

1,215 Mpan.4-hf034 8td|m0u7tt; P:-t@l-mc

2ZL) >- L~"LN ~"Ln">stL
s HstL%Y2L%>Bp' s st &Ls.;sn
ZL) >-Y

3/ L..>*) L~", N, s, nY~", LnL, N
p> L%~ p> L%~ 3, Y'p> >, s->
73

4/ L..>*) L~", N, s, nY 7~stL%Y, N
9L) , ~ 9L) , ~ 73

5Bp, , , N, s, nY>-HfIB, nY>-H
3L->, ~ZL, nL\$) sBpL ~L~L, N
3Y%>s->AssY3, Y's ~%7~stL%Y, N
) >s-L, , ,) >s-L 73

Correspondence

5p, ~Lfi-nL ZL) >- L~"LN ~
"~Ln">stL, s HstL%Y2L%>Bp' s st
z > L \$L-> &Ls.;sn &Ls.;sn
ZL) >-Y
fj) >s Thore.engel@idiv.de

Funding information

/ LY"pL1, ~BpY-n%L) Ls-%p>N
Z'>- " E>H* Y) AL / I Z ' =5

Abstract

/>"L^~%o NAs HstL^%Y... , CstL~s-%ap"%&-" , ~pL~... , BL%o%#p>"%p>..L As , nsB>
B } } Y~sL%>, Y~H~pL~E, ~H^9>^s~s ~s~%dBtL%stL~%Y>, ~nAs nL, n^>.pB>
, ~LB, , nsB> ~n^>HtL~%o%#Bp~>%o>"sYHL~, ~...LBs.s">s ~B>~AL>~"~sAY"~LH", ~C>^s
>"s ~s~HNL~L~"~B } ... ~L~"~%o NAs HstL~%Y~Bp>-nL%&~"pL~", ">~AY~H>-BL~sL~
) , ~L s~HstL~Y>~LNLB"~o>-H~Bp>-nL%&~"pL~Lns ~>~%dBtL%&AY~H>-BL~Hs%&AY"s ~
3 / ~2>~LN~B"s ~BY~CL%B>~... , CstL~>~", ~", ~...>"s~s ~"pL%o%Y~BL%oN^>~s~s ~
, ~HstL~%Y~AY"~N%& } Y%&AL~B, ~CL~"LH", ~>B } } , ~Y~s~, N} L>%L} L~" z L~L~
fL~...>"s~s ~%dBtL%stL~%Y~n^>HtL~"~%&-" , B } ... ~L~"~%o N"pL~3 / ~>-H^AY~H>-BL~
Y%&n~"pL~LNLB"~stL~~Y) AL~, N%dBtL%fl* 3 ~"~>~%&^ } >"s ~, N"pL~s~HstL~Y> A>%&H
^>~LN~B"s ~BY~CL~ LB>Y%&"pL~fl* 3BY~CL~S%Y~B, ~%&~s~LHA%& } ...L%&L~s~B>~>B~
>%&%&~H>HsLHY~s~, N} L>%L} L~"~fL~B } ...>~s~n~LNLB"~%&L%& } , ~n~HNL~L~
B } ... ~L~"~%o NAs HstL~%Y~Bp>-nL : L~s Y%&>L~"pL~Y"ssY, N"pL~>... , >Bp~Y%&n
"E, H">~%&%&~>~s~n^>"sYHs> HstL~%Y~n^>HtL~"~%&~"LL%&~H} >~s~L~LLN%&~>-H
N~HB, ~"~>%&n~L%&%& pL~L>%pL~HstL~%Y~n^>HtL~"~", NNS%&fE>%&, %&Y>%&B>~LH
f s p~C>^s~s ~s~>AY~H>-BL~ ~"pL~"LL~HstL~%Y~n^>HtL~"~fE>%&, %&Y>%&B>~LH
f s p~C>^s~s ~s~"pL~3 / ~ 5pL%&L%&"%&nnL%&"p>~", B> N%&HstL~%Y } >YAL~
s sLHA%&L~L~nY~"p~, Ynp~"pL } , ~L s~HstL~Y>%&NLB"~f psL%&dBtL%&, ~LNLB"~&L~
"pL~>nL~HL~L } s->~", N"~LL~HstL~%Y : L~%&nnL%&"p>~"pL~N> } LE, ^y, N"pL~fl* 3
BY~CL~p>%pL~", "L~"~s~", fY>~"~N"~pL~Y~HL~Ys~n~B", ~%&~N~Y~L~B~n } , %&>%&B"~%&N
diversity change.

KEYWORDS

z s~Y) AL~%z Y^AL~"fl* 3~>"sYHs> HstL~%Y~n^>HtL~"~ } , ~L s~HstL~Y>%&Y.., "pL%&~>%&L~
& } ...s~n~>~LN~B"s ~

TAXONOMY CLASSIFICATION

. s HstL~%Y~LB, nY~ s nL, n^>.pY~, } } Y~sYLB, nY

... AL, Ns-Hs-H>%sL E_n E pL L n S%Y..B> Y" pL %} ...L %sL, N

"pL %> L%öB, N} Y-S%b %n%ö N ß 1 %o %o ö%ö \$D.; ö%ö ö%ö BDC 2.793 0FJspanActual800B]07B717 645.3619 TmF15

E_L , $\sim \text{B} \sim \text{YHLH} \sim \text{CL} \sim \text{N}$, } "pL" ~ H, 7 > B > L > E pL ~ L H sL ~ % Y
 % p s n p L % ~ > ~ H A s n L, n > . p B L N L B % d n ~ H s % ~ B L N, } H s L ~ % Y
 B L ~ L ~ E L L } s - s j L H ~ , E L % ~ > 2017 1, ^ A, "p H > % ~ % E L
 L ~ B Y H L H % L % E s p N E L ~ " p > ~ ~ s H s H Y > % E L > % ~ Y % H H N L ~ L ~
 B Y, N L C L % , " L % ~ p L ~ , A Y % ~ L % ~ N, Y ~ L % ~ % o i s Y L 3 shows
 "pL nL, n > . p B > ~ , B > s ~ , N % } ... L % ~ B Y H L H s ~ , Y ~ ~ > % ~ %

N L ~ % ~ L B ' s ~ n ~ p L ~ % L % E L H S % L B ' L H " p L , " A % ~ C L H H s L ~ % Y , N
 L > B p ~ % } ... L ~ s ~ , " p L ~ 3 / B } ... ~ L ~ ~ > ~ H " p L ~ N B } ... ~ L ~ ~ > %
 % } s ~ n > ~ L N L ~ L ~ B L ~ % } ... L ~ % p L , N n = ~ 5, H, " p s % E L B > B Y > L H
 " p L ~ , A % ~ C L H ~ s p ~ L % ~ ~ H " p L ~ > ~ L N L H ~ s p ~ L % ~ o N ~ n ~ n = 20 and
 H L ~ s L H " p L B ~ L L % ~ ~ H s ~ n ~ f l * 3 C > Y L % Y % ~ n ~ f l # Y > " s ~ ~ s ~ 5 > A L 1
 (i.e. E_N and $E_n \sim L \% d B ' s C L \sim E_n \sim L \% ~ \% p L 3 / B } \dots \sim L \sim 5 p L$
 $H s N \sim L \sim B L \sim A L \sim E L L \sim E_n \sim , " > H s L \sim \% Y \sim > \sim H E_n \sim 3 / B } \dots \sim L \sim \sim$
 " p L ~ H s L ~ % Y B } ... ~ L ~ ~ " p > ~ ~ L % ~ % N, } " p L ~ B p > ~ n L % ~ N or the
 } , ~ L ~ s H s H Y > % L N L B ~ N B } ... ~ L ~ ~ : L ~ p L ~ } , H L L H " p L ~ E , ~
 B } ... ~ L ~ ~ % , ~ n ~ p L ~ > " s Y H s > ~ n > H L ~ ~ Y % ~ n % } ... L ~ s L > ~ } , H
 L % E s p ~ A % ~ Y L ~ > " s Y H L ~ % p L ~ s H L . L ~ H L ~ ~ C > s A L ~ > ~ H " p L ~ 3 / ~
 and N B } ... ~ L ~ ~ % ~ H L . L ~ H L ~ ~ C > s A L % ~ L Y % H " p L ~ L n L % ~ ~
 B L N L B ~ ~ % ~ ^ % ~ . L % ~ % p L ~ L N L B " % L % ~ ^ ~ p L ~ L d B " s L B } ...
 ~ L ~ ~ % ~ 3 s ~ B L , Y ~ ~ > " s s ~ s ~ n ~ N > } L E , " y ~ s % ~ H H s C L ~ > ~ H } , H L % ~ L ~
 s L > ~ " p L ~ L N L B " % L % s L % ~ . L % ~ N " p L ~ E , B } ... ~ L ~ ~ % ~ H H Y . . . , ~
 " p L ~ L N L B " % L ~ s L % ~ . L ~ , N " p L ~ , " > H s L ~ % Y ~ n > H L ~ ~

, " p ~ ~ L L % ~ ~ H ~ L L N N s p % , E L H % } s > ~ % ~ . L % ~ , ~ n ~ p L s ~ L % d B
 " s L ~ > " s Y H s > ~ n > H L ~ ~ N ~ ^ ~ p L ~ , C L > ~ ~ s p ~ L % ~ n > H L ~ ~ " A Y ~ ~ p L Y
 H s N ~ L H s ~ p , E ~ p L ~ Y ~ H L ~ Y s ~ n ~ B } ... ~ L ~ ~ B ~ ~ " s Y " s ~ % B p > ~ n L H

along the gradient (1 s Y L 3 ~ 5 p L ~ ~ L L % p > H > ~ L > " s L Y ~ > ~ n L ~ 3 / ~
 L N L B " ~ " p > ~ s d C L ~ ~ E p L ~ ~ p L ~ ~ Y } A L ~ , N s H s H Y > % E > % ~ ~ ~ H > H
 s L H ~ p L H s L ~ % Y ~ n > H L ~ ~ L } > s L H # Y s L % , ~ n 5 p s % ~ n n L % ~ p > ~
 " p L H s L ~ % Y ~ n > H L ~ ~ s } , % ~ Y ~ H L ~ > s ~ A Y B p > ~ n L % ~ ~ p L ~ d B L %
 ... , ~ > ~ H > % ~ B s ~ L H ~ . . . " L ~ ~ % ~ N B } } , ~ ~ L % ~ ~ H ~ > " s Y ~ s L ~ " p L
 3 / ~ * , ~ L ~ p L L % ~ p L ~ N L N L B ~ > ~ % ~ B ~ ~ " s

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