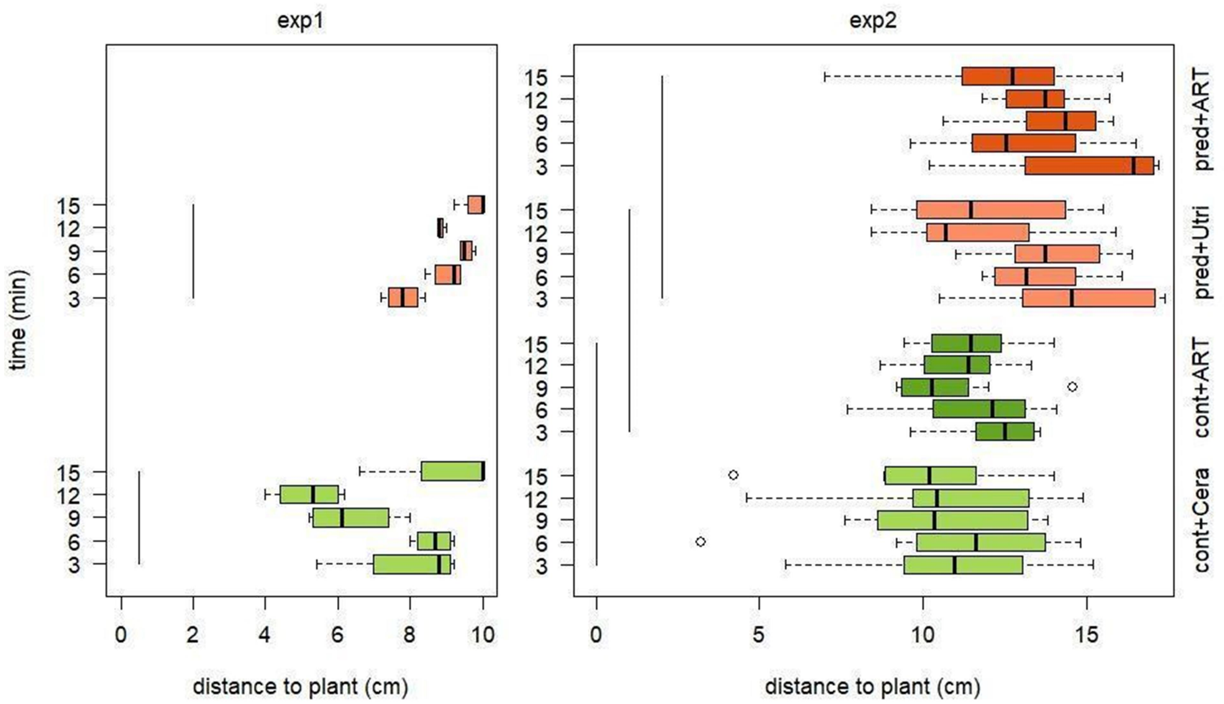

Fig. 2 Distance of daphniids from plants through the experiments in the horizontal setup. Green boxes - control medium (cont), orange boxes - predator medium (pred). Light colours - live plants (Cera - *Ceratophyllum*, Utri - *Utricularia*), dark colours - artificial plants (ART). Black lines, boxes and whiskers mark medians, quartiles and extrema. Vertical lines mark homogeneous groups.

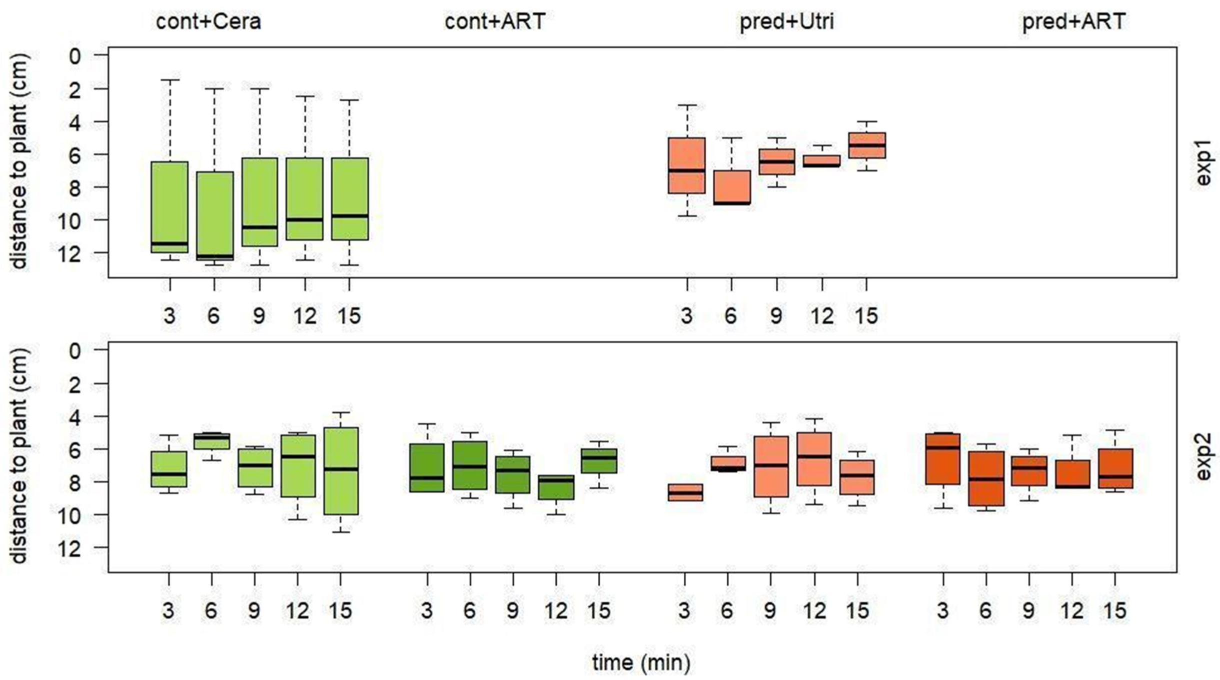

Fig. 3 Distance of daphniids from plants through the experiments in the vertical setup. Labels as in Fig. 2.

Supplementary Material

Predation tests

These tests were performed to simply confirm that the studied animals get preyed upon by *Utricularia*. Importantly, as we did not test for the effects of prey density nor any other effects, we did not force the plants to empty the bladders, nor count them. Yet, as the predation rate of *Utricularia* may depend on prey density (Harms and Johansson, 2000), we used a range of daphniid densities (not tested independent variable), not to miss out any predation effects. We placed 2, 4, 8, 16, 24 or 32 daphniids were placed in each of 12 paired 12 mL plastic cube containers filled with aerated lake water, either alone or with one about 1.5 cm long bladderwort stem fragment with leaves and traps on them (2 treatments x 86 = 172 individuals in all). The number of daphniids remaining in the water was checked after 12 and 36 hours.The numbers of daphniids remaining in the control and bladderwort paired cube containers were compared using paired t-test. The number of remaining daphniids was lower in the presence of bladderwort relative to control (paired Student's t-tests: $t_5 = 3.95$, $P = 0.0108$ and $t_5 = 4.0$, $P = 0.0103$, after 12 and 36 hours, respectively). Altogether, 1 in control and 17 animals in bladderwort containers were missing at the test end.

Harms S and Johansson F (2000) The influence of prey behaviour on prey selection of the carnivorous plant *Utricularia vulgaris*. Hydrobiologia 427, 113–120. https://doi.org/10.1023/A:1003961614595

Table S1

Tab. S1 Results of analysis of variance (car::Anova) on the results of generalized least squares model for models (nlme::gls) without and with interaction. Correlation of errors formula: corAR1(form = ~ time | vessel) for horizontal 1 and both vertical experiments, and corAR1(form = ~ time | vessel / day) for horizontal 2 experiment.

experiment	source	df	Chi^2	p
horizontal 1	distance ~ treatment + time (Anova, type II)			
	treatment	**1**	**10.6**	**0.0011**
	time	1	0.591	0.442
	distance ~ treatment * time (Anova, type III)			
	treatment	1	0.0017	0.97
	time	1	2.80	0.094
	treatment x time	1	3.11	0.078
horizontal 2	distance ~ treatment + time (Anova, type II)			
	treatment	**3**	**18.9**	**0.0003**
	time	**1**	**9.9**	**0.0017**
	distance ~ treatment * time (Anova, type III)			
	treatment	**3**	**12.8**	**0.0051**
	time	1	0.542	0.462
	treatment x time	3	2.39	0.496
vertical 1	distance ~ treatment + time (Anova, type II)			
	treatment	1	0.481	0.488
	time	1	0.427	0.513
	distance ~ treatment * time (Anova, type III)			

	treatment	1	0.147	0.702
	time	1	0.716	0.397
	treatment x time	1	0.305	0.581
vertical 2	distance ~ treatment + time (Anova, type II)			
	treatment	3	0.885	0.829
	time	1	0.005	0.942
	distance ~ treatment * time (Anova, type III)			
	treatment	3	1.231	0.746
	time	1	0.034	0.854
	treatment x time	1	1.164	0.762

Data

Columns: dist – distance to plant in cm, rep – replicate, time – timing of measurement in minutes after start of test, treat - treatment, trough – trough number

Treatment labels in experiment 1: k – control, p – *Utricularia*

Treatment labels in experiment 2: ROG – *Ceratophyllum* in control medium, KS – artificial plant in control medium, P – *Utricularia* in predator medium, SS – artificial plant in predator medium

Horizontal experiment 1

dist	time	rep	treat
10	3	1	k
10	3	1	k
9	3	1	k
9	3	1	k
8	3	1	k
9	3	2	k
4	3	2	k
6	3	2	k
4	3	2	k
4	3	2	k
10	3	3	k
10	3	3	k
9	3	3	k
9	3	3	k
5	3	3	k
9	3	4	k
10	3	4	k
9	3	4	k
9	3	4	k
8	3	4	k
9	6	1	k
10	6	1	k
10	6	1	k
9	6	1	k
7	6	1	k
9	6	2	k
9	6	2	k
10	6	2	k
8	6	2	k
6	6	2	k
8	6	3	k
10	6	3	k
10	6	3	k
9	6	3	k
9	6	3	k
7	6	4	k

527	10	6	4	k
528	10	6	4	k
529	9	6	4	k
530	4	6	4	k
531	8	9	1	k
532	10	9	1	k
533	6	9	1	k
534	6	9	1	k
535	4	9	1	k
536	10	9	2	k
537	5	9	2	k
538	5	9	2	k
539	4	9	2	k
540	2	9	2	k
541	8	9	3	k
542	10	9	3	k
543	10	9	3	k
544	6	9	3	k
545	6	9	3	k
546	5	9	4	k
547	8	9	4	k
548	8	9	4	k
549	3	9	4	k
550	3	9	4	k
551	9	12	1	k
552	9	12	1	k
553	6	12	1	k
554	6	12	1	k
555	1	12	1	k
556	8	12	2	k
557	8	12	2	k
558	2	12	2	k
559	1	12	2	k
560	1	12	2	k
561	5	12	3	k
562	6	12	3	k
563	7	12	3	k
564	7	12	3	k
565	4	12	3	k
566	6	12	4	k
567	8	12	4	k
568	6	12	4	k
569	2	12	4	k
570	2	12	4	k
571	7	15	1	k
572	8	15	1	k
573	8	15	1	k
574	5	15	1	k
575	5	15	1	k
576	10	15	2	k
577	10	15	2	k

578	10	15	2	k
579	10	15	2	k
580	10	15	2	k
581	10	15	3	k
582	10	15	3	k
583	10	15	3	k
584	10	15	3	k
585	10	15	3	k
586	10	15	4	k
587	10	15	4	k
588	10	15	4	k
589	10	15	4	k
590	10	15	4	k
591	9	3	1	d
592	10	3	1	d
593	6	3	1	d
594	6	3	1	d
595	5	3	1	d
596	8	3	2	d
597	8	3	2	d
598	10	3	2	d
599	6	3	2	d
600	6	3	2	d
601	9	3	3	d
602	8	3	3	d
603	8	3	3	d
604	8	3	3	d
605	7	3	3	d
606	10	3	4	d
607	9	3	4	d
608	8	3	4	d
609	8	3	4	d
610	7	3	4	d
611	9	6	1	d
612	10	6	1	d
613	9	6	1	d
614	10	6	1	d
615	9	6	1	d
616	10	6	2	d
617	10	6	2	d
618	9	6	2	d
619	8	6	2	d
620	8	6	2	d
621	9	6	3	d
622	9	6	3	d
623	10	6	3	d
624	10	6	3	d
625	9	6	3	d
626	10	6	4	d
627	9	6	4	d
628	8	6	4	d

629	8	6	4	d
630	7	6	4	d
631	9	9	1	d
632	10	9	1	d
633	10	9	1	d
634	10	9	1	d
635	9	9	1	d
636	9	9	2	d
637	9	9	2	d
638	10	9	2	d
639	10	9	2	d
640	9	9	2	d
641	9	9	3	d
642	10	9	3	d
643	10	9	3	d
644	9	9	3	d
645	9	9	3	d
646	10	9	4	d
647	10	9	4	d
648	10	9	4	d
649	10	9	4	d
650	9	9	4	d
651	10	12	1	d
652	10	12	1	d
653	8	12	1	d
654	8	12	1	d
655	8	12	1	d
656	9	12	2	d
657	9	12	2	d
658	10	12	2	d
659	9	12	2	d
660	8	12	2	d
661	8	12	3	d
662	8	12	3	d
663	10	12	3	d
664	9	12	3	d
665	9	12	3	d
666	10	12	4	d
667	10	12	4	d
668	10	12	4	d
669	8	12	4	d
670	6	12	4	d
671	9	15	1	d
672	9	15	1	d
673	10	15	1	d
674	9	15	1	d
675	9	15	1	d
676	10	15	2	d
677	10	15	2	d
678	10	15	2	d
679	10	15	2	d

10	15	2	d
10	15	3	d
10	15	3	d
10	15	3	d
10	15	3	d
10	15	3	d
10	15	4	d
10	15	4	d
10	15	4	d
10	15	4	d
10	15	4	d

Horizontal experiment 2

treat	trough	time	dist	rep
KS	A1	3	5.00	1
KS	A1	3	14.00	1
KS	A1	3	15.00	1
KS	A1	3	18.00	1
KS	A1	3	16.00	1
KS	A1	6	9.00	1
KS	A1	6	13.00	1
KS	A1	6	18.50	1
KS	A1	6	15.00	1
KS	A1	6	15.00	1
KS	A1	9	7.00	1
KS	A1	9	18.00	1
KS	A1	9	14.00	1
KS	A1	9	6.00	1
KS	A1	9	1.00	1
KS	A1	12	6.00	1
KS	A1	12	15.00	1
KS	A1	12	18.00	1
KS	A1	12	7.00	1
KS	A1	15	6.00	1
KS	A1	15	16.00	1
KS	A1	15	17.00	1
KS	A1	15	5.00	1
KS	B4	3	12.50	1
KS	B4	3	17.00	1
KS	B4	3	18.00	1
KS	B4	3	18.50	1
KS	B4	3	2.00	1
KS	B4	6	14.00	1
KS	B4	6	17.00	1
KS	B4	6	13.00	1
KS	B4	6	9.00	1
KS	B4	6	7.00	1
KS	B4	9	8.00	1
KS	B4	9	9.00	1
KS	B4	9	13.00	1
KS	B4	9	11.00	1

731	KS	B4	9	10.00	1
732	KS	B4	12	8.00	1
733	KS	B4	12	17.00	1
734	KS	B4	12	17.00	1
735	KS	B4	12	15.00	1
736	KS	B4	12	6.00	1
737	KS	B4	15	8.00	1
738	KS	B4	15	9.00	1
739	KS	B4	15	13.00	1
740	KS	B4	15	14.50	1
741	KS	B4	15	5.00	1
742	KS	C2	3	8.00	1
743	KS	C2	3	10.00	1
744	KS	C2	3	10.00	1
745	KS	C2	3	13.00	1
746	KS	C2	3	16.00	1
747	KS	C2	6	17.00	1
748	KS	C2	6	16.00	1
749	KS	C2	6	6.00	1
750	KS	C2	6	7.00	1
751	KS	C2	6	18.00	1
752	KS	C2	9	8.00	1
753	KS	C2	9	18.00	1
754	KS	C2	9	16.00	1
755	KS	C2	9	12.00	1
756	KS	C2	9	6.00	1
757	KS	C2	12	18.00	1
758	KS	C2	12	16.00	1
759	KS	C2	12	13.00	1
760	KS	C2	12	2.00	1
761	KS	C2	12	8.00	1
762	KS	C2	15	11.00	1
763	KS	C2	15	18.00	1
764	KS	C2	15	16.00	1
765	KS	C2	15	14.00	1
766	KS	C2	15	11.00	1
767	KS	D3	3	6.00	1
768	KS	D3	3	13.50	1
769	KS	D3	3	15.00	1
770	KS	D3	3	17.00	1
771	KS	D3	3	14.50	1
772	KS	D3	6	4.00	1
773	KS	D3	6	10.50	1
774	KS	D3	6	16.00	1
775	KS	D3	6	17.00	1
776	KS	D3	6	4.00	1
777	KS	D3	9	4.50	1
778	KS	D3	9	8.50	1
779	KS	D3	9	6.00	1
780	KS	D3	9	15.50	1
781	KS	D3	9	12.50	1

782	KS	D3	12	10.00	1
783	KS	D3	12	10.00	1
784	KS	D3	12	14.00	1
785	KS	D3	12	17.50	1
786	KS	D3	12	15.00	1
787	KS	D3	15	7.00	1
788	KS	D3	15	10.00	1
789	KS	D3	15	13.50	1
790	KS	D3	15	17.00	1
791	KS	D3	15	12.50	1
792	ROG	A3	3	8	1
793	ROG	A3	3	15	1
794	ROG	A3	3	17	1
795	ROG	A3	3	12	1
796	ROG	A3	3	10	1
797	ROG	A3	6	6	1
798	ROG	A3	6	13	1
799	ROG	A3	6	15	1
800	ROG	A3	6	12	1
801	ROG	A3	6	6.5	1
802	ROG	A3	9	5	1
803	ROG	A3	9	13	1
804	ROG	A3	9	15	1
805	ROG	A3	9	9	1
806	ROG	A3	9	6	1
807	ROG	A3	12	6	1
808	ROG	A3	12	0	1
809	ROG	A3	12	16	1
810	ROG	A3	12	18	1
811	ROG	A3	12	8	1
812	ROG	A3	15	0	1
813	ROG	A3	15	12	1
814	ROG	A3	15	17	1
815	ROG	A3	15	15	1
816	ROG	A3	15	11	1
817	ROG	B2	3	4	1
818	ROG	B2	3	12	1
819	ROG	B2	3	17.5	1
820	ROG	B2	3	13	1
821	ROG	B2	3	10	1
822	ROG	B2	6	7	1
823	ROG	B2	6	8	1
824	ROG	B2	6	16.5	1
825	ROG	B2	6	8.5	1
826	ROG	B2	6	6	1
827	ROG	B2	9	3	1
828	ROG	B2	9	3	1
829	ROG	B2	9	18.5	1
830	ROG	B2	9	7.5	1
831	ROG	B2	9	6	1
832	ROG	B2	12	0	1

833	ROG	B2	12	10	1
834	ROG	B2	12	11	1
835	ROG	B2	12	15	1
836	ROG	B2	12	13	1
837	ROG	B2	15	3.5	1
838	ROG	B2	15	15	1
839	ROG	B2	15	14.5	1
840	ROG	B2	15	11	1
841	ROG	B2	15	0	1
842	ROG	C4	3	14	1
843	ROG	C4	3	2	1
844	ROG	C4	3	1	1
845	ROG	C4	3	18	1
846	ROG	C4	3	18	1
847	ROG	C4	6	10	1
848	ROG	C4	6	18	1
849	ROG	C4	6	16	1
850	ROG	C4	6	6	1
851	ROG	C4	6	2	1
852	ROG	C4	9	18	1
853	ROG	C4	9	17	1
854	ROG	C4	9	14	1
855	ROG	C4	9	10	1
856	ROG	C4	9	10	1
857	ROG	C4	12	1	1
858	ROG	C4	12	16	1
859	ROG	C4	12	17	1
860	ROG	C4	12	17	1
861	ROG	C4	12	18	1
862	ROG	C4	15	10	1
863	ROG	C4	15	15	1
864	ROG	C4	15	18	1
865	ROG	C4	15	18	1
866	ROG	C4	15	0	1
867	ROG	D1	3	2	1
868	ROG	D1	3	4	1
869	ROG	D1	3	11.5	1
870	ROG	D1	3	13	1
871	ROG	D1	3	14	1
872	ROG	D1	6	11	1
873	ROG	D1	6	12.5	1
874	ROG	D1	6	16.5	1
875	ROG	D1	6	16	1
876	ROG	D1	6	7.5	1
877	ROG	D1	9	7	1
878	ROG	D1	9	9	1
879	ROG	D1	9	13.5	1
880	ROG	D1	9	15.5	1
881	ROG	D1	9	7	1
882	ROG	D1	12	10.5	1
883	ROG	D1	12	12	1

884	ROG	D1	12	17.5	1
885	ROG	D1	12	17.5	1
886	ROG	D1	12	6	1
887	ROG	D1	15	9.5	1
888	ROG	D1	15	10	1
889	ROG	D1	15	12	1
890	ROG	D1	15	2.5	1
891	ROG	D1	15	10.5	1
892	SS	A2	3	17	1
893	SS	A2	3	18	1
894	SS	A2	3	18	1
895	SS	A2	3	17	1
896	SS	A2	3	16	1
897	SS	A2	6	7	1
898	SS	A2	6	16	1
899	SS	A2	6	17	1
900	SS	A2	6	15	1
901	SS	A2	6	6	1
902	SS	A2	9	11	1
903	SS	A2	9	18	1
904	SS	A2	9	18	1
905	SS	A2	9	12	1
906	SS	A2	9	11	1
907	SS	A2	12	14	1
908	SS	A2	12	17	1
909	SS	A2	12	14	1
910	SS	A2	12	9	1
911	SS	A2	15	18.5	1
912	SS	A2	15	14	1
913	SS	A2	15	9.5	1
914	SS	A2	15	2	1
915	SS	B1	3	16.5	1
916	SS	B1	3	17.5	1
917	SS	B1	3	18	1
918	SS	B1	3	17	1
919	SS	B1	3	16	1
920	SS	B1	6	6	1
921	SS	B1	6	7	1
922	SS	B1	6	10	1
923	SS	B1	6	14	1
924	SS	B1	6	17	1
925	SS	B1	9	5	1
926	SS	B1	9	16.5	1
927	SS	B1	9	16.5	1
928	SS	B1	9	16	1
929	SS	B1	9	14	1
930	SS	B1	12	3	1
931	SS	B1	12	14	1
932	SS	B1	12	14.5	1
933	SS	B1	12	15.5	1
934	SS	B1	12	12	1

935	SS	B1	15	3	1
936	SS	B1	15	5	1
937	SS	B1	15	5	1
938	SS	B1	15	7	1
939	SS	B1	15	15	1
940	SS	C1	3	4	1
941	SS	C1	3	12	1
942	SS	C1	3	18	1
943	SS	C1	3	18	1
944	SS	C1	3	18	1
945	SS	C1	6	6	1
946	SS	C1	6	6	1
947	SS	C1	6	16	1
948	SS	C1	6	18	1
949	SS	C1	6	18	1
950	SS	C1	9	10	1
951	SS	C1	9	16	1
952	SS	C1	9	18	1
953	SS	C1	9	18	1
954	SS	C1	9	17	1
955	SS	C1	12	11	1
956	SS	C1	12	2	1
957	SS	C1	12	17	1
958	SS	C1	12	17	1
959	SS	C1	12	18.5	1
960	SS	C1	15	3	1
961	SS	C1	15	10	1
962	SS	C1	15	12	1
963	SS	C1	15	17	1
964	SS	C1	15	18.5	1
965	SS	D2	3	9.5	1
966	SS	D2	3	11	1
967	SS	D2	3	12	1
968	SS	D2	3	1.5	1
969	SS	D2	3	17	1
970	SS	D2	6	8.5	1
971	SS	D2	6	8.5	1
972	SS	D2	6	14	1
973	SS	D2	6	17	1
974	SS	D2	6	0	1
975	SS	D2	9	5	1
976	SS	D2	9	5	1
977	SS	D2	9	11.5	1
978	SS	D2	9	15	1
979	SS	D2	9	16.5	1
980	SS	D2	12	12	1
981	SS	D2	12	12.5	1
982	SS	D2	12	16	1
983	SS	D2	12	16.5	1
984	SS	D2	12	13	1
985	SS	D2	15	2.5	1

986	SS	D2	15	10.5	1
987	SS	D2	15	15	1
988	SS	D2	15	17	1
989	SS	D2	15	12	1
990	P	A4	3	17	1
991	P	A4	3	18	1
992	P	A4	3	18.5	1
993	P	A4	3	16	1
994	P	A4	6	12	1
995	P	A4	6	18	1
996	P	A4	6	14	1
997	P	A4	6	6	1
998	P	A4	9	14	1
999	P	A4	9	17	1
1000	P	A4	9	18	1
1001	P	A4	9	9	1
1002	P	A4	12	0	1
1003	P	A4	12	6	1
1004	P	A4	12	16	1
1005	P	A4	12	18	1
1006	P	A4	15	14	1
1007	P	A4	15	18	1
1008	P	A4	15	15	1
1009	P	A4	15	14.5	1
1010	P	B3	3	13.5	1
1011	P	B3	3	17.5	1
1012	P	B3	3	17	1
1013	P	B3	3	16	1
1014	P	B3	3	3	1
1015	P	B3	6	16.5	1
1016	P	B3	6	17	1
1017	P	B3	6	18	1
1018	P	B3	6	16	1
1019	P	B3	6	3.5	1
1020	P	B3	9	12.5	1
1021	P	B3	9	15	1
1022	P	B3	9	17	1
1023	P	B3	9	17	1
1024	P	B3	9	2.5	1
1025	P	B3	12	8	1
1026	P	B3	12	14	1
1027	P	B3	12	15	1
1028	P	B3	12	16	1
1029	P	B3	12	2	1
1030	P	B3	15	16	1
1031	P	B3	15	18.5	1
1032	P	B3	15	17	1
1033	P	B3	15	12	1
1034	P	B3	15	3	1
1035	P	C3	3	17	1
1036	P	C3	3	17	1

1037	P	C3	3	17	1
1038	P	C3	3	18	1
1039	P	C3	3	18	1
1040	P	C3	6	8	1
1041	P	C3	6	14	1
1042	P	C3	6	14	1
1043	P	C3	6	10	1
1044	P	C3	6	16	1
1045	P	C3	9	13	1
1046	P	C3	9	16	1
1047	P	C3	9	17	1
1048	P	C3	9	18	1
1049	P	C3	9	18	1
1050	P	C3	12	5	1
1051	P	C3	12	5	1
1052	P	C3	12	6	1
1053	P	C3	12	11	1
1054	P	C3	12	15	1
1055	P	C3	15	9	1
1056	P	C3	15	5	1
1057	P	C3	15	6	1
1058	P	C3	15	16	1
1059	P	C3	15	16	1
1060	P	D4	3	7	1
1061	P	D4	3	7.5	1
1062	P	D4	3	15.5	1
1063	P	D4	3	17	1
1064	P	D4	3	17.5	1
1065	P	D4	6	9	1
1066	P	D4	6	10	1
1067	P	D4	6	14.5	1
1068	P	D4	6	17	1
1069	P	D4	6	18.5	1
1070	P	D4	9	10.5	1
1071	P	D4	9	11	1
1072	P	D4	9	11	1
1073	P	D4	9	15.5	1
1074	P	D4	9	17	1
1075	P	D4	12	8.5	1
1076	P	D4	12	13	1
1077	P	D4	12	16.5	1
1078	P	D4	12	18	1
1079	P	D4	12	13.5	1
1080	P	D4	15	8	1
1081	P	D4	15	13.5	1
1082	P	D4	15	8.5	1
1083	P	D4	15	10	1
1084	P	D4	15	16	1
1085	KS	A1	3	0	2
1086	KS	A1	3	9	2
1087	KS	A1	3	16	2

1088	KS	A1	3	16	2
1089	KS	A1	3	7	2
1090	KS	A1	6	0	2
1091	KS	A1	6	12	2
1092	KS	A1	6	18.5	2
1093	KS	A1	6	16	2
1094	KS	A1	6	5	2
1095	KS	A1	9	0	2
1096	KS	A1	9	15	2
1097	KS	A1	9	17	2
1098	KS	A1	9	16	2
1099	KS	A1	9	6	2
1100	KS	A1	12	0	2
1101	KS	A1	12	17	2
1102	KS	A1	12	17.5	2
1103	KS	A1	12	16	2
1104	KS	A1	12	6.5	2
1105	KS	A1	15	1	2
1106	KS	A1	15	17	2
1107	KS	A1	15	17	2
1108	KS	A1	15	16.5	2
1109	KS	A1	15	8	2
1110	KS	B4	3	12	2
1111	KS	B4	3	14	2
1112	KS	B4	3	14	2
1113	KS	B4	3	14	2
1114	KS	B4	3	5	2
1115	KS	B4	6	2.5	2
1116	KS	B4	6	13	2
1117	KS	B4	6	13	2
1118	KS	B4	6	7	2
1119	KS	B4	6	3	2
1120	KS	B4	9	12.5	2
1121	KS	B4	9	14	2
1122	KS	B4	9	12	2
1123	KS	B4	9	5	2
1124	KS	B4	9	3	2
1125	KS	B4	12	13	2
1126	KS	B4	12	18.5	2
1127	KS	B4	12	12	2
1128	KS	B4	12	4	2
1129	KS	B4	12	4	2
1130	KS	B4	15	10	2
1131	KS	B4	15	16	2
1132	KS	B4	15	12	2
1133	KS	B4	15	5	2
1134	KS	B4	15	4	2
1135	KS	C2	3	8	2
1136	KS	C2	3	16	2
1137	KS	C2	3	15	2
1138	KS	C2	3	13	2

1139	KS	C2	3	12	2
1140	KS	C2	6	12	2
1141	KS	C2	6	16	2
1142	KS	C2	6	17	2
1143	KS	C2	6	13	2
1144	KS	C2	6	9	2
1145	KS	C2	9	10	2
1146	KS	C2	9	13	2
1147	KS	C2	9	15	2
1148	KS	C2	9	17	2
1149	KS	C2	9	18	2
1150	KS	C2	12	6	2
1151	KS	C2	12	11	2
1152	KS	C2	12	12	2
1153	KS	C2	12	13	2
1154	KS	C2	12	7	2
1155	KS	C2	15	10	2
1156	KS	C2	15	12	2
1157	KS	C2	15	13	2
1158	KS	C2	15	16	2
1159	KS	C2	15	13	2
1160	KS	D3	3	16	2
1161	KS	D3	3	18	2
1162	KS	D3	3	15.5	2
1163	KS	D3	3	4.5	2
1164	KS	D3	3	7	2
1165	KS	D3	6	5.5	2
1166	KS	D3	6	5	2
1167	KS	D3	6	17.5	2
1168	KS	D3	6	18	2
1169	KS	D3	6	15	2
1170	KS	D3	9	2	2
1171	KS	D3	9	4.5	2
1172	KS	D3	9	13.5	2
1173	KS	D3	9	14	2
1174	KS	D3	9	17.5	2
1175	KS	D3	12	0.5	2
1176	KS	D3	12	4	2
1177	KS	D3	12	10	2
1178	KS	D3	12	15	2
1179	KS	D3	12	14	2
1180	KS	D3	15	1.5	2
1181	KS	D3	15	4.5	2
1182	KS	D3	15	13.5	2
1183	KS	D3	15	17.5	2
1184	KS	D3	15	16	2
1185	ROG	A3	3	0	2
1186	ROG	A3	3	3	2
1187	ROG	A3	3	16	2
1188	ROG	A3	3	16.5	2
1189	ROG	A3	3	14	2

1190	ROG	A3	6	0	2
1191	ROG	A3	6	17	2
1192	ROG	A3	6	15	2
1193	ROG	A3	6	17	2
1194	ROG	A3	6	16	2
1195	ROG	A3	9	0	2
1196	ROG	A3	9	13	2
1197	ROG	A3	9	16	2
1198	ROG	A3	9	18.5	2
1199	ROG	A3	9	18	2
1200	ROG	A3	12	0	2
1201	ROG	A3	12	3	2
1202	ROG	A3	12	16	2
1203	ROG	A3	12	18	2
1204	ROG	A3	12	14	2
1205	ROG	A3	15	0	2
1206	ROG	A3	15	8	2
1207	ROG	A3	15	12	2
1208	ROG	A3	15	16	2
1209	ROG	A3	15	18.5	2
1210	ROG	B2	3	9	2
1211	ROG	B2	3	18	2
1212	ROG	B2	3	18	2
1213	ROG	B2	3	16	2
1214	ROG	B2	3	15	2
1215	ROG	B2	6	13	2
1216	ROG	B2	6	18.5	2
1217	ROG	B2	6	17	2
1218	ROG	B2	6	13	2
1219	ROG	B2	6	11	2
1220	ROG	B2	9	10	2
1221	ROG	B2	9	18.5	2
1222	ROG	B2	9	17	2
1223	ROG	B2	9	6	2
1224	ROG	B2	9	0	2
1225	ROG	B2	12	13	2
1226	ROG	B2	12	17	2
1227	ROG	B2	12	16	2
1228	ROG	B2	12	4	2
1229	ROG	B2	12	3	2
1230	ROG	B2	15	8	2
1231	ROG	B2	15	18.5	2
1232	ROG	B2	15	16	2
1233	ROG	B2	15	3	2
1234	ROG	B2	15	2	2
1235	ROG	C4	3	13	2
1236	ROG	C4	3	10	2
1237	ROG	C4	3	2	2
1238	ROG	C4	3	0	2
1239	ROG	C4	3	4	2
1240	ROG	C4	6	1	2

1241	ROG	C4	6	1	2
1242	ROG	C4	6	1	2
1243	ROG	C4	6	4	2
1244	ROG	C4	6	9	2
1245	ROG	C4	9	0	2
1246	ROG	C4	9	9	2
1247	ROG	C4	9	2	2
1248	ROG	C4	9	18	2
1249	ROG	C4	9	9	2
1250	ROG	C4	12	0	2
1251	ROG	C4	12	1	2
1252	ROG	C4	12	1	2
1253	ROG	C4	12	9	2
1254	ROG	C4	12	12	2
1255	ROG	C4	15	1	2
1256	ROG	C4	15	0	2
1257	ROG	C4	15	2	2
1258	ROG	C4	15	9	2
1259	ROG	C4	15	9	2
1260	ROG	D1	3	6	2
1261	ROG	D1	3	13.5	2
1262	ROG	D1	3	15	2
1263	ROG	D1	3	16	2
1264	ROG	D1	3	18	2
1265	ROG	D1	6	12	2
1266	ROG	D1	6	14	2
1267	ROG	D1	6	18	2
1268	ROG	D1	6	18	2
1269	ROG	D1	6	12	2
1270	ROG	D1	9	7.5	2
1271	ROG	D1	9	13.5	2
1272	ROG	D1	9	16	2
1273	ROG	D1	9	17.5	2
1274	ROG	D1	9	12	2
1275	ROG	D1	12	15	2
1276	ROG	D1	12	17.5	2
1277	ROG	D1	12	17	2
1278	ROG	D1	12	14.5	2
1279	ROG	D1	12	10.5	2
1280	ROG	D1	15	15.5	2
1281	ROG	D1	15	18	2
1282	ROG	D1	15	18	2
1283	ROG	D1	15	12.5	2
1284	ROG	D1	15	6	2
1285	SS	A2	3	18.5	2
1286	SS	A2	3	18	2
1287	SS	A2	3	16	2
1288	SS	A2	3	15	2
1289	SS	A2	3	18	2
1290	SS	A2	6	18	2
1291	SS	A2	6	17.5	2

1292	SS	A2	6	15	2
1293	SS	A2	6	13	2
1294	SS	A2	6	11.5	2
1295	SS	A2	9	15	2
1296	SS	A2	9	17.5	2
1297	SS	A2	9	18	2
1298	SS	A2	9	17	2
1299	SS	A2	9	9	2
1300	SS	A2	12	17	2
1301	SS	A2	12	18.5	2
1302	SS	A2	12	17	2
1303	SS	A2	12	8	2
1304	SS	A2	12	18	2
1305	SS	A2	15	13	2
1306	SS	A2	15	18	2
1307	SS	A2	15	16	2
1308	SS	A2	15	15	2
1309	SS	A2	15	18.5	2
1310	SS	B1	3	17	2
1311	SS	B1	3	18	2
1312	SS	B1	3	16.5	2
1313	SS	B1	3	16	2
1314	SS	B1	6	18	2
1315	SS	B1	6	17	2
1316	SS	B1	6	16	2
1317	SS	B1	6	15	2
1318	SS	B1	9	14	2
1319	SS	B1	9	16.5	2
1320	SS	B1	9	16	2
1321	SS	B1	9	14.5	2
1322	SS	B1	12	18.5	2
1323	SS	B1	12	14	2
1324	SS	B1	12	13	2
1325	SS	B1	12	11	2
1326	SS	B1	15	13	2
1327	SS	B1	15	18	2
1328	SS	B1	15	13.5	2
1329	SS	B1	15	9	2
1330	SS	C1	3	1	2
1331	SS	C1	3	16	2
1332	SS	C1	3	16	2
1333	SS	C1	3	16	2
1334	SS	C1	6	17	2
1335	SS	C1	6	16	2
1336	SS	C1	6	15	2
1337	SS	C1	6	1	2
1338	SS	C1	9	18	2
1339	SS	C1	9	17	2
1340	SS	C1	9	15	2
1341	SS	C1	9	1	2
1342	SS	C1	12	18	2

1343	SS	C1	12	14	2
1344	SS	C1	12	15	2
1345	SS	C1	12	1	2
1346	SS	C1	15	15	2
1347	SS	C1	15	16	2
1348	SS	C1	15	15	2
1349	SS	C1	15	12	2
1350	SS	D2	3	16.5	2
1351	SS	D2	3	13.5	2
1352	SS	D2	3	17	2
1353	SS	D2	3	15	2
1354	SS	D2	3	18	2
1355	SS	D2	6	10.5	2
1356	SS	D2	6	11	2
1357	SS	D2	6	16.5	2
1358	SS	D2	6	16.5	2
1359	SS	D2	6	17	2
1360	SS	D2	9	9	2
1361	SS	D2	9	13.5	2
1362	SS	D2	9	16.5	2
1363	SS	D2	9	17	2
1364	SS	D2	9	17.5	2
1365	SS	D2	12	6	2
1366	SS	D2	12	14	2
1367	SS	D2	12	17	2
1368	SS	D2	12	18	2
1369	SS	D2	12	17.5	2
1370	SS	D2	15	3	2
1371	SS	D2	15	14	2
1372	SS	D2	15	18.5	2
1373	SS	D2	15	17.5	2
1374	SS	D2	15	14.5	2
1375	P	A4	3	13	2
1376	P	A4	3	17	2
1377	P	A4	3	18.5	2
1378	P	A4	3	15	2
1379	P	A4	3	15	2
1380	P	A4	6	16	2
1381	P	A4	6	17	2
1382	P	A4	6	15	2
1383	P	A4	6	14	2
1384	P	A4	6	13.5	2
1385	P	A4	9	18.5	2
1386	P	A4	9	17	2
1387	P	A4	9	15	2
1388	P	A4	9	12	2
1389	P	A4	9	10	2
1390	P	A4	12	16	2
1391	P	A4	12	17	2
1392	P	A4	12	12	2
1393	P	A4	12	11	2

1394	P	A4	12	7	2
1395	P	A4	15	14.5	2
1396	P	A4	15	17	2
1397	P	A4	15	12	2
1398	P	A4	15	5	2
1399	P	A4	15	10	2
1400	P	B3	3	17.5	2
1401	P	B3	3	18	2
1402	P	B3	3	17	2
1403	P	B3	3	16.5	2
1404	P	B3	3	15	2
1405	P	B3	6	18.5	2
1406	P	B3	6	16.5	2
1407	P	B3	6	16.5	2
1408	P	B3	6	14	2
1409	P	B3	6	15	2
1410	P	B3	9	15	2
1411	P	B3	9	18.5	2
1412	P	B3	9	18	2
1413	P	B3	9	15	2
1414	P	B3	9	15	2
1415	P	B3	12	16	2
1416	P	B3	12	17	2
1417	P	B3	12	16.5	2
1418	P	B3	12	16	2
1419	P	B3	12	14	2
1420	P	B3	15	18	2
1421	P	B3	15	17	2
1422	P	B3	15	15	2
1423	P	B3	15	14.5	2
1424	P	B3	15	13	2
1425	P	C3	3	6	2
1426	P	C3	3	8	2
1427	P	C3	3	17	2
1428	P	C3	3	17	2
1429	P	C3	3	18	2
1430	P	C3	6	15	2
1431	P	C3	6	18	2
1432	P	C3	6	12	2
1433	P	C3	6	9	2
1434	P	C3	6	5	2
1435	P	C3	9	13	2
1436	P	C3	9	17	2
1437	P	C3	9	18	2
1438	P	C3	9	9	2
1439	P	C3	9	7	2
1440	P	C3	12	11	2
1441	P	C3	12	18	2
1442	P	C3	12	9	2
1443	P	C3	12	9	2
1444	P	C3	12	5	2

P	C3	15	5	2
P	C3	15	7	2
P	C3	15	9	2
P	C3	15	18	2
P	C3	15	3	2
P	D4	3	5	2
P	D4	3	8.5	2
P	D4	3	9.5	2
P	D4	3	14	2
P	D4	3	15.5	2
P	D4	6	10.5	2
P	D4	6	13	2
P	D4	6	13.5	2
P	D4	6	14	2
P	D4	6	9	2
P	D4	9	10.5	2
P	D4	9	11	2
P	D4	9	3	2
P	D4	9	15	2
P	D4	9	15.5	2
P	D4	12	8	2
P	D4	12	11	2
P	D4	12	12	2
P	D4	12	18.5	2
P	D4	12	1.5	2
P	D4	15	1.5	2
P	D4	15	5.5	2
P	D4	15	10.5	2
P	D4	15	13.5	2
P	D4	15	15	2

Vertical experiment 1

dist	time	rep	treat
13	5	1	k
12	5	1	k
3	5	2	k
0	5	2	k
13	5	3	k
10	5	3	k
13	8	1	k
11.5	8	1	k
3	8	2	k
1	8	2	k
13	8	3	k
12.5	8	3	k
12	11	1	k
13.5	11	1	k
4	11	2	k
0	11	2	k
12	11	3	k
9	11	3	k

11.5	14	1	k
13.5	14	1	k
5	14	2	k
0	14	2	k
11	14	3	k
9	14	3	k
12.5	17	1	k
13	17	1	k
5.5	17	2	k
0	17	2	k
11.5	17	3	k
8	17	3	k
8	5	1	d
11.5	5	1	d
4	5	2	d
10	5	2	d
3	5	3	d
3	5	3	d
8	8	1	d
10	8	1	d
7	8	2	d
11	8	2	d
5	8	3	d
5	8	3	d
9.5	11	1	d
6.5	11	1	d
7	11	2	d
6	11	2	d
4	11	3	d
6	11	3	d
5.5	14	1	d
8	14	1	d
8.5	14	2	d
5	14	2	d
5	14	3	d
6	14	3	d
7	17	1	d
4	17	1	d
9	17	2	d
5	17	2	d
4	17	3	d
4	17	3	d

Vertical experiment 2

wariant	rynna	czas	odleglosc
KS	A1	3	4
KS	A1	3	6
KS	A1	3	9
KS	A1	3	12
KS	A1	3	12
KS	A1	6	6

1547	KS	A1	6	6
1548	KS	A1	6	7
1549	KS	A1	6	9
1550	KS	A1	6	12
1551	KS	A1	9	1
1552	KS	A1	9	5
1553	KS	A1	9	5.5
1554	KS	A1	9	7
1555	KS	A1	9	12
1556	KS	A1	12	6
1557	KS	A1	12	8
1558	KS	A1	12	12
1559	KS	A1	12	12
1560	KS	A1	12	12
1561	KS	A1	15	1
1562	KS	A1	15	5
1563	KS	A1	15	7
1564	KS	A1	15	7.5
1565	KS	A1	15	12
1566	KS	B4	3	0
1567	KS	B4	3	1
1568	KS	B4	3	10
1569	KS	B4	3	12
1570	KS	B4	3	12
1571	KS	B4	6	3
1572	KS	B4	6	9
1573	KS	B4	6	9
1574	KS	B4	6	12
1575	KS	B4	6	12
1576	KS	B4	9	6
1577	KS	B4	9	8
1578	KS	B4	9	10
1579	KS	B4	9	12
1580	KS	B4	9	12
1581	KS	B4	12	0
1582	KS	B4	12	7
1583	KS	B4	12	9
1584	KS	B4	12	10
1585	KS	B4	12	12
1586	KS	B4	15	0
1587	KS	B4	15	5
1588	KS	B4	15	8
1589	KS	B4	15	8
1590	KS	B4	15	12
1591	KS	C2	3	5
1592	KS	C2	3	7
1593	KS	C2	3	9
1594	KS	C2	3	10
1595	KS	C2	3	12
1596	KS	C2	6	3
1597	KS	C2	6	5

1598	KS	C2	6	6
1599	KS	C2	6	4
1600	KS	C2	6	7
1601	KS	C2	9	4
1602	KS	C2	9	4
1603	KS	C2	9	7
1604	KS	C2	9	9
1605	KS	C2	9	10
1606	KS	C2	12	6
1607	KS	C2	12	6
1608	KS	C2	12	9
1609	KS	C2	12	10
1610	KS	C2	12	10
1611	KS	C2	15	3
1612	KS	C2	15	4
1613	KS	C2	15	4
1614	KS	C2	15	7
1615	KS	C2	15	10
1616	KS	D3	3	4.5
1617	KS	D3	3	4.5
1618	KS	D3	3	5
1619	KS	D3	3	1
1620	KS	D3	3	7.5
1621	KS	D3	6	10
1622	KS	D3	6	10
1623	KS	D3	6	1
1624	KS	D3	6	2.5
1625	KS	D3	6	7.5
1626	KS	D3	9	9
1627	KS	D3	9	9
1628	KS	D3	9	6.5
1629	KS	D3	9	11
1630	KS	D3	9	3.5
1631	KS	D3	12	2
1632	KS	D3	12	7
1633	KS	D3	12	10
1634	KS	D3	12	12
1635	KS	D3	12	7.5
1636	KS	D3	15	10.5
1637	KS	D3	15	11
1638	KS	D3	15	9
1639	KS	D3	15	4.5
1640	KS	D3	15	7
1641	ROG	A3	3	2
1642	ROG	A3	3	5
1643	ROG	A3	3	9
1644	ROG	A3	3	12
1645	ROG	A3	3	12
1646	ROG	A3	6	2
1647	ROG	A3	6	6
1648	ROG	A3	6	6.5

1649	ROG	A3	6	7
1650	ROG	A3	6	12
1651	ROG	A3	9	0
1652	ROG	A3	9	2
1653	ROG	A3	9	7
1654	ROG	A3	9	9
1655	ROG	A3	9	11.5
1656	ROG	A3	12	0
1657	ROG	A3	12	0
1658	ROG	A3	12	4
1659	ROG	A3	12	11
1660	ROG	A3	12	12
1661	ROG	A3	15	0
1662	ROG	A3	15	1
1663	ROG	A3	15	7
1664	ROG	A3	15	9
1665	ROG	A3	15	11
1666	ROG	B2	3	6
1667	ROG	B2	3	9
1668	ROG	B2	3	9
1669	ROG	B2	3	9.5
1670	ROG	B2	3	10
1671	ROG	B2	6	0
1672	ROG	B2	6	0
1673	ROG	B2	6	4
1674	ROG	B2	6	11
1675	ROG	B2	6	11
1676	ROG	B2	9	5
1677	ROG	B2	9	7
1678	ROG	B2	9	8
1679	ROG	B2	9	12
1680	ROG	B2	9	12
1681	ROG	B2	12	0
1682	ROG	B2	12	3
1683	ROG	B2	12	11
1684	ROG	B2	12	12
1685	ROG	B2	12	12
1686	ROG	B2	15	0
1687	ROG	B2	15	10
1688	ROG	B2	15	11
1689	ROG	B2	15	11.5
1690	ROG	B2	15	12
1691	ROG	C4	3	1
1692	ROG	C4	3	2
1693	ROG	C4	3	7
1694	ROG	C4	3	8
1695	ROG	C4	3	8
1696	ROG	C4	6	2
1697	ROG	C4	6	2
1698	ROG	C4	6	5
1699	ROG	C4	6	6

1700	ROG	C4	6	10
1701	ROG	C4	9	2
1702	ROG	C4	9	7
1703	ROG	C4	9	9
1704	ROG	C4	9	3
1705	ROG	C4	9	10
1706	ROG	C4	12	2
1707	ROG	C4	12	1
1708	ROG	C4	12	6
1709	ROG	C4	12	7
1710	ROG	C4	12	9
1711	ROG	C4	15	1
1712	ROG	C4	15	2
1713	ROG	C4	15	8
1714	ROG	C4	15	8
1715	ROG	C4	15	0
1716	ROG	D1	3	5
1717	ROG	D1	3	7.5
1718	ROG	D1	3	11.5
1719	ROG	D1	3	8.5
1720	ROG	D1	3	3
1721	ROG	D1	6	0
1722	ROG	D1	6	7
1723	ROG	D1	6	8.5
1724	ROG	D1	6	4.5
1725	ROG	D1	6	7
1726	ROG	D1	9	1.5
1727	ROG	D1	9	3
1728	ROG	D1	9	11
1729	ROG	D1	9	12
1730	ROG	D1	9	12
1731	ROG	D1	12	4
1732	ROG	D1	12	11.5
1733	ROG	D1	12	12
1734	ROG	D1	12	12
1735	ROG	D1	12	12
1736	ROG	D1	15	9.5
1737	ROG	D1	15	12
1738	ROG	D1	15	12
1739	ROG	D1	15	11.5
1740	ROG	D1	15	10.5
1741	SS	A2	3	3
1742	SS	A2	3	10
1743	SS	A2	3	11
1744	SS	A2	3	12
1745	SS	A2	3	12
1746	SS	A2	6	4
1747	SS	A2	6	7
1748	SS	A2	6	11
1749	SS	A2	6	11.5
1750	SS	A2	6	12

1751	SS	A2	9	6
1752	SS	A2	9	7
1753	SS	A2	9	10
1754	SS	A2	9	11
1755	SS	A2	9	12
1756	SS	A2	12	2
1757	SS	A2	12	7
1758	SS	A2	12	10
1759	SS	A2	12	11
1760	SS	A2	12	12
1761	SS	A2	15	3
1762	SS	A2	15	6
1763	SS	A2	15	11
1764	SS	A2	15	11
1765	SS	A2	15	12
1766	SS	B1	3	0
1767	SS	B1	3	3
1768	SS	B1	3	4
1769	SS	B1	3	9
1770	SS	B1	3	10
1771	SS	B1	6	7
1772	SS	B1	6	9
1773	SS	B1	6	10
1774	SS	B1	6	11
1775	SS	B1	6	12
1776	SS	B1	9	1
1777	SS	B1	9	6
1778	SS	B1	9	7
1779	SS	B1	9	9
1780	SS	B1	9	12
1781	SS	B1	12	4
1782	SS	B1	12	5
1783	SS	B1	12	9
1784	SS	B1	12	11
1785	SS	B1	12	12
1786	SS	B1	15	3
1787	SS	B1	15	4
1788	SS	B1	15	8
1789	SS	B1	15	10
1790	SS	B1	15	11
1791	SS	C1	3	2
1792	SS	C1	3	3
1793	SS	C1	3	5
1794	SS	C1	3	7
1795	SS	C1	3	8
1796	SS	C1	6	4
1797	SS	C1	6	4
1798	SS	C1	6	7
1799	SS	C1	6	9
1800	SS	C1	6	9
1801	SS	C1	9	4

1802	SS	C1	9	5
1803	SS	C1	9	6
1804	SS	C1	9	9
1805	SS	C1	9	6
1806	SS	C1	12	2
1807	SS	C1	12	3
1808	SS	C1	12	5
1809	SS	C1	12	7
1810	SS	C1	12	9
1811	SS	C1	15	1
1812	SS	C1	15	2
1813	SS	C1	15	6
1814	SS	C1	15	6.5
1815	SS	C1	15	9
1816	SS	D2	3	8.5
1817	SS	D2	3	4.5
1818	SS	D2	3	7
1819	SS	D2	3	12
1820	SS	D2	3	1.5
1821	SS	D2	6	6
1822	SS	D2	6	6
1823	SS	D2	6	12
1824	SS	D2	6	0
1825	SS	D2	6	4.5
1826	SS	D2	9	5
1827	SS	D2	9	6.5
1828	SS	D2	9	11.5
1829	SS	D2	9	12
1830	SS	D2	9	1.5
1831	SS	D2	12	8
1832	SS	D2	12	8.5
1833	SS	D2	12	11
1834	SS	D2	12	2.5
1835	SS	D2	12	12
1836	SS	D2	15	11
1837	SS	D2	15	12
1838	SS	D2	15	10.5
1839	SS	D2	15	6.5
1840	SS	D2	15	1
1841	P	A4	3	0
1842	P	A4	3	10
1843	P	A4	3	12
1844	P	A4	3	12
1845	P	A4	3	12
1846	P	A4	6	1
1847	P	A4	6	3
1848	P	A4	6	9
1849	P	A4	6	11.5
1850	P	A4	6	12
1851	P	A4	9	0
1852	P	A4	9	8

1853	P	A4	9	9
1854	P	A4	9	11
1855	P	A4	9	12
1856	P	A4	12	1
1857	P	A4	12	6
1858	P	A4	12	8
1859	P	A4	12	9
1860	P	A4	12	11.5
1861	P	A4	15	0
1862	P	A4	15	8
1863	P	A4	15	10
1864	P	A4	15	11
1865	P	A4	15	11.5
1866	P	B3	3	5
1867	P	B3	3	7
1868	P	B3	3	8
1869	P	B3	3	10
1870	P	B3	3	11
1871	P	B3	6	5
1872	P	B3	6	6
1873	P	B3	6	7
1874	P	B3	6	7
1875	P	B3	6	12
1876	P	B3	9	1
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1880	P	B3	9	9
1881	P	B3	12	8
1882	P	B3	12	9
1883	P	B3	12	9
1884	P	B3	12	10
1885	P	B3	12	11
1886	P	B3	15	2
1887	P	B3	15	6
1888	P	B3	15	7
1889	P	B3	15	9
1890	P	B3	15	12
1891	P	C3	3	5
1892	P	C3	3	6
1893	P	C3	3	8
1894	P	C3	3	10
1895	P	C3	3	12
1896	P	C3	6	4
1897	P	C3	6	6
1898	P	C3	6	7
1899	P	C3	6	8
1900	P	C3	6	10
1901	P	C3	9	3
1902	P	C3	9	3.5
1903	P	C3	9	6

1904	P	C3	9	7
1905	P	C3	9	11
1906	P	C3	12	3
1907	P	C3	12	3
1908	P	C3	12	5
1909	P	C3	12	7
1910	P	C3	12	11
1911	P	C3	15	1
1912	P	C3	15	3
1913	P	C3	15	4
1914	P	C3	15	11
1915	P	C3	15	12
1916	P	D4	3	8.5
1917	P	D4	3	9
1918	P	D4	3	11
1919	P	D4	3	7.5
1920	P	D4	3	10
1921	P	D4	6	1.5
1922	P	D4	6	3
1923	P	D4	6	5.5
1924	P	D4	6	10
1925	P	D4	6	9.5
1926	P	D4	9	11.5
1927	P	D4	9	11.5
1928	P	D4	9	12
1929	P	D4	9	8.5
1930	P	D4	9	6
1931	P	D4	12	1.5
1932	P	D4	12	3
1933	P	D4	12	4.5
1934	P	D4	12	5
1935	P	D4	12	7
1936	P	D4	15	11
1937	P	D4	15	11
1938	P	D4	15	9
1939	P	D4	15	8.5
1940	P	D4	15	8