La synthèse des connaissances : une introduction aux méta-analyses et revues systématiques
- Extraction des données quantitatives -

Mercredi 5/10/22 - Montpellier

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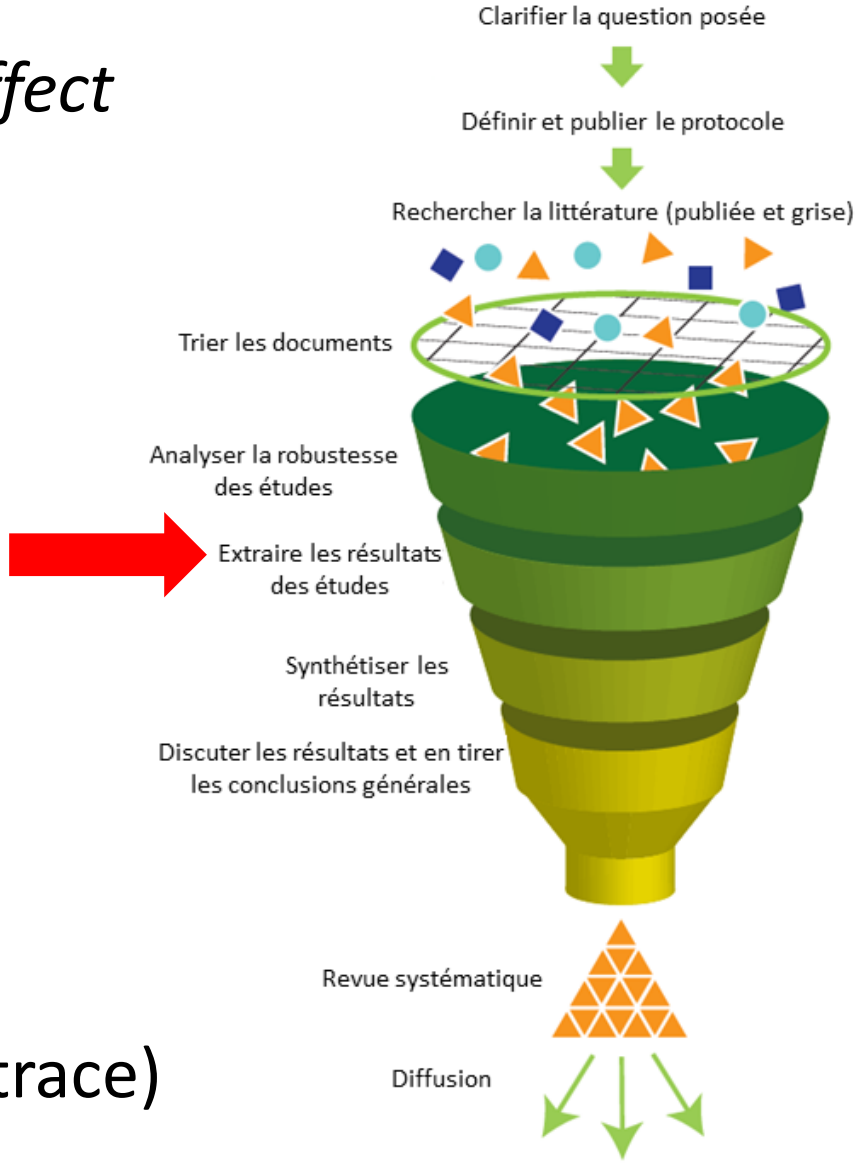
Extraction des données quantitatives

Extraction des données nécessaires au calcul des *effect sizes* (moyenne, effectif, sd/se/IC 95%)

+ extraction des variables pouvant expliquer l'hétérogénéité des effect sizes (*effect modifiers*)

Extraction à partir
- texte
- tableau
- figure
- supp. mat.

+ des calculs peuvent être nécessaires (garder une trace)



Jessica Kaufman, Cochrane Consumers & Communication Review Group, Centre for Health Communication and Participation, La Trobe University, 2011.

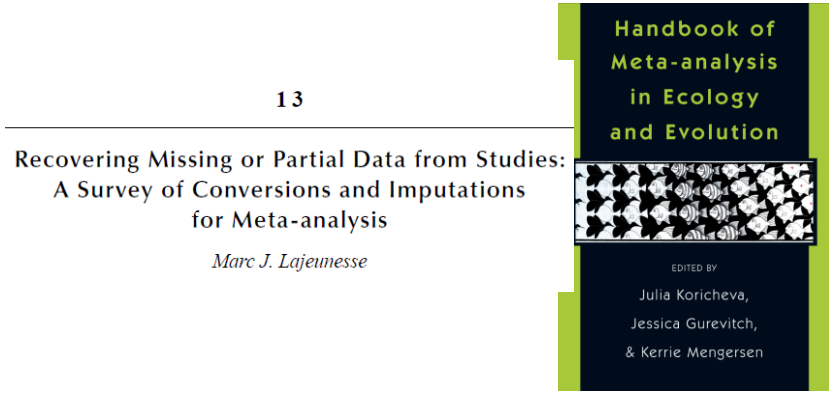
Extraction des données quantitatives

! Attention !
L'extraction des données prend du temps : bien définir la grille d'extraction, les *effect modifiers* à extraire

Importance de **tester** la grille d'extraction sur un échantillon d'articles pour vérifier l'adéquation avec le contenu des études

Documenter le travail, les décisions (transparence, répétabilité)

Décider quoi faire en cas d'**information manquante**
(« missing data », contacter les auteurs, imputation)


13

Recovering Missing or Partial Data from Studies: A Survey of Conversions and Imputations for Meta-analysis

Marc J. Lajeunesse

Handbook of Meta-analysis in Ecology and Evolution

EDITED BY
Julia Koricheva,
Jessica Gurevitch,
& Kerrie Mengersen

Consistency check

S’assurer de l’objectivité / robustesse de l’extraction :

- extraction des données de chaque étude effectuée **indépendamment** par 2 personnes

- si plusieurs personnes se partagent le travail, **vérifier la cohérence de l’extraction** entre les personnes avant le début du travail sur un échantillon (discuter les désaccords)

- si 1 seule personne, faire vérifier un échantillon de l’extraction par quelqu’un au début du travail (discuter les désaccords)

Exemples de grille d'extraction

Echelle **cas d'étude** : ex. plusieurs concentrations d'une même exposition

IDdata	ID_map	author	...	taxon	Population_descri	Life_stage	Type_system	Tempera	pH
ScreenTA_9680	880	Cantin, N.E.	...	*Acropora tenuis*	Colonies	Adult	500 L outdoor tank	27.5	NA
ScreenTA_9680	880	Cantin, N.E.	...	*Acropora tenuis*	Colonies	Adult	500 L outdoor tank	27.5	NA
ScreenTA_9680	884	Cantin, N.E.	...	*Acropora valida*	Colonies	Adult	500 L outdoor tank	27.5	NA
ScreenTA_9680	884	Cantin, N.E.	...	*Acropora valida*	Colonies	Adult	500 L outdoor tank	27.5	NA
ScreenTA_9680	889	Cantin, N.E.	...	*Pocillopora damicornis*	Colonies	Adult	500 L outdoor tank	27.5	NA
ScreenTA_9680	889	Cantin, N.E.	...	*Pocillopora damicornis*	Colonies	Adult	500 L outdoor tank	27.5	NA

Treatment_description	Control_description	Solvent	Concentration_nom	Concentration_eff	Duration	Measured_variable	Time_after
Diuron	Unfiltered oceanic seawater	No	1 µg/L	0.91 µg/L	53 days	Symbiodinium density / total protein	NA
Diuron	Unfiltered oceanic seawater	No	10 µg/L	8.8 µg/L	53 days	Symbiodinium density / total protein	NA
Diuron	Unfiltered oceanic seawater	No	1 µg/L	0.91 µg/L	90 days	Symbiodinium density / total protein	NA
Diuron	Unfiltered oceanic seawater	No	10 µg/L	8.8 µg/L	90 days	Symbiodinium density / total protein	NA
Diuron	Unfiltered oceanic seawater	No	1 µg/L	0.91 µg/L	67 days	Symbiodinium density / total protein	NA
Diuron	Unfiltered oceanic seawater	No	10 µg/L	8.8 µg/L	67 days	Symbiodinium density / total protein	NA

Exemple de grille d'extraction

Treatment_description	Control_description	Solvent	Concentration_nom	Concentration_eff	Duration	Measured_variable	Time_after
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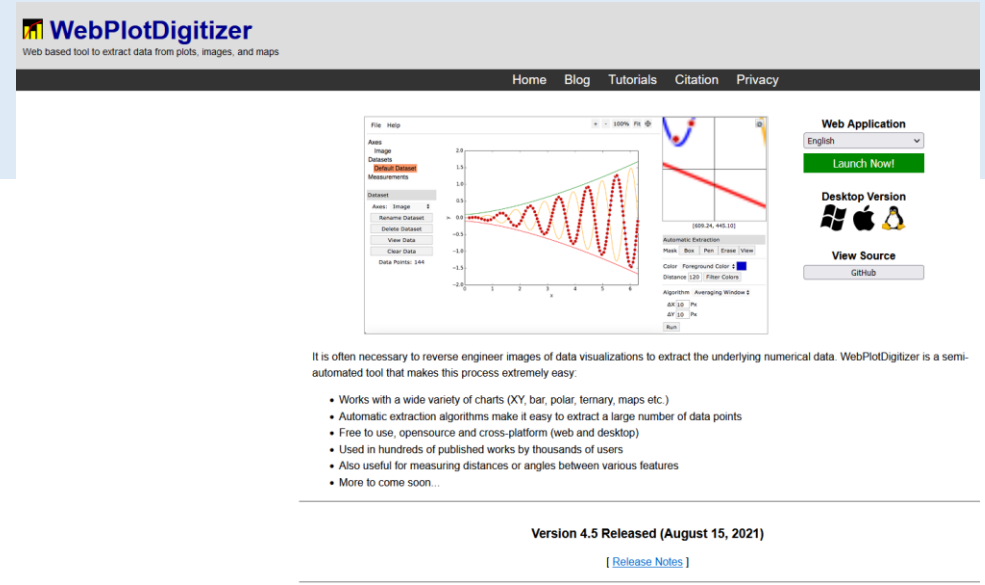
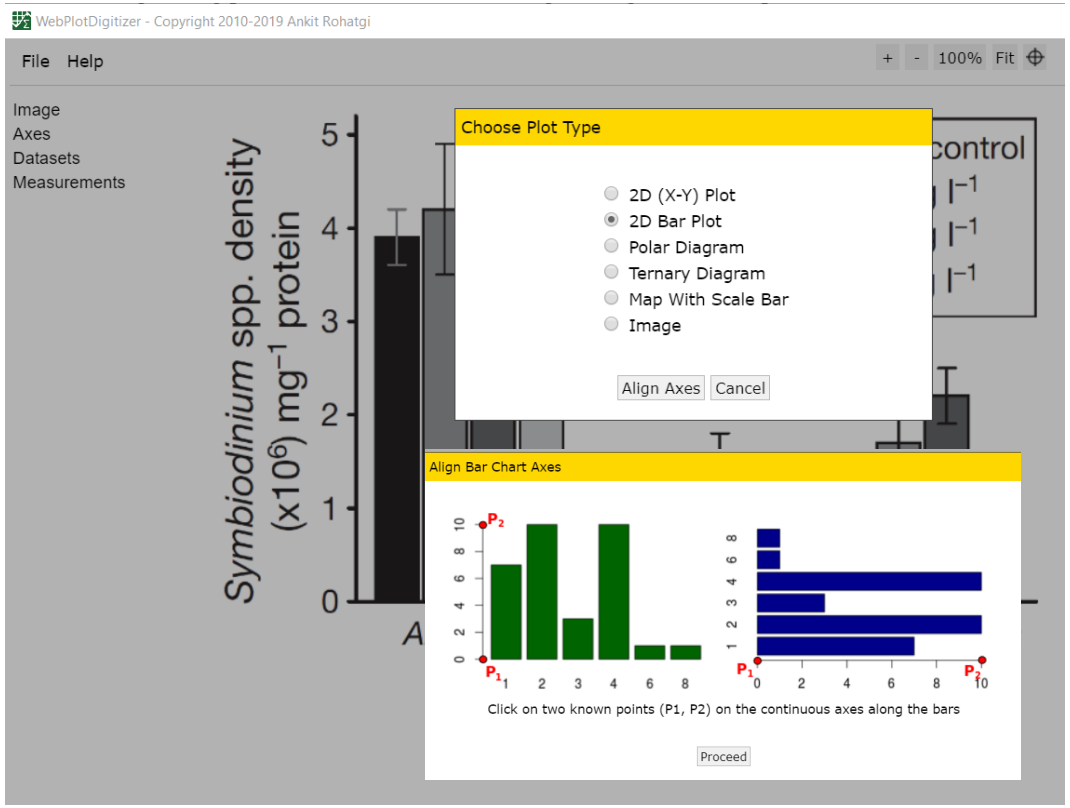
Metaanalyse_data	unit	ID_experiment	ID_case	ID_common_control	N_c	Mean_c	Type_variation_c	Variation_c	N_t	Mean_t	Type_variation_t	Variation_t
OK (Fig3, SE, n=6)	x 10^6 / mg protein	1	3	1	6	4.2	sd	1.714642819	6	3.5142857	sd	0.979795897
OK (Fig3, SE, n=6)	x 10^6 / mg protein	1	4	1	6	4.2	sd	1.714642819	6	3.6	sd	0.524890659
OK (Fig3, SE, n=6)	x 10^6 / mg protein	2	7	2	6	0.928571	sd	0.454905237	6	1.4142857	sd	0.979795897
OK (Fig3, SE, n=6)	x 10^6 / mg protein	2	8	2	6	0.928571	sd	0.454905237	6	1.3142857	sd	0.699854212
OK (Fig3, SE, n=6)	x 10^6 / mg protein	3	11	3	6	1.714285	sd	0.699854217	6	2.2285714	sd	0.699854212
OK (Fig3, SE, n=6)	x 10^6 / mg protein	3	12	3	6	1.714285	sd	0.699854217	6	0.9142857	sd	0.244948974

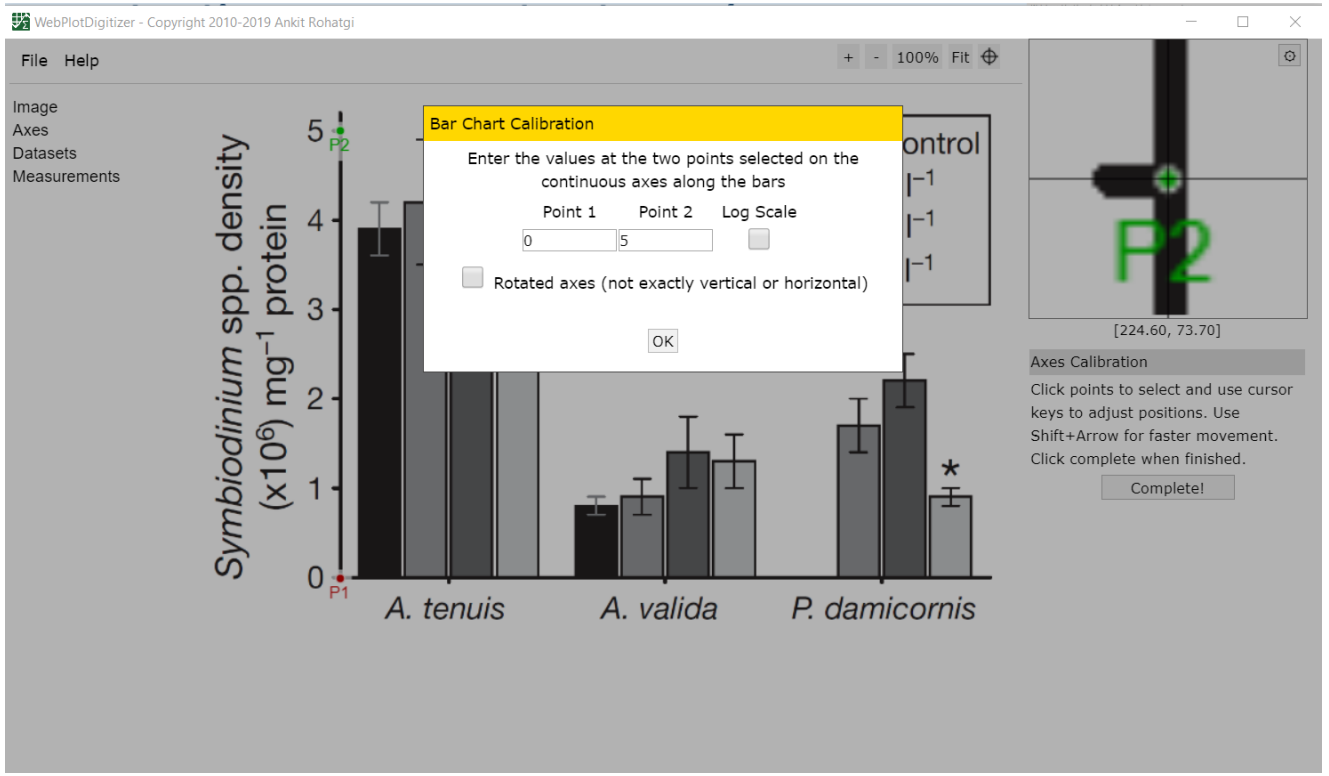
Method_extraction	Source	Comment_extract	Name_data_extractio
Figure	Figure 3	NA	DYO
Figure	Figure 3	NA	DYO
Figure	Figure 3	NA	DYO
Figure	Figure 3	NA	DYO
Figure	Figure 3	NA	DYO
Figure	Figure 3	NA	DYO

Outils d'extraction des figures

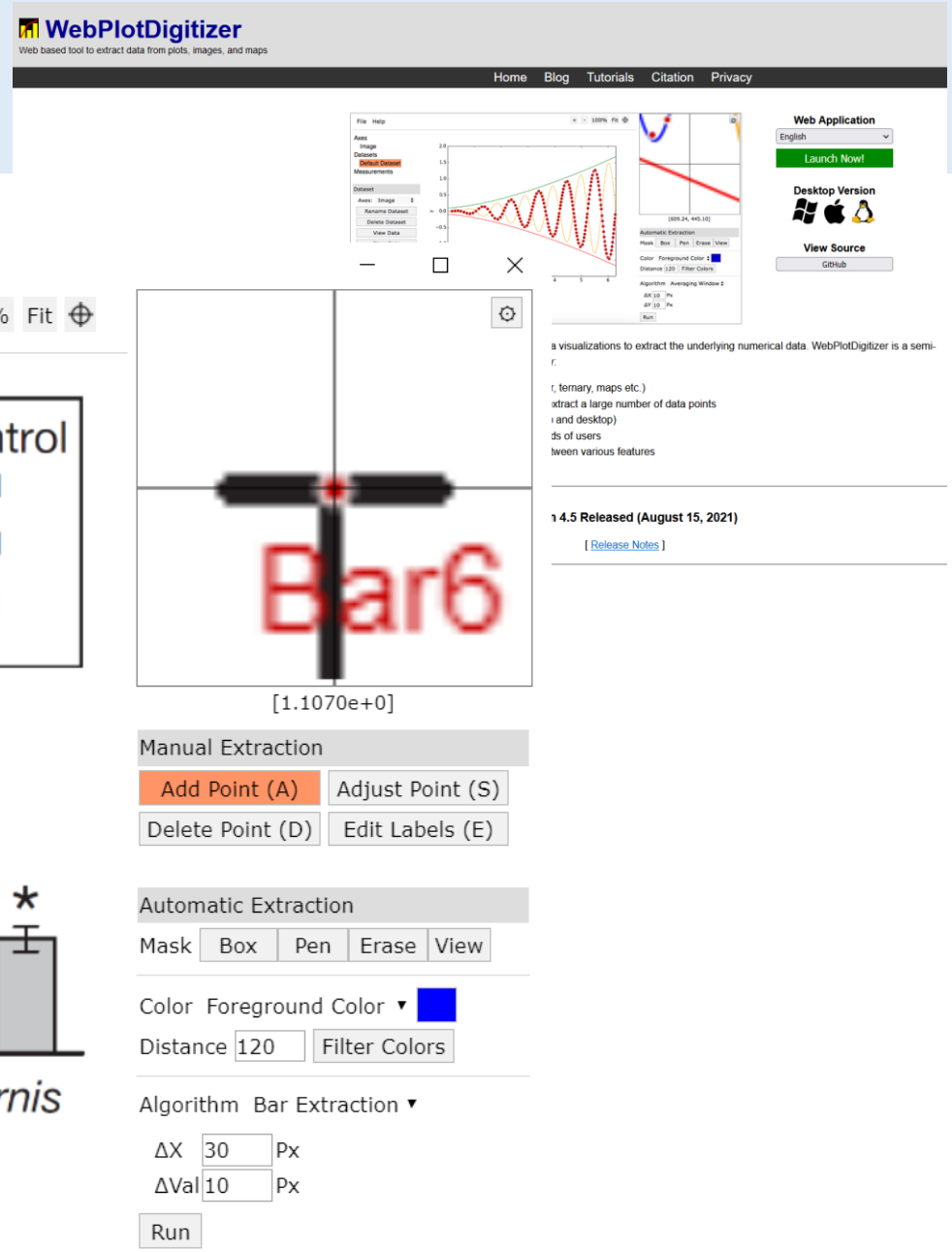
https://automeris.io/WebPlotDigitizer/





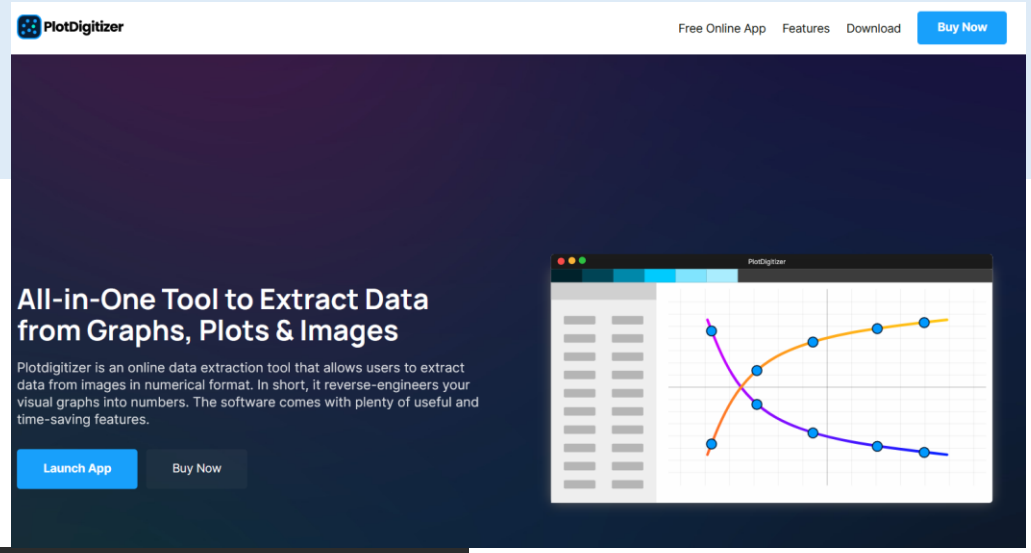


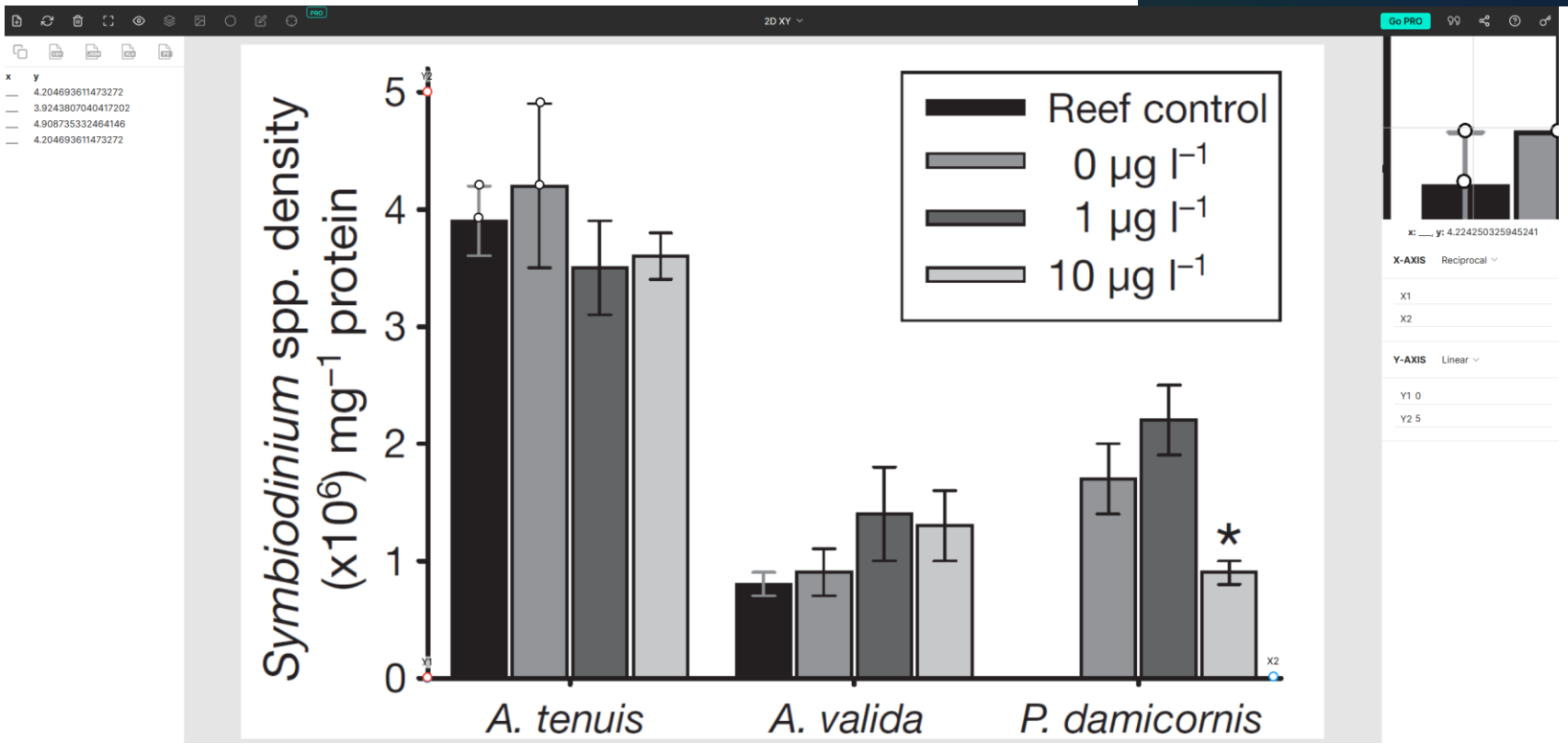
Outils d'extraction des figures



Outils d’extraction des figures

https://plotdigitizer.com/





Outils d'extraction des figures : metaDigitise

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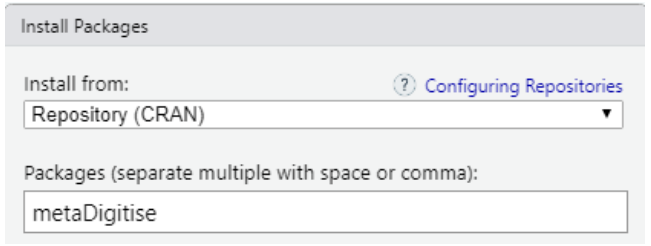
APPLICATION

Methods in Ecology and Evolution | BRITISH ECOLOGICAL SOCIETY

Reproducible, flexible and high-throughput data extraction from primary literature: The METADIGITISE R package

Joel L. Pick | Shinichi Nakagawa | Daniel W. A. Noble

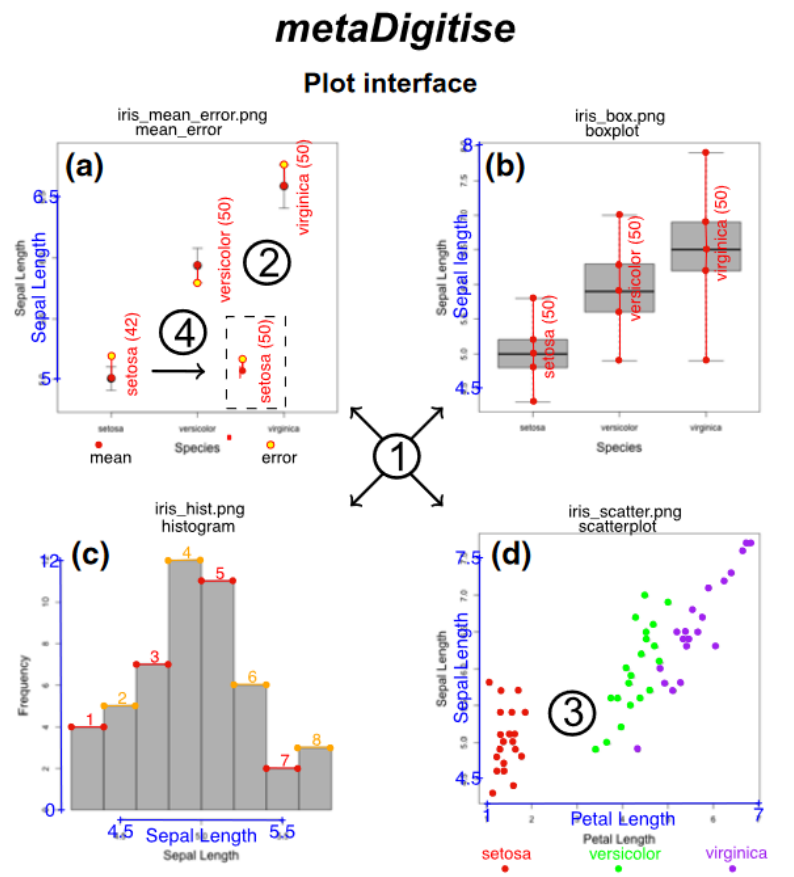


(+) permet d'enregistrer, de re-tracer et de modifier l'extraction des données

(-) pas de zoom

https://cran.r-project.org/web/packages/metaDigitise/vignettes/metaDigitise.html

Outils d'extraction des figures : metaDigitise



filename	variable	group_id	mean	sd	n	r	plot_type
iris_box.png	Sepal length	setosa	5.01	0.317	50	NA	boxplot
iris_box.png	Sepal length	versicolor	5.93	0.497	50	NA	boxplot
iris_box.png	Sepal length	virginica	6.49	0.603	50	NA	boxplot
iris_hist.png	Sepal Length	setosa	4.95	0.364	50	NA	histogram
iris_mean_error.png	Sepal Length	setosa	5.01	0.680	50	NA	mean_error
iris_mean_error.png	Sepal Length	versicolor	5.94	1.025	50	NA	mean_error
iris_mean_error.png	Sepal Length	virginica	6.59	1.251	50	NA	mean_error
iris_scatter.png	Petal Length	setosa	1.44	0.215	20	0.109	scatterplot
iris_scatter.png	Sepal Length	setosa	5.03	0.427	20	0.109	scatterplot
iris_scatter.png	Petal Length	versicolor	4.29	0.415	20	0.786	scatterplot
iris_scatter.png	Sepal Length	versicolor	5.97	0.603	20	0.786	scatterplot
iris_scatter.png	Petal Length	virginica	5.66	0.668	20	0.932	scatterplot

FUNCTIONALITY

1 *Different plot types*

Capable of handling A) mean error plots, B) boxplots, C) histograms and D) scatterplots

2 *Entry of Metadata*

Enter sample sizes variable and group names while digitising that are displayed on plot

3 *Grouped Data*

Enter as many groups as needed to capture descriptive statistics for sub-samples of data

4 *Digitise, edit or replot digitisations*

Simple user interface to guide user. Can digitise new images, edit digitisations or easily replot previous digitisations and metadata by cycling through images or choosing specific images

5 *Summarising data*

Get descriptive statistics automatically calculated for all plot types or use raw x,y data, if desired

6 *Multiple image processing*

Process as many images at once as needed and of varying types efficiently and quickly. New plots automatically plotted for digitisation

TD

Question : estimer les effets des substances chimiques sur la performance de la photosynthèse **(*maximum quantum yield*, Fv/Fm)** des coraux constructeurs de récifs tropicaux

Echantillon de 3 articles
Une **étude** = combinaison **un taxon × une exposition × un outcome**
Un **cas d'étude** = un niveau de concentration-durée testé
Effect size = différence de moyenne standardisée

Si suivi au cours du temps, extraction de la durée d'exposition la plus longue

Extraire les données en utilisant le package metaDigitise

TD

Question : estimer les effets des substances chimiques sur la performance de la photosynthèse **(*maximum quantum yield*, Fv/Fm)** des coraux constructeurs de récifs tropicaux
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Un **cas d'étude** = un niveau de concentration-durée testé
Effect size = différence de moyenne standardisée
Si suivi au cours du temps, extraction de la durée d'exposition la plus longue

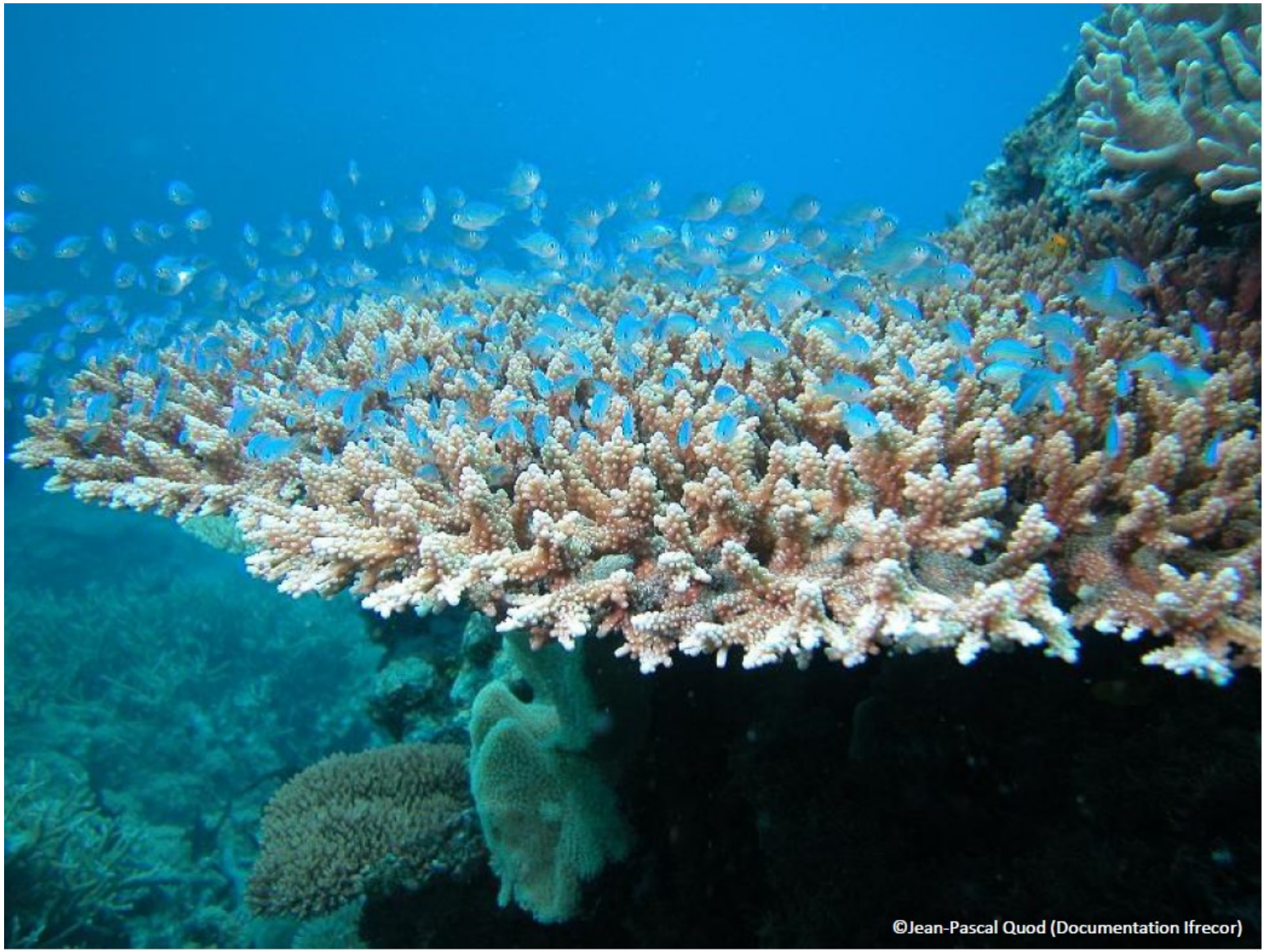
1 – Extraire les données
Installer et charger le package metaDigitise ; spécifier le répertoire de travail
Préparer les figures avec les données à extraire (capture écran → .png), les mettre dans un dossier « figs » dans le répertoire de travail

```
> dat <- metaDigitise(dir = "./figs")
```

Extraire les données dans un fichier Excel

2 – Discussion

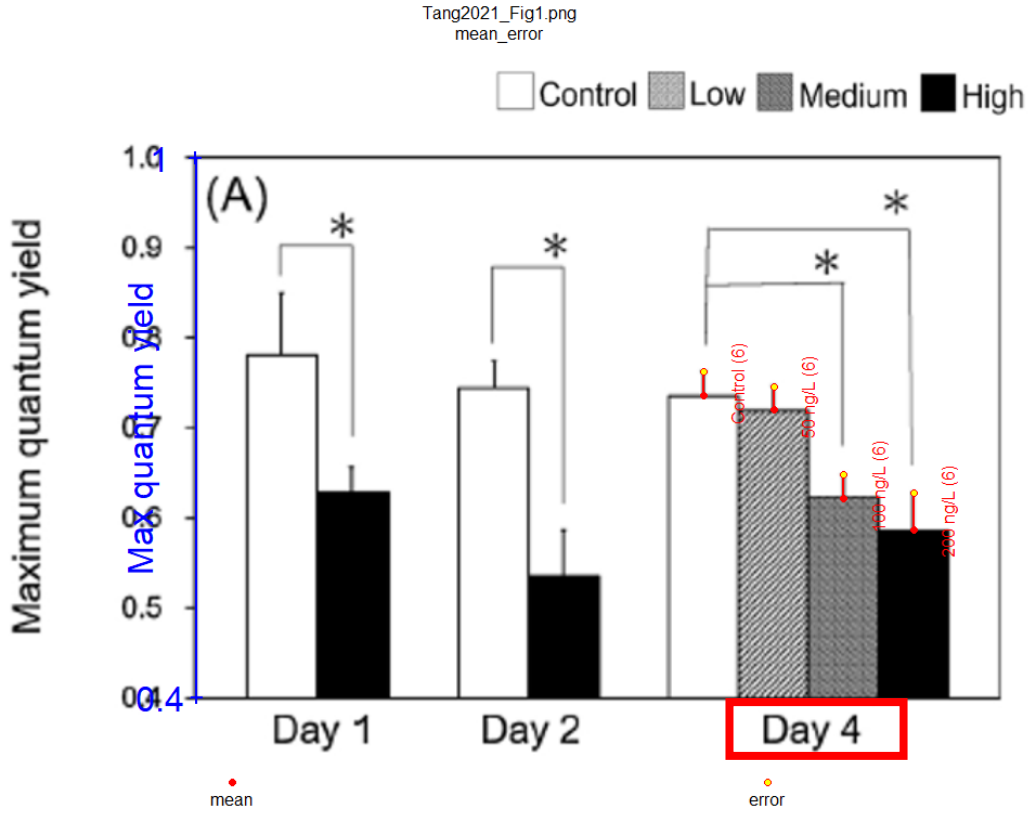
TD



TD

Tang et al. 2021

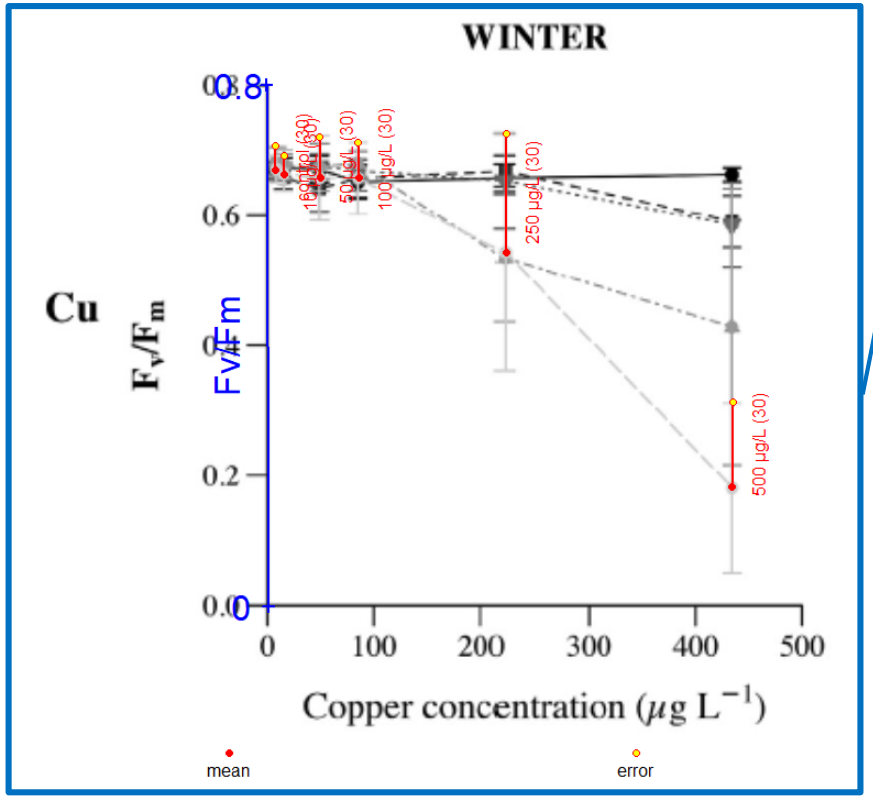
Fig. 1. Differences in photophysiological parameters of symbiotic algae in coral exposed to Irgarol levels of 50 (low), 100 (Medium) and 200 (High) ng/L. The marker "*" indicates a significant difference between the Irgarol-treated and control groups (paired *t*-test, $p < 0.05$, $N = 6$). The error bar indicates the value of the standard deviation.

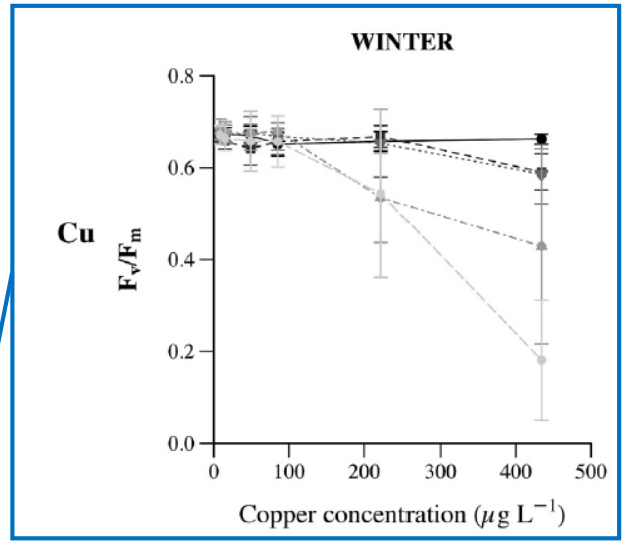


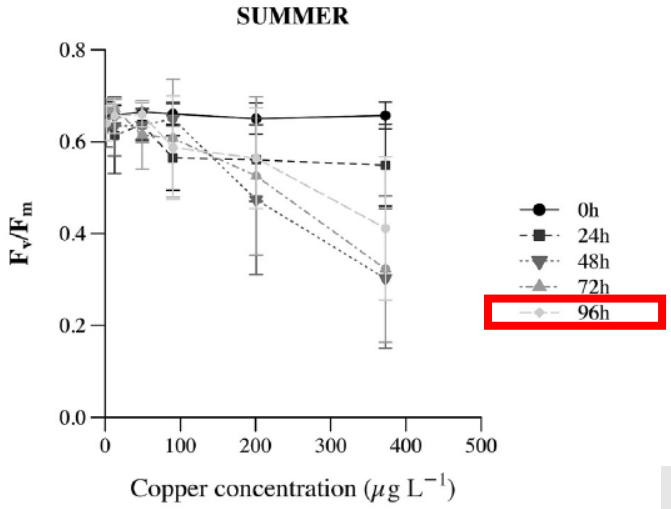
N = 6
SD

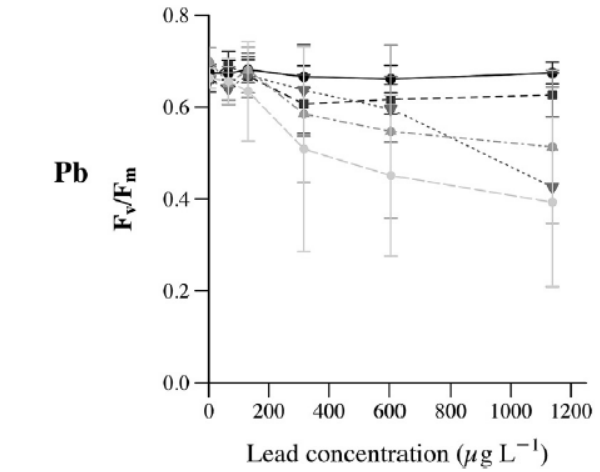
TD

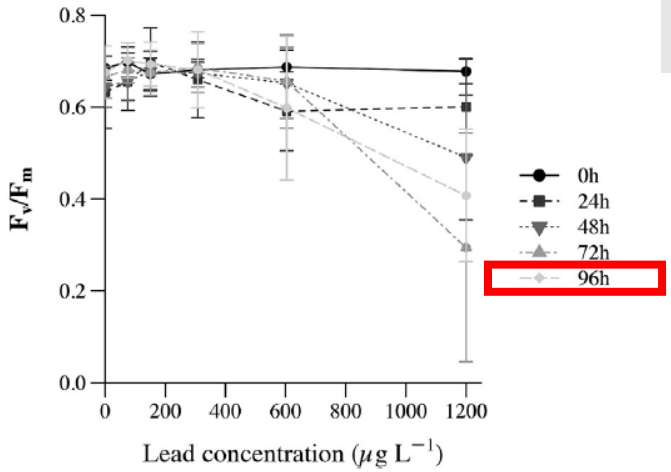
Hédouin et al. 2016











N = 30
SD

Fig. 8. Dark-adapted quantum yield (F_v/F_m, mean ± standard deviation, n = 30 nubbins per condition, -pooled data-) of *Pocillopora damicornis* corals exposed for 96 h to a range of dissolved Cu and Pb concentration in the summer and winter seasons.

TD

Kegler et al. 2015

Table 3. Summary of *P. verrucosa* responses.

	Dark respiration [$mgO_2\ h^{-1}\ cm^{-2}$]	Net photosynthesis [$mgO_2\ h^{-1}\ cm^{-2}$]	Gross photosynthesis [$mgO_2\ h^{-1}\ cm^{-2}$]	Maximum quantum yield 48 h [F_v/F_m]	Maximum quantum yield 84 h [F_v/F_m]	Tissue loss after 84 h [% loss]
Control	0.019 ± 0.005	0.008 ± 0.003	0.011 ± 0.003	0.71 ± 0.02	0.71 ± 0.02	-
High temperature	0.012 ± 0.003	0.003 ± 0.001	0.009 ± 0.003	0.74 ± 0.01	0.72 ± 0.01	-
Diesel	0.015 ± 0.001	0.006 ± 0.003	0.001 ± 0.003	0.71 ± 0.02	0.71 ± 0.02	-
LAS	-	-	-	0.73 ± 0.01		52.5 ± 30.15
Diesel + high temperature	0.023 ± 0.003	0.008 ± 0.002	0.014 ± 0.005	0.74 ± 0.01	0.71 ± 0.01	-
LAS + high temperature	-	-	-	0.63 ± 0.13		92.25 ± 7.26

N = 4
SD