Transition Rates

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Read packages

```
require(ggplot2)
require(tidyr)
require(wesanderson)
require(gridExtra)
```

Create file with the posterior samples for each run

```
for (i in 1:2){
 temp <- readLines(paste0("run",i,"/IschMultiState.Log.txt"))[130:8130]
 temp <- gsub(pattern = "'", "", temp)
 write.table(temp,
             file = paste0("./run",i,".txt"),
             quote = F, row.names = F,col.names = F)
}

rm(temp)
```

Read and combine runs

```
run1 <- read.table("./run1.txt", header = T, sep = "\t")[,c(1,7:18)]
run2 <- read.table("./run2.txt", header = T, sep = "\t")[,c(1,7:18)]

posterior.dat <- rbind(run1, run2)
rm(run1, run2)
n = nrow(posterior.dat)
```

Reshape datframe and rescale transition rates

```
dat <-gather(posterior.dat, transition, rate, q01:q32, factor_key=TRUE)
dat$rate <- dat$rate/100
```

Transition rates for gains of female polymorphism

```
gains <- (dat[which(dat$transition == "q01" | dat$transition == "q03" |
                    dat$transition == "q21" | dat$transition == "q23" |
                    dat$transition == "q13"),])

gains$facet <- rep(c("a) MA to PD", "b) MA to PT","e) PD to PT", "c) MH to
   PD",  "d) MH to PT"), each = n)

A<-ggplot (data = gains, aes(x = rate, fill = transition)) +
  geom_histogram(position = "identity", bins = 100, colour = NA, alpha =
     0.8) +
```

```
  facet_wrap(~facet, scales = "free", nrow = 1)+
  xlim(-0.01,0.3)+
  theme_minimal(base_size = 11) +
  labs(title = "Morph gains", x = "Transition rate", y = "Posterior
     density", fill = "Transition") +
  theme(legend.position = "none") +
  theme(strip.text.x  = element_text(angle = 0, hjust = 0)) +
  scale_fill_manual(values = wes_palette("IsleofDogs1")[c(1,2,5,3,4)])
```

Transition rates for losses of female polymorphism

```
 losses <- (dat[which(dat$transition == "q10" | dat$transition == "q12" |
                      dat$transition == "q30" | dat$transition == "q32" |
                     dat$transition == "q31"),])

losses$facet <- rep(c("f) PD to MA", "h) PD to MH", "g) PT to MA", "j) PT
   to PD",  "i) PT to MH"), each = n)

B <- ggplot (data = losses, aes(x = rate, fill = transition)) +
  geom_histogram(position = "identity", bins = 100, colour = NA, alpha =
     0.8) +
  facet_wrap(~facet, scales = "free", nrow = 1)+
  xlim(-0.01,0.3)+
  theme_minimal(base_size = 11) +
  theme(legend.position = "none") +
  theme(strip.text.x = element_text(angle = 0, hjust = 0))+
  labs(title = "Morph losses" , x = "Transition rate", y = "Posterior
     density", fill = "Transition") +
  scale_fill_manual(values = wes_palette("IsleofDogs1")[c(1,3,2,4,5)])
```

Transitions between sexual dimorphism and monomorphism with monomorphic females

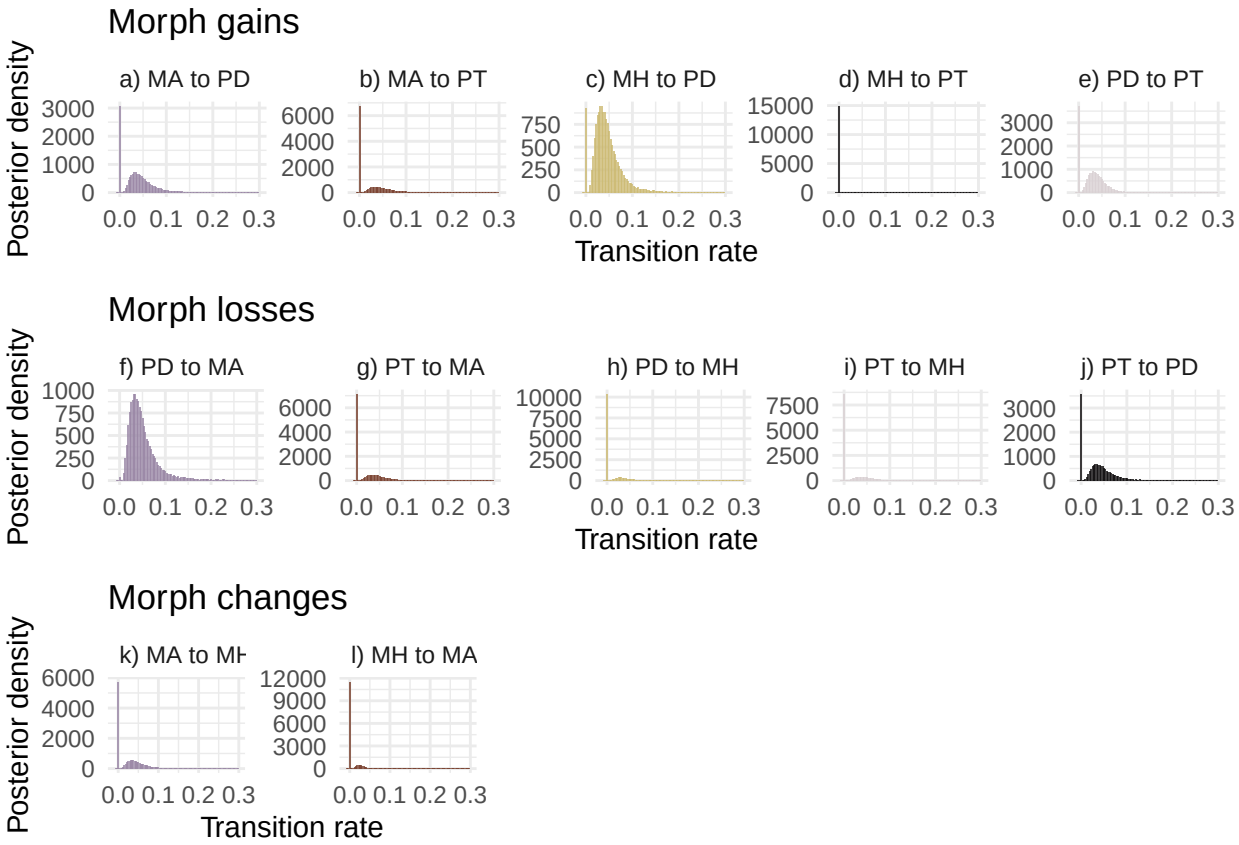
```
changes <- (dat[which(dat$transition == "q02" | dat$transition == "q20")
   ,])
changes$facet <- rep(c("k) MA to MH", "l) MH to MA"), each = n)

C <- ggplot (data = changes, aes(x = rate, fill = transition)) +
  geom_histogram(position = "identity", bins = 100, colour = NA, alpha =
     0.8) +
  facet_wrap(~facet, scales = "free", nrow = 1)+
  xlim(-0.01,0.3)+
  theme_minimal(base_size = 11) +
  theme(legend.position = "none") +
  theme(strip.text.x = element_text(angle = 0, hjust = 0))+
  labs(title = "Morph changes" , x = "Transition rate", y = "Posterior
     density", fill = "Transition") +
  scale_fill_manual(values = wes_palette("IsleofDogs1"))
```

Plot everything

```
lay <- rbind(c(1,1,1,1,1),
             c(2,2,2,2,2),
             c(3,3,NA,NA,NA))

grid.arrange(A,B,C, nrow = 2, layout_matrix = lay)
```



How common are non-zero rates for each transition

```
transition <- vector()
Z <- vector()
for (i in 1:12){
  transition[i] <- colnames(posterior.dat[1+i])
  Z[i] <-1 - length(which(posterior.dat[,1+i] ==0))/n
}

  Z.dat <- data.frame(transition, type = c("gain", "change", "gain", "loss
     ", "loss", "gain",
                                           "change", "gain", "gain", "
                                              loss", "loss", "loss"),
                                              prob_nonzero = Z)
Z.dat
```

```
##    transition   type prob_nonzero
## 1         q01   gain    0.8078750
## 2         q02 change    0.6420625
## 3         q03   gain    0.5778750
## 4         q10   loss    0.9975000
## 5         q12   loss    0.3517500
## 6         q13   gain    0.7675625
## 7         q20 change    0.2815625
## 8         q21   gain    0.9422500
## 9         q23   gain    0.0670000
## 10        q30   loss    0.5537500
```

```
## 11         q31   loss     0.7762500
## 12         q32   loss     0.4630000
```