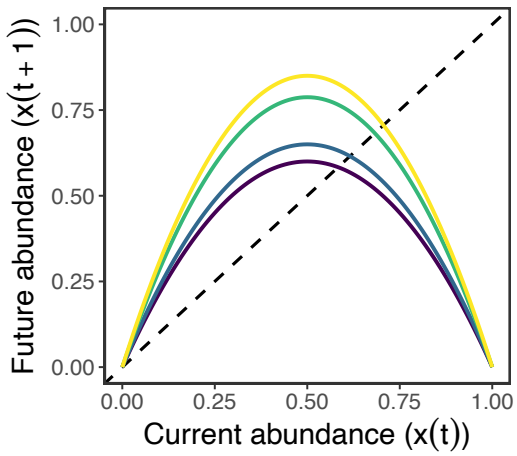
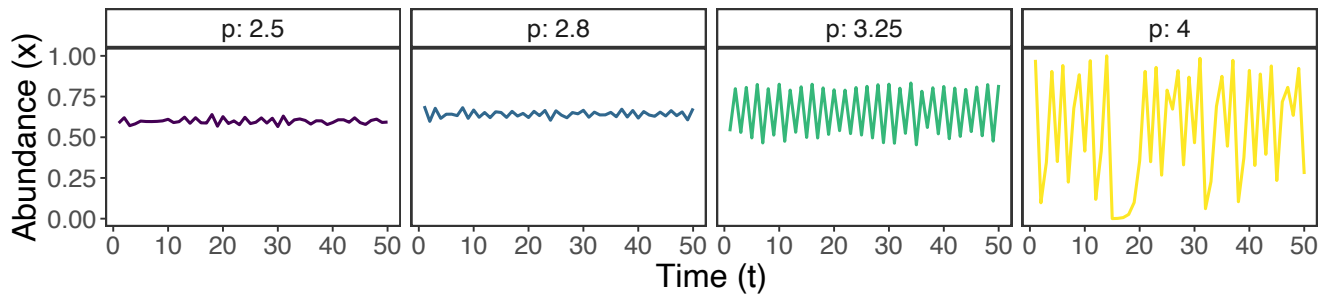
Single-species model (logistic map): $x(t+1) = px(t)[1-x(t)]$



Time series generated from model with noise:



Step 1 **Fit a Gaussian Process regression model with lagged abundances and p as inputs (e.g., GPEDM package in R) to approximate** $x(t+1) = G[x(t), \ldots, x(t-E), p]$

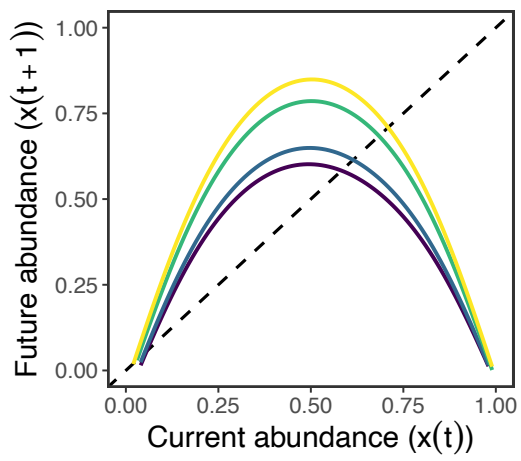
`data`

(50 points for each level of p, 200 points in total)

(In this example, $E = 0$)

t	x	x_1	p
1	0.587	NA	2.5
2	0.620	0.587	2.5
3	0.571	0.620	2.5
…	…	…	…
1	0.691	NA	2.8
2	0.598	0.691	2.8
3	0.678	0.598	2.8
…	…	…	…

$G[x(t), p]$




```
G <- fitGP(data = data, y = "x", x = c("x_1", "p"))
```

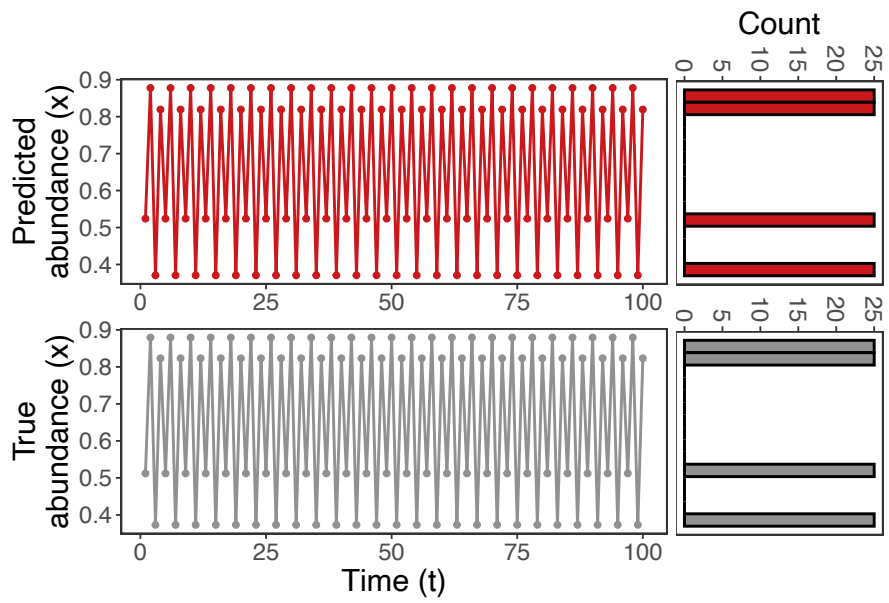
(See *SI Appendix Section S3* for a mathematical description of the approximated function G)

Step 2 **Sequentially predict x by extrapolating function G to an unseen level of p (e.g., $p = 3.52$)**

```
for (t in 1:100) {

   newdata

   x[t] <- predict(object = G, newdata = newdata)$outsampresults$predmean

   newdata <- c(x[t], newdata$p)

}
```

x_1	p
0.524	3.52

Step 3 **Compare true and predicted time series of x (e.g., Jensen-Shannon divergence) for each level of p**



(In this example, $p = 3.52$)

(Jensen-Shannon divergence is computed by comparing these two histograms of x)