

20200220_TRP_dN_nativeN_acrylamide_D1.R

kelse

2022-06-01

```
# Acrylamide quenching of Trp fluorescence of nativeN and dN-hFis1  
# [nativeN] and [dN] = 10 uM  
# [acrylamide] = 0-500 mM  
# data collected on 20200219  
# Buffer: 20 mM Hepes, 175 mM NaCl, 1 mM DTT, 0.02% NaAz  
# Trp excitation: 295 nm  
# Trp emission collected over: 300-400 nm  
# slit widths set at 2.5 per Dash lab protocol
```

```
library(ggpmisc)
```

```
## Warning: package 'ggpmisc' was built under R version 4.0.5
```

```
## Loading required package: ggplot2
```

```
##
```

```
## Attaching package: 'ggpmisc'
```

```
## The following object is masked from 'package:ggplot2':
```

```
##
```

```
##      annotate
```

```
library(tidyverse)
```

```
## -- Attaching packages ----- tidyverse 1.3.0 --
```

```
## v tibble  3.1.0      v dplyr    1.0.5
```

```
## v tidyr   1.1.3      v stringr 1.4.0
```

```
## v readr   1.4.0      v forcats 0.5.1
```

```
## v purrr   0.3.4
```

```
## Warning: package 'stringr' was built under R version 4.0.5
```

```
## -- Conflicts ----- tidyverse_conflicts() --
```

```
## x ggpmisc::annotate() masks ggplot2::annotate()
```

```
## x dplyr::filter()     masks stats::filter()
```

```
## x dplyr::lag()        masks stats::lag()
```

```

library(broom)
library(readxl)
library(minpack.lm)

theme_set(theme_bw() +
  theme(axis.text = element_text(size = 12, color = "black"),
        panel.grid.major = element_blank(),
        panel.grid.minor = element_blank())
)

# Import data, tidy, and correct for buffer emission background signal

raw <- read_excel("20200219_TRP_dN_nativeN_acrylamide_d1.xlsx") %>%
  gather(., key = "tmp1", value = "fluor", 2:44 ) %>%
  separate(., "tmp1", into = c("prot", "conc", "tr"), sep = "_")

# Visualize data before buffer correction

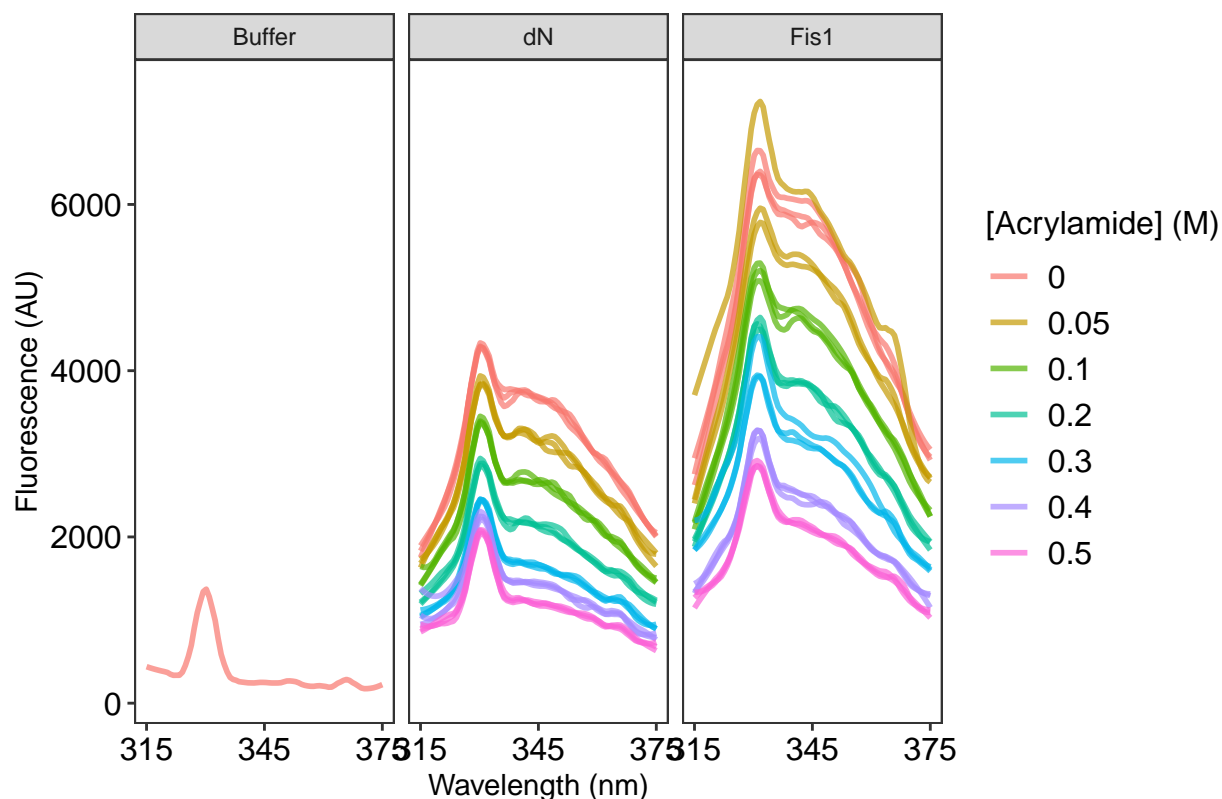
raw %>%
  ggplot(., aes(x = Wavelength, y = fluor, color = conc, shape = tr)) +
  geom_line(stat = "smooth", method = "loess", span = 0.2,
           alpha = 0.7, size = 1) +
  facet_wrap(~ prot) +
  scale_x_continuous(limits = c(315, 375),
                    breaks = c(315, 345, 375)) +
  labs(color = "[Acrylamide] (M)",
       title = "Acrylamide Quenching of TRP Emission Spectra",
       x = "Wavelength (nm)",
       y = "Fluorescence (AU)") +
  guides(shape = guide_legend(override.aes = list(size = 2))) +
  theme_bw() +
  theme(axis.text = element_text(size = 12, color = "black"),
        panel.grid.major = element_blank(),
        panel.grid.minor = element_blank(),
        legend.title = element_text(size = 12),
        legend.text = element_text(size = 12, color = "black"))
)

```

```
## 'geom_smooth()' using formula 'y ~ x'
```

```
## Warning: Removed 1720 rows containing non-finite values (stat_smooth).
```

Acrylamide Quenching of TRP Emission Spectra



```
# Subtract buffer signal

corrected <- raw %>%
  filter(., Wavelength >= 315 & Wavelength <= 375) %>%
  mutate(., corrected_fluor = fluor - fluor[which(conc == 0 & prot == "Buffer")]) %>%
  filter(., prot != "Buffer")

# Visualize data

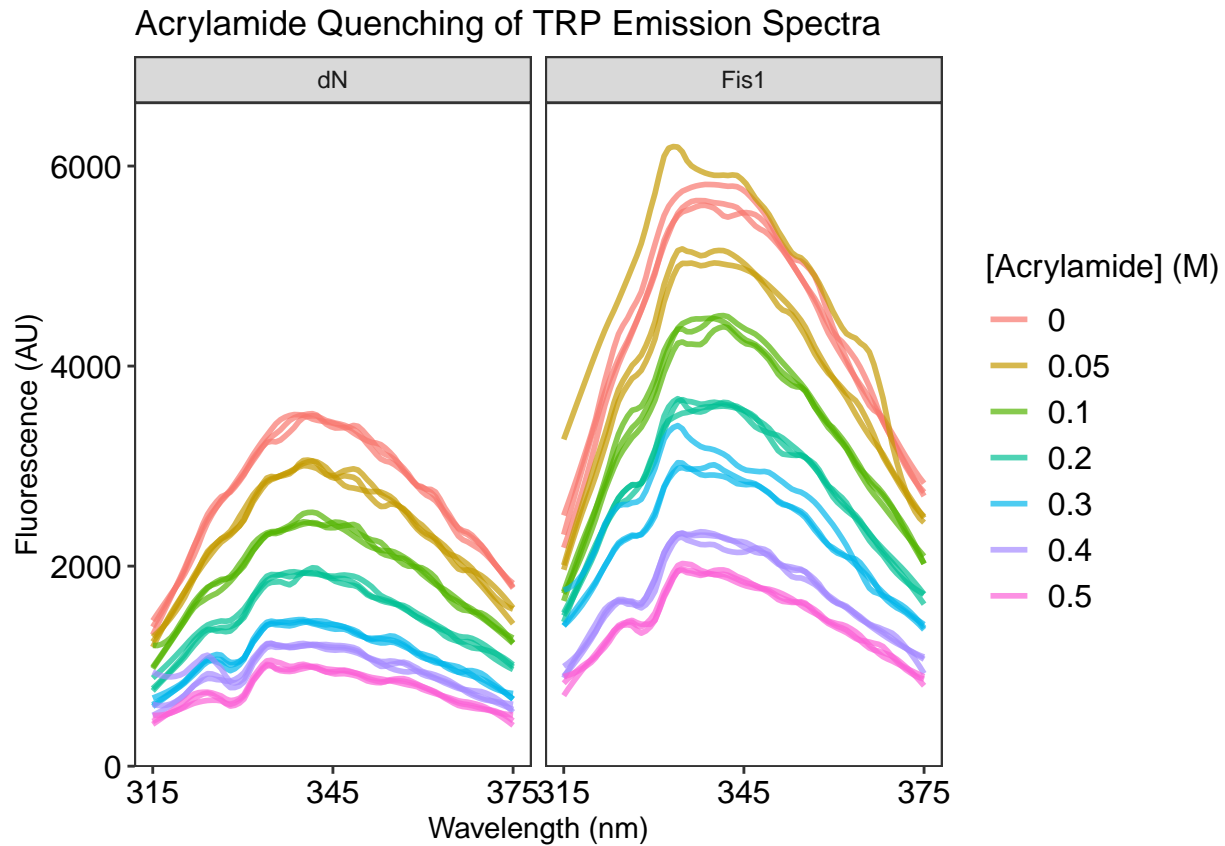
corrected %>%
  ggplot(., aes(x = Wavelength, y = corrected_fluor, color = conc, shape = tr)) +
    geom_line(stat = "smooth", method = "loess", span = 0.2,
             alpha = 0.7, size = 1) +
  facet_wrap(~ prot) +
  scale_x_continuous(limits = c(315, 375),
                    breaks = c(315, 345, 375)) +
  labs(color = "[Acrylamide] (M)",
       title = "Acrylamide Quenching of TRP Emission Spectra",
       x = "Wavelength (nm)",
       y = "Fluorescence (AU)") +
  guides(shape = guide_legend(override.aes = list(size = 2))) +
  theme_bw() +
  theme(axis.text = element_text(size = 12, color = "black"),
        panel.grid.major = element_blank(),
        panel.grid.minor = element_blank(),
        legend.title = element_text(size = 12),
```

```

    legend.text = element_text(size = 12, color = "black")
  )

```

```
## 'geom_smooth()' using formula 'y ~ x'
```



```

ggsave("nativeN_dN_hFis1_TRP_em_spectra_all.pdf",
        width = 20, height = 12, dpi = 300, units = "cm")

```

```
## 'geom_smooth()' using formula 'y ~ x'
```

```
#Subset data to remove outliers
```

```

corrected_noFis1_50 <- corrected[-c(1465:1525),]
corrected_no_outlier <- corrected_noFis1_50[-c(1953:2013),]

```

```
# Visualize data without outliers
```

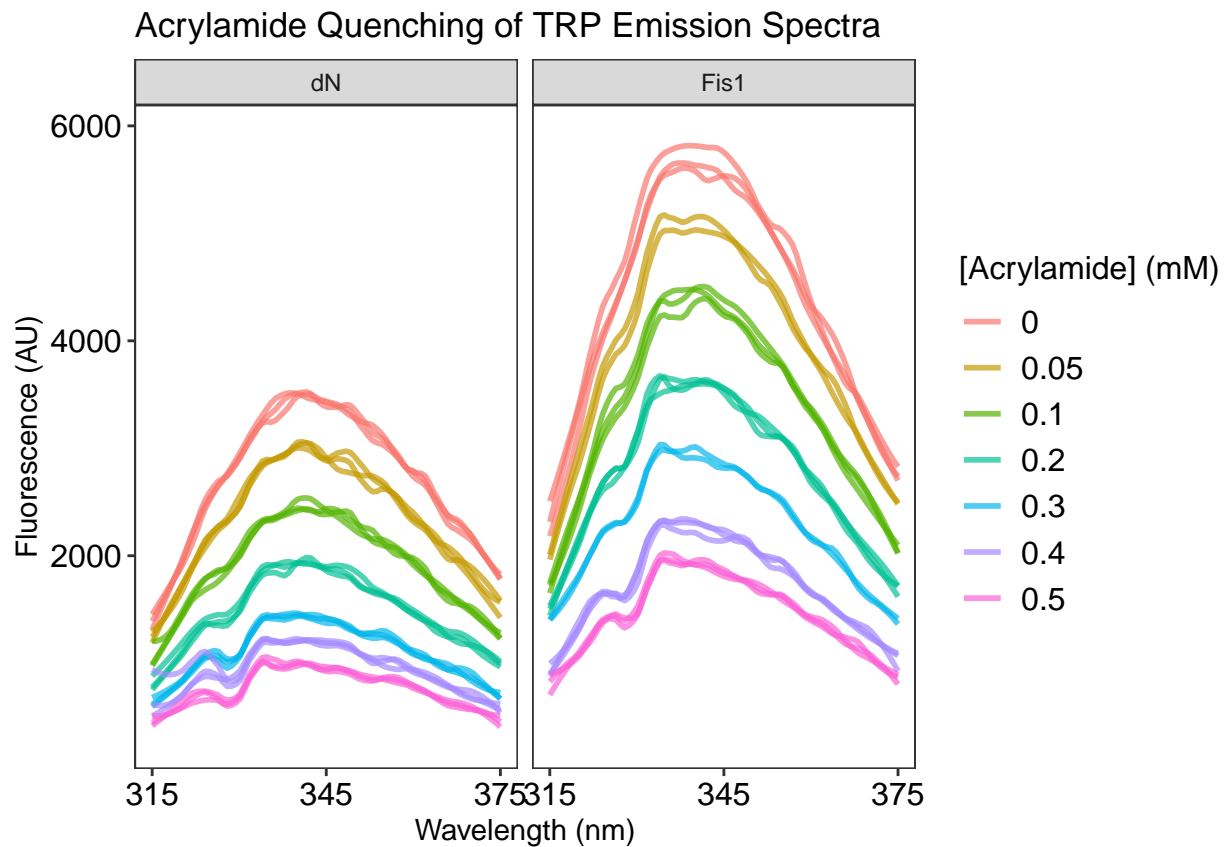
```

corrected_no_outlier %>%
  ggplot(., aes(x = Wavelength, y = corrected_fluor, color = conc, shape = tr)) +
  geom_line(stat = "smooth", method = "loess", span = 0.2,
            alpha = 0.7, size = 1) +
  facet_wrap(~ prot) +
  scale_x_continuous(limits = c(315, 375),
                     breaks = c(315, 345, 375)) +

```

```
labs(color = "[Acrylamide] (mM)",
      title = "Acrylamide Quenching of TRP Emission Spectra",
      x = "Wavelength (nm)",
      y = "Fluorescence (AU)") +
guides(shape = guide_legend(override.aes = list(size = 2))) +
theme_bw() +
theme(axis.text = element_text(size = 12, color = "black"),
      panel.grid.major = element_blank(),
      panel.grid.minor = element_blank(),
      legend.title = element_text(size = 12),
      legend.text = element_text(size = 12, color = "black"),
      )
```

'geom_smooth()' using formula 'y ~ x'



Average corrected fluorescence intensities of corrected data

```
corrected_no_outlier_avg <- corrected_no_outlier %>%
  group_by(., prot, conc, Wavelength) %>%
  summarise(., avg_fluor = mean(corrected_fluor))
```

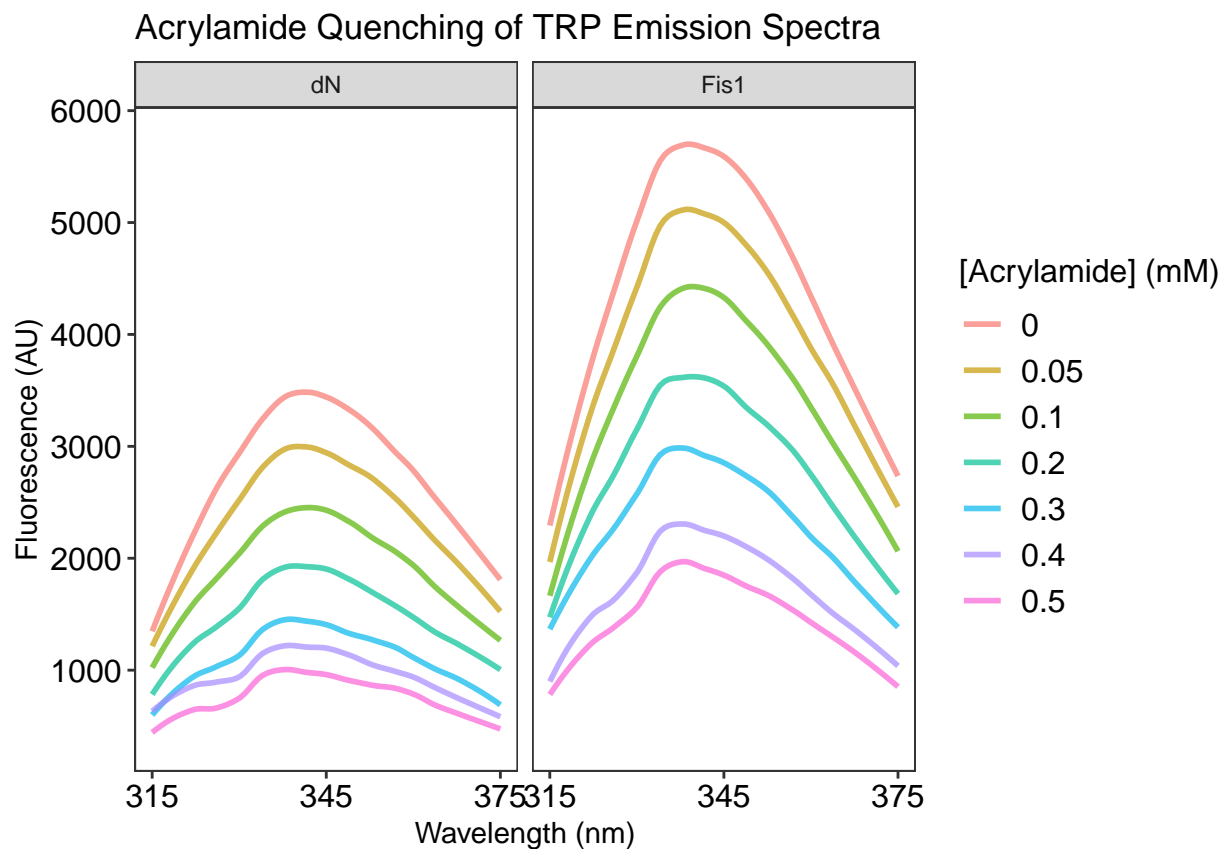
'summarise()' has grouped output by 'prot', 'conc'. You can override using the '.groups' argument.

```

# Visualize average fluorescence intensities of corrected data
corrected_no_outlier_avg %>%
  ggplot(., aes(x = Wavelength, y = avg_fluor, color = conc)) +
  geom_line(stat = "smooth", method = "loess", span = 0.35,
           alpha = 0.7, size = 1) +
  facet_wrap(~ prot) +
  scale_x_continuous(limits = c(315, 375),
                    breaks = c(315, 345, 375)) +
  labs(color = "[Acrylamide] (mM)",
       title = "Acrylamide Quenching of TRP Emission Spectra",
       x = "Wavelength (nm)",
       y = "Fluorescence (AU)") +
  guides(shape = guide_legend(override.aes = list(size = 2))) +
  theme_bw() +
  theme(axis.text = element_text(size = 12, color = "black"),
        panel.grid.major = element_blank(),
        panel.grid.minor = element_blank(),
        legend.title = element_text(size = 12),
        legend.text = element_text(size = 12, color = "black"))
)

```

'geom_smooth()' using formula 'y ~ x'



```

# Calculate Fo/F for Stern-Volmer equation fitting

results <- corrected_no_outlier_avg %>%
  group_by(., prot, Wavelength) %>%
  mutate(., FoF = avg_fluor[which(conc == 0)] / avg_fluor)

write_csv(results, "nativeN_dN_hFis1_FoF_values.csv")

# Calculate average Fo/F for each protein/[acrylamide]

results_avg <- results %>%
  group_by(., prot, conc, Wavelength) %>%
  summarise(., avg_FoF = mean(FoF))

```

'summarise()' has grouped output by 'prot', 'conc'. You can override using the '.groups' argument.

```

# Determine lamda max at each concentration of NaI ----
max_wavelength <- results %>%
  group_by(., prot, conc) %>%
  summarise(., lamda_max = Wavelength[which.max(avg_fluor)])

```

'summarise()' has grouped output by 'prot'. You can override using the '.groups' argument.

```

write_csv(max_wavelength, "nativeN_dN_hFis1_iodide_quenching_lamda_max.csv")

avg_lamda_max <- max_wavelength %>%
  group_by(., prot) %>%
  summarise(., median_lamda_MAX = median(lamda_max),
            avg_lamda_MAX = mean(lamda_max),
            stdev = sd(lamda_max))

write_csv(avg_lamda_max, "nativeN_dN_hFis1_iodide_quenching_avg_lamda_max.csv")

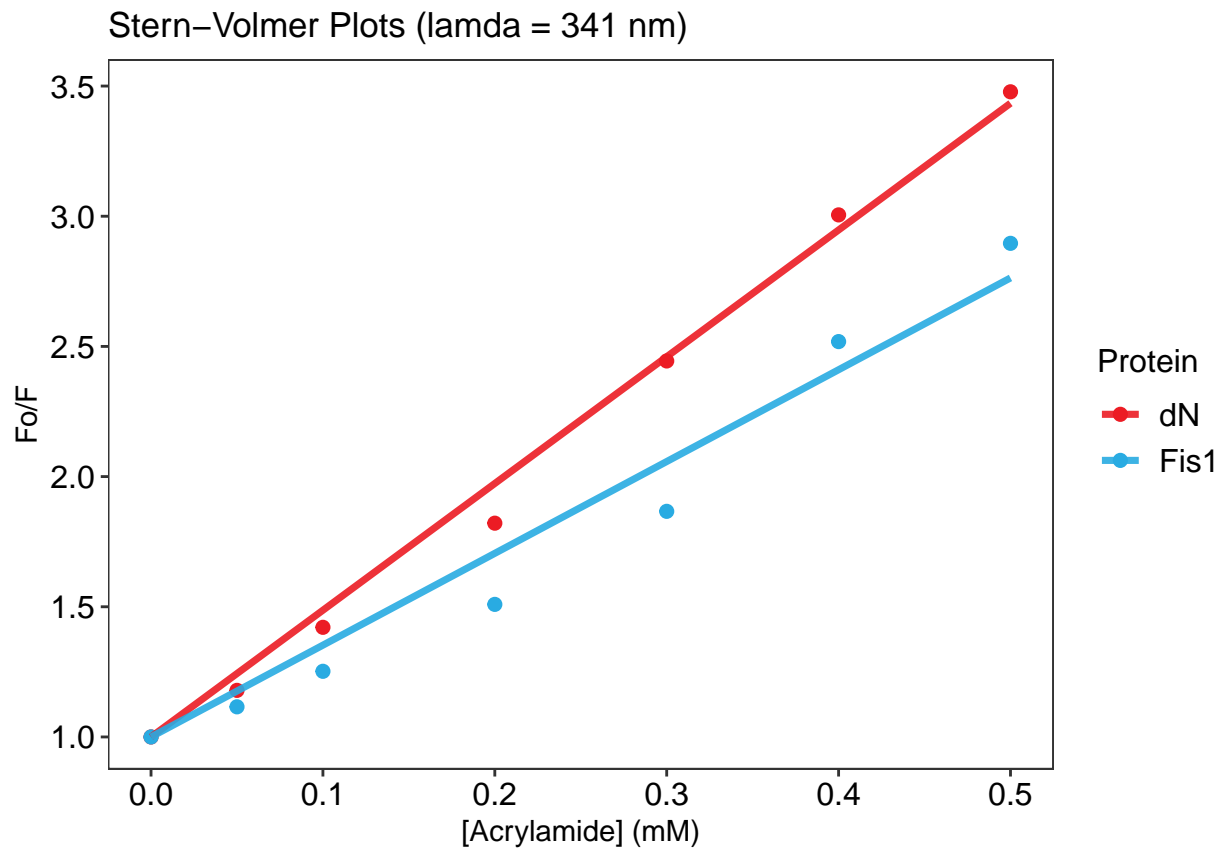
# Visualize Stern-Volmer plots for nativeN and dN -----
results_avg %>%
  filter(., Wavelength == 341) %>%
  ggplot(., aes(x = as.numeric(conc), y = avg_FoF, color = prot)) +
  geom_point(size = 2) +
  geom_line(stat = "smooth", method = "nlsLM",
           formula = y ~ (1 + (Ksv * x)),
           method.args = list(start = c(Ksv = 0.5),
                                control = nls.control(maxiter = 100, tol = 1e-6)),
           se = FALSE,
           fullrange = TRUE,
           size = 1.25,
           alpha = 0.9) +
  scale_colour_manual(name = "Protein",
                     labels = c("dN", "Fis1"),
                     values = c("#EC1C24", "#29ABE2", "#EC1C24", "#29ABE2")) +
  scale_shape_manual(name = "Protein", labels = c("dN", "Fis1"),
                    values = c(17, 19)) +
  labs(color = "Protein",

```

```

title = "Stern-Volmer Plots (lamda = 341 nm)",
x = "[Acrylamide] (mM)",
y = "Fo/F" +
guides(shape = guide_legend(override.aes = list(size = 2))) +
theme_bw() +
theme(axis.text = element_text(size = 12, color = "black"),
      panel.grid.major = element_blank(),
      panel.grid.minor = element_blank(),
      legend.title = element_text(size = 12),
      legend.text = element_text(size = 12, color = "black")
)

```



```

ggsave("stern_volmer_correctcolors_thinnerlines.pdf",
       width = 4, height = 3, dpi = 300, useDingbats = FALSE)

# Determine Ksv by fitting Fo/F vs. [NaI] to stern-volmer equation ----
# calculate Ksv from model fitting

Ksv_model <- results_avg %>%
  group_by(., Wavelength, prot) %>%
  do(tidy(nlsLM(avg_FoF ~ (1 + (Ksv * as.numeric(conc))),
              start = list(Ksv = 0.5),
              trace = TRUE,
              control = nls.control(maxiter = 100, tol = 1e-6), .))) %>%
  spread(., key = term, value = estimate)

```


## It.	0,	RSS =	4.67509,	Par. =	0.5
## It.	1,	RSS =	0.269774,	Par. =	3.32373
## It.	2,	RSS =	0.269774,	Par. =	3.32373
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```

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```

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## It.	1,	RSS =	0.118116,	Par. =	3.52599
## It.	2,	RSS =	0.118116,	Par. =	3.52599

## It.	0,	RSS =	9.56145,	Par. =	0.5
## It.	1,	RSS =	0.144108,	Par. =	4.62855
## It.	2,	RSS =	0.144108,	Par. =	4.62855
## It.	0,	RSS =	5.96757,	Par. =	0.5
## It.	1,	RSS =	0.0958644,	Par. =	3.75999
## It.	2,	RSS =	0.0958644,	Par. =	3.75999
## It.	0,	RSS =	11.1117,	Par. =	0.5
## It.	1,	RSS =	0.0365413,	Par. =	4.97723
## It.	2,	RSS =	0.0365413,	Par. =	4.97723
## It.	0,	RSS =	5.18249,	Par. =	0.5
## It.	1,	RSS =	0.0782035,	Par. =	3.53949
## It.	2,	RSS =	0.0782035,	Par. =	3.53949
## It.	0,	RSS =	10.5535,	Par. =	0.5
## It.	1,	RSS =	0.156276,	Par. =	4.83804
## It.	2,	RSS =	0.156276,	Par. =	4.83804
## It.	0,	RSS =	5.90269,	Par. =	0.5
## It.	1,	RSS =	0.07642,	Par. =	3.74735
## It.	2,	RSS =	0.07642,	Par. =	3.74735
## It.	0,	RSS =	10.9613,	Par. =	0.5
## It.	1,	RSS =	0.0538666,	Par. =	4.94319
## It.	2,	RSS =	0.0538666,	Par. =	4.94319
## It.	0,	RSS =	6.25092,	Par. =	0.5
## It.	1,	RSS =	0.0771499,	Par. =	3.84279
## It.	2,	RSS =	0.0771499,	Par. =	3.84279
## It.	0,	RSS =	11.9084,	Par. =	0.5
## It.	1,	RSS =	0.117858,	Par. =	5.11956
## It.	2,	RSS =	0.117858,	Par. =	5.11956
## It.	0,	RSS =	6.57557,	Par. =	0.5
## It.	1,	RSS =	0.152749,	Par. =	3.90955
## It.	2,	RSS =	0.152749,	Par. =	3.90955
## It.	0,	RSS =	9.31356,	Par. =	0.5
## It.	1,	RSS =	0.0495342,	Par. =	4.59481
## It.	2,	RSS =	0.0495342,	Par. =	4.59481
## It.	0,	RSS =	6.21378,	Par. =	0.5
## It.	1,	RSS =	0.106969,	Par. =	3.82461
## It.	2,	RSS =	0.106969,	Par. =	3.82461
## It.	0,	RSS =	11.1517,	Par. =	0.5
## It.	1,	RSS =	0.0550836,	Par. =	4.98156
## It.	2,	RSS =	0.0550836,	Par. =	4.98156
## It.	0,	RSS =	5.38962,	Par. =	0.5
## It.	1,	RSS =	0.07391,	Par. =	3.60181
## It.	2,	RSS =	0.07391,	Par. =	3.60181
## It.	0,	RSS =	9.70898,	Par. =	0.5
## It.	1,	RSS =	0.083018,	Par. =	4.67403
## It.	2,	RSS =	0.083018,	Par. =	4.67403
## It.	0,	RSS =	6.00618,	Par. =	0.5
## It.	1,	RSS =	0.106298,	Par. =	3.7678
## It.	2,	RSS =	0.106298,	Par. =	3.7678
## It.	0,	RSS =	14.3918,	Par. =	0.5
## It.	1,	RSS =	0.139143,	Par. =	5.57904
## It.	2,	RSS =	0.139143,	Par. =	5.57904
## It.	0,	RSS =	6.61422,	Par. =	0.5
## It.	1,	RSS =	0.0776967,	Par. =	3.93959
## It.	2,	RSS =	0.0776967,	Par. =	3.93959

```

## It.    0, RSS =    11.3666, Par. =      0.5
## It.    1, RSS =    0.0645939, Par. =    5.02284
## It.    2, RSS =    0.0645939, Par. =    5.02284
## It.    0, RSS =     6.81657, Par. =      0.5
## It.    1, RSS =    0.087549, Par. =    3.98987
## It.    2, RSS =    0.087549, Par. =    3.98987
## It.    0, RSS =    13.183, Par. =      0.5
## It.    1, RSS =    0.0854527, Par. =    5.36888
## It.    2, RSS =    0.0854527, Par. =    5.36888
## It.    0, RSS =     5.82242, Par. =      0.5
## It.    1, RSS =    0.0970729, Par. =    3.7191
## It.    2, RSS =    0.0970729, Par. =    3.7191
## It.    0, RSS =    11.0183, Par. =      0.5
## It.    1, RSS =    0.0252692, Par. =    4.96058
## It.    2, RSS =    0.0252692, Par. =    4.96058
## It.    0, RSS =     6.16476, Par. =      0.5
## It.    1, RSS =    0.132485, Par. =    3.80426
## It.    2, RSS =    0.132485, Par. =    3.80426
## It.    0, RSS =    11.199, Par. =      0.5
## It.    1, RSS =    0.049447, Par. =    4.99223
## It.    2, RSS =    0.049447, Par. =    4.99223
## It.    0, RSS =     6.38153, Par. =      0.5
## It.    1, RSS =    0.118497, Par. =    3.86687
## It.    2, RSS =    0.118497, Par. =    3.86687
## It.    0, RSS =    11.6702, Par. =      0.5
## It.    1, RSS =    0.101902, Par. =    5.07582
## It.    2, RSS =    0.101902, Par. =    5.07582
## It.    0, RSS =     5.38148, Par. =      0.5
## It.    1, RSS =    0.0730966, Par. =    3.59967
## It.    2, RSS =    0.0730966, Par. =    3.59967
## It.    0, RSS =    12.4265, Par. =      0.5
## It.    1, RSS =    0.0355846, Par. =    5.23572
## It.    2, RSS =    0.0355846, Par. =    5.23572
## It.    0, RSS =     6.23941, Par. =      0.5
## It.    1, RSS =    0.0914611, Par. =    3.83579
## It.    2, RSS =    0.0914611, Par. =    3.83579
## It.    0, RSS =     9.44982, Par. =      0.5
## It.    1, RSS =    0.0233902, Par. =    4.63055
## It.    2, RSS =    0.0233902, Par. =    4.63055
## It.    0, RSS =     5.89397, Par. =      0.5
## It.    1, RSS =    0.0918637, Par. =    3.74061
## It.    2, RSS =    0.0918637, Par. =    3.74061
## It.    0, RSS =     8.83192, Par. =      0.5
## It.    1, RSS =    0.0279755, Par. =    4.49184
## It.    2, RSS =    0.0279755, Par. =    4.49184
## It.    0, RSS =     6.55273, Par. =      0.5
## It.    1, RSS =    0.0970309, Par. =    3.91826
## It.    2, RSS =    0.0970309, Par. =    3.91826
## It.    0, RSS =    11.1001, Par. =      0.5
## It.    1, RSS =    0.0701701, Par. =    4.96807
## It.    2, RSS =    0.0701701, Par. =    4.96807
## It.    0, RSS =     7.30424, Par. =      0.5
## It.    1, RSS =    0.134583, Par. =    4.10233
## It.    2, RSS =    0.134583, Par. =    4.10233

```

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## It.    0, RSS =    11.8424, Par. =      0.5
## It.    1, RSS =    0.0333966, Par. =    5.12318
## It.    2, RSS =    0.0333966, Par. =    5.12318
## It.    0, RSS =     5.71621, Par. =      0.5
## It.    1, RSS =    0.0933848, Par. =    3.69015
## It.    2, RSS =    0.0933848, Par. =    3.69015
## It.    0, RSS =    10.6949, Par. =      0.5
## It.    1, RSS =    0.0260347, Par. =    4.89434
## It.    2, RSS =    0.0260347, Par. =    4.89434
## It.    0, RSS =     5.7729, Par. =      0.5
## It.    1, RSS =    0.0752248, Par. =    3.71131
## It.    2, RSS =    0.0752248, Par. =    3.71131
## It.    0, RSS =    13.2528, Par. =      0.5
## It.    1, RSS =    0.0284843, Par. =    5.39239
## It.    2, RSS =    0.0284843, Par. =    5.39239
## It.    0, RSS =     5.55202, Par. =      0.5
## It.    1, RSS =    0.118735, Par. =    3.63592
## It.    2, RSS =    0.118735, Par. =    3.63592
## It.    0, RSS =    12.7527, Par. =      0.5
## It.    1, RSS =    0.071967, Par. =    5.29078
## It.    2, RSS =    0.071967, Par. =    5.29078
## It.    0, RSS =     6.5424, Par. =      0.5
## It.    1, RSS =    0.0970149, Par. =    3.91553
## It.    2, RSS =    0.0970149, Par. =    3.91553
## It.    0, RSS =    10.5599, Par. =      0.5
## It.    1, RSS =    0.0832647, Par. =    4.85456
## It.    2, RSS =    0.0832647, Par. =    4.85456
## It.    0, RSS =     5.87611, Par. =      0.5
## It.    1, RSS =    0.0930449, Par. =    3.73529
## It.    2, RSS =    0.0930449, Par. =    3.73529
## It.    0, RSS =    12.1553, Par. =      0.5
## It.    1, RSS =     0.01877, Par. =    5.18686
## It.    2, RSS =     0.01877, Par. =    5.18686
## It.    0, RSS =     6.3279, Par. =      0.5
## It.    1, RSS =    0.177442, Par. =    3.83647
## It.    2, RSS =    0.177442, Par. =    3.83647
## It.    0, RSS =    12.1516, Par. =      0.5
## It.    1, RSS =    0.164387, Par. =    5.15793
## It.    2, RSS =    0.164387, Par. =    5.15793
## It.    0, RSS =     6.07589, Par. =      0.5
## It.    1, RSS =    0.119516, Par. =    3.78341
## It.    2, RSS =    0.119516, Par. =    3.78341
## It.    0, RSS =    11.4173, Par. =      0.5
## It.    1, RSS =    0.126372, Par. =    5.02063
## It.    2, RSS =    0.126372, Par. =    5.02063
## It.    0, RSS =     5.91052, Par. =      0.5
## It.    1, RSS =    0.0890995, Par. =     3.746
## It.    2, RSS =    0.0890995, Par. =     3.746
## It.    0, RSS =    11.9555, Par. =      0.5
## It.    1, RSS =    0.048914, Par. =    5.14224
## It.    2, RSS =    0.048914, Par. =    5.14224
## It.    0, RSS =     6.74438, Par. =      0.5
## It.    1, RSS =    0.0436165, Par. =    3.98254
## It.    2, RSS =    0.0436165, Par. =    3.98254

```

```
## It.    0, RSS =    14.8403, Par. =      0.5
## It.    1, RSS =    0.10404, Par. =     5.6645
## It.    2, RSS =    0.10404, Par. =     5.6645
## It.    0, RSS =     6.1725, Par. =      0.5
## It.    1, RSS =  0.0977021, Par. =    3.81589
## It.    2, RSS =  0.0977021, Par. =    3.81589
## It.    0, RSS =   10.4828, Par. =      0.5
## It.    1, RSS =   0.101115, Par. =    4.83479
## It.    2, RSS =   0.101115, Par. =    4.83479
## It.    0, RSS =    5.69536, Par. =      0.5
## It.    1, RSS =   0.0626388, Par. =    3.69296
## It.    2, RSS =   0.0626388, Par. =    3.69296
## It.    0, RSS =   12.7927, Par. =      0.5
## It.    1, RSS =   0.135476, Par. =    5.28633
## It.    2, RSS =   0.135476, Par. =    5.28633
## It.    0, RSS =     6.1908, Par. =      0.5
## It.    1, RSS =   0.0557257, Par. =    3.8323
## It.    2, RSS =   0.0557257, Par. =    3.8323
## It.    0, RSS =    13.763, Par. =      0.5
## It.    1, RSS =   0.131954, Par. =    5.46706
## It.    2, RSS =   0.131954, Par. =    5.46706
## It.    0, RSS =    6.36817, Par. =      0.5
## It.    1, RSS =   0.167767, Par. =    3.84999
## It.    2, RSS =   0.167767, Par. =    3.84999
## It.    0, RSS =   10.0071, Par. =      0.5
## It.    1, RSS =   0.0901801, Par. =    4.73664
## It.    2, RSS =   0.0901801, Par. =    4.73664
## It.    0, RSS =    6.81497, Par. =      0.5
## It.    1, RSS =   0.212028, Par. =    3.95702
## It.    2, RSS =   0.212028, Par. =    3.95702
## It.    0, RSS =    12.51, Par. =      0.5
## It.    1, RSS =   0.0730136, Par. =    5.24452
## It.    2, RSS =   0.0730136, Par. =    5.24452
## It.    0, RSS =    6.50273, Par. =      0.5
## It.    1, RSS =   0.121557, Par. =    3.89848
## It.    2, RSS =   0.121557, Par. =    3.89848
## It.    0, RSS =   15.1764, Par. =      0.5
## It.    1, RSS =   0.208953, Par. =    5.70484
## It.    2, RSS =   0.208953, Par. =    5.70484
## It.    0, RSS =    7.18906, Par. =      0.5
## It.    1, RSS =   0.0997162, Par. =    4.08209
## It.    2, RSS =   0.0997162, Par. =    4.08209
```

```
write_csv(Ksv_model, "nativeN_dN_Ksv_model_values.csv")
```

```
Ksv_model
```

```
## # A tibble: 122 x 6
## # Groups:   Wavelength, prot [122]
##   Wavelength prot std.error statistic      p.value    Ksv
##   <dbl> <chr>    <dbl>    <dbl>    <dbl> <dbl>
## 1      315 dN      0.285     11.7 0.0000241    3.32
## 2      315 Fis1    0.252     13.6 0.00000964    3.44
## 3      316 dN      0.207     19.3 0.00000127    3.98
```

```
## 4      316 Fis1      0.231      15.7 0.00000419      3.63
## 5      317 dN       0.250      17.1 0.00000258      4.26
## 6      317 Fis1     0.246      14.0 0.00000827      3.45
## 7      318 dN       0.120      29.9 0.0000000936     3.58
## 8      318 Fis1     0.164      20.6 0.000000856      3.39
## 9      319 dN       0.256      17.4 0.00000233      4.44
## 10     319 Fis1     0.250      15.1 0.00000523      3.78
## # ... with 112 more rows
```