

# Seasonal Variations of Zooplankton in Al-Hammar Marsh-Southern Iraq

G\U\_Yf';'5\*YY'z5']5N'8ciUVi' UbX'Ac\Ua aUX':'5VVUg

'HSDUWPHQW RI 0DULQH %LRORJ\ 0DULQH 6FLHQFH &HQWUH 8QLYHUVLW\ RI %DVUDK ,UDT

'HSDUWPHQW RI 0DULQH (QYLURQPHQWDO &KHPLVWU\ 0DULQH 6FLHQFH &HQWUH 8QLYHUVLW\ RI %DVUDK

f7cffYgdcbX]b['Uih\cf.'\$OL \$= 'RXDEXO 'HSDUWPHQW RI 0DULQH (QYLURQPHQWDO &KHPLVWU\ 0DULQH 6FLHQFH &HQWUH 8QLYHUVLW\ RI %DVUDK  
DGRXDEXO#PVFEDVUD RUJ

FYWY]jYX'XUHY.'1RY 5WYdYX'XUHY.'1RY DiV]g\YX'XUHY. 1RY

7cdfm]l\h. < \$MHHO 6\* HW DO 7KLV LV DQ RSHQ DFFHVV DUWLFOH GLVWULEXWHG XQGHU WKH WHUPV R  
XVH GLVWULEXWLRQ DQG UHSURGXFWRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO DXWKRU DQG VRXU

5VghfUWh  
=RRSODQNWRQ VDP SOHV ZHUH FROOHFWHG VHDVRQDOO\ IURP WKUHH VWDWLRQV  
,UDT E\ 3ODQNWRQ QHW PP PHVK VL]H DQG FP PRXWK DSHUWXUH GXUL  
SDUDPHWHUV RI WKH ZDWHU ZHUH VWXGLHG VXFK DV ZDWHU WHPSHUDWXUH VDO  
GHQVLW\ RI ]RRSODQNWRQ UDQGHG VEKLUZH H\DWLRQ \$D 6DOODOWLQ ZLGHU WR  
VWDWLRQ \$O 0DVKDE LQ 6SULQJ 7KH LPSRUWDQW JURXS RI ]RRSODQNWRQ LQ V  
DQG &ODGRFHU 7KH KLJKHVW YDOXH RI DYHUDJH GHQVLW\ RI &LUULSHG  
VSULQJ

?YmkcfXg.'=RRSODQNWRQ 'HQVLW\ \$O +DPPDU 0DUVKHV

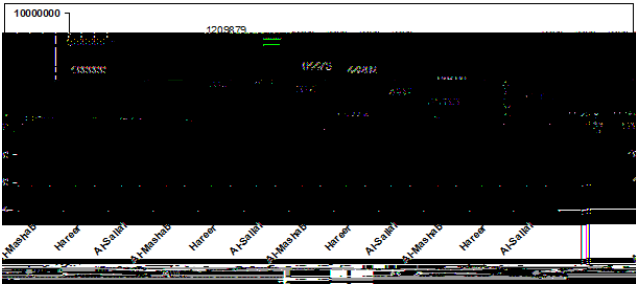
,QWURGXFWRQ

=RRSODQNWRQV LQYDULDEO\ IRUP DQ LQWJUDO FRPSRQHQW DQG  
VLJQL}FRVWUULEXWH WR ELRORJLFDO SURGXFWLYLW\ RI IUHVKZDWHU  
FRPPXQLWLHV > @ 'XH WR WKHLU\WKLPSRUWDQFH DV IRRG IRU  
]RRSODQNWRQV KDYH EHHQ VWXGLHG IURP YDULRXV LQODQG HFRV\ VWHPV RI  
,UDT ,QIRUPDWLRQ RQ WKH HFRORJ\ RI WKLV JURXS RI RUJDQLVPV LQ ,UDTLV  
\$O +DPPDU 0DUVKHV KRZHYHU LV VWLOO OLPLWHG =RRSODQNWRQ PD\ DOVR  
RvHLQVLJKW RQ SURGXFWLYLW\ RIURWKHRIJURXS RI RUJDQLVPV  
]RRSODQNWRQ SURGXFWLRQ FDQ EH XVHG DV D WRRO WR HVWLPDWH WKH  
H[SORLW\RIURFN RI DQ DUHD > @ ,Q PDUVK HQYLURQPHQW  
]RRSODQNWRQ DUH JRRG HFRORJLFDO LQGLFDWRUV GXH WR WKHLU ZLGH

]RRSOA K 0 € K€ @P €0 PÀ€I

VSHFLHV RI 5RWLIHUD VSHFLHV ZHUH QHZ UHFRUGV WR ,UDT )LQDOO\ UHSRU  
RI 6DOPDQ HW DO > @ DERXW ]RRSODQNWRQ VRXWKHUQ ,UDT

+RZHYHU WKH PRVW VWXGLHV RI WKLV UHYLHZ ZHUH PDLQO\ FRQFHUQH  
ZLWK WKH WD[RQRP\ RI &ODGRFHU DQG WR D OHVVHU H[WHQW RI &RSHSRGD  
ZKHUHDV WKH ODWWHU DUWLFOHV ZHUH LQYHVWLJDWLQJ WKH DEXQGDQFH DG  
GLVWULEXWLRQ RI &ODGRFHU DQG &RSHSRGD DQG RQO\ IHZ SDSHUV ZHUH  
FRQFHUQH ZLWK URMLHHRUDKH DEXQGDQFH WKURURXJK  
LQYHVWLJDWLQJ RI WKH YDULRXV JURXS RI ]RRSODQNWRQ WKURXJKRXW  
GLVWULEXWLRQV LQ %DVUDK DQG IRU RQH FRPSOHWH \HDU )RU WKLV UHDVRQ  
DQG IRU HVWLPDWLQJ WKH ]RRSODQNWRQ SURGXFWLRQ LQ YDULRXV ORFDOLWLH  
%DVUDK ZKLFK KDV QRW EHHQ FRQGXFWHG EHIRUH WKH SUHVHQW VWXG\ ZDV  
FDUULHG RXW 0RVW RI WKH UHSRUWHG VWXGLHV RQ ]RRSODQNWRQ LQ HFRV\VWH  
RI VRXWKHUQ ,UDT IRFXV RQ RQH RU D IHZ WD[RQRPLF JURXS )HZ VWXGLHV  
H[WHQGHG LQYHVWLJDWLQJ WR LQFOXGH HTXDOO\ LPSRUWDQW JURXS RI  
]RRSODQNWRQ 0RUHRYHU VWXGLHV ODFNHG DGHTXDWH WHPSRUDO FRYHU ,Q WK



:KLFK REVHUYHG WKH &LUULSHGH ODUYDH ZHUH ZHDN SRVLWLYH  
UHODWLRQVKLS ZLWK DOO IDFWRUV ZKHUHDV WKH 2OLJRFKDHWD 2VWUDFRGD  
\$QQHOLGD )LVK ODUYDH )RUDPLQLHUD \*D VWURSRGD ,QVHFW ODUYDH  
5RWLIHUV \$PSKLSRGD 1DXSOLL DQG &RSHSRGD ORZ SRVLWLYH UHODWLRQVKLS  
ZLWK GLVVROYHG R[\JHQ DQG QHJDWLYH UHODWLRQVKLS ZLWK RWKHU IDFWRUV  
:KLOH &ODGRFHU =RHD RI VKULPS DQG ]RHD RI FUDE KDG EHHQ OLQNHG  
SRVLWLYH UHODWLRQVKLS ZLWK DOO IDFWRUV H[FHSW GLVVROYHG R[\JHQ DV  
UHFRUGHG QHJDWLYH



)LJXUHH &ODGRFHU SHUFHQWDJH RI WKH WRWDO ]RRSODQNWRQ DW  
VWXG\ DUHD

HLJKW VSHFLHV WKDW KDYH EHHQ UHFRUGHG LQ WKDW 5LYHU .KDODI HW DO >  
FDUULHG RXW DW \$O =DDIDUDQLDK SRROV \$EEDV > @ DW WKH 1RUWKHUQ SDU



.KDOS16KLLK\$E 6HDVRRQDO YDULDWLRQKLSKIDWOPBSBXODWYRORQRHQWDO \$SSURDFK  
0RLQDFDFURF@SDDXVORLDDGFUXNDJ&UXVWDFHQBQLYHUVLW\RI%DVUDK ,Q\$UDELF  
&ODGRFHU LQ=RDIDUDQL\KSRROV +\GURELRLR7DSDUL&&-)\$ERZHL=RRSO(DCHFWB&URHH  
\$KPDG 8 3DUYHHQ 6 .KDQ \$\$ .DELU +\$ 0RLQDU+5\$OMW 1D0HULD (QYLURQ (FRO  
=RRSODQNWRQ SRSXODWLRQ LQ UHODWLRQ\$MROKAVLEBFFKHPLFDO\$ODFWRUV RLRPSOD  
VHZDJH IHG SRQG RI \$OLJDUK 8WWDU 3UDGHRKWKHGLQ ,%LRODUVKQEXOHGLVLOH  
6SHFLDO ,VVXH \$O=XESLGL 'LVWULEXWLRQ DQG DEXQGD  
5HLG \* (FRORJ\ RI LQODQG ZBXED DQ@ W\KWXDULMW \$H\$QDEH VVWXDU\ DQG 1RUW  
&RUS 1HZ <RUN 3XOI K@0  
6DE\$L \$OL #MD\$6KDZND.VV7P 9HUWLFDO  
GLVWUJERSVLRONSVHFQHFV LQ 6DPDUUD3URFRXQGPHQW ,UDT  
WK 6FL &RQI 65&  
\$O 0DKPRR+ \$X DZLO \$FOUD-K 6XUYH\ IRU WKH  
HYDOXDWLRQ RI SK\VLFDQ FKHPLFDO SDUDPHWHUV RI 6KDWW \$O \$UDE :DWHUV  
%DVUDK &LW\ %DVUDK - \$JULF 6FL VSHFLDO LVVXH  
\$O /D\$\$ H HQYLUREP#HWWD@IHUS\$ODUP RQ  
WKH 7LJULV 5LYHU EHIRUH HQWMLURROOHWKHH %DJKGDG FLW\ 3K '  
6FLHQFH 8QLYHUVLW\ RI \$O 0LVWDQVLUD ,Q \$UDELF  
\$O 0RV\$Z\$+XVVDL\$Q H SK\VLFDQ DQG FKHPLFDO  
SURSHUWLHV RI ZKZRU LQDVRXWVHQQ