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(73) 특허권자
한국해양과학기술원
경기도 안산시 상록구 해안로 787 (사동)
(72) 발명자
염승식
경상남도 거제시 중곡로2길 25 504-1303
이나영
부산광역시 동래구 쇠미로17번길 3 A동 501호 (사직동,성지그린빌)
조예진
부산광역시 금정구 안뜰로5 정원맨션 201호
(74) 대리인
이원희

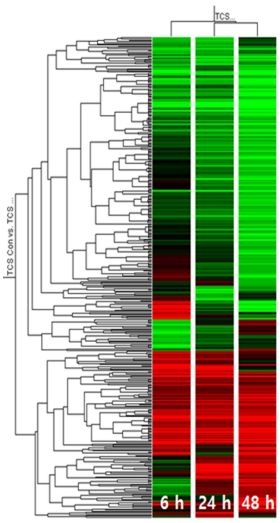
전체 청구항 수 : 총 11 항 심사관 : 김정태

(54) 발명의 명칭 **트리클로산 노출에 대응하는 히드라 유전자 및 이를 이용한 수생태계 환경오염 진단 방법**

(57) 요 약

본 발명은 트리클로산(Triclosan, TCS) 노출에 대응하는 히드라(*Hydra magnipapillata*) 유전자 및 이를 이용하여 수생태계 환경오염을 진단하는 방법에 관한 것으로, 구체적으로 히드라를 배양하여 트리클로산을 7.35 μg/L 농도로 6 h, 24 h 및 48 h 동안 노출시킨 후, 이로부터 RNA를 분리하고, cDNA를 합성한 뒤, Cy3 및 Cy5로 표지하여 혼성화하였고, oligo-마이크로어레이를 제작하여 이를 분석한 결과, 트리클로산 6시간 노출군에서는 32종의 유전자(증가 20종, 감소 12종); 24시간 노출군에서는 10종의 유전자(증가 9종, 감소 1종); 48시간 노출군에서는 114종의 유전자(증가 22종, 감소 92종)의 유전자들이 트리클로산 노출에 의해 발현량이 변화되는 것을 확인함으로써, 상기 156종의 유전자들은 트리클로산 노출을 확인할 수 있는 바이오마커로 유용하게 활용될 수 있다.

대 표 도 - 도1



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명 세 서

청구범위

청구항 1

서열번호 1 내지 156으로 기재되는 모든 유전자 각각의 핵산 서열의 올리고뉴클레오티드 전부 또는 그의 상보가닥 분자가 집적된, 시료내 트리클로산(triclosan, TCS) 노출 여부 검출용 마이크로어레이 칩(microarray chip).

청구항 2

제 1항에 있어서, 상기 유전자는 히드라 (*Hydra magnipapillata*)로부터 유래된 것을 특징으로 하는 트리클로산 노출 여부 검출용 마이크로어레이 칩.

청구항 3

1) 피검 시료에 노출된 실험군의 히드라와, 정상 대조군의 히드라에서 각각 RNA를 분리하는 단계;

2) 단계 1)의 실험군 및 대조군의 RNA로부터 cDNA를 합성하면서 실험군과 대조군을 각기 다른 형광물질로 표지하는 단계;

3) 단계 2)의 각기 다른 형광물질로 표지된 cDNA를 제 1항의 마이크로어레이 칩과 혼성화시키는 단계;

4) 반응한 마이크로어레이 칩을 분석하는 단계; 및

5) 분석한 데이터에서 제 1항의 마이크로어레이 칩에 집적된 유전자 발현 정도를 대조군과 비교하여 확인하는 단계를 포함하는, 시료내 트리클로산 노출 여부 검출 방법.

청구항 4

제 3항에 있어서, 상기 시료는 생체시료, 식품시료, 화학시료, 공업시료, 임상시료 및 환경시료로 구성된 군으로부터 선택되는 어느 하나인 것을 특징으로 하는 트리클로산 노출 여부 검출 방법.

청구항 5

제 3항에 있어서, 상기 단계 2)의 형광물질은 Cy3, Cy5, FITC(poly L-lysine-fluorescein isothiocyanate), RITC(rhodamine-B-isothiocyanate) 및 로다민(rhodamine)으로 이루어진 군으로부터 선택되는 어느 하나인 것을 특징으로 하는 트리클로산 노출 여부 검출 방법.

청구항 6

1) 피검시료에 노출된 실험군의 히드라와, 정상 대조군의 히드라에서 각각 RNA를 분리하는 단계;

2) 단계 1)의 RNA를, 서열번호 1 내지 156으로 기재되는 각각의 유전자에 상보적이고 유전자를 증폭할 수 있는 프라이머 쌍을 모두 사용하여 정량 실시간 RT-PCR(Quantitative real-time reverse transcript polymerase chain reaction, qRT-PCR)을 수행하는 단계; 및

3) 단계 2)의 유전자 산물을 대조군과 비교하여 발현 정도를 확인하는 단계를 포함하는, 시료내 트리클로산 노출 여부 검출 방법.

청구항 7

제 6항에 있어서, 상기 시료는 생체시료, 식품시료, 화학시료, 공업시료, 임상시료 및 환경시료로 구성된 군으로부터 선택되는 어느 하나인 것을 특징으로 하는 트리클로산 노출 여부 검출 방법.

청구항 8

제 1항의 마이크로어레이 칩을 포함하는 트리클로산 노출 여부 검출용 키트.

청구항 9

제 8항에 있어서, 스트렙타비딘-알칼리 탈인화효소 접합물질(strepavidin -like phosphatease conjugate), 화학형광물질(chemiflurorensce) 및 화학발광물질(chemiluminescent)로 이루어진 형광물질군으로부터 선택되는 어느 하나를 추가적으로 포함하는 것을 특징으로 하는 트리클로산 노출 여부 검출용 키트.

청구항 10

제 8항에 있어서, 혼성화에 사용되는 완충용액, RNA로부터 cDNA(complementary DNA)를 합성하기 위한 역전사효소, dNTPs(deoxynucleotide triphosphates) 및 rNTPs(ribonucleotide triPhosphates, 사전 혼합형 또는 분리 공급형), 표식시약, 및 세척 완충용액으로 이루어진 반응 시약군으로부터 선택되는 어느 하나를 추가적으로 포함하는 것을 특징으로 하는 트리클로산 노출 여부 검출용 키트.

청구항 11

서열번호 1 내지 156으로 기재되는 각각의 유전자에 상보적이고 유전자를 증폭할 수 있는 프라이머 쌍을 모두 포함하는 트리클로산 노출 여부 검출용 키트.

발명의 설명

기 술 분 야

[0001] 발명은 트리클로산(Triclosan, TCS) 노출에 대응하는 히드라 (*Hydra magnipapillata*) 유전자 및 이를 이용하여 수생태계 환경오염을 진단하는 방법에 관한 것이다.

배 경 기 술

[0003] 트리클로산(Triclosan, TCS)은 항균 및 항진균 활성을 갖는 화학물질로, 치약, 방취제, 비누, 세제 등과 같은 개인 청결용품에 사용된다. 미국 식품의약국(US Food and Drug Administratin)에 의하면 트리클로산이 인간에게 위험하다고 알려진 것은 아직 없다고 하지만, 그 위해성에 대해서는 계속 논란이 진행 중이다. 즉, 트리클로산이 독성을 일으키고 면역력을 저하시키며 체내의 호르몬 조절, 특히 에스트로겐 관련 반응과 갑상선 호르몬 관련 반응에 문제를 일으킬 수도 있는 것으로 알려져 있다. 미국의 비영리 환경단체인 EWG 2008년 보고서에 의하면 트리클로산은 수돗물의 염소와 반응하여 발암물질인 염화 다이옥신을 생성하고 그 자체만으로도 갑상선 기능과 갑상선 호르몬을 방해하는 물질로 의심하고 있다.

[0004] 생물들은 환경오염, 기후변화 및 병원성 미생물의 감염 등과 같은 외부 환경변화에 대응하여, 항상성을 유지하기 위해 생체방어기작을 진화시켜왔다. 이 생체방어기작의 대부분은 특정 유전자의 발현량을 능동적으로 변화시켜, 특정 단백질의 양을 조절하는 것으로 나타난다. 따라서 특정 변화에 대한 특이적인 유전자들을 발굴하여 이들의 발현량 변화를 모니터링한다면, 특정지역의 환경변화에 관한 정보뿐만 아니라, 이러한 환경변화가 생명현상에 미치는 영향 및 생태계의 건강에 관한 정보를 얻을 수 있다.

[0005] 히드라(*Hydra magnipalillata*)는 신경세포를 갖고 있는 최초의 다세포 동물로서, 생물 진화의 연구에도 매우 중요한 위치를 차지하고 있다. 이배엽성 동물로서 번식은 무성 및 유성생식에 의하며, 뛰어난 재생능력을 갖고 있다. 형태형성과 관련된 신호전달계(Hobmayer 등, 2000, Nature 407: 186-189; Arvizu 등, 2006, Differentiation 74: 305-312; Augustin 등, 2006, Dev. Biol. 296: 62-70; Kaesbauer 등, 2007, Bev. Biol. 303: 376-390), 재생과 관련된 신호 및 신호전달계(Bode, 2003, Dev. Dyn. 226: 225-236; Fujisawa, 2003, Dev. Dyn. 226: 182-189; Holstein 등, 2003, Dev. Dyn. 226: 257-267), 세포분화의 신호전달과 관련된 연구(Thomsen 등, 2004, Mech. Dev. 121: 195-204; Philipp 등, 2005, Gene Expr. Patterns, 5: 397-402) 및 조직의 fate 결정 신호(Bielen 등, 2007, Development, 134: 4187-4197)등이 알려져 있다. 이러한 신호전달계는 진화과정을 통해 모든 동물에 공통적으로 존재함으로, 히드라에서의 신호전달계 이상을 다른 동물에 외삽할 수 있다. 대부분의 동물에서 초기발생과정에만 발현하는 다양한 유전자들이 Hydra에서는 성체에서도 그 발현이 유지된다. 따라서 시기적인 제한을 받지않고 이와 관련된 신호전달계의 연구가 가능하다. 각 세포형에 대한 분자마커들이 알려져 있어, 세포분화에 대한 연구도 가능하다. 유전자 및 단백질 발현의 localization을 위한 in situ hybridization(ISH) 및 immunohistochemistry(IHC)법도 정립되어 있다. 현재 160,000 클론의 ESTs 정보 및 genome data(Chapman 등, 2010, Nature 464: 592-596)가 DB화되어 있어, 다양한 신호전달계에 속하는 유전자들에 대한 정보 검색이 가능하다.

[0006] 이에 본 발명자들은 트리클로산 노출에 대한 특이 유전자후보의 확보 및 검출을 위해, DDBJ/EMBL/NCBI 유전자 데이터베이스에 축적되어 있는 유전자 정보로부터 17,000여개의 singleton을 추출하였다. 추출된 singleton들에 대한 oligo-probe를 디자인하고, 이들을 탑재한 17K Hydra Express Gene Microarray(HEGEM)을 완성하였다. 이 17K HEGEM을 이용하여 TCS 6시간 노출군에서는 32종의 유전자(증가 20종, 감소12종); 24시간 노출군에서는 10종의 유전자(증가 9종, 감소 1종); 48시간 노출군에서는 114종의 유전자(증가 22종, 감소 92종)들이 트리클로산 노출에 의해 발현량이 변화되는 것으로 파악되며, 노출에 의해 발현량이 변화되는 유전자를 발굴, 트리클로산 노출 여부를 확인할 수 있는 바이오마커 및 이를 이용한 노출 여부를 확인하는 방법을 확립하여 본 발명을 완성하였다.

발명의 내용

해결하려는 과제

[0008] 본 발명의 목적은 트리클로산(Triclosan, TCS) 노출에 대응하는 히드라 (*Hydra magnipapillata*) 유전자 및 이를 이용한 트리클로산 노출 여부를 확인하는 방법을 제공하는 것이다.

과제의 해결 수단

[0010] 상기 목적을 달성하기 위하여, 본 발명은 서열번호 1 내지 156으로 기재되는 모든 유전자 각각의 핵산 서열의 올리고뉴클레오티드 전부 또는 그의 상보가닥 분자가 집적된, 시료내 트리클로산(triclosan, TCS) 노출 여부 검출용 마이크로어레이 칩(microarray chip)을 제공한다.

[0011] 또한, 본 발명은

[0012] 1) 피검 시료에 노출된 실험군의 히드라와, 정상 대조군의 히드라에서 각각 RNA를 분리하는 단계;

[0013] 2) 단계 1)의 실험군 및 대조군의 RNA로부터 cDNA를 합성하면서 실험군과 대조군을 각기 다른 형광물질로 표지하는 단계;

[0014] 3) 단계 2)의 각기 다른 형광물질로 표지된 cDNA를 상기 마이크로어레이 칩과 혼성화시키는 단계;

[0015] 4) 반응한 마이크로어레이 칩을 분석하는 단계; 및

[0016] 5) 분석한 데이터에서 상기 마이크로어레이 칩에 집적된 유전자 발현 정도를 대조군과 비교하여 확인하는 단계를 포함하는, 시료내 트리클로산 노출 여부 검출 방법을 제공한다.

[0017] 또한, 본 발명은

[0018] 1) 피검시료에 노출된 실험군의 히드라와, 정상 대조군의 히드라에서 각각 RNA를 분리하는 단계;

[0019] 2) 단계 1)의 RNA를, 서열번호 1 내지 156으로 기재되는 각각의 유전자에 상보적이고 유전자를 증폭할 수 있는 프라이머 쌍을 모두 사용하여 정량 실시간 RT-PCR(Quantitative real-time reverse transcript polymerase

chain reaction, qRT-PCR)을 수행하는 단계; 및

[0020] 3) 단계 2)의 유전자 산물을 대조군과 비교하여 발현 정도를 확인하는 단계를 포함하는, 시료내 트리클로산 노출 여부 검출 방법을 제공한다.

[0021] 또한, 본 발명은 상기 마이크로어레이 칩을 포함하는 트리클로산 노출여부 검출용 키트를 제공한다.

[0022] 아울러, 본 발명은 서열번호 1 내지 156으로 기재되는 각각의 유전자에 상보적이고 유전자를 증폭할 수 있는 프라이머 쌍을 모두 포함하는 트리클로산 노출 여부 검출용 키트를 제공한다.

발명의 효과

[0024] 본 발명에서 히드라(*Hydra magnipapillata*) 유전자 oligo-마이크로어레이를 활용한, 마이크로어레이 실험분석을 통해, 트리클로산 6시간 노출군에서는 32종의 유전자(증가 20종, 감소 12종); 24시간 노출군에서는 10종의 유전자(증가 9종, 감소 1종); 48시간 노출군에서는 114종의 유전자(증가 22종, 감소 92종)의 유전자들이 트리클로산 노출에 의해 발현량이 변화되는 것을 확인함으로써, 상기 156종의 유전자들은 트리클로산 노출을 확인할 수 있는 바이오마커로 유용하게 활용될 수 있다.

도면의 간단한 설명

[0026] 도 1은 트리클로산(Triclosan, TCS)에 노출한 히드라(*Hydra magnipapillata*)의 차등 발현 유전자 프로파일링 Hierachial clustering 결과를 나타낸 도이다.

발명을 실시하기 위한 구체적인 내용

[0027] 이하, 본 발명을 상세히 설명한다.

[0028] 본 발명은 트리클로산(triclosan; TCS) 노출에 대응하여 발현이 변화하는 히드라(*Hydra magnipapillata*) 유래의 유전자를 발굴하여, 상기 트리클로산 노출에 대하여 발현량이 변화하는 히드라 유래 유전자를 집적한 마이크로어레이 칩을 트리클로산 노출 여부 검출 및 수생태계 오염 상태를 진단하는데 이용할 수 있다.

[0030] 본 발명은 서열번호 1 내지 156으로 기재되는 각각의 핵산 서열의 올리고뉴클레오티드 전부 또는 그의 상보가닥 분자가 집적된, 시료내 트리클로산(triclosan, TCS) 노출 여부 검출용 마이크로어레이 칩(microarray chip)을 제공한다.

[0031] 상기 유전자는 히드라 (*Hydra magnipapillata*)로부터 유래된 것이 바람직하다.

[0032] 상기 트리클로산 노출 여부 검출용 마이크로어레이 칩은 당업자에게 알려진 방법으로 제작할 수 있다. 상기 마이크로어레이 칩을 제작하는 방법은 하기와 같다. 상기 탐색된 유전자를 프로브로 이용하여 마이크로어레이 칩의 기판상에 고정화시키기 위해 파이조일렉트릭(piezoelectric) 방식을 이용한 마이크로피펫팅(micropipetting)법 또는 핀(pin) 형태의 스폿터(spotter)를 이용한 방법 등을 사용하는 것이 바람직하나 이에 한정되지 않는다. 상기 마이크로어레이 칩의 기판은 아미노-실란(amino-silane), 폴리-L-라이신(poly-Llysine) 및 알데히드(aldehyde)로 이루어진 군에서 선택되는 하나의 활성기가 코팅된 것이 바람직하나 이에 한정되지 않는다. 또한, 상기 기판은 슬라이드 글라스, 플라스틱, 금속, 실리콘, 나일론 막, 및 니트로셀룰로스 막으로 이루어진 군에서 선택될 수 있으나 이에 한정되지 않는다.

[0034] 또한, 본 발명은

[0035] 1) 피검 시료에 노출된 실험군의 히드라와, 정상 대조군의 히드라에서 각각 RNA를 분리하는 단계;

[0036] 2) 단계 1)의 실험군 및 대조군의 RNA로부터 cDNA를 합성하면서 실험군과 대조군을 각기 다른 형광물질로 표지하는 단계;

[0037] 3) 단계 2)의 각기 다른 형광물질로 표지된 cDNA를 상기 마이크로어레이 칩과 혼성화시키는 단계;

[0038] 4) 반응한 마이크로어레이 칩을 분석하는 단계; 및

[0039] 5) 분석한 데이터에서 상기 마이크로어레이 칩에 집적된 유전자 발현 정도를 대조군과 비교하여 확인하는 단계를 포함하는, 시료내 트리클로산(triclonsan, TCS) 노출 여부 검출 방법을 제공한다.

[0040] 상기 시료는 생체시료, 식품시료, 화학시료, 공업시료, 임상시료 및 환경시료로 구성된 군으로부터 선택되는 어

느 하나인 것이 바람직하다.

[0041] 또한, 상기 단계 2)의 형광물질은 Cy3, Cy5, FITC(poly L-lysine-fluorescein isothiocyanate), RITC(rhodamine-B-isothiocyanate) 및 로다민(rhodamine)으로 이루어진 군으로부터 선택되는 어느 하나인 것이 바람직하다.

[0043] 또한, 본 발명은

[0044] 1) 피검시료에 노출된 실험군의 히드라와, 정상 대조군의 히드라에서 각각 RNA를 분리하는 단계;

[0045] 2) 단계 1)의 RNA를, 서열번호 1 내지 156으로 기재되는 각각의 유전자에 상보적이고 유전자를 증폭할 수 있는 프라이머 쌍을 모두 사용하여 정량 실시간 RT-PCR(Quantitative real-time reverse transcript polymerase chain reaction, qRT-PCR)을 수행하는 단계; 및

[0046] 3) 단계 2)의 유전자 산물을 대조군과 비교하여 발현 정도를 확인하는 단계를 포함하는, 시료내 트리클로산 노출 여부 검출 방법을 제공한다.

[0047] 상기 시료는 생체시료, 식품시료, 화학시료, 공업시료, 임상시료 및 환경시료로 구성된 군으로부터 선택되는 어느 하나인 것이 바람직하다.

[0048] 또한, 본 발명은 상기 마이크로어레이 칩을 포함하는 트리클로산 노출 여부 검출용 키트를 제공한다.

[0049] 상기 키트는 스트렙타비딘-알칼리 탈인화효소 접합물질(strepavidin -like phosphatease conjugate), 화학형광물질(chemiflurorensce) 및 화학발광물질(chemiluminescent)로 이루어진 형광물질군으로부터 선택되는 어느 하나를 추가적으로 포함하는 것이 바람직하다.

[0050] 또한, 상기 키트는 혼성화에 사용되는 완충용액, RNA로부터 cDNA(complementary DNA)를 합성하기 위한 역전사효소, dNTPs(deoxynucleotide triphosphates) 및 rNTPs(ribonucleotide triPhosphates, 사전 혼합형 또는 분리 공급형), 표식시약, 및 세척 완충용액으로 이루어진 반응 시약군으로부터 선택되는 어느 하나를 추가적으로 포함하는 것이 바람직하다.

[0051] 아울러, 본 발명은 서열번호 1 내지 156으로 기재되는 각각의 유전자에 상보적이고 유전자를 증폭할 수 있는 프라이머 쌍을 모두 포함하는 트리클로산 노출 여부 검출용 키트를 제공한다.

[0054] 이하, 본 발명을 실시예에 의해서 상세히 설명한다.

[0055] 단, 하기 실시예는 본 발명을 예시하기 위한 것일 뿐, 본 발명이 하기 실시예에 의해서 한정되는 것은 아니다.

[0056] **<실시예 1> 히드라의 배양 및 트리클로산 노출**

[0057] **<1-1> 히드라의 배양**

[0058] 히드라(*Hydra magnipapillata*)의 야생종(wild strain) 105는 1 mM NaCl, 1 mM $CaCl_2$, 0.1 mM KCl, 0.1 mM $MgSO_4$, 1 mM Tris (hydroxymethyl) aminoethane (pH7.6)에 배양하였다. 수온은 20℃로 고정하였으며, 이틀에 한번 갓 부화한 아르테미아(*Artemia*) 유생을 먹이로 공급하였다. 먹이 공급 후, 수 시간 이후에 배양액을 교환하였다.

[0060] **<1-2> 트리클로산 노출**

[0061] 히드라를 대상으로 트리클로산 노출 조건을 확립하기 위해, 트리클로산 반수치사농도(Lethal concentration 50, LC_{50})를 결정하였다. 그 결과, 48 시간 노출 반수치사농도는 367.72 μg/L로 확인되었다. 차등발현 유전자 프로파일링을 위한 노출 농도는 48 h LC_{50} (367.72 μg/L)의 약 1/50에 해당하는 7.35 μg/L에 히드라 20 개체를 각각 6 h, 24 h, 48 h 동안 노출하였다.

[0063] **<실시예 2> 트리클로산 노출에 의한 유전자 발현량 변화 측정**

[0064] **<2-1> RNA 추출 및 cDNA 합성**

[0065] 노출 시험군(6, 24, 48시간) 및 노출하지 않은 대조군의 히드라조직에 Tri-Reagent 용액(Molecular Research Center Inc, Cincinnati, Ohaio, USA) 1 ml을 넣고 유리 균질기(glass homogenizer)를 이용하여 균질화하고, 실온에 분간 방치하였다. 클로로포름 200 μl를 첨가하여 잘 섞은 후, 실온에서 10분간 방치하고, 15분간 원심

분리(12,000×g, 4℃)하였다. 그런 다음, 상층액을 수득하여, 아이소프로판올(isopropanol) 500 ㎕를 넣고, 상온에 5분간 방치하였다. 약 20 분간 원심분리(12,000×g, 4℃)한 후, 용액을 제거하여 침전물만을 취합하였고, 상기 침전물에 70% 에탄올 용액 50 ㎕를 넣어 5분간 원심분리한 뒤, 에탄올 용액을 제거하고 침전된 RNA를 건조시켰다. 건조 후, 적당량의 에틸피로카보네이트(diethylpyrocarbonate, DEPC)로 처리한 멸균수에 용해하였다

[0067] **<2-2> Cy3 및 Cy5 표지**

[0068] 정제된 노출군 및 대조군의 전체 RNA는 Agilent's Low RNA Input Linear Amplification Kit Plus (Agilent Technologies, USA)를 사용하여 제조사의 프로토콜을 따라 다음과 같이 Cy3 및 Cy5로 표지하였다.

[0069] 구체적으로, RNA 1 ㎍을 dT-프로모터 프라이머(dT-promoter primer)와 MMLV-역전사효소(MMLV-Reverse transcriptase)와 혼합하여 40℃에서 2시간 동안 역전사반응을 수행하였다. 그런 다음, T7 중합효소(T7 polymerase)를 첨가하여 40℃에서 2시간 동안 선형 증폭(linear amplification)을 수행하였다. 이와 같은 증폭과정을 통해 실험군 및 대조군의 시료를 각각 Cy3-CTP와 Cy5-CTP로 표지하였다.

[0071] **<2-3> 혼성화(Hybridization) 및 스캐닝(scanning)**

[0072] 형광물질이 라벨링된 cRNA 시료를 Qiagen PCR purification kit을 사용하여 정제하고, 증류수로 용출하였다. 정제된 형광표지-cRNA 시료를 혼성화 완충액(hybridization buffer)(3×SSC, 0.3% SDS, 50% 포름아미드(formamide), 20 ㎍ Cot-1 DNA, 20 ㎍ 효모균(yeast) tRNA)에 첨가한 후, microcon YM-30으로 농축하여 혼성화 혼합물을 만들었다. 혼성화 혼합물을 95℃로 3분 동안 가열하여 변성시키고 12,000×g에서 30초간 원심분리하며 온도를 낮추었다. 제조된 히드라 oligo-마이크로어레이에 커버슬립(coverslip)을 덮고, 변성시킨 혼성화 혼합물을 파이펫팅(pipetting)하였다. 그 후, 상기 마이크로어레이를 GT-Hyb 챔버(Chamber)에 넣고 65℃에서 16시간 동안 반응시켜 혼성화를 시켰고, 혼성화가 끝난 후, 챔버에서 마이크로어레이를 꺼내어 세척과정을 수행하고, 마이크로어레이를 회전하여 건조한 후 스캐닝 할 때까지 암실에서 보관하였다. 실험이 완료된 히드라 oligo-마이크로어레이를 Axon GenePix 4000B scanner(Axon Instrument, USA)를 사용하여 스캔하였으며, GenePix Pro 6.0 program을 이용하여, 스캔 이미지로부터 각 점을 그리딩 파일(gridding file)을 이용하여 그리딩하고, 정량화하여 각 점의 Cy5/Cy3 강도 및 비율등의 분석값이 포함된 GPR 파일(GPR file)을 얻었다.

[0074] **<실시예 3> 마이크로어레이 자료 분석**

[0075] GenePix Pro Program에서 얻어진 GPR 파일로부터, 분석 프로그램인 GeneSpring 7.3.1(Agilent Technologies, USA)를 이용하여 아래와 같이 분석을 수행하였다:

[0076] 표준화(Normalization)는 LOWESS(locally weighted regression scatterplot smoothing)를 이용하여 수행하였고, 신뢰할 수 있는 유전자(Reliable gene)는 중앙값의 합이 배경(background) 보다 낮거나, 각 화소(pixel) 값의 표준편차가 유의하지 않은 점을 플래그 아웃(flag-out)함으로써 유의한 유전자를 얻었다. 유의한 유전자(Significant genes)는 평준화된 비율(normalized ratio) 값이 10배 이상 차이를 보이는 점을 선별하였다.

[0078] **<3-1> 특이유전자후보군의 확인**

[0079] 1차적으로 트리클로산 노출 시간별 유전자 발현량이 1.5배이상 변화되는 유전자들을 선별하였다. 그 결과, 6시간 노출군에서는 32종의 유전자(증가 20종(표 1), 감소12종(표 2)); 24시간 노출군에서는 10종의 유전자(증가 9종(표 3), 감소 1종(표 4)); 48시간 노출군에서는 114종의 유전자(증가 22종(표 5), 감소 92종(표 6))의 유전자들이 트리클로산 노출에 의해 발현량이 변화되는 것으로 분석되었다. 즉, 표 7 및 표 8에 나타난 바와 같이, 트리클로산 노출에 의해 총 51종의 유전자가 발현이 증가하고, 105종의 유전자 발현이 감소하는 것을 확인함으로써, 상기 156종의 유전자들은 트리클로산 노출을 확인할 수 있는 바이오마커로 활용 가능할 것으로 생각된다.

표 1

[0081] 트리클로산 6 시간 노출군에서 발현량이 1.5배이상 증가되는 유전자 목록(20종)

유전자	발현량
Glucosamine--fructose-6-phosphate aminotransferase [isomerizing] 2, partial mRNA	1.50
nematocilin B (NemB), mRNA	1.51
ferritin, partial mRNA	1.55
AHNAK nucleoprotein, partial mRNA	1.58

microtubule-actin crosslinking factor 1, partial mRNA	1.59
SNF1-like kinase 2, mRNA	1.60
Glucosamine--fructose-6-phosphate aminotransferase 1, partial	1.61
Radixin, partial mRNA	1.61
harbinger transposase derived 1, partial mRNA	1.64
oxidative stress protein, mRNA	1.68
mitochondrial RNA ligase 2, mRNA	1.76
heat shock protein 90, alpha (cytosolic), class A member 1, mRNA	1.96
5-azacytidine induced 1, mRNA	1.97
testis expressed gene 264, mRNA	2.15
Tumor necrosis factor, alpha-induced protein 8-like protein, mRNA	2.18
DEHA2D14190p, mRNA	2.37
mucin 1, cell surface associated, mRNA	3.14
Sox10, mRNA	5.79
zinc finger with UFM1-specific peptidase domain, partial mRNA	8.04
ERYTHROCYTE MEMBRANE PROTEIN PFEMP3, mRNA	8.57

표 2

[0083] 트리클로산 6 시간 노출군에서 발현량이 1.5배이상 감소되는 유전자 목록(12종)

유전자	발현량
zinc finger protein Ssu-Zic, partial mRNA	-1.50
ribonucleoside-diphosphate reductase small chain, mRNA	-1.50
glutamine rich 2, mRNA	-1.50
c-K-ras2 protein, mRNA	-1.51
phospholipase A2, mRNA	-1.55
homeobox Hx, mRNA	-1.63
homeobox protein Otx, mRNA	-1.65
GLI pathogenesis-related 2, mRNA	-1.65
potassium channel homolog, mRNA	-1.69
coenzyme Q5 homolog, methyltransferase, mRNA	-1.76
acyl-Coenzyme A dehydrogenase, long chain, mRNA	-1.82
aldehyde dehydrogenase 8A1, mRNA	-1.99

표 3

[0085] 트리클로산 24 시간 노출군에서 발현량이 1.5배이상 증가되는 유전자 목록(9종)

유전자	발현량
TANK-binding kinase 1, mRNA	1.52
variable membrane protein, partial mRNA	1.52
complement component C3-like protein, partial mRNA	1.52
WntX2, mRNA	1.60
translationally controlled tumor protein, mRNA	1.60
polyprotein, mRNA	1.72
antistasin, mRNA	1.75
Glycoprotein 3-alpha-L-fucosyltransferase A, mRNA	1.81
Probable voltage-dependent N-type calcium channel subunit alpha-1B, partial mRNA	1.91

표 4

[0087] 트리클로산 24 시간 노출군에서 발현량이 1.5배이상 감소되는 유전자 목록(1종)

유전자	발현량
Ornithine decarboxylase, partial mRNA	-1.60

표 5

[0089] 트리클로산 48 시간 노출군에서 발현량이 1.5배이상 증가되는 유전자 목록(22종)

유전자	발현량
PMP1 protein, mRNA	1.51
tfiia large subunit, mRNA	1.52
pregnancy zone protein, partial mRNA	1.55
conserved hypothetical protein, mRNA	1.56
alpha macroglobulin, partial mRNA	1.59
selenium binding protein 1, mRNA	1.59
Protein C20orf11 homolog, mRNA	1.60
LSM14 homolog B, mRNA	1.60
C3 and PZP-like, alpha-2-macroglobulin domain containing 8, partial mRNA	1.62
HyTSR1 protein, partial mRNA	1.65
golgi reassembly stacking protein 2, mRNA	1.66
protein disulfide isomerase, mRNA	1.67
G-protein coupled receptor 112, mRNA	1.69
acheron, partial mRNA	1.76
Hexosaminidase domain-containing protein, mRNA	1.77
brachyury, mRNA	1.79
DnaJ (Hsp40) homolog, subfamily C, member 3, mRNA	1.84
Na,K-ATPase alpha subunit, mRNA	1.91
Brain-specific angiogenesis inhibitor 3, mRNA	1.98
chondroItin 4-sulfotransferase, mRNA	4.05
hydra Na channel 3, mRNA	6.25
ADP-ribosylation factor-like 11, mRNA	129.42

표 6

[0091] 트리클로산 48 시간 노출군에서 발현량이 1.5배이상 감소되는 유전자 목록(92종)

유전자	발현량
protein phosphatase 1, catalytic subunit, alpha, partial mRNA	-1.50
Latent-transforming growth factor beta-binding protein, isoform	-1.50
Late histone H2A.2.2, mRNA	-1.50
von Willebrand factor D and EGF domains, partial	-1.51
myosin V, mRNA	-1.52
poly-gamma-glutamate synthesis protein, mRNA	-1.52
PIF1p DNA helicase (yeast) homolog family member (pif-1), partial mRNA	-1.52
S-adenosylmethionine decarboxylase; SAMDC, partial mRNA	-1.53
adult brain protein 239-like protein, partial mRNA	-1.53
tyrosine kinase receptor, mRNA	-1.54
doublesex-Mab related 99B, mRNA	-1.54
hemicentin 1, partial mRNA	-1.55
Zinc transporter ZIP12, mRNA	-1.56
beta-tubulin, transcript variant 1, mRNA	-1.56
mini-collagen, transcript variant 1, mRNA	-1.56
hydra Na channel 2 (hynac2), mRNA	-1.57
beta-tubulin, transcript variant 2, mRNA	-1.57
dickkopf-3 related protein, mRNA	-1.58
voltage-dependent calcium channel alpha-2 delta subunit, partial mRNA	-1.58
sulfotransferase family 1B, member 1, mRNA	-1.58
hydra Na channel 3, partial mRNA	-1.58
General transcription factor II-I repeat domain-containing protein 2A, mRNA	-1.59

NAD+-dependent 15-hydoxyprostaglandin dehydrogenase, mRNA	-1.59
receptor for egg jelly 6, partial mRNA	-1.59
adenylate kinase 1, mRNA	-1.60
apextrin, mRNA	-1.60
Serine/threonine-protein phosphatase beta isoform, partial mRNA	-1.61
Ift46 protein, mRNA	-1.61
KSI, mRNA	-1.61
FLJ42117 protein, mRNA	-1.61
zinc finger, MYM domain containing 1, mRNA	-1.61
flagellar calcium-binding protein TB-44A, mRNA	-1.61
Cation transport regulator-like protein 2, mRNAactivin B, mRNA	-1.62
activin B, mRNA	-1.62
prdl-b protein, mRNA	-1.62
nematocyst outer wall antigen, mRNA	-1.62
HyTSR1 protein, mRNA	-1.63
Kinesin-like protein KIF19, mRNA	-1.64
calmodulin, partial mRNA	-1.64
ATP-binding cassette sub-family F member 3, mRNA	-1.64
carbonic anhydrase 7, mRNA	-1.65
Na,K-ATPase alpha subunit, partial mRNA	-1.67
advillin, mRNA	-1.69
voltage-gated sodium channel alpha subunit protein, partial mRNA	-1.70
Neuropilin-1a precursor (znrp1), mRNA	-1.71
mitogen-activated protein kinase 6, transcript variant 2, mRNA	-1.71
carbonic anhydrase 2, mRNA	-1.74
neuropeptide, mRNA	-1.75
mitogen-activated protein kinase 6, transcript variant 1, mRNA	-1.76
FERM domain-containing protein 5, mRNA	-1.76
calmodulin, mRNA	-1.78
glutathione synthetase, mRNA	-1.80
BTB (POZ) domain containing 7, mRNA	-1.82
nudix-type motif 3, mRNA	-1.83
Rho GTPase activating protein 6, mRNA	-1.84
Prion-like-(Q/N-rich)-domain-bearing protein family member (pqn-13), mRNA	-1.84
Calmodulin CG8472-PA, transcript variant 3, mRNA	-1.86
calmodulin-like 3, mRNA	-1.86
nematoblast specific protein (nb035), partial mRNA	-1.87
ferritin, mRNA	-1.88
myopalladin, mRNA	-1.89
collagen, partial mRNA	-1.90
secreted protein, mRNA	-1.90
carbonic anhydrase 7, transcript variant 1, mRNA	-1.91
epitheliopeptide HYM-301, mRNA	-1.93
Ece1 protein, partial mRNA	-1.93
Metabotropic glutamate receptor 3, partial mRNA	-1.95
SCO-spondin, partial mRNA	-1.96
Sox17 alpha, mRNA	-1.96
ventropin, partial mRNA	-1.96
Ras-like protein family member 11B, mRNA	-1.98
PXN-FBPL, mRNA	-1.98
hydra Na channel 4 (hynac4), partial mRNA	-2.00
WD repeat domain 86, mRNA	-2.04
viral A-type inclusion protein, mRNA	-2.04
deleted in colorectal carcinoma, mRNA	-2.05
minicollagen-15, mRNA	-2.08
Polycystic kidney disease 2-like 2 protein, part	-2.08
carbonic anhydrase 7, transcript variant 2, mRNA	-2.09

Cysteine and glycine-rich protein 2, mRNA	-2.16
calcium transporter 2, partial mRNA	-2.19
transglutaminase, mRNA	-2.32
TiTiN family member (ttn-1), mRNA	-2.33
Rh-associated glycoprotein, partial mRNA	-2.40
probable zinc metalloproteinase, mRNA	-2.41
gamma-glutamyl hydrolase, mRNA	-2.45
mini-collagen, transcript variant 4, mRNA	-2.61
mini-collagen, transcript variant 3, mRNA	-2.62
bcl-2-like 3, mRNA	-2.82
mini-collagen, mRNA	-2.86
Calmodulin CG8472-PA, partial mRNA	-3.02
equinatoxin V, mRNA	-4.22

표 7

[0093] 트리클로산 노출에 의해 히드라에서 발현이 증가하는 유전자 목록(51종)

서열번호	유전자
1	Glucosamine--fructose-6-phosphate aminotransferase [isomerizing] 2, partial mRNA
2	nematocilin B (NemB), mRNA
3	ferritin, partial mRNA
4	AHNAK nucleoprotein, partial mRNA
5	microtubule-actin crosslinking factor 1, partial mRNA
6	SNF1-like kinase 2, mRNA
7	Glucosamine--fructose-6-phosphate aminotransferase 1, partial
8	Radixin, partial mRNA
9	harbinger transposase derived 1, partial mRNA
10	oxidative stress protein, mRNA
11	mitochondrial RNA ligase 2, mRNA
12	heat shock protein 90, alpha (cytosolic), class A member 1, mRNA
13	5-azacytidine induced 1, mRNA
14	testis expressed gene 264, mRNA
15	Tumor necrosis factor, alpha-induced protein 8-like protein, mRNA
16	DEHA2D14190p, mRNA
17	mucin 1, cell surface associated, mRNA
18	Sox10, mRNA
19	zinc finger with UFM1-specific peptidase domain, partial mRNA
20	ERYTHROCYTE MEMBRANE PROTEIN PFEMP3, mRNA
21	TANK-binding kinase 1, mRNA
22	variable membrane protein, partial mRNA
23	complement component C3-like protein, partial mRNA
24	WntX2, mRNA
25	translationally controlled tumor protein, mRNA
26	polyprotein, mRNA
27	antistasin, mRNA
28	Glycoprotein 3-alpha-L-fucosyltransferase A, mRNA
29	Probable voltage-dependent N-type calcium channel subunit alpha-1B, partial mRNA
30	PMP1 protein, mRNA
31	tfiia large subunit, mRNA
32	pregnancy zone protein, partial mRNA
33	conserved hypothetical protein, mRNA
34	alpha macroglobulin, partial mRNA
35	selenium binding protein 1, mRNA
36	Protein C20orf11 homolog, mRNA
37	LSM14 homolog B, mRNA
38	C3 and PZP-like, alpha-2-macroglobulin domain containing 8, partial mRNA
39	HyTSR1 protein, partial mRNA

40	golgi reassembly stacking protein 2, mRNA
41	protein disulfide isomerase, mRNA
42	G-protein coupled receptor 112, mRNA
43	acheron, partial mRNA
44	Hexosaminidase domain-containing protein, mRNA
45	brachyury, mRNA
46	DnaJ (Hsp40) homolog, subfamily C, member 3, mRNA
47	Na,K-ATPase alpha subunit, mRNA
48	Brain-specific angiogenesis inhibitor 3, mRNA
49	chondroItin 4-sulfotransferase, mRNA
50	hydra Na channel 3, mRNA
51	ADP-ribosylation factor-like 11, mRNA

표 8

[0095] 트리클로산 노출에 의해 히드라에서 발현이 감소하는 유전자 목록(105종)

서열번호	유전자
52	zinc finger protein Ssu-Zic, partial mRNA
53	ribonucleoside-diphosphate reductase small chain, mRNA
54	glutamine rich 2, mRNA
55	c-K-ras2 protein, mRNA
56	phospholipase A2, mRNA
57	homeobox Hx, mRNA
58	homeobox protein Otx, mRNA
59	GLI pathogenesis-related 2, mRNA
60	potassium channel homolog, mRNA
61	coenzyme Q5 homolog, methyltransferase, mRNA
62	acyl-Coenzyme A dehydrogenase, long chain, mRNA
63	aldehyde dehydrogenase 8A1, mRNA
64	Ornithine decarboxylase, partial mRNA
65	protein phosphatase 1, catalytic subunit, alpha, partial mRNA
66	Latent-transforming growth factor beta-binding protein, isoform
67	Late histone H2A.2.2, mRNA
68	von Willebrand factor D and EGF domains, partial
69	myosin V, mRNA
70	poly-gamma-glutamate synthesis protein, mRNA
71	PIF1p DNA helicase (yeast) homolog family member (pif-1), partial mRNA
72	S-adenosylmethionine decarboxylase; SAMDC, partial mRNA
73	adult brain protein 239-like protein, partial mRNA
74	tyrosine kinase receptor, mRNA
75	doublesex-Mab related 99B, mRNA
76	hemicentin 1, partial mRNA
77	Zinc transporter ZIP12, mRNA
78	beta-tubulin, transcript variant 1, mRNA
79	mini-collagen, transcript variant 1, mRNA
80	hydra Na channel 2 (hynac2), mRNA
81	beta-tubulin, transcript variant 2, mRNA
82	dickkopf-3 related protein, mRNA
83	voltage-dependent calcium channel alpha-2 delta subunit, partial mRNA
84	sulfotransferase family 1B, member 1, mRNA
85	hydra Na channel 3, partial mRNA
86	General transcription factor II-I repeat domain-containing protein 2A, mRNA
87	NAD+-dependent 15-hydoxyprostaglandin dehydrogenase, mRNA
88	receptor for egg jelly 6, partial mRNA
89	adenylate kinase 1, mRNA
90	apextrin, mRNA
91	Serine/threonine-protein phosphatase beta isoform, partial mRNA

92	Ift46 protein, mRNA
93	KSI, mRNA
94	FLJ42117 protein, mRNA
95	zinc finger, MYM domain containing 1, mRNA
96	flagellar calcium-binding protein TB-44A, mRNA
97	Cation transport regulator-like protein 2, mRNA
98	activin B, mRNA
99	prdl-b protein, mRNA
100	nematocyst outer wall antigen, mRNA
101	HyTSR1 protein, mRNA
102	Kinesin-like protein KIF19, mRNA
103	calmodulin, partial mRNA
104	ATP-binding cassette sub-family F member 3, mRNA
105	carbonic anhydrase 7, mRNA
106	Na,K-ATPase alpha subunit, partial mRNA
107	advillin, mRNA
108	voltage-gated sodium channel alpha subunit protein, partial mRNA
109	Neuropilin-1a precursor (znrp1), mRNA
110	mitogen-activated protein kinase 6, transcript variant 2, mRNA
111	carbonic anhydrase 2, mRNA
112	neuropeptide, mRNA
113	mitogen-activated protein kinase 6, transcript variant 1, mRNA
114	FERM domain-containing protein 5, mRNA
115	calmodulin, mRNA
116	glutathione synthetase, mRNA
117	BTB (POZ) domain containing 7, mRNA
118	Prion-like-(Q/N-rich)-domain-bearing protein family member (pqn-13), mRNA
119	Rho GTPase activating protein 6, mRNA
120	nudix-type motif 3, mRNA
121	Calmodulin CG8472-PA, transcript variant 3, mRNA
122	calmodulin-like 3, mRNA
123	nematoblast specific protein (nb035), partial mRNA
124	ferritin, mRNA
125	myopalladin, mRNA
126	collagen, partial mRNA
127	secreted protein, mRNA
128	carbonic anhydrase 7, transcript variant 1, mRNA
129	epitheliopeptide HYM-301, mRNA
130	Ece1 protein, partial mRNA
131	Metabotropic glutamate receptor 3, partial mRNA
132	SCO-spondin, partial mRNA
133	Sox17 alpha, mRNA
134	ventropin, partial mRNA
135	Ras-like protein family member 11B, mRNA
136	PXN-FBPL, mRNA
137	hydra Na channel 4 (hynac4), partial mRNA
138	WD repeat domain 86, mRNA
139	viral A-type inclusion protein, mRNA
140	deleted in colorectal carcinoma, mRNA
141	minicollagen-15, mRNA
142	Polycystic kidney disease 2-like 2 protein, part
143	carbonic anhydrase 7, transcript variant 2, mRNA
144	Cysteine and glycine-rich protein 2, mRNA
145	calcium transporter 2, partial mRNA
146	transglutaminase, mRNA
147	TiTiN family member (ttn-1), mRNA
148	Rh-associated glycoprotein, partial mRNA
149	probable zinc metalloproteinase, mRNA

150	gamma-glutamyl hydrolase, mRNA
151	mini-collagen, transcript variant 4, mRNA
152	mini-collagen, transcript variant 3, mRNA
153	bcl-2-like 3, mRNA
154	mini-collagen, mRNA
155	Calmodulin CG8472-PA, partial mRNA
156	equinatoxin V, mRNA

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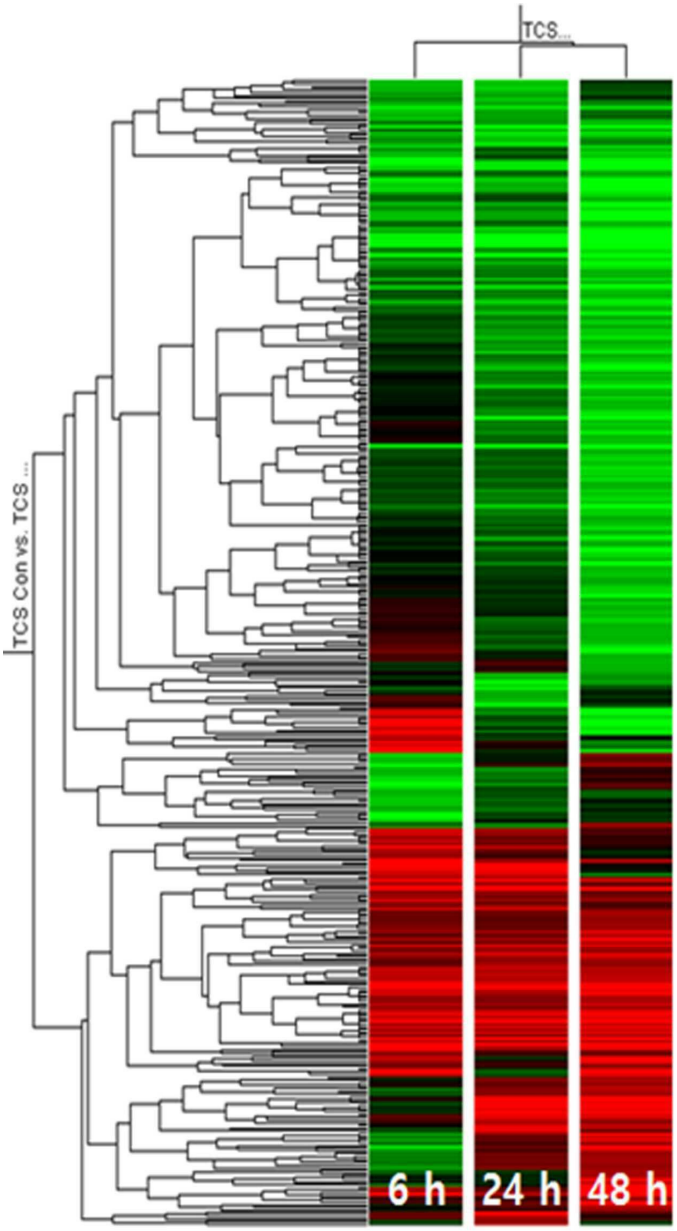
도면1



서 열 목 록

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gagtcgatta gatgaatcca atttaataaa aattaaaaga gaggtgcaga tcatgaagtt 300

attggaacat cctaatgtct taaaactata tcaggttatg gaaaccaaaa atatgcttta 360

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<210> 7
<211> 563
<212> DNA
<213> Hydra magnipapillata
<400> 7

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gtgatttcct tgatagaaat acaccaatat ttcgagatga tgtttgcttt ttcataagtc 480
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tagttgttgg tataaccaat aca 563

<210> 8
<211> 1585
<212> DNA
<213> Hydra magnipapillata
<400> 8

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tgtaacaatc aatgaaacat cagataaatt accagagtta tataagtcaa agatgggaaa 180

atcaataaat gtccgcgtca caactgcgga tgatgaacta gaatttttta tccaacccag 240

cacaactggt cagcagatgc ttgatcaagt gtttaatata attggtcttc aagaaatatg 300

ttttttgga cttcaatata ctgatgtaaa aaactgtact acttggttaa agttaaaaaa 360

gaaagtcata gcgcaagaaa ttaaaaaaga atctccgttg caatttacgc ttcgttccaa 420

atttttcct gaaaatgttg tctctgagtt gacccaagat attacccaaa gattattttt 480

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gcttttggct tcctatgcgg ctcaggtaaa atacggtagc tataaacgtg atattcacat 600

aagcggcttt ttatcaagcg aaaaattatt acctgaggga gtctatacaa aataccaaat 660

aactaaagag cagttagaag aaagagttac aagcttgtgg agtaaacaca caaatatttc 720

gagacaagat tcaatgatgg agtatctaaa aatagcacaa gacctagaga tgtttggagt 780

aaactatttt gaaataaaga acaagtctgg ggttgatctt ttaattggca ttaatgcttt 840

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ctccattcaa aatctttctt ttaatggcaa aaaattttac atcaagttaa ttgatcgtaa 960

agcacatgaa tttatatttt atgtttctca tcatataacc aacaaaagta ttatgtcgct 1020

atgtatggat aattatgaac tttacttgag aagaagaaag cctttaacgg aagttcatca 1080

aataaaagcc caaatgagga ataaaaagaa tgaaaagcac gacgacgcag aaaatgaaaa 1140

aataatgtta gagttaaggc ttaaaaaatt tgaagaagaa gcacgtttag cacatgaagc 1200

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acaagaagct gagcatgaaa gaatggaaaa attagagttt gaaagaaaat catctgagtc 1380

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taagttacgc gacgaagaac aacaaacaaa aatttttttct tctagtccat cagttgtgct 1500

tcaaactaat gaaaaagaag aaaataataa cagcatttta atgacacaaa ataaacatga 1560

cgaatatctc actacaaaga aaaag 1585

<210> 9

<211> 768

<212> DNA

<213> Hydra magnipapillata

<400> 9

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acgaagatgt ttctgacaac gtttttcgag agcagtatcg agtcccaaga gctgtattag 180

atttttttaga aactaggctt aaagatgatt tgcaacatta cactaagcga aataaaagta 240

tttcagtacg tttccagata atggtatttc ttcattttat cggcacaaat gttttttttc 300

atgttctcag agactgtcat ggaatctcta ccaacacagt ttatcgtatt atacacagtg 360

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ctcttccaca aaagtttatg gaaattggag gttttcctag cgtatgtggt gtcctggatg 480

ggtctcatat actcatttct aaccctccta acgcagacga agattctcta atcaatcgcc 540

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ggaacaagtt tgaaattgga gagcttccat ttaatggagc tgtaattttg gctgactctg 720

cctacccatg ccgagaatgg ttaattccac cttttcctag tgatctag 768

<210> 10

<211> 1393

<212> DNA

<213> Hydra magnipapillata

<400> 10

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gcaaagtaat catgactaag ggtttacata gttatataaa aggctcttat aaaatgaagc 120

aaaatacaac aactaagtta gattcaactt tgtctgctgg agaataagtt taaagatgtc 180

tttatttgaa aaagaagtac acatgaaagt ttattatgtc gagaatcaac ataataatga 240

aattcgaaag ttttcagtag aaaatcgaat ggctgctaat tacaaataca ttttggataa 300

gatccgccaa gtatttacaa atttgtatga aaaagatctt gatttgtttt ataaagataa 360

agaaaatgat ttcatttcaa tctcctctga tattgaattc cagcaagcct ttgagagcat 420

caacaatggt tgccttaagc tctatgtaaa aaagaaattg acaaagccag ctcaatcaaa 480

taaagaacat attggagtta gttgtgatgg atgtaattct aagatatatg gaaatcgctt 540

caaatgcact caatgttttg actttgattt gtgctcatta tgctacaaaa aaggagagca 600

cccatcagac catgaaatgc tggttatcaa agaacctcga tcttctaagc atatgtgtta 660

cagtcagctt ccgttttcac attgctggga aagatatgca cacatgaaca cgaacaattc 720

ttgttctaat aaaaatgcaa gcaataatga agaaaataaa cctactgcat ctgatcaaaa 780

gtttggggta cctgctgaac aaatgcatgc tttggttgat tgttttataa aacagtgcaa 840

tcttaaaagc aatgaaagaa atagtgataa agatataaat agttcaaaca atgaagtatt 900

cagaaataac ggagacatga accaggctaa ttttccagat aaaaaagatg tatcattaga 960

aaaccagctc atcaataaag acaaggatct tgtaaatcct tcaaactcat tgtgtcagac 1020

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aataaatccg cttgagtctt tgtgtcaaca aacctctgag ttgcaggttg atagttcaca 1140

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aaagcttgaa agatctctta gacaaatgga agcgatgggt tttgagaatg aaggcgggtg 1320

gttgcgtcag ttgttaattt ctaaagattg taacattgat aaagtgcttg atgctttaag 1380

tcctgccaaa tag 1393

<210> 11

<211> 748

<212> DNA

<213> Hydra magnipapillata

<400> 11

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ggaaaaaact tcttggattg ttttagaaaa aatacacggg gcaaatttca gttttcatac 240

agacggcgaa tgggtacaaa tcggtcgtcg aagagatttc ttaatggaag gcgaaaactt 300

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gtttggaggt tactattcca atgtaccgac aaacggaaac caaaaaccaa tacaaaaaga 480

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taatagaaca ttaaatttgt tattagataa atatatcaat atctaaaaat ataaaaataa 720

atgatatata aattacttta ttattagc 748

<210> 12

<211> 2436

<212> DNA

<213> Hydra magnipapillata

<400> 12

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ccgttactta tcactaaccg atccgactgt tttggattct ggaagtgaat taaagatcga 300

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ggaagctctt caagctggag cagatatatc catgattaga cagtttggtg tcgggttcta 480

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atatatatgg gtttcttctg ctggtggctc atttactgta caaagagaca cagtcaatga 600

accacttggt agaggaacaa aaattatact gcacatgaaa gaagatcagc tagatttttc 660

cgaagaaaaa aaagtaaaag atatcattaa aaaacacagt cagtttattg gatatccaat 720

caatttgaga gttcagaaaa ctagagacaa ggaggtttct gatgacgaag ctgaagatga 780

agagaaaaaa gataaatctg aagaaaaaat ggaggatgaa gatgaagatg aacctaaaat 840

agaagatgtt ggtgatgatg cagaagctga gaaaaaagac aaaaagaaaa aaaagaaaat 900

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cccagatgat attagctctg aagagtatgc tgatttttac aaaagtttga ctaatgattg 1020

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<210> 13

<211> 1656

<212> DNA

<213> Hydra magnipapillata

<400> 13

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gttacaaatt ttggaaattc taatgtcact gaccgtgcag ctgcaatatt tacagattac 180

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aaaagacgga agtccgaaag agcttatgct ggtttaggcg cattactaaa ggaaggttct 300

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gcagttcgaa aagaaaggga aaactgcaga gagcgacttg aacaacaaat tcaagaggaa 720

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attcagcaaa aaatagctgc agaaaaacga gctgaacatc tcgaacaatt acttacagag 1620

cagcgcaaaa aaattcttgc caagtgaata actttt 1656

<210> 14

<211> 755

<212> DNA

<213> Hydra magnipapillata

<400> 14

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acttaacagt ctgaatgatg gagtttataa tttttagtac tgctttaatt ttaatctctt 180

tgttgattgt ttttttaact tattcgggat ggatgagcac catagatatt caagtaacag 240

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gcatgggaat ttattatgac gatcctaaaa agatagaaaa caacaagact cgatatgcta 420

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ttggttattc acatgtccaa ctacctccag ttaaagcaat tgttgctgaa tttccctttc 540

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gcgaaaacca aaaactaaat gcgcatcctt acttggaggt gtacgatcaa aaaaccattt 660

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gtattgacta attcaaaata tttatgctaa aaggt 755

<210> 15

<211> 912

<212> DNA

<213> Hydra magnipapillata

<400> 15

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ccgaaaaaat tatgaaaaat atgataaaaa ttgttgtcaa ggttgcactt ttgtcatcta 240

acaatcgttt tacaaaagaa gaaatgtcaa ttattcaaaa tttccaaaac aaatttaaaa 300

ccattgcaaa atctataata agtttttatg aggtagattt tacatttgat tgtgagtata 360

cggttactat gatgaaagat tctcaaaagc ttttagaaaa gttggtttgc aaccatctca 420

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aattttaaaa tg 912

<210> 16

<211> 1136

<212> DNA

<213> Hydra magnipapillata

<400> 16

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tccaaatgaa ataaaaaaca atttagcact ctatgctggt tgtatagcag gtgctatgtc 720

aatagaagaa ctaaaggatg cattagaaaa aactggtttt gaaaacataa gtattcaaat 780

aaataaacta agctgcacgt tccttgaaaa gtggatagtt gaaggatgtg atgctgaaag 840

ttgcatagct tcagcagtta ttgaggcatc tcaaccaaag tagttttatc acactttaat 900

tataactctt gttaatagaa ttaataatta aaataaatgg aataactgta ttttttttctt 960

ctgatttcga tattcagaag atgttttaat cagcagcttt tttaacttga tttcttattt 1020

taaagaaact tgatttctta aagtattgtt taaaacttca atttttatga aagtaaattg 1080

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<210> 17

<211> 1041

<212> DNA

<213> Hydra magnipapillata

<400> 17

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atgaagcaat tgcgtagttt ggaaaaactc aacaaatcac taccactcgc accaaatttt 180

tcaacagcac ttccaatcgc accaaatctt tctacaacaa taccaatcgc accaaatctt 240

ttaacagcac ttccaaccgc accaaatctt tcaacagcac ttccaatcgc accaaatctt 300

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tcaacagcac taccaatcgc accaaatctt tcaacagcac ttccaatcgc accaaatctt 960

tcaacagcac taccaatcgc accaaatctt tcaacagcac taccaatcgc accaaatctt 1020

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<210> 18

<211> 1067

<212> DNA

<213> Hydra magnipapillata

<400> 18

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catcgcaagc taaacctgaa tttatgacgc cacatacaac acaattaggt ctacatcaaa 180

gtcaatctcc agctcccaca gtagctccca cttccccaaa tccattaaat ggagatatgt 240

ctcacgtgaa aaggccgatg aatgcattca tggtatggtc acgtggcaaa agaagacaaa 300

tggcacaaga caacccaagg atgcacaatt cagaaatatc caaacgatta ggagcagaat 360

ggaaatgtct gacacagcaa gaaaagcaac cctttatcga tgaagcaaaa cgccttcgtg 420

ctgttcatat tcaggaacac cccgattaca agtataagcc aaaaagaaga aaacaaaaaa 480

ctactaaaaa agatatatat acgccttacc caaatattgg tcaaggaatg gttcccaata 540

ttgattctaa atatgcttca attggttatc aaccgacact aagctacgga atgagctcag 600

atatgtataa caaattgaac ggaggttacg gttaccagac aacaattagc accggttacc 660

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ctcctactgg agcacatcaa tcatacccat cttctacaat aacttcacaa attggtacac 780

ctgtcataac agattccaca taccgtgttt cgacgtcaga ctatattaat agtaaaaatt 840

atttttcaaa catgaacagt ccttatagtc cggtagattc agctgctacc tcaactcatt 900

ctcaaaatcg atatcctact acagacgaaa acagaaatat tgtaaatcac gcacattctg 960

ttggaaacgg aatggtatcg aagttaatac aagaacacga tgttcagtct aattttccag 1020

acaacgctgt aaatagaaac tggtcattaa atttttcttc tgtttag 1067

<210> 19

<211> 222

<212> DNA

<213> Hydra magnipapillata

<400> 19

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ttggaactac cgaagtttgt gcattgctac gtagtttaaa attaaaggca caaatcgttg 120

actttcacaa accaaatgaa aatttgcatg tattaatgat ggaatggatt tgtgattatt 180

ttcaaaatgg tttaaagcta cctttatatc tgcaacatca ag 222

<210> 20

<211> 784

<212> DNA

<213> Hydra magnipapillata

<400> 20

ctaaatagct ctaacggtat ttattataat attgttgaac ttttttactt ttagttgatt 60

ttatagaagc tttttacagt gcacaaaaaa agaagaacta tgagtgggga aaaaaaataa 120

gaatacaaaa taacttatca taatggagcc attattaatc atattaattt ttattatagg 180

gaacggtata tgtttacaag tcacatcgat aaacttaaac aatcattcaa ttgaaataaa 240

cgcctcccga atttttccta acgagtttac acatatagaa aaagataaag tgaaagaagg 300

ttcgtctcgt tcagaaagat acaaaatgca aaatggtctt atacttcttc atgctcaaag 360

accgcacaca gtttctgatg taaagaaatc tcaattgacc gataattctc agagtattaa 420

ttaccacgtt cgcaaaaaag aacaaaataa cgaaacggta tttaaaatat tagaatttaa 480

tcgattcgga gttaatataa ctattaagaa aaatgatttt atacaaataa acaataattt 540

attaaaacac atttcaaaga atgatacgaa tatttttcaa ttggctaaca gcacagaaaa 600

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aaatgataaa attcaaagac aaaatacaat tactcaacaa atagtaaaac taaacaacgc 720

tatagaagat gcgaaaccaa atgctcgaat aaaaagagga aaagctggta gagaagccaa 780

ataa 784

<210> 21

<211> 1092

<212> DNA

<213> Hydra magnipapillata

<400> 21

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caagaagtta ttggaaatgg tgcaactgga acagtgtaca aatgtttagc taagaaaaca 120

ggtgctccat gtgctgcaaa agtattcaac tcacaagctg acagaagacc atacgaagtg 180

cggatccgag aaattgaatt gcttaaaaaa ttatcacatc ctaatattat taaattgatg 240

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ataaacatta tccaagatgt ttgtgcaggt atggagtatc tgaaaaattc aaatgttgtt 420

catcgtgatg taaaaccagg gaatatattg cgtgcagata aaggttctgg aggatacatt 480

tataagatca cagattttgg agcagctcga gaacttggtg aagctgaaca gtttgtatct 540

ttgtacggaa ctgaagagta tttgcatcct gatatatacg aaaaagctgt tatgaagtgg 600

tccagtaaca aaacatttac atcaagggtg gatatgtgga gtttaggagt tacattctat 660

cacttagcaa ctggacagtt acctttttcga cctgcaggag gtcggcaaaa taaagatata 720

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tgtgaacgct ga 1092

<210> 22

<211> 1314

<212> DNA

<213> Hydra magnipapillata

<400> 22

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gaaacaaatc aaaatgaaat acagcaaaaa caacacaatg aaaataaaca tattacattg 180

gctgaaaatc taatagcagt tacctacaga agtgaagtgt ttttagaaag cagtatgaaa 240

gaagacaaaa cagaagacaa aattgaatct gtaaaaaatc aatcattagt tgatattaaa 300

gagatacaac aagaagaaga gcatgatgaa cataaacatg atatagaaat taaaaatgcc 360

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gacagcgaaa cagaagacaa tattgaatct gaaaaagatg actcatctgt tgataatagt 480

gttaaagaaa cacaacaaga aaaaggacat gatgaacata aacatacaga agttgtaaat 540

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tacattgaca gcaaaacaga agacaatatt gaatctgaaa aagatgactt atttgttaat 840

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gaaaacaaaa ttaatgacga aacagaatac aatattgaat ctgaaaaaga tgacttatct 1200

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gaaattgtga atattttgaa agaagaacca gtggtagttg ctagcactag tgag 1314

<210> 23

<211> 285

<212> DNA

<213> Hydra magnipapillata

<400> 23

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caaacatctg tgcagtataa tgtaaaagaa gttactcaga aaccttcatt ccaacttacg 120

tcatctgtca catctgttca tgaagctata actgcacaac aatcgtgtaa accacagaac 180

atcaaagtat gtgcatatta tacaggtgtt ggtgactcaa acatggccat tattgatatt 240

caaatgatat ctggatttga accaaataaa gaatcacttg ataag 285

<210> 24

<211> 1415

<212> DNA

<213> Hydra magnipapillata

<400> 24

aaaaaaatct atgaaaaaag accgacattt tcctatgcta ctttttgatt taaaacgttg 60

ggtaaaataa gttcaatcaa atgttgatta aaaccaaata tgaaaactgt tagtttcgtt 120

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<210> 25
<211> 936
<212> DNA
<213> Hydra magnipapillata
<400> 25

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<210> 26

<211> 3990

<212> DNA

<213> Hydra magnipapillata

<400> 26

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<211> 945

<212> DNA

<213> Hydra magnipapillata

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<211> 1291

<212> DNA

<213> Hydra magnipapillata

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<210> 29

<211> 1350

<212> DNA

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<210> 30

<211> 984

<212> DNA

<213> Hydra magnipapillata

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<212> DNA

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<211> 3981

<212> DNA

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ttctatgctc cttggtgtgg ccattgcaag agcatgaagc cagcctatga gaaagctgca 2400

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aataaagttg ttccaaaagc tttagcttta cagggatacc caactttgat gtatttcaaa 2520

aatggtcatc agttagaaaa gtatgaaggg gatcgttcat ttgaatcaat tgttgattat 2580

atgaaaaaag cttcagaaaa aaaagaagga ccatctgctg ttaaagaatg gaaagacgag 2640

ccatcagccg tacaccacat aacccaaaat tcttttgaag aatttattct tgaaaaagat 2700

gtacttatca tgttttatgc tccttggtgt agtcactgta atggaatgaa acctgcattt 2760

atgcaggcag ctaatacatt aaagaaagaa aattttcctg gtgtgttagc agcagttgat 2820

gcgactaaag cagtagagtt ggcaaataag gaaggtgtga aggcataccc tacattgcga 2880

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ttatgcaaaa atattctgta actctaatgt caatactgta aaatgtattt gcgttgatat 3660

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<210> 42

<211> 1834

<212> DNA

<213> Hydra magnipapillata

<400> 42

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aatgtttgtg atttagattt agatcgacat agaaatgatg caaatgattg taaaaatagt 180

tgtcaccctg atgctatttg taataatagt atttgcgttt gtaaaaaagg ttttgttggt 240

gatggtgtaa ataaatgttc agactgttgt attgaacaga ctgttggaga agacagttac 300

actggaatat ataattttcc agtgacttta agagatgatg ttcatgtttc tctctgtgta 360

tataatgcaa gtattcaatt tcaaagacga tgtttgtttg ttagtaattt tgctattcct 420

gagtgggaac ctgctattct ttcgaattgt ccttcaaaat ctgaaatatc ccagaaactc 480

atcaacttgg aaaacattaa tgtcacaaca tcaaacattt taaatgttac atattactta 540

aatgacatag ttcaaaatgg taacctatca agcatatatg atgttcaaat gatttcaagt 600

attataaaac agattataaa tgtgaacttc tcatcagaaa aggttaccca tggtattttg 660

tcatctatag atgctttaat aacttcaaat acaagtttaa ttaagagcgc aaaccagaag 720

tttaatttgt ctgctgtttt tttatcatta attgatgttt tggggaaaca acaaaccaca 780

aatattacta tgtcactgaa aaacttggga atggcttcat acattaccaa acaaaaaaga 840

aactcaatat ttatttttttc aatggaaaat gaatctagtg ttggtgtaaa tatatctagt 900

gataatttca agtctacatc agatataaaa gactacataa ttcttccttc ttcattattt 960

attgaacata atgaaactca aatttactct tttatatata gaacaaaagc atttttcagg 1020

gaacaagtag gagttataga tagtgtgata ctgtcagtct cagtaaatgg tttaccattc 1080

ggtattacta taattacatc tgttagtaaa cctgagtacc taggtccttc atctgataat 1140

gatgctaaaa tatgtgttgt tcgaggtttt ccgttttact tgggtatcct tttacctgtc 1200

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tacactgttg agaacaaaaa agttaaagaa caatggatgt tatttatgtg gggaaaatta 1500

agaagaaaaa agacaaaaaa gacaacggta aactcaaaga tgcgaacaat ttcacaaact 1560

acaactatct cttactttac aaattctaag gaaagattca ataatatgtg cgttgattct 1620

aaagatgcaa agttgtagac catataattt ggctaattat tggttcatag acgtttgcag 1680

aggtttttga agatctaaaa tttaaatctt ttaatgttct caaccctttt ttagtcgcta 1740

agctcaaatg cttgatttta aacatttaaa catcacgttt ttacgttctg ttcatttgtg 1800

accgtgtaaa tagaaataat cgatcaatga aaaa 1834

<210> 43

<211> 1353

<212> DNA

<213> Hydra magnipapillata

<400> 43

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cttcgagcga cgaaaataaa tctgatatcg acgatgaaga tagagcaaat tctagcaaat 180

ttttaaacga agaatgcatt agcattaatg aactacataa aaaaatcata gctcaagctg 240

agttgtactt tagtaatgaa aatttgttaa aagataaatt tttattgaag cacataaaac 300

ggaataagga aggttatgta aatattaagc taatagcttc cttcaaccgt atgcgatctt 360

taacaaaaga ttttaatata attgttgacg ctcttagaac ttcgtcaaga cttgcagtag 420

acgaaaatgg actaaagtta aaaaggcttg aacctttacc taaagagctt ttagagcaag 480

cacatgtaca atatctggta ttaagtgata taccatctga aaatccttca gttgatttca 540

tcaaaaatgc cttcatttta atgaaaaatg atattttatc agttaaaatt ataaaacctt 600

gcaagagttt tcccaatgat ttacaatcac attactcaaa acatccagaa ctaaaagaaa 660

agttagttgc tttagttgaa tttaaaaata cagattctgc gaaggaagca tcaaaaactc 720

agtttactga agcttattca ggtttgaaag tgtcttttct tgaactagga ccaaaacaat 780

taagaaatat tgcaagcggt gagacccact cagatgctga ttcagataaa agttgcggaa 840

aaaagaagaa gatgaaaaag aaaaaaaata atgttaagca tttatcacct agagaggata 900

gctatagtag ttgtgcaagt tcttctgata atgaattttg ctcttttacc aattgtagta 960

agagatactc tcgctccaaa aaacatccta cagacaatat ttctcagcat tataaaaatg 1020

aaagatacaa ctcttcacaa aattcttcac ctttatcaag cccttcagta agtcctgttt 1080

atcatcgtaa aaacaaatct ggttaccaat ctcctaaaga atacaagtta tcaccattaa 1140

taagtaattt aagtccatta tccagtccag atataaatcg cagagaaatt cccaagtttc 1200

aagagtcgta tgaaaattta catagtgcat ggatgttaaa aagaatggag ttaaataaga 1260

ctaattatgt tgaatctgga tcaacaaatg tcaatagcgt atgcaagcaa ctagagataa 1320

ttaggcaacc aaaaggtcca gatggatcaa acg 1353

<210> 44

<211> 1946

<212> DNA

<213> Hydra magnipapillata

<400> 44

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aggcaaagag taaacatcga aagtttggaa gtaaatttga aaaaaattcc agaaattaat 120

tctaatgcta atcattggta tgagttggtt gatatcagca ttactaaatt tacggagccc 180

ccaacaacac aacatttttc aattgagcaa atccaatatg cgattgacaa taatgttaaa 240

cctgaaatcc ccgactttcc atctcactcc cagagtgttg agcgagcggt ttttcacacc 300

agatttggga ttaatgtaat gcctccaaag attccaatac caatttttta tagttttacc 360

tttgaaacaa tatggactaa tttaaagcga attgttcatt ttgatttgaa gggtgcacct 420

ccaaaacatt catattttct taaacttttg cctttactta agtctcttgg tgcttcaggt 480

ttattaatag aatatgaaga catgtttcca tactctggac ttctgcacca aatatcatcc 540

ccttttgcat acagcaaagt tgagattcaa gaacttttgg atacagctaa aaaattgaac 600

atggaggtca taccacttgt tcaaacattt ggccattttg agtttgttct taaacatgag 660

caatttcgat atttaagaga aactcctgag tatgcaaatc ttccatgccc gcttcataat 720

gaaacattaa gtatggtatt gaagatggtt gatcaagtgt tatctgtgca tccagatatt 780

acattaatac acctaggagg tgatgaggtt ttcaacttga aagattgcgc cagatgtaaa 840

gaaagtggca tgcaaaagga acacatttat ctccatcata tggtccctat tttaaaatat 900

attgaaaaaa agacaaatct gcgtgtgaga ccaataattt gggatgatat gataagaaac 960

tggcctttag tggagatgca aaaattatca aatctcacag atattatggt ttggggttat 1020

ggaccgaatt tagacaatca ctttccaaaa gatatgtggg aaaaatactt agcagctttt 1080

aaatctttat ggttagctag ttcatttaaa ggtgcattat ctcccaacaa taacatacca 1140

ccaataccta tgcatataaa aaatcatgaa tcttggctgc gaatactaga gaaaaacaag 1200

gttctcgaaa ctaaaatctc tggaattgct ttaacaggat gggcaaggta tgaccatttt 1260

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tcaaatgaaa tcatggttga gaaagatcct tttggaagtt gggatacagc aattccagga 1440

tttacaggtg gtgatgtcta tgctttagta gctgaattag aaaaccacat ttcgtgggtt 1500

tcagataaca aaagaaggtt ggatagctgg gggaatgacc gtcaaaagca taatggattt 1560

gttagtgttt ttcagttaaa tgcagtagct aactctttaa aacaattaat tccatcattt 1620

gaaaacctttc gtaataaatg ttttaaaact atggcaccat acttctatga gcattccatt 1680

gatgaatggg tcaaagataa aattgatcct tatattttac tgagtgattc tcttaataaa 1740

tctgtgtgga attttaaaag gacattaatt gataaaaatg tttagtttac taatattgtt 1800

aacatttgac tttattatta ttagatattt atttgttatt taatttctca aaagaaattc 1860

ttaagaaaag tttttcatta taagtatttt tactttaata attatttttt ttttataaaa 1920

gtttttttatt taatgttaat agttgt 1946

<210> 45

<211> 1383

<212> DNA

<213> Hydra magnipapillata

<400> 45

gttataggtt cttataaatt aaaaaactaa aaatatgaag tccgatttct ccatggcttc 60

gattttgaaa gataacgaaa gtaaaaaaca aaaggtagag aagaaattaa ctaaagattt 120

gatgctaaga gtaaaacttg aggataaaaa tctatgggca agctttcatc gaatgaccaa 180

tgaaatgatt gtcacaaaaa atggcagacg tatgtttccg gttttaaagt catctgtcga 240

tgggttagat cctcaatcca tgtatactat tatgctagac tttttaccag tagatgaaaa 300

tcgatggaag tatgttaacg gcgaatggtc acacgcaggt aaaccagagt ctacaccacc 360

gagtaaaata tatgtccatc ctgattcacc gaactttgga tgtcactgga tgaaaaatcc 420

tattgtattt tccaaggtaa aattaaccaa caaggaaagt accaatgggc aagtgctcat 480

gctgaactcg ttgcataagt acattcctcg catccacatt gtcaaggtct gcaacggtga 540

aaaaattacg tctacacata ccttcgttga aacggaattc atcgctgtta ctgcttatca 600

aaacgaagag ataacgaact taaaaattcg atacaacccg ttcgcaaaag cttttctgga 660

tgccaaagaa cgaaacgaac aaaaagagtt tatcgagaaa aaaaaattat gtaattgttg 720

tacggcacgt tctcattgtt acgatgatat cgaattttca aatagacgca attcaatggt 780

ggacactcag caacttcaaa atgtacttaa tgataaaatg ttaatacgtc aacacccata 840

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accatttttt gatataccat ctcatcaatt cctacctacg tcgcatacaa aaaattctca 960

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gaaattcaat actgcaaatc tcaacaatga agctttttat gaatcgctta gacgtaaaca 1140

cgagtttgat atatctcatc aaagaaaagg gcgcattgag catttccata ttcgtcaatg 1200

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taa 1383

<210> 46

<211> 1821

<212> DNA

<213> Hydra magnipapillata

<400> 46

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ctttaaatgc attacatgct gttgtataaa aattatatgt aaattatttt gggaaaactt 120

tattaattaa gttgttaaga aatattttag taatgtggac cgaaaaatca agttgttata 180

gaatttttc atgtctctct gtccttttta tgacttttga tacgaatggt tttaaaggtg 240

ttgatggtga tacgtcagca agtgttgatc accatcttga aatgggaaaa aaaatgttag 300

cagctggtca attaacagaa gctttatctc attaccattc agctattgag ggtgatccaa 360

aaaattatat gacatacttt aagcgtgcag cagttctttt ggctttggga agatcaaaat 420

cagcccttcc tgatttggac aaaacacttg aattgagagc agatttttg agtgctcgct 480

tacaaagagc aagcattcta ttgaaacatg gaaagtttga agaagctaaa gctgactatc 540

ttcatgtgag tagacaagat tcttctaatg cagaggctac tcagggtcta tctattattg 600

gtccagttca tgaaaaagta aagacggcag aggaaatgtt tgaacaccac cattggtata 660

tggttataag tcatctcgaa aatcctattg aggtatgccc ttgggatgtt catttaagag 720

aaatgcgagc gaaaagttat gaacaaatag gagattactt aaaagctatt caagattatc 780

gaattacaac aaaattaaaa agtgatgata cagaaggcca tctgaaagtt gcagaactct 840

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tacacagagt accttctact cctagtagaa agaagaaagc ttttattgct aaaaaaaaca 1740

ttcgaggtca tacatacttc aatatattta acaatgttta aaaccatata tatagataga 1800

aaaataaatt gtttgctatt a 1821

<210> 47

<211> 3111

<212> DNA

<213> Hydra magnipapillata

<400> 47

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tccaaaaaaa agaatatgga tgatctcaaa aaagagcttg aaatggatga acataaaatt 180

gacataaagg atttgctaat aaggctggaa acaagtgtag agaaagggct gagttcaagt 240

gttgctgcta gaaatttaga tcgtgatggc ttaaatactc ttcaaggtat taaaggcaca 300

cctgagtgga tcaaatttgg aaggcaaatg ataagtggtt ttgcattgct tttgtgggct 360

ggtgctttac tatgttatat tgtcaccatt attcgattta caactgaacc aaatccagta 420

tatgacgaag tttacttggg cactgttttg gtagttgttg ttgttttaac tggcatttt 480

tcttattatc aggaagcaaa aagttcagct ataatggata gttttcaaaa acttattcca 540

caagaagcaa ttgtgatgcg agatggttca aaaatgacaa taagtccgag tcattgtgtc 600

ataggtgatg ttgtatattt aaaaagtggt gacagaattc ctgcagatgt tcgtattatt 660

gaatctagag ggatgaaggt tgacaactct tcattaactg gggaatcaga gcctcaatca 720

agaaatattg aatgtacttc tgacaatccg attgagacaa aaaatcttgg ttttttttct 780

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gttagtagat gtagaagtgc tggtatcaaa gtcatcatgg taaccggtga ccatcctatt 1920

acagcaaaag ctatagctag aagtgttgga attatatctg aaggaactga gactattgaa 1980

gacatagcac aaaggttaaa tataccaatt gaacaagtcc aaaaaaatca tgcaaaagca 2040

tgtgtagtaa gtggaagtca gttaaaagac atgagtcaaa aagatcttga tgatgttttg 2100

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<210> 48

<211> 1048

<212> DNA

<213> Hydra magnipapillata

<400> 48

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cacacctgca aatctatgcc aaggaatttc tctatttgat actacttcct gtaatgtgga 240

atacagttgt ccagattata gacttggtga ttggggtaca tggagttctt gctcagaatc 300

atgcagagca actcaatcga atccaactcg tgttcgaact cgttcttact gtcttagtaa 360

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ttttgtcaaa agctcagcat ttggagtgaa tccaaatgtt gatgtagctg tggtaaacta 600

tggtagtact gctcaagtag aggctgattg tggtacattt aaaagctact caacttttga 660

aactttcatg aacaatttaa aaatggtaac tggtggaact gcgatacaca gagggcttac 720

aactgcagaa actgtattcc aaagatgcca aaaactcaat atgaatcctg ttatagttct 780

tcttaccgat ggttttgaaa acatagatac aaatattgac agcaacatag ctattgaaaa 840

tcgtataaaa agtgaagctc ttttagttgc aggtgccgta catgaataca aaaaggatga 900

aatagataga ataacaagtt acattgttaa tggacagaat gtatcttata acttctttgc 960

tacaaacttc acgtatcttc gatctggatt tgctgacaac ctatataatt ttgttgttgg 1020

aaagagccaa tgtgaaagta atgattaa 1048

<210> 49

<211> 1254

<212> DNA

<213> Hydra magnipapillata

<400> 49

acaaacaagt atattaaact taacatcaag ctaaagaaat tgactaatca aaatatttaa 60

cgacttaatt ttttataaac tatgaaatat atatcgattt ggatcttata tatttgcttt 120

atgagtaaat cggttatacg tgcttcagtt aatcaatcag aaatagctaa tacaaataat 180

cgcctcgatt tgaaaatgtc gtcttcaatt ggtcgtgtaa agcgaaatct tgaatcgata 240

aacctttcg atcagcaaga aaaaagacaa acagtaatgc ttaaattttg ttcaaactct 300

aacttttcaa ataaaactat ggatgaacac atgatttaca ctgacaaaga aagtcttctt 360

tactgctata tacctaaagc tgcttgtaca acttggaagc gaatgtttca gatatttgac 420

ggaaaaatgg atttaaatca agtgatggct gttgaaaaaa atgcagtcca taagctgcat 480

tataacaatt ttacaactct tgacgctgca caaaaagttt tccgtgagaa aaattattat 540

tcatttttag taagtcgcca tccatttgaa agattgttgt cagcgtatag aaataaattt 600

ttggaccctt acacaacgca ttatcaaaaa aagtatggtg cagaaatcct tcgtttatat 660

cggaacgatc ttacagaaga acagtattta aaaggagaag gggttacatt tcgagaattt 720

atcaagtatg ttatatcagg aaaacctttt gataaacatt ggcgtcctat gacgcaacta 780

tgctctccgt gtcgttttaa gtacagatac ttgggtaaaa tggaaacatt atttgaagac 840

gccaccgcaa tactcaaaaa cgctggcata tctcaaaagt ttttgttcct ctccaattca 900

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gcttcagaaa ttagaaagct atactacatg tataaagatg attttctcgc ttttggctat 1020

actgttccat attacattga agagcttcta gcaaccatcg acaatattta aatataaatg 1080

atataatgtt ttatcaacaa aatagttgta ttactagttg tttttcattt ctagcatttt 1140

atattgtttt aaatttttat ttatgatttt ataaaaatac ataatatgag aactgttttt 1200

ttttttttt gcttacgatt attaaaattg taacaaggta ataataaaga taat 1254

<210> 50

<211> 1362

<212> DNA

<213> Hydra magnipapillata

<400> 50

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aaggagcatg ttgcgcattt aattaaaaat gtttctttcc atggtctttc ttacgtcgcc 120

gacaaaagaa acaattattt tcgaagagct atatggtttt taattacggt tggtgcgttt 180

atctatgctg ttgaaaaagt ttatgaaagt actgttaatt acttttctta tccattcaaa 240

accgctcgca tgaaaattta tgtcaatgaa ttaaattttc cggctgtatc attctgtaat 300

ttgaatgatt ttttgtttag caaactaaat ggcaccaaac ttgatgaatc aattttgtac 360

cctgatgatc ctgaaaaaaa caatgtctca gaaatagaaa ttagcaacat tacttctgat 420

gccacaattc gattagatca aatgttagtt gattgtgagt ttgaaggcaa aaaatgcact 480

catgaaaact ttacagattt ctggactatg cagggcgaac tttgttttac atttaactct 540

ggaaaaaatt ctcattcatt attaaaggta agtggagttg gggtgttaag aagcttaaaa 600

ctgacaatta atgtccaaca ttatgaatat tatcgagatg aaatggctgg tgggattcat 660

ttaatgattc atggacagga tgaggaacca gtaaaaatgc aaggacaaat agtatctcca 720

ggatattctt tttatgttaa agttgaaaaa aaaactataa tgaacttaga aaaaccttac 780

aaaactgaat gtggtacagt aaaattaaag tactttgatc gttactccat gcatacatgc 840

tggcttgagc aacttacaga ctatgttaat aaaatgtgtc attgcaaaga tttttttatg 900

cctggaaaca ttccatattg cagtttgcct gaattacaaa actgtacatg gatagaatgg 960

gcaaagttta acaaggataa aatgtataag tgcccgttgc catgtaaaat tgatttgtat 1020

ggagtgagct tatctcgagc attgtttccg actacccaat attctagcat acttgctgaa 1080

cagtttcgca aacagcctca tgttttaagt attgtacaca atattactga tgagctctta 1140

tttatgagag ataatttact tcgttttatt atttattatg atgatttgtc gtacgaggta 1200

cttgaacaga aaccaagtta tgaaacatta gtctggttag gagatattgg tggacagata 1260

ggcttattta taggagcagg tgtaatgtcg tattttgagt ttcttgattg tttggctata 1320

gtgatataca cacggttttt tcagaagttt acttcctcat ga 1362

<210> 51

<211> 819

<212> DNA

<213> Hydra magnipapillata

<400> 51

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gggtttatgg ctatcaaagt tagcatcagc tttaaatgat tttggtaata gaagagctcg 120

cattctttta cttggtttag atgcagctgg aaaaacaaca atactttata agttaaagct 180

caacgaaaac gtcacaacca ttcctacaat cgggtttaat gtggaagagg tgactccagt 240

aaaaaacgtt acttttacca tgtgggatgt tggaggtcag gaaaaaattc gacctttatg 300

gagacactat tatcaaggtg ccgaaggact agtttttgtt gttgatgctt gtgacgtttt 360

aagaattcaa gaagcgcgtg aagagttttt ttctgtttta aaagatgaag gcattgaaaa 420

aggaattcct gcagtgattc ttgcaaacaa acaagatctc ccaaatgcat taaaatcgtg 480

ggaactagtt gataaaatgc ggttaaaaga attaagcggt aatccttggc acgttcaaga 540

aatgtgcgct ttaacagggg atggtttata tgaaggtatt caaagacttg cagatatggt 600

aaaaacatat caaagagaaa acaaagttag atggtaacag catgaaacta aagtaaaaaa 660

tgtataatca tcaacaatat tattcctatc acgatgataa taaataaagt actattttat 720

cagtgaatat ttttttaaat ttttagcttg taaactattt aacttacttg aaaatatctt 780

tataaaatcc gaatttttg attaataaca aggaaaaaa 819

<210> 52

<211> 1257

<212> DNA

<213> Hydra magnipapillata

<400> 52

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tacttagatc acatgagtcc atcaacatct aggtatgccg atcacaatgt ttcagatcac 120

gttgcttcac ctcctgggat ttttaatgca cattctgcca tgatgagtcc atctcaggct 180

gtaggaagtg taggtacgta cgcttcacgt tcatctagtc aaagtgaata ccaacattct 240

tctggagtcg gaaattctga ttttatgaat ggatataaaa caatacacga ggaaccacca 300

atattaactg cagcacagcc aactcattca ataccaacta tgatgaatga cacaaatacg 360

catgctggga gaacacattg tatgtttgct agtggtgcac tgcatcataa tactgaaata 420

aactcacgat ttcactctaa tttgaatcaa aatcacggat attcttctaa cccaagtacc 480

ccttcgtctt tttatcctct atcccatcac gaattatcgc acaacagcca ctatcctgga 540

aaatacccaa agcacgatta tgcaagtgac gttaagccag catacaacta tcagccacta 600

aattcatctt acgaatacta cggaagccca cagtacggat actcaaatct tcaacctcat 660

aacagttttc ggcaacctct taatcaagtt atatcatgca tgtggcaaga tcaaaccaca 720

aaaggaaaac cgtgcggaaa acagtttttt gttatgatgg acatagtgca gcatttagct 780

gaagatcacg tgggcttaaa tgactcgaca gaacatatat gttattggaa agattgccca 840

cgagcaggac ttgctttcaa agctaaatat aaacttatta atcacctaag agtacacaca 900

ggtgaaaaac cttttccatg tccattccca ggatgtggta aactatttgc aagatcggaa 960

aatttaaaga tacataagcg aacgcacacc ggtgaaagac cgtttgtgtg tgaatttaca 1020

ggttgcggta gaagatttgc aaactcttcc gaccgtaaaa aacacagtca cgtgcatact 1080

tccgacaagc catatatttg taaatacgat ggatgcaata aaacgtatac acatccaagt 1140

tcccttcgca aacatatgaa attgcatggg aagcctgata ccgtaaaaga tataaaactt 1200

tcaaaaataa caaactcaga ttcaaaaata agaacttctg atcaagattt acattcc 1257

<210> 53

<211> 1092

<212> DNA

<213> Hydra magnipapillata

<400> 53

atgatagagc aagaaaaaga aacaagttgt tcaaatttta ttgacggtga attcccggtt 60

tcgcgattac ttttagagta tgatgccaat gacgaaaaaa aaaaagattc agaagaggaa 120

atcttaaata aagacctctc acgcttggtt gttaaaccaa tcaattccaa acacaaggta 180

atttgggatc tttataaaaa acaaaaagac gcatattgga ccgctgaaga aattgatttt 240

agtaatgatc gtcatgattt tttaaaagtt gataaaaata tccaacattt tattaagaga 300

attttagcat tttttgcagg agccgattca attgttaaca ttaatattaa gaaaaaatta 360

tcaaaaataa ctgtcaaaga agctgaaatt gcttatggat tccaacaaat gatggaagat 420

acgcatagtg aagtttatgc agacatgtta atcaaaatta ttacagatcc ggttgaacgc 480

gacgaactta ttaatgcgtt taaaacagtt gcatctatta agagaatgat tcaatgggct 540

caacgatgga ttaattctaa acgcagaatt gggtactcga ttgtcgtatt ttgtatttt 600

gagggattaa tgttttcggg ggcttttgcc ggaatatatt ggctcaaaaa gattcttggc 660

gaagatataa tgaaaggttt aatacaatca aataatttaa ttgccaaaga tgaaggcatg 720

cacacaattt tcggatgtgt catttacacc ttcattattt atagactgtc ttttgaggag 780

atttgtgaat taatgaaaga ggctgttgaa atttgcaaat cttttacaaa agacgcaatt 840

tgtgttgaca tgattggtat gaacgtcgaa cttatgtata attacattga gtatgttgct 900

gacaggctta tggtatatct cggttatgaa aagatcttta tgacaaaaat tcctgatcag 960

tttcagttta tggacacaat cggttttctt aataaggaca acttctttga acgtcgtgca 1020

accgaatatc aaaaagctta taatgaccga aatagggctg actggaactt taaacttctc 1080

cctatttact aa 1092

<210> 54

<211> 666

<212> DNA

<213> Hydra magnipapillata

<400> 54

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gactggttca ctgataagga gtttatattt cgacaagata atgatacatg tcatatggac 120

aacggtgtta aagatttgga ggaactttct ttccaaacta accgtgcatg cggaggcgct 180

catacattga ttgagcagca taaaagaaac ccaagtaaaa accaaacata tttcaaagac 240

gaaggagatc aatttcagaa agaagataaa gtaatagacg ttcttggtcg cgacggacac 300

atttataaag gaaatttgca aacaccacta ccagctatac ctagatcacc acttacatta 360

gaaaccgata cagttgaact aaccgatgag aacaacgaga gcgttctatc acaattatct 420

aatcattgga aagtaaactt gaatgcaaca gcttaatata aaactgttta tttaaatttt 480

aacattttat atttttgta tattttactt gttaacgaat tgaaataaag tatattttca 540

aaaaacaaaa actacactaa tgtaaaatta atatatattg tttcaactac tttataattc 600

atataaaaca actccaaatt ataaacgatg atacacacag ccatacaatc acgcattgaa 660

agatct 666

<210> 55

<211> 1200

<212> DNA

<213> Hydra magnipapillata

<400> 55

atgtcttatt cggcgagaaa aagttcgtac gtatttgagt acagaatagc gttcatgggt 60

gaagatggcg ttggaaaatc tgctttaata aaccaaatag ttgaaaaaaa atttattgaa 120

aagtataatc cgacagtttc aaatcacctt acgcacgttg ttgagtttga aggtcatctt 180

tgcgtgtgtt tgttagttga tactgctggt gtggctgact ttccggctat gagaaagtta 240

gccatatcaa aaggaaacgc atttgtagtt gtatatgctg tggataaccg aaaatcattt 300

gaaacggcaa aaaatttaat acgagaaata aaacttctaa aaggtacagc gaaagaaact 360

cgcgttgtac ttgtaggaaa caaaaaggat ttacctcgta ctgtcactta taaagaaggt 420

ttagattatt caaaaatgat tcaagaagac aactgcgtga gtacatttat tgaagcaagc 480

gcaaaagaac gagaaagttc aacagaaata ttgtataaaa tattaaatat gtttttgcct 540

cccattaaac gagtagaaga atacaataat ctaaagaaaa agccttcatt atattcgtcg 600

acattaagca accgacgatc ttccaagtca ctaataagac gtaaacaaag ttgcggttca 660

aaaaatgaaa cgactcaaaa agatagggta attggtgata tagaaggtag tgtttttgaa 720

acaaaatctt caccaaccgg aagatttaga agtcgttcaa aaagccaccc tattatttcg 780

gttaaaggta tattagaaac attatctcca aagacttcta gaagaaagtt ttcagccaat 840

gctacgctat tttcagcaaa taccagaaga gtatctttac cgcaaaataa tttttcacca 900

aaaacaaacc gtcctgtgta ctttacacat tcgacaagcc taaacagttc cagtttagaa 960

ttttcaaata gtttaacctc gatgagtagc catgacagcg gtcttggtga cacaatacgc 1020

cacgacagtg gtcttagtga tgtttcaaat aaaaagactt tgagtgaaat tcatatcaga 1080

cttacaaaat cactttcaga acccccctcgt tcggaaagaa ggacgatgaa acaaataata 1140

acagggattt ttaaatctaa aaaaacaact acaaactttt ctgcaggcgt gaaaccttga 1200

1200

<210> 56

<211> 730

<212> DNA

<213> Hydra magnipapillata

<400> 56

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gtttctcgtg ggataagatt tcaaaaagtg ttgaagatga aaatgatgaa gatcatgtta 120

aagcatttct tgaagatcaa aaaaaacaag gattttcaga aagagaagta tttgaaaaaa 180

ttcaaaatga tgaatcaatt gctaggaaat tagttgcaac taaacttatt aatactgaaa 240

atggtggaaa aaaaaaaatt attctttatg gaactaagta ttgcggtcat ggaaataatt 300

caaaatcaga taaggatcgc ggattctttg atcaactcga tgaatgctgt tttgaacacg 360

ataaatgtaa attaagtatt ggagcaggaa aattcagatg gggtttacat aacaccaaag 420

gttatactat atccgattgc aaatgcgacg acaaatttta ttactgctta aaaaacgtga 480

acaaagattt tcaagttcca ttggcatact ttactggcaa gctgtttttt aacatcataa 540

atatcaagtg cgtcgaaata ccaaatggat ttaaccctga tagtgataaa gaatcttaca 600

agaatactta tgagcctaca ccggatggtt ccccccaacc atactttcgt gctcctaaac 660

attataagta atataaaata tctttgtaaa tattattaaa aatataatta ttttaaagct 720

ccttattaaa 730

<210> 57

<211> 541

<212> DNA

<213> Hydra magnipapillata

<400> 57

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ttagaaatac ctagatacgg agaagaaaat ggagggcgac catcaccgga aattagaaaa 120

atacgaacca ctttttctag tgatcaagtg ttcttacttg aaatgcaatt taataaacaa 180

aagtatctct cagctgcaga acggatcgag ttagcgcaaa aactaaaact taccgataat 240

caggtaaaaa catggtatca aaatcgacga atgaaattaa agcgtcatat aaaacttcac 300

acccaaagca atatatactc ccaaaaaatt caaaattgtt tacgacctaa tatatttatg 360

agctcagaga aaacgcgcaa agaatttttt tcagtttctt ctgtattata tcctcaacac 420

gaacatgtat ttatgatgaa aagagagcat gaaaaccgca caaacattta ttaaagccgg 480

tcgtatttgt aaatattttt ttaaattgta aatagtaaaa ttaaaataaa tagttttcaa 540

t 541

<210> 58

<211> 1452

<212> DNA

<213> Hydra magnipapillata

<400> 58

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ttttcttgaa aaagaaaaag atttatcttg tgcgcgatga ccatgtccga tagcccctg 120

gatagtccat taaacatgaa ttctggagca ataaagtcag agactccacc taaaagacgg 180

cgtgaaagga ccacttttac aaaagcacaa cttgacgtgc tggaagatat gtttggaaaa 240

actatgtatc cggatgtatt tatgagagaa gaagtagcta aaaaaattaa tttggctgaa 300

gcccgagtac aggtttggtt taaaaatcga cgtgcaaagt ttcgacgctc tcgtgaaaac 360

cctggtcgac attttgataa taataagtat ttagggcgtg agaaattaat gcctgaagat 420

ctcattcgaa cctttcctaa aagtagtggt ggcactccac actcttaccc aaatacaagc 480

aattatcctc cgctatggaa atatccaggt gcagaccaca gtccaccata tgcaggaaat 540

aatataattg aagaaccggt ttatagacaa tcaaaccctt acgctcccat ctcaccttat 600

gaatataatt ttcctagtgg gagaccacca tactttactc agccacctta ttatagtccg 660

tctgcaccta gtcaagatta tctttcaaat tccgtttcgg cgccatcaag cacaaatagt 720

atatcaagtt tatctttttc gcaacatgac actaaaaatg aattaaatct tcctgcgtct 780

tattggagtg gagcagggta tatgggtgcg aatatgtagt ttaattataa agcacctcaa 840

aaatggaaat ctatttcaga tagacacaac aaaattgatt taaaaatcaa acagttgtac 900

atagaaaagc ttttttttaca attcattaaa aaaagatatc ctttagattt aagtctaaga 960

ccaatgaacc aatcgattgc gtaaattaca aaactaattg gttgtgtcta gaaaacaatt 1020

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ttgttttatt tgcatttttа aaatatatat accatgtttt aaatttttat cgtagaacta 1140

ttatgcagtt atttttgttc aacttttttat ttatgtataa atcgatatga cactgctata 1200

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aaacaatgat ttttttaaca attttgtttt aacaaattta ttttgttaat aaaaaaaatg 1320

tagcagcgat caaaaatgga aaaatatatg ttattgaaac aacttttttaa ttttctattt 1380

atcaattaac tgatttaacg tataaacctg ttttagattt tttttgtaaa tatattatta 1440

ctgtaataga aa 1452

<210> 59

<211> 1056

<212> DNA

<213> Hydra magnipapillata

<400> 59

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aatcacggag ttcctgaatt aaaatggtca tacttactag aaggaaacgc acataaatgg 120

gcaaaaaagt gcttaaagcg tttgttattt gattacgacg aacaaactca ggaaggggag 180

aacattgctg taatgaaaga tattgaagtt tctggaacca cagtggtaga ctactggtat 240

aaagaaataa ataactatga cttcagtaac gacggtttag cgcagaaaac tggatgcttt 300

acacaactgg tttggaaaag tactatcaaa gtaggggttg caagagtgtc aacttcaaat 360

gggacgcaat ttatagtcgc tcgatacttt ccacctggta ataacttaag aaaagttagc 420

caaaatgttt tacctcctac aatacgacat atgtcaataa gtagatatga tggagacgat 480

agacgattaa gtatgcgtcc taatttagca gtgatttcac ctgatagtcc tgttaatgtg 540

tcttctttgc gaagagcttc gagcatgggt tccagtttac caaaagcttc tggacccata 600

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cataatgcta agccactttc attaagcagt ggattgacac taaaagctca gcaggttgcc 720

gagactattg ctaaaaatga agttttgact gattttgata atgttggtcg aaatatactg 780

gcttgtacta aaggaattac aggaaatgaa gcttcctcca tttggtataa cgaagagaat 840

gatttcaatt ataataacaa gagtttctca atgaaaacag gaagctttac tcaaatgata 900

tggaaagaaa ctaaagaaat tggcgtaggt cgagcaatag atgacagagg ttgcactcat 960

gttgtgtgcc tatacaaacc tgccggaaat attagagcat tatttgaaga aaatattggc 1020

ttacctaatg gtccacctcc aaaatttatt tattga 1056

<210> 60

<211> 1437

<212> DNA

<213> Hydra magnipapillata

<400> 60

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gttgctggac aactatttca gacgtaccga actacacttg aacgatatcc ggatacttta 180

cttggagatc caaaaaagcg acaacatttt aaaaatccaa aaacaaaaga actatttttt 240

gacagacata gagaatcgtt tcaatgtatt ttgtattatt atcaatcggg gggagtaatg 300

gagaaatcac ctggcatacc tattgatatt tttgtgaacg aactaatttt ctacgagtta 360

gacagtaaat taatagaaaa aatgcaactt gataatggtt taaaagaaat agatacgaaa 420

gaaaatttac cattatttaa accgtttcgc attttatggg aatttttga atacccagag 480

tcaagtaagg cggcaaaagt gttcgcaata gcttcgctat ttgtaattgt ttattcatta 540

attctatttg taatagaaac tctgccaagt ttccaaccac atgtagttat tatatctgat 600

aattcaacaa tgacgatacc aagtgtcaat gcagtatgga caaaatattc taatacggct 660

gttattgtct ggtttacaat tgaattttta atccggctga tttcttgtcc taacaaacta 720

atgtttttc taaatggtgg taacatcatt gatttttat caatactacc attctatttg 780

agtttgatta tttcttcaaa cagaacagaa acttcgatac ttcgtgtaat gcgagtgttt 840

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gcttctttta atgaactaat gatgcttgtt tttttcttgt ttgtaatgat attatttttt 960

ggaagcctta tatattatgc agaaaaagac gttcctggta caacatttac gtcaatacca 1020

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gctttgccag tccctataat tgtttccaat tttgagtttt attataaaaa agatcaaaac 1200

agaaaaaaag tcgaaaaaga aaaaattata aaagaaaagg aaaaaaatcg ctactttaaa 1260

acttattatc gctttcttct aaacagagac tttactaaaa atataaaaaa agctcacatc 1320

agaagatatt caatgtctca aaaccctgat ggtttgtcaa ctaaacttga cgagtcccca 1380

aatttaaatg acaattgtct ctcaaaaaac aacatatcct atgctgaaga aaaataa 1437

<210> 61

<211> 732

<212> DNA

<213> Hydra magnipapillata

<400> 61

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cgtggcgtgt ttgactccgt cgcccccaaa tacgacctga tgaacgacct gatgtcagcc 120

ggcctgcacc gcgcctggaa ggcctacacc gtgctggtgg ccaacctcaa agagggcgac 180

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aaccgtttgc tggatgcggg catcgtgttg cccacgctgg tgtgcgatgc ggagaagttg 360

cccttccccg acaactactt caatgtggtc agcgtggcct tcggtttgcg caacatgacc 420

tacaaagacg tggctttggc agaaatgcaa cgggtcttga aaccgggtgg caagctgttg 480

gtactggagt tttccaaggt ggcgcccccc ttggagaagg tgtacgactg gtactccttc 540

aaggtgttgc cgcgcttggg caagatgatc gccggagatg acgcaagtta ccgctatctg 600

gcggaatcca ttcgcatgca tccgggccag caagagctaa agaccatgat gcacaaagtg 660

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atcaagtgct ga 732

<210> 62

<211> 1164

<212> DNA

<213> Hydra magnipapillata

<400> 62

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cgcgaggtgt ggaacaaggc cggcgagaac ggctttttgt gcatgaccat gccggaggaa 180

tacggcggct ccgaggcgga caagctgtac tcggtgatcc agatggagga gttggcccgc 240

ggtggcttca ctggtatcgg cttcgggctg cacagcgaaa tcgtggcgcc ttacatcctg 300

cactacggta cgcccgagca aaaggccagg tacctgccca agttggccag tggcgagatg 360

gtgggcgcga ttgccatgag cgagccggca gccggctcgg acctgcaggg catcaagtcc 420

accgccatcc agcagcccga cggcagctac ctgctcaacg gcagcaagac ctttattacc 480

aatggctggc atgccgacct cgtggtggtg gtggctaaaa ccaatccggc ggccggcggc 540

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gtacccgccg agaacctgct gggcggtgcg gcctatgaaa acaaaggctt catttgcctg 720

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cgcgtgtttg tggacaagtg ctgtgagctg atcggtaaag accagctcga cacagccact 960

gccagcatgg ccaagtactg gacgaccgac ctgcagtgca aggtgatgga cgaatgtgtg 1020

cagctcttcg gcggctacgg ctacatgtgg gaatacccca tcacccgcgc ctacgccgat 1080

gcccgggtgc agcgcatcta cggtggcacc aatgagatca tgaaagaagt aatcacccgg 1140

tccatggggc tgggcggcaa gtag 1164

<210> 63

<211> 906

<212> DNA

<213> Hydra magnipapillata

<400> 63

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cgccgggttc cacacggcgt ggtgggcgtg atttccccgt tcaactttcc cctgattttg 120

agcctgcgct ctgtggctcc agcgctggcg ctgggcaatg cggtagtcct gaaaccggac 180

gtgcgcacac cggccagcgg cggctttatt ctcgcgaagg tgtttgagga agccgggctt 240

ccgcctggcg tcttgcaggt gctgcccggc aatgccgagg tcggagaagc cttggtcact 300

gacccccgcg tgcccatgat cgccttcaca ggttcgcccg cagtggggcg ccgcatcggc 360

gagttggccg gcaagcatct caaaaaggtg tccctggaat tgggtggtgc gaacaacctc 420

atcattctgg aagatgcaga ccttgatgcc gcggccagtg ccgccgcgtt cggtgcctgg 480

ttccaccagg gccagatctg catggccagc aaccgtgtgc tggtgcacag cgccatcgcc 540

gaaggcctga agcacggctc ccgggtatgc gcagttttga tgacgagccc tttcgggccg 600

ctggtcaacc tcgtcacttt taactccgat gaagaagcca tcgcattggc caataccagc 660

cagggcgggc tgtcggccgc ggtcatcagc cgtgatgtcg gtcgtgccat ggccattggt 720

gagcgcatca acgccggcat ggtccacatc aacgaccaga ccgtgaacga cgactgcacc 780

aacccttcg gcggcccagg cttgggcggc aacggcagcg cggtcggtgg ccctgccgat 840

atcgatgaat acacacgttg gaagtggatc actgtcaaag cctcggtgcc gcagttcccc 900

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<210> 64

<211> 890

<212> DNA

<213> Hydra magnipapillata

<400> 64

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gaattatttt tgctaatcca tgtaaacaag agtcacatgt caaatatgct aatactaaaa 180

atgtgaggaa aatgacattc gacagtgaag gagaattgta taaagtaaaa gaaaatttcc 240

ctggagcaga gcttgtctta agaatcaagg tagatgattc caaatcaact tttaagcttg 300

gacgtaagtt tggtgcaagt cttgaaacta cacagaaatt gttgcaactt gcaaaagatc 360

ttgatttaaa tgttattggt gtaagttttc atgttggaac tggttgctat gatgctgctt 420

tgttctacaa tgcagtgaag tccgcagcag atgtatttca acaaggggac aatattggct 480

ttactttcac gttgttggac attggtggtg gatttccagg atttaaagac gaaactattt 540

caatggaaaa ttttacatta tgctgtaatg tgatttcagt taaagaagtt agtaacaatg 600

acaaaaacga gcagtttatg tattatttga acgatggagt ttacacttct tttaaggatg 660

ttttatttgg taaaaagttt ataccatttt tacttcaaga atcgagcacg agtttgttgt 720

ttaaaagcag tctttgggga ccaacctgcg attcaacaga ttgcatatca gaggaaatat 780

atttgccgaa gctttctgtt caagatttgt tgtattttaa aaacatgggt gcatactcaa 840

catgctttgc ttcaaaattc aatggcttca atcctcctgt tatttattat 890

<210> 65

<211> 246

<212> DNA

<213> Hydra magnipapillata

<400> 65

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ttttgtgtcc acggtggact ctcaccagat ttaaatgatc ttgatcagat tagacaaatg 180

gctcgaccca tggatattcc tgatcatggt attgcagcag atttactttg gtctgatcca 240

gatgag 246

<210> 66

<211> 1519

<212> DNA

<213> Hydra magnipapillata

<400> 66

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attaaattat cttcaaatgc taatgtaact ttacttcaaa caagttcatg gggtgttgca 120

ttaatagaaa attctccctt ttcaaatact tcagacaaag gacctattat gctgactaaa 180

ttttcaccag ccaattactc tacgtgggtt gttggtataa gtaaagaatg gaagtgtgaa 240

gcatctggtg acggcaactt ggcatacata tggtataaaa ataatgagat tattgatgta 300

caatatgaaa atattggata tttaaaaatt gctggaaaca tcaatgacag tggtagctat 360

agctgtgtgg ttcagttaga taacattaat gtttcttcca attctcttta cattaatata 420

tatgatattg atgaatgcgc tttaaaaatg aataactgtt caacaaatgc aacttgtttt 480

aatactcctg gaagtttttt ttgtcaatgc aactctggat tttctggtga tggtcagttg 540

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aataattgta ctgatataaa tgaatgctta gaagaaaatt ttcaatgtga catcaatgca 720

ttctgtttaa atacaaatgg tagttataat tgtatttgca ataaaggttt tgaaggaaat 780

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gaatctaata attgcaagaa tggtaattgt tcaaatacaa ttggatcgta tacttgtgta 1140

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aaacgggaca acaatatcct ttgcaatggt ttatttttag cgctcatcat tctttctgta 1320

attgcaataa ttgttgtgct atttgtcgtt aagtatatga aatcaagaaa attgaagaaa 1380

attggcccag tgaaagtgca aagagataag tacatagaaa tggaaaacga gtctgagcta 1440

taaacacttt tattttgcat aagtttttgt aaatatttct tcggataaat ctatttataa 1500

atcaatttag gtttataaa 1519

<210> 67

<211> 528

<212> DNA

<213> Hydra magnipapillata

<400> 67

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aaagctaaag ccaaggccaa gacacgatct ttcagagccg gtcttcagtt tcccgttggt 120

cgcgttcatc gatttttacg caaaggtcat tacgccaacc gaatcggatc aggcgctcca 180

gtttacttgg ctgctgtttt ggagtaccta tccgctgaaa tcttggagtt ggctgataac 240

gctgcccgag acaacaagaa agccagaatt gttcctcgtc acttacagct cgctgttcgc 300

aacgacgagg agctgaacaa actgttgtcg ggtgtaacca ttgcaagcgg tggtgtgctg 360

ccaaacattc aagccgtttt gctgcccaag aagaacgaaa aacttccaaa accagcagca 420

gccaagtaaa gagtggagct acgcgagcac gcactaaaac aaaaaggcta ttttcatagc 480

cacacatttg tcaaaaacat ttttgcgtga acgaaaacga ctccagaa 528

<210> 68

<211> 412

<212> DNA

<213> Hydra magnipapillata

<400> 68

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tgtgggactt ttgataataa caaaggcaat gaaaggatcc caagaggtga acaatcttca 180

accaatgacc aaaacaagtt tactgaaagt tggaaattga attctgagga gagtttgttt 240

tacttcaaag gagggcctcg aaagtgtaca gcaacacgag caaagactta ctgtgtttgt 300

agtgaatcat gttgtgggaa tgaacgaaaa gtcagttgtg attttgaagg gtatgcagac 360

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<210> 69

<211> 585

<212> DNA

<213> Hydra magnipapillata

<400> 69

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tgataagatt ggggacggaa aaatttcaga tgttcaaatt attgatgttc ttcgggcgtg 120

cggcttaaac ccacttacta atgatgtcga aaagatcaag aaagattcat ccttggttgg 180

aaaacgtatt gacttagaaa ctttttgtcc aatttatgaa caaatagcaa gtatgtctgg 240

tcaagcaacg tatgaagata tggttgaagc ttttaaaacc tttgaccgcg accagacagg 300

aacaatttca gctggtgaat tgcgtcagtt gcttgtaaat ttaggtgata cattaacaga 360

agagcaagcg gacgtaattg ttcaaccaca cgaagatgaa aaaggtgcgg tttcttacca 420

ccaaataatt aaacacctca tggcgtcata attagtatac ttgttgtaat tatatgttta 480

agttgatagt tcatttaatt tacttttat tgttaaaaaa attagtttgc aaaaaagtgt 540

tgaaaaattt ttaagaaaag taaaaacacc ctttacaata ataaa 585

<210> 70

<211> 1233

<212> DNA

<213> Hydra magnipapillata

<400> 70

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aaaatgaagg tatatattaa ctttgttttc ctattattgt ttattggaaa ggctcttcta 120

aaagagtttg aagctgatat tatatttggg ggagatatta gttttgattc cccaattcgt 180

gtggcttctg gatcatcttg tccttatcct gagattctga agtatgttgc aaaatatttt 240

aaaaatgctg actttaacat gataaacttg gaagccccat ttgtgttgaa acaaaatgaa 300

aaccttacat tttttcctaa caaaggaatt cacaacaaag cttggcccga aagtgttgag 360

gcattaacat ctgctggtat aaaatcagtt acattagcta ataatcatat tagtgactat 420

ggtggtgact ctgttgacct gacaacaaaa attctttttt ataacaagat tgattatgtt 480

ggaataactt atggtgaaag cccaccttac tctcctcaga aaccactgat aaaagaaata 540

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tttcgtgctg gtgttaaaac aagcacagca ctacttcgga agcaaacagt tgaatatgat 660

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gtaaatttaa tcattggtag ccacccacat gtaatgcaag gacatgagtg gctgaacaat 840

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ccaaaaccta aagttgagga taactggatt gaagtatgcg gacctcaaga tgataactgc 1140

tatgtaccta gaccgggtag tccacaatat taatcatttt tgttaaacat tgtatttaat 1200

aaactttaaa tacaaagtaa tatttttaaa aaa 1233

<210> 71

<211> 1731

<212> DNA

<213> Hydra magnipapillata

<400> 71

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gtagatgttt tagaaagatg gagaaataca cacgttttga ttattgatga aatttcaatg 180

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gacgaattat ttggtgggat acaagttatt acttgcggtg atttctgtca actgccacct 300

gtaaaaggtg attatgtttt taaatccgcc atatggaaaa aatacatgtt taatgttatc 360

aaacttactg aatcttttag acaaaaaaat attgaatttt ttaacgcttt aaacgaaata 420

cgaattggaa aagtatctaa taaaacggtt gatttattat tgacaagaca ttatgaagtt 480

gatcataata taaatccaaa tttcatacga ttgtttttta caaatatgga agttgatttt 540

tataacttgc gtcaattaat ggtacctatt agtataaata ttaaaattgg tgctgtagtc 600

atgtcagtta aaaatattta cgtcgaagaa ggtttatgta acggtacaat tggcgttgta 660

tcatttatag aaacagatgg tgtttgggtt aatgtaattg gtagagaatt taaaatcgaa 720

aactccagaa gatttaatga aaagaagtgg aacgtaaact caattaaaga atggaataca 780

atagtattgg aaaaaaaacg acaagatttt tattctgaag aaaacataat gcaatttctt 840

atcgaagatg aaaacgattc gtggatacac gtattaagtc acttaaaaga aaaaaagtgt 900

ggactcaaat atactcgatt aactaacaaa cacgaatgta aaggatttta tttaacagac 960

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ggtttagatg aaagagtttt agatactgta gttttgggtt ctgtaataat tgattttgat 1140

gaaagaacat ttcaatttac tcattttcga atgttaactc acttgagtgt ttttagttat 1200

tgtagtaaac tcaattcagc tatgagtcaa attcaaatac aatatccacc ctctgaagaa 1260

cacgaacgta tgattgaaaa aagtgttaga ggtggcatgt cttcaaacgg ttcgcaaaga 1320

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attgaaaaat atcaccgtgt caatcctgac agtttttcaa caagtgcttt agttcattgt 1560

caaatcaaaa tggaacccaa atatcaagat aaagtaggag gcttttcacc tatggtcgaa 1620

aaagatgtta tacctttgaa tgattatact cctactaaaa ttgtagctaa acgaacatta 1680

aaaaaaatgg tcaatacact atcgaaaaaa ataagactgt caaactccta a 1731

<210> 72

<211> 502

<212> DNA

<213> Hydra magnipapillata

<400> 72

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tgagtttatt gattcctatg ttttaagtga aagcagcatg tttatttcca aagatcggtt 120

cataataaaa acatgtggta ttataacact tttggaatca gtccagcaaa ttctaagact 180

tgctgaaaag tatggcaaaa tgtctattgt tcagaacttt ttttactctc ggcgtgctta 240

ccttcgtcca aacgatcaaa ttggaattca taaaaccttt aatgaagaag taaactacct 300

caagcttttt attccatatg gagcagctta ctcaatggga ctaaatgaga gtagtaagtg 360

gtatttattt accacagaca atcctcatga aggtccacaa gcatgtgatg caacccttga 420

aatacttatg tctgatttag acgaagagac tatgctccaa ttcaccaaaa taaaaaatcc 480

caactccgaa gagttgatac gg 502

<210> 73

<211> 788

<212> DNA

<213> Hydra magnipapillata

<400> 73

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atgctattcg ttttgtgtgc atatcagaca ctcatggtaa acacagcgaa ataccggacc 120

ttcctgaagg cgatattttg atacattcag gagattttag tatgttgagc cataagaatg 180

agttagaaag ttttaacaat tatttaggaa ccttaacaaa caagtttaag catataattg 240

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tcttatctgt tgcaaaaaca tattatttag gttcaccatt tgctaaaatg ttgagtccta 360

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atagaataaa aatttatggg tcaccttggc aacctcctca ttttgattta gcatttaatt 480

taacacgtgg aagcaacata atggaaaaat ggaataatat tccatctgat actgacattt 540

taattactca tggaccacca cttggcattg gagatgaaat aagtaattgt tatcatgttg 600

ggtgtgcaga tttgttagtc actgtacaag acagagttaa accaaagttt catatatttg 660

gacatattca tgaaagccat ggtatgtgga gtgatggaac tacaactttt gttaatgcaa 720

caatttgtga taaaaaatat gaaccagttc aatctcctat agtctttgac tattattgca 780

ataaataa 788

<210> 74

<211> 3132

<212> DNA

<213> Hydra magnipapillata

<400> 74

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aaggaattcc cacttccatc tatatcactg ttaggcaagc ttaaagcagg tgaaattgat 120

tctatgaaag ttttaaagtt gttacatgaa aatgggagct tatcaaaaga tcttttaaga 180

atttttgatg aaatgtattt gcaaaaatgt gctgaatatt ctggcggaga tataattggg 240

gttagtgagg aaaatgaatg ctatagaagc attgtttcct tcatggtagt tggtttaaaa 300

gaaaatatct tttgtgttgt caaagcagtt ccaattataa aattaaacag tgattggttg 360

aagactgaaa ttcttaacct gattcaatct ttaataaaaa atagttttaa tgttcgaggt 420

tttaaagatg aaattcatgt tcaaccagga gaaatatcat ggaaaatatt tcatgattta 480

ttagaaaagg acagcctgtt ggatgcaagt ttaaaaaaag caccaaaaat aaatagcaaa 540

gttgtccatc ctggaaacta caagcaaaat gtcactattg ctttagcttt tactgactgg 600

ttaaataaat ggaaaaacac aaaaattcca aattttgaga aatatacatc tcctcaaacg 660

ttatcagcac tacaaagaac tttattatgt catgctttat taatagaaga tctgttcgaa 720

gataattata aatttatatt gactgctcgt tttcaaagtg atccattaga aagaagattt 780

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agtgagaaga taatccaaat aaaaagttta gtaaagaaag gaattcaaat tttcgaaaat 900

gatattaatg ctgtagaaga tacacaacat gctagatcct tgatgaatga gatcaaagaa 960

agagatttag attgtgtgac tttatcagat gattctcgtg aagttgctag ttatattgct 1020

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caacattgtc aacaggagtt gaatgattat aattatttaa atatattgtc ccgaggtggg 1140

ctaacaactc catcattacc ccttttagaa tatgtctgtg atagttttgc tatgctagat 1200

catgtatttg atgttattta tcagtctcga atgcaacacc gtaaaacagc aaagttagtt 1260

cttggcagta gagaagatga cagaatacaa cctgttattc ttcctgcaga gtaccttgtt 1320

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aaccgttatt ttgatacaaa accaattagg aaaggtatgt ggacaaatgt tgaggtgagt 1620

caaattttga agggaaatgt ctttatatat acaatcagaa taaatggaga agttgtttta 1680

tctgcagtta acaatgactc tcaaaatttt gacaatgtca aagtatatgc ttcagaatca 1740

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<210> 75
<211> 1110
<212> DNA
<213> Hydra magnipapillata
<400> 75

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tgtccaaaat gtctgctaat cgtagaaagg caaagagtgt tagcagcaca agtcgctctg 180
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gataacgtgt cgttaaccga tcttcaattc aacgaacgca aaacgtcgta caaaagtgaa 360

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cacacgcaaa gttatgtacc aataccaatg agatattttg gcaaatcggc aagtttaaaa 480
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tacaacggaa aaatataccc agacgatcgc tgccacaaaa gtagttggat gcaccatata 660
cctaatcatc cgcattctgt agattatatt ttggaagata aaaatttaaa cgaagaaaaa 720
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<210> 76

<211> 732

<212> DNA

<213> Hydra magnipapillata

<400> 76

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gtcaagggca atcactttca gatgtaatgt catgtaatgc aggcgtagta tgtccaggtc 540

aattgactga ttggacatca tggagtcaat gtccagctac atgtcaacaa gcagttggtc 600

aatttaatat gcagtacaga tcaagacaat gtgttaatac aactactgga aattgtggtg 660

gagcttcgtt aaacgatcaa gttgtttgtg ttagagatgt tccttgtcct ggtaagatat 720

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<210> 77

<211> 576

<212> DNA

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<400> 77

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atatcaacta atgccagtga agtaagttta acgcataaag aagaaagtgg tgttgttttt 180

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cacgagttga gcgattttgc tattttgatt acagccggat tatcaataaa acaagctctg 420

gctatgcatt ttatttcttc aatcactgca tatggtggcg gttttttagg tgtttctctt 480

ggaactgatt ggaacgctgg accatggata ttctctatta ctgctggttt atttgtttat 540

gtttcgataa ttaaaaaaaa tcctgatctg ttataa 576

<210> 78

<211> 2325

<212> DNA

<213> Hydra magnipapillata

<400> 78

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cactgaaagt cttataaaaa tttgatgagt ttaacgtttc attgaatagt ctatttgatt 120

gcgaagcggg aggttcaaat ttcctctaga agctttattt tatcagctgt ttattgtttt 180

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tctgaacaga tttagttgaa aatttttaca atcgaagata cttaatcaac atgagagaaa 480

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taaagtaatt tcaatactaa caaccgaaag tttgaaagtt ttttcttttt taaattataa 1920

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aaaacaacag caatgatttg aaattccatc ttaatgaaat tttagataaa aaattttaga 2040

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<210> 79

<211> 654

<212> DNA

<213> Hydra magnipapillata

<400> 79

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caaaaactct gcatgaaact ttatcaaaga gaagtgcaca agcatgtggt tataattgtc 180

ctgctatctg tgccccagca tgtactccaa tttgctgcgc tcctcctcca ccacctccac 240

caccacctcc accaccacca ccaccaccac cacctccacc accaccacca gttgcaattc 300

caggaaaccc aggaccacca ggacgtccag gacctccagg atttccagga ccaatgggac 360

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attgccctca gtattgttgc ccattgaaaa agtaaaatgg tcaagtttgt ccagaatcaa 540

cttttattga agaaagttgg gtaaatgaat aaaaatatgt aaatatatta gttttgaaac 600

tataaaaaga atttacagct caaaaaaagt ttcgtttatt aaaagttatt aaaa 654

<210> 80

<211> 1902

<212> DNA

<213> Hydra magnipapillata

<400> 80

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gaacctagtt taacttttcc agcaattagt gtatgtaatc tgaaccattt tttacttagt 360

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agtttagaaa atccaggatt cgatattcaa ggagaagaac tttatagtat attaaaaact 480

tcttcacaaa gtatagacga aatattttta agttgcgaat ggaaaagtag agatacagct 540

aaaaatgggg taccaaaccc atgcaagcca aacaatttta ctgtgtatag tggcctttat 600

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gaaactggag ttaacatggg gtttaaacta gaactagatt tgaaatcaaa agattctctt 720

cagggaattc aagaaattgg agctatagta attgttcacc atcagcagga aacaccagtt 780

cttcaagctg gttttgttgt ttcaccaggt tttcaaacgt ttgtggaaat aaaagtgaga 840

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tgaatcttga attcccaaag ttgtattttt attatgaatt ctctttttaa gaattattta 1860

ttgatagcat tttatttaaa aataaaatat tttcatggct aa 1902

<210> 81

<211> 1873

<212> DNA

<213> Hydra magnipapillata

<400> 81

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gatttgcaac tagaaagagt aaatgtttat tatgctgaag gatcagtttt ttcaacttct 180

ttaggaggaa agtatgttcc aagagcagtt cttgttgatt tggaacctgg tactatggac 240

tccgttagat ccggtccatt tggcgcaatt tttagaccag acaattttgt ttttggacaa 300

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gtatcagaca ctgtagtaga accttataat gctaccctct ccgtccatca gttagttgag 600

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gtaaacatgg taccgtttcc tcgacttcat ttctttatgc ctggatttgc accactcaca 840

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tgacgttttt ttgtattaaa actcttttct ctctctcttt tttcttttta ttcggcaaaa 1800

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atacacaaca aaa 1873

<210> 82

<211> 1045

<212> DNA

<213> Hydra magnipapillata

<400> 82

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ggacaaccag gaacattttg tgatagacac gaggattgtg ctggagaagg aaaagcggct 420

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acatgaatca ctaggtactg attacaaatt ccacaccaag caagcaaaca caaacaataa 720

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tcaaccaata tgttctatta acgaaattgg ttttctcaat agaataagta tttttggcgt 840

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<210> 83

<211> 2158

<212> DNA

<213> Hydra magnipapillata

<400> 83

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ccagtagatc gtgttttaaa ggaaatggct tgtaacaatc gtggtcactt ttataaaatt 180

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ggagtttgtt ataatcagag tactttaacg gaggagttgc ccgagttttg tggagctg 2158

<210> 84

<211> 970

<212> DNA

<213> Hydra magnipapillata

<400> 84

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cgtcgatggc ttccaccaga ttttgttgaa aatgcaattt catatcaagc aacttgtaca 120

gatacattta tagttggtta tccacgagct ggatcatctt ggatttcata tatcatatat 180

ctgctaaaaa atgaaggtga accaattcac tcctcagaaa ggttatggga agaaatacct 240

gaaattggaa tgggaaggca cgttgcacaa agatttggga aatattttgt tcaactagct 300

gaaatggttc cacaccctag aattcttcga actcaacttc catacgataa agtacctatt 360

catcccaaag caaaatgtat ttatatatca agaaacccat ttgatacagc tgtttcttta 420

tttcacgaag ttaggtctat aaacgaattc tccggttctt ttaatgactt ttttacgtac 480

tttttgcatg ggcaaactga ttataacgat tattttgatc accataaaag ctggtaccaa 540

aggaagtttg agcaaacagt tttgtggata acgtacgaag atcttatgac atatccgaga 600

gctataatta aacaaattgc tgattacatg ggtggtgtgt atcagagaag tgctaatgat 660

gaatttataa tgaaaaagat cattaacaat tcctctttta aggaaatgag agagaaagaa 720

tctctgttag ttcaaaaaaa tccaaataga attaacgact tttcattttt tagaaaaggc 780

cagattcatg atttcgaaaa ctttttttaat gaggagcaga taaaaaaact cacagaaaaa 840

tttctggctc aatttaaggg tagcaagctg ctcaacagct gggagagata ttgtcttcct 900

gttaaatgta tgtaacaaca ctactcaaat tatgttaaat tataaataaa aatgtgtaaa 960

gtaaaaaaat 970

<210> 85

<211> 885

<212> DNA

<213> Hydra magnipapillata

<400> 85

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attctgttcg tcgcacaata tggtttttta taacaatagc tgcatttgcc tatgcgatgc 180

aaaaagttta tgaaagtaca atgaactact tttcgtaccc attttacact gttcgcatga 240

gaatgtatgt taatcagata gattttccag cgatatcttt ttgtaattta aacgatataa 300

aatttagtgc tatgaatggt acaattgttg atgatgcagt cgtaacgcaa aatcatgaag 360

caaatataac aggtgaagaa tatagaagct ataatcaagc agccagacac acattaaatg 420

aaatgttagt tgattgtgac tttgaaggaa aaaaatgctc ccacaaaaat tttacagaat 480

ttagttggat gcagggagaa agttgcttta catttaattc tggcaaacct cctcatactc 540

tgttgaaagt gaaaggagca ggtataaaca gaagtttaaa acttaccatc aacgtccaac 600

actacgatta ctatagagac aaaatggact ctggaattcg tttaattcta cacggacaag 660

acgaaacacc agttaaaatg agtggtttaa cagttccacc tgggtttact acatacattc 720

aaatagaaaa aaagacgatt ataaacttag aagcgccata caaaacaaaa tgtggttcag 780

taaagttaaa atattttgat agttactcga tgcatacctg ctggcttgaa caacttacag 840

attatgttta caaaacatgt aattgtaaag actattttat gccag 885

<210> 86

<211> 1398

<212> DNA

<213> Hydra magnipapillata

<400> 86

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gaaaaccttg cagtgagtgc taataaaaga cgtagagctg aaactgaaag tggaagagga 120

ggtcgtatat ttaacccatc ttggacaaat gaatattttg tatgccctga aaaaatacaa 180

tttgctgaag atctcagtct ttcacaccag acaattgcaa gaagggttga agatctatca 240

aagaatattg aattagcatt gaaagaaaaa ctatgtaagt gtgaagcata tagtctggca 300

cttgatgaat caacagatag aagtgatacg gctcagttag ctatttttat tagatttata 360

acaagtaatt ttgaaataat tgaagaactg ttggatttca ggcacatgaa aggcactact 420

aaaggggaag atattctttc tgaagtcaaa aaaacaatga taaagtttga tttgccagaa 480

acaaaactct ctggtgtcac tacagatgga gcaagttcaa tgaaaggaaa aaatattgga 540

tttgtggcat tatttaagaa atccattaat cacaacattc tttcatatca ctgtattata 600

catcaggaac agttatgtgc aaaagtatta gaaatgaaag aagtcatgga aattgttatc 660

caaactgtta attttataag aagtcgtggc cttaatcaca gacagttcaa acaattgctt 720

gaggattgtg gaagtgaggc agaagatgta atttatttct gccaagttag atggcttagt 780

cgagctgcaa ctttgaaaag attttggata ttaatacctg aaataataaa gtttctaaaa 840

attaaagata aagacacaag ctttcttgaa aataatgact ggctgaatga tttggcattt 900

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cttattataa ttgatgaatt tgacacaaga ttttgtgatt ttaaagaaga aaagaatgag 1020

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gctatgaaat acttttccct ttttggaagc acatacatct gtgaacaatt tttttcaaga 1260

atgaaacatg ttaaatcaga gcagagacat aggttgaaag atgaacacct cactgataca 1320

cttcggattt catcgtccac tataaaagct gacattgatc aattgtgtaa aaataaacaa 1380

tgccaagttt cccattaa 1398

<210> 87

<211> 891

<212> DNA

<213> Hydra magnipapillata

<400> 87

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aaggtctggg aaaaggtttt gctcttgctg tattgaaaca cggtggtaaa gtgatacttg 120

tagatattca aaaagaaacg ggcgaagaaa cggaaaatga attcaataaa acttatccag 180

gtcagtccgt tttctaccat ggaaatattt ctgataaatt catgatgaat tatatttggg 240

aggacagtga aaaaaaactc aacggaaaaa tttccgtgct tgtaaacaac gctggagttt 300

attgcccctc caacttcatt aaaacaatgg aaataaacct catatcactt atgcaaacga 360

cctatattgc tttggagaag atgagtatca aaaatggtgg caatggtggt attatcatta 420

acatcgcttc ttctgctggt ttatcaccag aaataatgtt attaactcat cctaatccca 480

tcgaaacaat accttattgt gtttccaaat cagctacagt aacgtttaca aagtctttgg 540

cactctccaa tatactggaa aatgatggcg tcaaagttgc tgcaatatgt cccaacgctg 600

ttgatactcc attagtaaca ggaaacgaaa cacttgttaa tatgttgaaa tctttagatg 660

ttgctttatt gtccgtagaa aaagtagcta acgactttat tcaactttta gaggatttgc 720

acaataatag cgcaaaaagt ggagatattt tatttgtagg gcaggtagcg aattacgtca 780

acaccccaaa atatgagcta cctgacatgt ccggaaaaaa ctgaaaatga aaaattggaa 840

atataaatag caaagttatt taaagaaaat tgttttaagg acacagaatg a 891

<210> 88

<211> 3859

<212> DNA

<213> Hydra magnipapillata

<400> 88

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tctgagttac aaagtctttc aatgtctact acagaaagat taccaataaa tgtaaataac 120

ttgcagcaac caatcatcat tgcaatatta aataaacctg aaaaaactag gggatataac 180

ttgtctttat ctgccccaga agaacctaag gtgttgtccc ttaaattgac atccagctta 240

tgcaatatga tgttgaaatt tagtgcatcc aatgatccta gtaatttgac ttttctcatt 300

gtatttcttc agtttggaaa agttcctaca aaaaatgatt atgatattag gcttaatata 360

tcaaacaaag atggcgttgt tcttacaaaa aataggcttg ctatgagttt taatgcaagt 420

gaagaagtat catttggtca aaaaaataac cttaccaaca gtgagattaa aaattcttct 480

ttttttgttg aaagaaatca acaagctcat ctacttgatg gtggtacttt aattttgtgg 540

gattttcaga attcaacata tgcttttctt aacaattcag ttttgtatat atcattcttc 600

tatgttggtc ctatgccagc taaaaaattg gaaaaaaatt catatactta tgatgaaaag 660

gaatacgaag gggagttcat ttatgaaatg aaatcttatt gcagtgaatg taattactgg 720

aatgaaatat caaataagtg gatgtctgat ggatgtcaac ttgactttga aacaaccagc 780

tttgaagtaa caaagtgtaa atgtaaacac ttgactggat ttggtggatt ttatgttgct 840

ccaaacgtta ttcagaaacc gtcattagca ttattgaaaa agggttatct tcttcttgta 900

attgttacaa taattttgtt gttttggatt tgtggtttaa tatttgcaag acgaatggat 960

ataaaagaca acactaaata tggtgtttgt ccacttcctg ataattctcc tgaagatagc 1020

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gaaagacaat gttttcaaag atcagcttct gactctttca tattaacaac accaaactgt 1200

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tggattgcaa tcgataaagg tgattgttta ttagatgtta caataccagt atcagcttct 1380

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atcaagaaaa aaaaaggttt ttatttacct tattgggcaa agtatgtcac atggtctctt 1920

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aataaaaagt ctttagattg gttaataagc gtaatactat caatggttca tgatgtattt 2040

gtaatgcaac ctatgaaaat ttttatcatt gcaataataa cagctcttgc aataaaaaag 2100

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tgcaatgaaa atctcaaatc tgttaagttt aatttagacg tacaaactga tttaacgatt 3840
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<210> 89
<211> 957
<212> DNA
<213> Hydra magnipapillata
<400> 89

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ttagatatcc gctgttggtt ctgcagaagc cattttgaa gaagtcgtca aaagcttgga 180
agcgtttgaa aagaaaaaaa atatgtcatc tgaactcgaa ggaaaaaaca ttatattcgt 240
tctaggtggt cctggaagtg gcaaaggaac tcaatgtgca aaaattgttg aaaaatatgg 300
tttttgtcat ttatcaactg gagatttact acgcgaagaa gtaaaatcta gttcagaaag 360

atcagagcaa ttgaaagcca tcatggctcg tggtgagctt gtatcccagg aaacaatatt 420

agaaatctta cgtgatgcaa tgattagaaa caaggattct aaaggctttc ttattgacgg 480

tttcccaaga gacgtaccgc aagggaaatt atttgaaaaa acggtggcaa aatgtaagtg 540

cgttttatac tttgaatgca ccaatgatgt tatgacagaa aggcttttag gtagagcagc 600

tacaagcaat cgagttgatg acaatttgga aaccataaag ttgcgtttaa aaacattcga 660

agatgctact ctgccagttt tagcagaatt cagtgatcgt cttaaaaagg tcaatgcgga 720

gagatctgtt gatcaaatat tctgtgacgt ttgtagcgta ttggacgggt tgtagttagc 780

aatatatatt tttcaatgac agggtgcatt tatggggagc gcgtttaata attcatgtag 840

ataaaaataa gcacttttat taaataattt taaaattata atagtatatt tttccggata 900

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<210> 90

<211> 1961

<212> DNA

<213> Hydra magnipapillata

<400> 90

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acgggttaca acattcttaa aggaaatccg tttactacca ctcaaactag tgatccagga 180

ttttcttcag gttacatatt tgtgccaact tatagaaccg aagatggcac ttatgcctta 240

cacgatggag ttactgttcg tcaaacttta cagtgcagcc tgacatcgag taccgatgta 300

attacaactc ttaatagtta cgtaaataaa atacaaaaga aatcttcata tgggagaaca 360

ttcacatcta atcttgaata cgaggttaaa ttagaagcaa aaatgggcga cgtaggtgca 420

gaagttagca caacaattcc tcctctgatt gaatcttcgt tttcatctag caatgaatac 480

agagataata aagatttctt cacaaaaaaa aaaggtgtgt tagcattacg tgacgcaact 540

tgtgctacct ataccgtccg tataagccct tacaaacctc caccatttag tgaaggattt 600

aaaatagctc tacaaagttt aaatgattca attggaaaaa gtactgaaga aataaaggaa 660

agttttaatg actttattcg tgaattcggc acacatttcc ttcagcaaac aacaatgggt 720

gctagaacag ctataacaag gagatattct ggagaggagt ttagacaaag tagagacgac 780

tcaatacaaa agtgcaacga agatcgttta aaagttacaa ttgcaggagt tggtgttggt 840

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tttgaacgag aatcaattac ttcgtacggt tctaagcctg caaaaaatct tgaagaatgg 960

gcgcaacaaa agtttgaatc tccattgcca attaaaatga aacttagccc aattcttaat 1020

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gaatgcagta caaaagaaaa gaacaaatgc ggctatgatg acaactgcat tccccgacaa 1200

caagtttgca acagtgatgg caatagttac acctgctgta cattaaagtg tgatgcacag 1260

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cgtaaagagt tgtacagtta cttggaaaga aattacaata cttacaagtt tgttgttaac 1500

tcatataatg agatcgatgg tgacgacacc gaagcacatt cagttgtagg caactatgtt 1560

cacttttata aaaaatatgg aagaaatctt gttgtcgcat gggcaaaaac tggatttcca 1620

aatcatgaag atattcctga attaactgct tctctctatc attctgttta taattatgat 1680

tcgaatgcaa aaaaaagcgt gttgaaagca tggaatgacc attacgctaa atataaagat 1740

caaaatccaa tagttttcat gcaagtcgtt cgacacggca atggtctacg ttccaatcat 1800

gataccaatt ttggtgtcta ctttgactat aaagtatcat actggaatcg agaagatgtg 1860

tcaagcttta ttgctttgta cggaaaaatg taacttaatt ttgtattgaa accattgtaa 1920

gttaaaaaat tgattttaat aaaaacattt aatattgtat a 1961

<210> 91

<211> 745

<212> DNA

<213> Hydra magnipapillata

<400> 91

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aaaacagtta aatgaagtta gaaccacagg aaaacaggct caactatctg aatcaaaaat 180

taagcagtta tgcaacatat ctcgtgagat ttttttggaa gattccaatc tgctagaaat 240

taatgcacct gttcatattt ttggtgatat acatggtcaa tttgaagatt tactacgaca 300

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agcagattta ctttggtctg atccagatga ggatattact ggatggggag acaacgatcg 660

tggagtttca tggacatttg gtggggatat agttcaaact tttttgaaaa aaaataattt 720

tagtttagtt gcccgggcac atcag 745

<210> 92

<211> 1590

<212> DNA

<213> Hydra magnipapillata

<400> 92

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aacttaccaa aagttattag aaacaatgac ggtttcttat ataatccaaa agatatagct 180

aataagataa ataactattt tgtatctgtt ggccctaatc tagcaaaaaa tattccagtt 240

gtaaccaaca aaacaaatta ttttagcccg aaatttccca aattcccaaa acttcctaaa 300

atttctgtac ttaataaatt tgaaatttca atgaaagaat ttgaatgtgc ttataaaatg 360

ctaaaaacaa ataaagcgag agtgtttagt tacacaataa aacaaggatt atttcctgac 420

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aattatcgac caatatctgg actctctggc ttttcaaaaa ttcatgtttt gaaccaacct 540

tatgatgaaa gtgtctcagt cggagatgat gaagaaatag aaagtgagct atctccaact 600

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gaagctagtg atgaagatga tgatgaggaa gatggtagtg aatcaagcga agatgaagat 840

gaaaaagaag gaatacatgt gaaaggggct tacgatccaa ctgagtttga acatcttcct 900

gtcagtaaag aaataaaaga attattccaa tatattgtta ggtatgtgcc tcagacaatt 960

gatttagatt ataaactgcg accattcatt ccagaatata ttcctgccgt tggagatatt 1020

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cttgatgaac cggcagcaga gcagtctgat cctactggta aatttttttc tagtcaatac 1140

atgtttattt tgttttgttt tatatgtaca gagattgttc gtagcattga agaccctgat 1200

aaaaatccaa aggcaatcga tagctggata acaaacattg tcaagttgca tcgtgaaaag 1260

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tgtgaacttg cagagtatat tgatattata tgtgctattg tcgatattcc tgtttatgcg 1440

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aagcaaagcc catccatttc atatgaataa 1590

<210> 93

<211> 781

<212> DNA

<213> Hydra magnipapillata

<400> 93

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ctaagaatca cgaagtacca gccaaaaaac aatttgcaga aactaaagtt gaaaaaaaga 180

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cagtagatat agaagaatgc aatgaagatg atgatgattg cgaagatgga ggagaaacag 300

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agaaaaagaa aaaggaaaac aaactgaaaa aagaaagcaa gaagaaaaat tcaaagaaaa 600

cagtgtcaaa gaatgcaaag aaaagttcta aaagatcaac aaatacaaaa aagaccagcc 660

aaaaaaaaca acaaaataaa agaagcgcaa ttcacaaaaa ccttaaagct aaaagaagca 720

aactttaaaa aaaagtcaac ttctgatatt ttaattattg catttttgta aaagttactg 780

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<210> 94

<211> 2307

<212> DNA

<213> Hydra magnipapillata

<400> 94

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ggtaaatcta tttatatcga aaatttacca tgtctaaaac gtttggaaag aaatatgttt 180

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agactaaaaa gattattcac attaaaagaa agaccagatt gcactgaaga tatgcctaag 720

aatattagtt taccagatga cattgatgtt ttcacacagg ttattgattc tttcagtttt 780

attgaaagca acacaaagtt aaatagttca gtgaaaaaaa atttacatat caatatatca 840

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<210> 95

<211> 2648

<212> DNA

<213> Hydra magnipapillata

<400> 95

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caccacgttt tttacaatat tttggaatta ttggaatgaa aaaagtgaaa agtggtgcca 180

ctaaaagaag agaaaaagct gcagccatgg agaaaatcat gaaatacccc aaactaacac 240

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gtgattattt gggtactaga ctagagtcag atgggttaat ctatgactca aatgcaaagt 360

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aacacgaaac atgcagtgca catttaaaat gctttgaaca ttggatgaca ttaagaaaag 780

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tgttttaa 2648

<210> 96

<211> 955

<212> DNA

<213> Hydra magnipapillata

<400> 96

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tgtaaaaatg tctattgatt gggcagcaat taattctaaa ctacctactg gaagaagtga 120

agaagagaaa gaacaacgac aagcgctgtt caaacaattt gataatggta atggattttt 180

atcgttagca gaaattgata aatctatcgg aaacttgctt cagttagacg atgtgtttga 240

tattaagcca gctataatga gggcatttca attagcaaag agtgttgtaa agtctagtaa 300

aaagtcgggt gacgacttta ttgaatggtg tgagtttaga tattttcttc tttctcttcg 360

acagtacctt gagtattatg aagcattcga acgcattgac agcgactcga atcaccaaat 420

ttctttaaca gaatttaaac aagcgcaaga aaaaattgag aaatgggttg gtccgatttc 480

gcccgaggat gagtttaatg cgattgacaa gaatggaggg ggatcaattt tgtttgatga 540

attttgtgat tgggcaatta agaagagtct tgatctagaa gatgacgttg attaagtaaa 600

atttgttgta atttttacga aaatttgtta acataatttt gtgcacaata atttctcttg 660

gttatccttg ttgtttcaat tataattttt cttttatctt aacctaaagg ggttcaaaaa 720

aatttattcg gtataagata tttgcttttg ttacacaaaa tctgtaactt acacataagt 780

tgtaatgtag agtgcattta ttatatattt aatatagttt ttattacttg tcatatatag 840

ctataatatt ttataataaa ggtgattaac taattgaaca aaaaatttag tgtaaaaaca 900

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<210> 97

<211> 759

<212> DNA

<213> Hydra magnipapillata

<400> 97

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aataaacttt cggaaaatca aaataaaggt gtgtggatat ttggttacgc gtctcttatg 120

tggaatgcta acttcaaata ttcaaaatcg cgtataggtt acataaaaaa ttttgtaaga 180

agattttggc aaggcagcac agatcataga ggagttccag gaaaacctgg cagagttgca 240

actttaattc caactgagag ggacaagcac attgtttggg gcaaagcata cttcattgaa 300

ccagcagacg ttcaagaaac gttcgaaata ttggattatc gagaaaaagg aggatattcc 360

caacaaatat gcgactttta tccgcgcgaa aacgaagaag ctgtaatacc cgttgttgtt 420

tacaatgcgg tggaaggtaa tgagaatttc ctcggtgaag catgtattga cgacatagcg 480

aaacaaatta gtaaatcagt tggaccgagc ggtccaaata aagattattt atacaagctg 540

tgtgaaactc taaatgagtt cgacattgct acagaagacg ataagatgca cacaatggaa 600

ttaaataagc tcgtaaaaaa tatactaggc gattaaatgt atgatgacaa tctgatgaag 660

aaagaataag taaaaaatac acaagtcact ttttttctgt gtttaaatat gtatatctcc 720

caatattaca ataataataa taaaaaagta atatataac 759

<210> 98

<211> 1134

<212> DNA

<213> Hydra magnipapillata

<400> 98

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taaaagaaaa ctggggacga tcaattcctg atcatgaaac aaaatgggaa aaacaatatg 120

cgacagaaat aaagttaaat atattaaagc agctccaaat gtttgaaagt ccaaaacaga 180

gcaattttac tcaaatatat ccgcagtcat taaaagaaag attatttgat gacgaacaag 240

aagaagtaac tcaactcata tttttagcaa aaatagatca acaatacccg tctccacaga 300

ttaccgttat cgaagaacat agtccaattg aaccggattc taaaataaca ttagctaaaa 360

tgtcagtttt tataacacca actataggag attcagactt ctttccaata ttaataaaag 420

aaaatgacat tttagtatca agtgtatcca tatcaaaaga gcatgttggc tggattgaca 480

ttgatattac tgtagcattt caaaagtgga ctaaataccc taaaaatggt ttaaaatcgc 540

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acactcctta ttttcttgta catgtcataa aaaaaaaatc accacggcaa cgaagaaact 660

tttggacgtg taacgaagat gccacttgct gttcgcgtcc tttttacgta agttttcaag 720

atttaaaatg gaattgggtg ctatcaccaa aaggattttg gacaaataaa tgtatgggta 780

aatgtaagga tggaaattta aataacagtg gttgttgtgc tccaaaatca ttcggttcaa 840

taacgatgtt ttatcacaac ggtgattata ttttgtatgg taaaaagatt gaaaatatcg 900

taacaaagga ctgcggctgt ctttaacgaa acaaaattac aatgatgata aacaagatgt 960

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attcacacat ccattaacaa gttgcatctt atgcattaat ttttgaaata ctgttgagtt 1080

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<210> 99

<211> 957

<212> DNA

<213> Hydra magnipapillata

<400> 99

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gacattcttg gacttaaaga gggaataaaa tcaaacggtg aagtgagttt aggcaatagc 180

tttgttgacg caataccttc aactcggtca cctcaatttc ctgaaagtga ttcggtttct 240

tctccagaat cttctagatc accaacatca ccttctttaa gagtgcaatc attaaatatt 300

ggaggaagca tatccggaga cgattgcgag acgctagaca gcccgacatt agacaatgac 360

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gaacttgaaa gagtgttcaa caggacacat tatccagata tattcctgag agaagaaatg 540

gctgtaaaat tgggattaac agaagcaagg atacaggtgt ggttccaaaa tcgacgtgca 600

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cctcaactta acaattacct taaaccctat acccccactc aaccatccac acctttttaat 720

aatagtatat cgaattcact ttttttaaaa tctcttaacc atccctctca aactgagaaa 780

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cgatacattc atcgcaacat atacaactat gattccagga gcataaataa tggatatcgt 900

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<210> 100

<211> 2375

<212> DNA

<213> Hydra magnipapillata

<400> 100

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cagaagcagc tcaaaaacac gcagatgaaa ttgcagcctc tggtgttgca aagcctgatc 360

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<210> 101

<211> 5101

<212> DNA

<213> Hydra magnipapillata

<400> 101

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gtggctgact gtggtacatt taaaagctat tcaacttttg aaactttcat gaacaattta 720

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<210> 102

<211> 2697

<212> DNA

<213> Hydra magnipapillata

<400> 102

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cttgaagata acatggtttg tctggaagat cctactgaca acgatgacca gattcacgga 180

aaccgttccc gagcaaaatc atatgtattt gatcatgcgt tcggtcccag cagcacgcag 240

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gcaaccattt ttgcttatgg gccaactgga actgggaaaa catatacaat gcttggtact 360

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acaaggcatg ataaaaagta taaagtgaag ctttcttatc tcgagcttta caatgaaatg 480

atacgtgacc ttttgaaacc atcgtctgag tacttagatc ttcgagaaaa tagtaaaggt 540

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agagacagta agcttacacg tttgttaaag gattcacttg atggaaattg taaaacagtt 960

atgataacac atgtaagtcc agcagacaga aactttgaag aaacaagaaa cactttgtca 1020

tatgcagata gagcaaaatc tatcaaaata aaaccaaaag tcaatcaata taatgttaat 1080

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aaaggacaga tgtctgatct tataactttt ccccacaata aggcagaatc atttgcaaag 1200

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gtaagtggaa cttcgtttgc tccaaagcca acattgccag gttttggaag aatatag 2697

<210> 103

<211> 428

<212> DNA

<213> Hydra magnipapillata

<400> 103

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tcaatatcaa gtgatgaaat tgatagaata atacaagaag ttgatagtaa caatgatgga 180

aaaattgatt ttgaagattt tgttaaaata atggcaaaac aaaaaaaaga ggaaaacaac 240

gaagatatta aaaaggcatt cgacgtattt gataaagatg gaaacggaaa aataactgct 300

gccgaactta aaataacaat gcaaactttg ggagaagagt taaataatga agaaattgat 360

gaaatgatac aagaagcaga ccttgacggg gatggagaga taaactacaa aggtttaagc 420

gatatagg 428

<210> 104

<211> 1035

<212> DNA

<213> Hydra magnipapillata

<400> 104

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tcaagtttag aacttttaa atctcgatgg cctggaaagc aagatgttga atacagatca 180

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ttggtcaatg gctttcctaa ttgtgttgaa ggaaaaatat tatcaataaa atctatgcag 420

tctattagag gacttgctat ttgcaaagga atcttggaag acttagagga atggaatctc 480

attgccaaca ttgtcgccga ggtttttgat acgactgcat gtaatacagg agttaggaat 540

ggagctgcaa ctcttttaga gggttgtaaa tcaatgaaaa ctcttctttg gctggcttgt 600

cgccatcaca ttttagagtt gatcttggga gcattttgga ggaccttatt taaaaaagaa 660

aaaaaagcta attataatat agatttcgaa gattttcaac aagaatgggt ttgcgcagag 720

aaggctccac taacgaaagc agacaaaact ggtgtgttct tagagaaacg agtaaaatgt 780

aagcatcttc gaggtgatta caaggaagct gcagagttag cactttatct tttagacgga 840

ccagaaccta aaatctttgt cagctctgct cctaatgttt cggatgaaat aatgtcaaaa 900

tgtgttctac cattgtttaa gaaagctgga acttatggaa atagatcata taaaaaaaac 960

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aaggcgattg tttga 1035

<210> 105

<211> 999

<212> DNA

<213> Hydra magnipapillata

<400> 105

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ttattaatat ctgctgaaaa agataataaa tcttatattt ggtgcttctt tgattctcat 120

tttggtttac aacgcaaaaa cttttattac tttcatcatt tatacaccag ttattgggat 180

tactctaaag aacatggtcc agatcattgg caagaaatat gggaatttaa aaattgtcaa 240

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tctacagaat ctggatctac aattataact aacaacttca gaccgataca acctttgaac 960

aatcgaattg taagatcatc atttaaaaat ttaatttag 999

<210> 106

<211> 423

<212> DNA

<213> Hydra magnipapillata

<400> 106

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gaccttctta aatccctaga aacctgtgtt gatactggat taactgcttc agttgccgct 180

cgtaatttag agcgtgatgg tccgaatgct ttaactcctc agaagcaaac atctgagttg 240

gttaaatttt taaaacagat gtttggaggt tttgccatgt tgttatgggt aggtgcagct 300

ttgtgtgttt ttgcttatat tatacgttct acaagagagg aaaatccacc aaaagatgag 360

ctttacttgg ggattgcttt aactgtgacc gttattctga gtggattttt ttcatattat 420

cag 423

<210> 107

<211> 2079

<212> DNA

<213> Hydra magnipapillata

<400> 107

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aaagaaaaca attacccaaa aaatacaaga attcacatta tgcacgaagg caatgaactg 780

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caggataaaa aaagttatga agagctaaaa agagaaattc aaaaagaaaa tatattcata 1920

aagtatcctg agagatcact gacttctaga gctccctccc tgcaagttac gccaaaaagt 1980

cagcgttatg aaaaacgtct tcggtacagt tactcatgtg aaaatctaag aaatccccaa 2040

acctttagaa ctgattttat aaatcagcga tggaaataa 2079

<210> 108

<211> 2097

<212> DNA

<213> Hydra magnipapillata

<400> 108

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ttgttagctt caattccatc aattgcaaat gttttgttta tatgtcttat attttggctg 180

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caagcaatta caacatccaa aaatatcggc gttagatcaa gagaaaaaac tttatggaaa 1980

attgagcgtt taattacagt gctatggaaa gcaaagtttg aatatcagaa atttattaaa 2040

gagtgtaacg aagaagtaga aacagagaga gaagatgata acacaactag agtttaa 2097

<210> 109

<211> 1528

<212> DNA

<213> Hydra magnipapillata

<400> 109

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aaaagcaaag aagattcaga tgatttaggc attgaatatg attttgaaag tatacttcat 180

tatggttcat atgatttctc caaaaatgga aaaaccctta aaacaattgt ccggttagta 240

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aatgttttat atagctgcaa gtctgataca actgaatttg ttagtgaatg gtcctcattt 360

ggaccttgta atgctttgtg ttataagtca cgccagcgat tttgctcaag ttcagacata 420

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tctgaatgtc aaggttacaa ttatggtttt ttttgttctt cagctccaat cgatggtcac 540

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<210> 110

<211> 1846

<212> DNA

<213> Hydra magnipapillata

<400> 110

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tatacagttt ctttcaaaaa agtataattt tattatcatt tataagaaaa tatttagtaa 1800

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<210> 111

<211> 900

<212> DNA

<213> Hydra magnipapillata

<400> 111

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aaaactttaa atacaaaaaa agcaaggcaa tctccgatta atattgatac aaaaagtgtg 180

caacatgacg aaagcctaaa acctttaaat ttagatcgtc aaaatatttt agttcatgta 240

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gaatttcatg cagttcattg gaataccgat ttatatcaga cagaaaatga agctatcgcg 480

aatcctgatg gtttagctgt catcggtata cttatagatg caaatgaaaa gtacgaagac 540

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gaatgggaac aacacaactg ttataagttc caacgtcaat ctgattcctc gacgattaca 840

aataactttc gattgacaca accgataaat gatcgagtaa taagatctcc attgccatga 900

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<210> 112

<211> 1322

<212> DNA

<213> Hydra magnipapillata

<400> 112

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tagtcaaaat gaagacaatc agaaatacgc cggtattgcg agatcattaa aagttttgtt 180

acaaaattat tatcagaagc aagaagaaaa aagtgatatt caaaatatta ttgaaaaatt 240

cagtgaatat caaaacacgg atcacaagag aaatgataaa acaaatccaa tgatcgaaaa 300

aaaagattcc gatactgaaa atcgttttaa cagagaggct attgaacagt ggtttagcgg 360

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cgaatttttg ttatcagaaa cttcggaaaa aagaaaaaaa taataaagtc aacaaaaaaa 1260

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<210> 113

<211> 1759

<212> DNA

<213> Hydra magnipapillata

<400> 113

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aagtctaaaa gtaatttcag gaaatggaaa tagttttgtt ttatcaggag tagacaattc 180

attgcttaat ggaactaata atgttaatgc ggcagtggcc ctcaaaagac taccacttgt 240

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<211> 2156

<212> DNA

<213> Hydra magnipapillata

<400> 114

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<210> 115

<211> 614

<212> DNA

<213> Hydra magnipapillata

<400> 115

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<210> 116

<211> 288

<212> DNA

<213> Hydra magnipapillata

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<212> DNA

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<400> 117

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acgcagtacc aatgcagcaa ccctgtcagg gtccaacatg ctctttgata atgcaaaatc 1500

cttgtattgg gccacaatgt tcaattccac caccaatgcc agcatcaccc tgtcaaggtg 1560

caacttgcgg tcaaccagcc caatttcaaa tgccgccaca gtacttcggt ttacctcaaa 1620

tgaatccatc ttcatgccca ccactatgtt ctcagaattg tgggccgatg tgtcctacac 1680

agtgctgcaa taatagagag caacaagttc cgttgtatcc acaaataaga tgtggtccac 1740

aggggtgcta a 1751

<210> 119

<211> 1725

<212> DNA

<213> Hydra magnipapillata

<400> 119

atgaccgata tcaaaatatc ttcaaatatt tcagggagaa atttacttcg ctttcatccc 60

gacaaacaaa gagaaaaaat aagtgatgcg tcctttaatg gtataatatt tgtaaaacaa 120

gataatagtg tcaatcttag caataacgaa tcacctcaaa tgtctccgtt taaacaaaat 180

gaggagaatg catttaacaa ttttgctact aacaaagttc tagaaactga tattgttgaa 240

tctttagata tttgtgaaac tgtaatatgt ggcaaagaag atgaaaactg caataatata 300

gttaaagaag atcatgttat agttaatcaa aaaaagaaat ctgcagtgca ttcctttaaa 360

aactttgttc gaggcacaat cattccaatg ccatctgaaa ctaaagaatg gctgggcaaa 420

cagcctccag actgtgcaat cgaaatggag aattgtgtat taaacaaaga acaaagtttc 480

tcaattaaaa ccgaagatgt tccaaggagg aaaaagcttt caagtgttat taatcgcact 540

aaaaaaactc gatcaagaat acataacgaa ggtgcttctt tatggacacc aatggaaaat 600

agtcgttgga agtctggaga aaaagttgtt gaactaaaag atatttcttt gcaccaatta 660

actgaatcag agcgtgaaaa attgaaacag tacggattag aaagattacg agaaaacaat 720

tttgattgtc atttaataat ccccaaagaa ttattgtttg catcaggttg cagtttgcac 780

catgacagta aagaaaaagg tgctaaagct gtcgtacaaa tatcagaata catgagcgca 840

tctcctaggc cttataaccc tgtgttttcg gtggatctaa accaagttat tgagaatgat 900

aaacttattg aaaaagcgca aaaagaggca atgcaaaaac ttgataaaaa tgaagagctt 960

ggggaaaact ttgaaacgaa tgaaaaagat caatcaaaca aaaacagtat aactagaact 1020

aaggtctgtg aagaggcgtt tacaaccgag gatcatgaag attacaactt gaattatttt 1080

aggacaatat gtacgctgca agaagaagac gaggatgaat ggagcaccaa taaaagaaaa 1140

tcaaggttaa ttgaagctct tgcactttct tcaacatctg cttcttcttt gtgcatactt 1200

gataaagaaa tagagtttaa acaacttcct cttcaaattc caaaagtcat tttgcaaaca 1260

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gaagaaagta atccaaacga tgttgcagca cttttaaaag agtttttaag atgtttacct 1440

gatccattgt tgactagaga actttaccaa gtttttttat ctttagcaaa aaaagaaaca 1500

caaacaaaag aagaaaaagt tgaaattatt cagcagctta tctggttgct acctgtggct 1560

aatcgagata ctttagaatg tctcctaaat tgcttgcgaa tggtagctga ccattcccaa 1620

aattcaaaag atgaatttaa taatgagata tgtggaaaca aaatggactc tctaaaccta 1680

gccactttaa tggctccaaa tattctacac agatgcaaag tatga 1725

<210> 120

<211> 671

<212> DNA

<213> Hydra magnipapillata

<400> 120

taatctgttt ataatttttt tggtttatac ttcagcaaaa atgcttcata tggctataat 60

atggaattaa ttttgtggtt gagtcttaga tcatcagtat aatctttaaa aatgaaagca 120

caagttccaa gaacctatga caaagaaggc tataaacttc gagcaggatg tttatgttat 180

aaggatgcgt caaaaaaaga aatattactg gtatccagct caagcaatga ttctctttgg 240

gttgttcctg ctggtggcat agaccctgga gaaaatccaa ttcaagctgc tattagagaa 300

gcatatgaag aggctggagt aataggtgtg gttggtgatt gtgttggagt gtttcaatta 360

ttgcgctgaa aagaatacgt gaaaagtgat ttaaatagtt ccaggaatat atcaaactta 420

catacatatt taaaagatta attaaaaaga acaaaagcaa tttaaaatta tacatgacga 480

atacttaaaa gttatataag ggattaaaat tgtacatgac aaatattcaa gtcattaaaa 540

gatgataaaa attgtaccaa gaaaaaacca aactattagt tgatataaag catagataaa 600

agctaataaa aatatttatt tatagaatta ttaaaactaa aaataagtgc ttattacatg 660

atacttaaaa t 671

<210> 121

<211> 1044

<212> DNA

<213> Hydra magnipapillata

<400> 121

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tgacttaatt acaaaaagca attgtgacgt agcttgtttg taaatggaac gaaaaactaa 120

agatagcaat caaataatta tcgaataatt ttttttttaca agagaacaat gaaaataaaa 180

agaggaaagt gtaaaattgc aaatattgtc agagaagagc aggaaatggc tcaaaccgtt 240

acgcctgaaa gcatgacggc cttaaaagaa gcatttcagg catttgacaa aaatgatgac 300

ggatttatct ctaaagaaga gctaactcaa gttatgttta gtctcggaca cgtcatgtca 360

accgcagaaa tagatcagat gataagctta gtagatacgg atggaaatgg tttgatagac 420

ttcaaagaat ttttgagttt aatgaacact accagtcaag aagaaataaa tgatgaggaa 480

gaaatgaaaa ttttatttac tttgattgac gcaaatcaag acggattttt gtgtgaaaaa 540

gaaatccgaa acatgatgaa aggtttagga gaaaaagtga aaaagaagca tatacgaaaa 600

atgataaaag aagccgacat aaataaagat ggaaaaatta gcttcaatga gtttaaacga 660

atggtatcaa atggtaactt tcttgttaaa tgaattttaa taaaaatact tttggacaat 720

tgagcaccaa agaacactaa tacatatata ttatcatcgg atatttttg gttttttcga 780

gttatggtta ttaaaagaaa atttttattg tcgatagtta atgacaaaac aaaaaaagca 840

gctaagtatg atactcgcaa cagtcatgaa cgcgactcgc aaaggttatg gtttgagaaa 900

aaagtcatct tgtactagta aaaagttaca ctcgtcaaga cgaactttgt gtacattaat 960

aggatgctta tttattactg cgaaatgaaa tctttcgttt tttttggatt tgtttttagt 1020

ttcaataatt tgattgaaat cgtg 1044

<210> 122

<211> 1080

<212> DNA

<213> Hydra magnipapillata

<400> 122

atggcaagat tatacgttat gaaacgaaat attgttgacg aattagttca aactcctgat 60

gacgagccga cttctccagt tacgtctcct ggagcaataa gcaatgaaga agattcttca 120

aaaagcactg ataagaaaaa taacgaaaca gacaatatta aggaagaacg tttcgataat 180

agtttgctac aatcaattat ttcggaattc cgtcaccacc cagattgctt actctcaaac 240

caaaacttgc aactaatttt agaaggtttg ggtgaaccta cagattcaaa tacaatacaa 300

gagtggatca gtttttatga ccaaaataat aaaggaggga ttgatttagt tggattttta 360

aggatggtga tggatcaaat tcttccaatc gaagattcag aggaggaagt tgaagattct 420

ttcaaagtat ttgatacaga aaattccgga caaattagct gcaatgcttt agaatacgtt 480

ctaaaaacca gaggaaatcc tttaacaaca gaagaatttt caatccttat aaataaaaac 540

aaccctaaaa aagaaaagct atttaattgg aaagaatttt gtcacaagtt taccaaagaa 600

gtttatgatg ctagtaatga ccctctataa ctggatgaca aatggtgatc ctgtgctaaa 660

tgtttgaagt taaacttgat ttatttatta caaaatatgc acacaaaaaa aaacaactat 720

agttttacaa taattaataa accaacactt ttaataaatt tatcaataat agtttattaa 780

tctttattta acaacttgtt tgtttttaaa atgtatttag agttgtattt aaagttgtaa 840

attaaaatta ttatgtattt aaaaatggaa ttaaaattgt aaatatgtaa gttttaaaaa 900

ttgtatttaa atgtttaaaa aaacaagcac cttataaaaa aacataaaag tattattgat 960

gtaaacttaa tatttatttt acctgtgtca atgtgattta ctttttaaaa aaatgcgaaa 1020

attaaataac ttcgataaag caatttgtac agcaattttt ttagaagata gattattaca 1080

1080

<210> 123

<211> 568

<212> DNA

<213> Hydra magnipapillata

<400> 123

agctctcaat ctgcgcgtga cgagagtttt acaaatgaaa atccaaatat gaacattgga 60

ggtctacaag gtaacagtgg ttttggggat gaaaacggac atggttcaga tgatggagct 120

tcaatgaact ttcagcgatc attgtttcca aacaatccat ttgttgaagc aaatcattac 180

ttctatgatg tagaaaaaaa taatttagac gactcaacag aacgagacgt taaatcgaca 240

atccttcgtg acgaggatga tacggacgac agcgactatc atgtacgtgt acataaagac 300

gaaattccta ggccagagaa ttttggatac taacatgcta caaaatagga aggagattca 360

tttactaacc gaacatcaaa tgaatcgaat ttcgactgca accacgtaac tgtgcaacca 420

tgcatttggc gtcaaaataa gatgtcatac agagttttaa cctaagagga tgcagaaaaa 480

acaaaacatt ttttttagga tttaaataaa aatgttaaaa ttagcgatat taatttcttt 540

ttctagaaga aacaaatcta cgtgtata 568

<210> 124

<211> 679

<212> DNA

<213> Hydra magnipapillata

<400> 124

acatagttag gcttctacag tgttagaacc agcgcagtgt tataaaactt tacatcttaa 60

actttaatac attatccaaa cataaaaagc atggcttctg gacaattaca tcaagaaagc 120

gaagatgcta ttaacaacca aataaacatg gagttgtatg caagttacca atatctttct 180

atggcctatt attttgatca agatgatgtt gcattagacg gatacttcaa gtttttcaag 240

catcaatcag atgaagaacg tgaacatgct caggaactaa tggactacca aaataaacgt 300

ggtgggcgtg tagtttacaa ggatattcaa gctcccaaat ttcaactgga tacgccagtt 360

tcagctttag aagcagcgct taatttggag aagaaagtta acgagtcgtt gttaaatgtt 420

catgccatcg ctgaaaaaaa cagtgatcct catttgtgcg acttcttaga atcagagttc 480

ttgaacgaac aagttgagtc aatcaatgag attgccaagt tgattactaa cgctaagaga 540

tgcggcgatg gtttgggtgt ctatcaattt gataagttga gcatgtcaag ttaaatgtca 600

atgttttttt atttcattgt tttgccttga ggactataca gtgtaaacaa tgttttttgt 660

taaagaaaaa taaatatta 679

<210> 125

<211> 935

<212> DNA

<213> Hydra magnipapillata

<400> 125

cttagaaatg tgattataat cgctagaaac gtttaacatt ctaaacgttt aaacactcta 60

aaaacataat tatttagaat cgatttactt atatttgatg tttacagtga ctagaagtaa 120

tttatactaa cctcaattaa agatgataaa attaatgact gatagtcgtg aacttactag 180

ctatcttgca tcctactatg ctttaaccaa agtggagcat tacaccgata ataatcggca 240

aaaacaacaa gctagaaaaa atacatctaa atggaaacgg gagcatttga atccgagaat 300

agttgaaaat gaagttgagg atgatgatga agcagaggag gattttagtt atttttctaa 360

agcttattta caaccaagat ttttaactca gttaccacgt aatttatcaa aaacattagg 420

tgaaaagctt gaagtggttt gcttaacaag cgttttgttt ccgactgaga ttgattggta 480

tttaaatggc atagtacttt ctaactcggc agacggtaga atagttatag agaacaacgc 540

taggcaacta acatttgtat ttgttaaaaa gactgatagt ggaaaactag tttgcattgc 600

taaaaataaa tttggaactg atatttcaat gtgcaatatt ttggttaaag agctgaaata 660

gattctcaaa ttttattgaa aaacttttcc gacgcaacat atatcaaaca agaaattcgt 720

gcgcgaataa aatgttaact gatagggtac tatcaaattt cgtaccgttg tttcgatatc 780

agaaaattaa gcattttccg actgcaagta aaaatgtttt acttgttttg acaaaaacat 840

gttacattac aaaataattt tccgcaagaa aaattggttt tggctaaatt ccaaatactt 900

aaattatatt actcataaat atttatgaaa aaaaa 935

<210> 126

<211> 1453

<212> DNA

<213> Hydra magnipapillata

<400> 126

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ttttacgaag atgatgaaca tagccgtata atgcctgtca tatttttgct tgaagaatcc 120

tggaaagtta aagcaaagct ttcagatcag ttcacttctg aaattaaagg ccatgattta 180

ttttaccaa acacaaagag tgatttgctt aaagaacatc aggcagaaga aaaaacccag 240
agcttgtaca catttggagt aatagaagaa ggtgacataa aagtcacaga attgtttcat 300
gaactaaaag ctgagaaaaa aacaaatttt tggagccaat caagttatca ttgggatcgt 360
acagcagttc cttacaaaat taattctgat attaatacaa acttgaaaaa tccaagttgt 420
gctggaattg ttgatgtagg ctttataatc gactcatctt ggagtttaag agaccaatat 480
catcaagaaa tagaattcct tataaatctt gcaaagacat ttaacataag caagaatggt 540
gcacatgcag gtgttataac atttagttcc agagcagtat tgaatattaa actaaatcaa 600

tactatgatc aagaacagtt tgagtttgct attgatgaaa taccgtatat gggttatgtt 660
acacgaatcg atttagcttt acgaaaagct ttagaaatgt ttgatgaaat aaatggagca 720
agaaaggaca ttcctcaact tttgtttttg ttaacagatg gtgaacaata tgcaggagac 780
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tcaagtgaaa aggtattttt ggcagaaaac tttgatgagt tgataaacaa gaatttttta 960
aagagaataa aagatggcac ctgtttagga aacactgaaa acgagtttaa gcttcataaa 1020

agtaatctac ttgctacctt atcagttatt gaagaagaat tcattatatc ttttgaaata 1080
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agatatatag cagttttgtt ttcagatgat ggaagtggaa ctcttattat taaatcagta 1200
tttggtacaa tagatgatga gattcaatca aataataata ttttactttc atcttggact 1260
gcagtaaaaa tatctcaaca gcgtttaaat aataaataca cttatatggt tgaagtaggg 1320
ggtagagttt tattttcaaa agaaaactta tttgcaaaat cattttcatc tgtagctgtt 1380
tatgctgcag ataaagaaaa tgttcctcaa gatgggttca tccggagttt gagcattaag 1440

aatgggaatg aag 1453

<210> 127

<211> 469

<212> DNA

<213> Hydra magnipapillata

<400> 127

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gatgcgcgac caaagacagc tcaattgaag gactctaaaa aaagttcaga acttgtcaag 120
ttgaatgatc cttcatttgg gcaaaaaatt ataaacagga ttaaaaaacc ttttgaacat 180

gtgatcaata gtttaaaaaa tggtattgct caaaaaagga aacaaaaccc ccaagaagat 240

gctacttgaa tggttattgt tctcctggta aaaaagaaat tacgcaaaaa aattaacgaa 300

ataaaaaatt aacaagacaa caaaacttgt atttttttgat actgctttta tttacggata 360

ttttttatat ttgtcacgaa ctttaatttt attctgctaa tgtgatttat gttcaaacaa 420

aacatttttt tttataaaca atgtgaaaga agaaatcaaa gttataaaa 469

<210> 128

<211> 1158

<212> DNA

<213> Hydra magnipapillata

<400> 128

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attcaaatag ttagattatc aaattaataa tttataatat aacaaaattt ttattagaat 120

gacaaaagat actgaaacaa aagaaaatgg ggttgaatct tctgataatc ctagtggact 180

tttgtgggat tcgtcgcaag ctcaagtttc tcagcattgg aaaaaaattt ggaagttttt 240

aaattcaaaa aaaacaagac aatctccgat taatattgat acaaaaaatg tgcaacatga 300

cgaaagccta aaacctttaa atttagatcg tcaaaatatt ttagttcatg taacgaacat 360

tggatggaat atttcattta aagctgacaa cgttaatgca atctctttta ctggaggggg 420

gttggttcac aactatgcgt ttcgtgaaat gcattttcac tggggagaag ttcacaaagg 480

taaatgcgaa cttggttgcg agcatactat tgacggaaaa agatacgcag cagaatttca 540

tgcagttcat tggaataccg atttatacca gacagaaaat gaagctatcg cgaatcctga 600

tggtttagct gtaatcggta tacttataga tgcaaatgaa aagtacgaag acaacaaaga 660

atttgaagtg tttcttgaga tgtttgataa agttccttat atgaacaaca gtgcttcgtt 720

caatgtagat ccttatcttc tgttacctaa aaatctaaac cattacttta cgtatcctgg 780

atcactaaca atgcctcctc ttactgaaaa tgtctcctgg acggttcttc cagagattgt 840

acgtatttct cttaatcaac ttgaaagaat gagcaaaaat aatcctcgag aagaatggga 900

acaacataac tgttataagt ttcaacgtca atctgattcc tcaacgatta caaataactt 960

tcgatataca caaccaataa atgatcgagt agtaagatct ccgttgccat gaatttaaat 1020

ttgagtttat atggatttgg ctaataaata attgtgtttc agatttatat ctaatacctt 1080

tatattattc aattaattta agtgtgtatc atttatttta ttcttatata ttaatttgcg 1140

agatattaga agcaaaaa 1158

<210> 129

<211> 482

<212> DNA

<213> Hydra magnipapillata

<400> 129

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gatgcgcgac caaagacagc tcgattgaaa gactctaaaa aaagttcaga acttgtcaag 120

ttgaatgatc cttcatttgg gcaaaaaatt ataaacagga ttaaaaaacc ttttgaacat 180

gtgatcaata gtttaaaaaa tggtattgct tcaaaaaagg aaacaaaacc cccaagaaga 240

tgctacttga atggttattg ttctcctggt aaaaaagaaa ttacgcaaaa aaattaacga 300

aataaaaaaa aaacaagaca acaaaacttg tatttttga tactgctttt atttacggat 360

atttttata tttgtcacga actttaattt tattctgcta atgtgattta tgttcaaaca 420

aaacattttt ttttataaac aatgttaaaa aagaaatcaa agttataaaa crtnartamr 480

na 482

<210> 130

<211> 1389

<212> DNA

<213> Hydra magnipapillata

<400> 130

attcgtgaaa aatatcgtaa tttgatgaaa agttatgttt cacttcttga gccagaggaa 60

aatgctgata aagttattga agacattatt ttttttgaga ctgaacttgc aaagattgca 120

atggatgctt catttattag aaacgtcatg cagcaataca acttgacaag tgtcaaaagg 180

ataagaaatt atcttggcag ttgggttgga aattttgggt tggaaaaaga tttcttgatt 240

tatattattt ctattgattg gttgcgttta accaatggat actttaggta tttaaacatt 300

gaaataaaag attacacact tattggtatt agatcattag actattttaa atcacttaat 360

gagttgatag cagtaactga taaacggatt gtaaaagact acattatctg gataacagtt 420

tggaagtatg gctcttatgc ctctagtctt tttcaagaag ctgagtttac ctttattagc 480

tcagtgcttg gtttaaagga aaaaccagat aggtggaaaa agtgcattgc tgatattgaa 540

caaacaatgg agttcgggtt ggcttcgttg tatgtagaaa aagctctgac agactctgat 600

aaaatattgg ttaattctat tcaatataac attgggtatc cagattatgt aaaaaacgat 660

acatatctaa acatattgta tgacaaggtt aaagtatcca aagatacata tttcgataat 720

gtattaatga tgttttctga aaaaaggtat gatttgcctc ccactcttgt ggaagcatac 780

tttgatccta acaaaaacaa aatggttttt ttggcaggca tattgcaaat tccattctat 840

gataatcttg ggcctatggc tttaaactat ggtgctttag gccttgtagt aggtcatgaa 900

gttacacatg catttgatga tttaggccgt cagtttgata aaaatggtga gcgtaaaaac 960

tggtggagtg aggcaagttt aaatgcattt catgaaagat caggatgtat ggccgagcaa 1020

tattctatgt actcgatgta tggaattaat gtaaatggaa acctgaccct gggcgaaaac 1080

atagcagata atggaggaat caaagtagct tttttggctt ataaaaaatg gcagtctttt 1140

catggggaag aaaaacgtct tcctgggatt ccactaacta tggagcagtt actttttgtt 1200

tcacatgcac aagtttggtg tggtgcttac agagaagaat acattaaaag acatttaaaa 1260

atagattatc attctccagc taaatacaga gtaataggtc cacttgccaa tcttgaagaa 1320

ttttcacgcg catttaattg cacatccggt tcgaccatga atccaataaa aaagtgcaga 1380

gtatggtag 1389

<210> 131

<211> 2214

<212> DNA

<213> Hydra magnipapillata

<400> 131

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gaaatagaca acagaactat tgcttggatg gaagctatga agtatacaat agaggaggaa 120

aacaaaaaat gtaacagaag tatatttgga tacgtaattt atgatacgta cgatcctaca 180

aatatggaca tgacgtcttt tgctgtatta gattcattaa gattaaacgt ttctaaccaa 240

aacgtttgca acagtgataa aatatgtatg gatttaaatg gccaattaaa tcaaaatcaa 300

tttaaaaaag ttttaggatt tgtaggtcca gctgaatcat ctacttctat ttacgttcat 360

gcattaacat cagtttatga acacattccc attattagtt acgcagcagt gagtttagaa 420

ttaaacgaca aaacaaaatt tcctaacttt tttcgaacgg ttcctgctga taactttcaa 480

gctgaattta taaaaaaagt tttacaaaag tacaactgga attttatttc agtaatagca 540

gtagatagtt catatggaag agctggactt gaaattttaa aacagaacta tgaaagtgat 600

gatatttgca tagatgtttt agaaatattg cagcaagcat acgacccaaa aatatattca 660

aaaattgcag aaaaacttac aactagcaca gctcgtgtta ttgtgttttg gggacaattt 720

agacctcttt taaacttttt acaggaggca ttaaatttaa atttatcaaa ccgaatatgg 780

attgtaagta aagcagttag taaaaactct ttttttctaa atttcaaaaa tacacttaat 840

aataagcttc tgtttgttag ttatacagct ggagaagatc agacatttaa aaattacttt 900

ttaagcctaa cctatgaaaa ttcgagtaaa tggctgaaag taatttttga acgaagcaga 960

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aattcaaatc aaagttttga tcctgtttat tttgagcttt atacatacaa tgaatcagaa 1260

tttctattgg ttgataggtg gtcatacagt gcaacatacc tagataccat taataacaca 1320

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acaatagttt cagatataaa aaaatgttgt tgggattgca ttctttgccc ggataaccat 1440

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aacccagcgt taactctgtt atcttctagt tttggcataa tgacatcaat ctttttttatt 1620

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<210> 132

<211> 581

<212> DNA

<213> Hydra magnipapillata

<400> 132

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gtattggcaa cactacgcaa actcttccgt gtaaactgtt tgactgtcca aaatcatgtg 180

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accaatttca atcaagaggc ttaactctcg gaggaattga aaccgtgctt ggatatttaa 300

gttcatacgg agatgatact gttgataaag catgtcaagc ttgcaacact atgatgttaa 360

ccacattgag atcgaatgtt gctgatcagt taactcaagc taaggctgca agagcaaaac 420

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<210> 133

<211> 834

<212> DNA

<213> Hydra magnipapillata

<400> 133

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aactcatttt tgctttgggc aaaatctgta aggaaaatgt atgcaagtga aaaccctaat 180

ctaagcaaca ctgaaataag cagactgtta ggcaaagttt ggaaagaaat gagtgaagtt 240

gagaaattgc cgtttattca aagtgcaaag tgtcttcgaa ctaagtttat acaagataat 300

ccaaattatc attacttctt taaaaaaagg aaaatcaatc aactaaataa tacaagtttt 360

tctaaaatgg cttccaaatt aacaagtaat gatttaaatg catacaaaat ttttaaatat 420

ttaaacatga gtgaaattat agaacacaaa gatttgaaaa gctttggcta ccttcaaagc 480

gtattcgcag cttatcagaa cgaaaggaac ggcaatcaaa atacattttc gcctaaaatt 540

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cattactatt cagatgaagc acaacatagc tgtgaaaact ctttcaacat caataacgaa 720

gaagatttta atcaaaataa tcaaataaaa aaaagagaag atgttattga acttgactct 780

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<211> 353

<212> DNA

<213> Hydra magnipapillata

<400> 134

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caagtgattg catgcaatgc cattgcaata taaacattgt gatgtgtaca ataagaacat 180

gtccttcttt gacttgtaac aatcccatat cagttaaaca cagctgttgt cttgtttgcc 240

cagatactga agttgcgaca gttgaaaagg ggtgcattca ttcgtcctct ttatttgatg 300

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<210> 135

<211> 1668

<212> DNA

<213> Hydra magnipapillata

<400> 135

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aagtggttta tgcttaaatc tatattgctt tacctggaac aacgggaaaa cgatttcctc 180

caagtggttg acttagccga acagtaccat gaggaaaaaa tgtcaaaaga agatatagta 240

tcaaaaactg tttcggagcc agtagttcgg tttgctattg ttggcgcacc aaaagtcgga 300

aagtcagcaa ttagtgtaag atttttgact cgacgctaca ttagcgaata tcagccaggc 360

gttgaaaata actatgtaag agaaatattt tttggagacg accatattac ttacgaatta 420

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ataaatccag tgccccaaaa tatcaacaaa actcgtaatg ttgacgactt tagaaataat 840

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ttaaaaaaaa gtcgaaaatc ctcaaaaacc gatgggttta agaaaaattc actcggttac 960

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tcacaagacg cacacaagac agacgatcat aaagaaaccg aaaaatctag gaaagagaaa 1080

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<210> 136
<211> 926
<212> DNA

<213> Hydra magnipapillata
<400> 136

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gacgttttta aaaagtggtt ttcaatatca aaagaagaat gtggaacagt ttgtgtgaca 180
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<210> 137
<211> 1118
<212> DNA

<213> Hydra magnipapillata

<400> 137

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agaactggca aaaatagtag tcgaggctgt acaagaaaat aataatcagc caataaatac 180

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tattcgacga acgatatggc tactcataac aatgacagct tttggttacg cagcacaaaa 360

agtgtatgaa agcacagtta actatttttc ttttccaatt agtactactc aaatgagaat 420

atacgttaat gaaattgatt tcccggctgt atctttctgc aatttcaacg aatttcggtt 480

aagcaaaatg gacggaacaa aagttgacca agctatttta aatccaaaat tacaaggact 540

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cgaatactat aaagacgaaa tggatgcggc tattcatatg atagtacatg gacagcaaga 840

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attaaatgat gcaatgagct gtatgtggcc agaatggg 1118

<210> 138

<211> 1413

<212> DNA

<213> Hydra magnipapillata

<400> 138

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aaaaaagatt tgcaatattt tattagcgaa gtccattgcc atgaaaaagg tatcaatact 120

atgtgtatgt catcaaatgg tactgtgcta ataactggtg gtgaagattg caatgcccaa 180

atctatgata cagaacaaga gaaagttgtc tcagtacttg ctggtcatga attttacata 240

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<210> 139

<211> 5381

<212> DNA

<213> Hydra magnipapillata

<400> 139

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tgttgctgca atattgcttt gtacttctgc attttcaagt acatgggcta ccttcaactt 180

ctaaaaacta tgaggggtct tcctttacaa ctattgataa cgaaacaatc gatgcatctg 240

aaatggaaga caatccgatt gtatcaaaaa ttaataataa agtcgaaaaa cttggataca 300

ataacgaaga aactggaaat aatgtggtag aaattacttc actcaacagc aaagatataa 360

aagttgatga tgtcaagtca tcaaatgaaa acagtgaaca accagatgat aatgctttgg 420

aaattacttt agaggcagat tcaggaaaca acgaaaagct aaacctaaaa aatatgcaga 480

tagaaacagc atcaaacgaa aatgttaacg ataaaaaaaa agttgaagaa aatgcaaaaa 540

aaaaacatgg attcattggc gattttggtg ttgatacaat ggcgcaccca ccgtatatat 600

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<211> 1068

<212> DNA

<213> Hydra magnipapillata

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<211> 1763

<212> DNA

<213> Hydra magnipapillata

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<211> 3261

<212> DNA

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gaaaaggaaa tagagaaaga gaaagaatat cctgtaggat tacgatcacc aacaggaacg 540

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cctgattgtc ctgcaaatga aaaaactgat ttccgatttc agattactcc tgaggtggtt 3180

ggaaaaaaga aatttaacgt cacttttaat tctctgcaac ttggtggact tagtggatcg 3240

cacaaagcga ttgttttgta a 3261

<210> 147

<211> 3152

<212> DNA

<213> Hydra magnipapillata

<400> 147

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taacttgcct tttttaatat acctgaggac cttgcggaat ggtttgatga aatatactag 180

ttaaaatgtt ttggaaaatt attgttttta tttttgctat agatcaccta tcaggtgcac 240

cacgacatca caaaaaattt cctaaagatg tttcaggtga aaagcgacaa agtcttggag 300

attgggatgt tcattatact gagccaagcc aattaggagc tgctagtttg gtacaaggtc 360

cgaacacaga agaccttctt tccttacaaa aagcaatggt tggttaccaa aaaataaata 420

aagcttacga gcctgctata gtattagctg gagcttttcc tcatctagag ggtgcagtac 480

cacatgctca actaataaaa acatttcata agccaatacc tcaagaagaa agcgctgttg 540

atgacgaaga tgatgatgac gacgacgacg acgatgaaga tgacaatgaa aacaaaaatt 600

cacgaaaaaa aagaactctt aagagccatc ctcgtcgatc taaaaaacgc actctcccta 660

acagtgaaaa agaaaagtca gacaaaaata aagagttaat aacaaccagc aaagacaatt 720

taaaaggtaa aaaatttgct gaacgtaaag aagttgaggg agataaaagt ctttcaaaaa 780

cagagcttga taatgacaaa aatacagaaa aagaaactaa gtttcaaaaa gaaacagaca 840

agttgcaaga aaaagaagtg agcaacgcaa aagaagaagt taaagaacga gaagaaaacc 900

atcataaaga actagctgat ttaaaaggaa aaaatgcaca gtatgaagga gataagccaa 960

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tacaatatga aggcgataag ttaaatgctg gtgaaaaaaa catgcagcct gaaggagaga 1080

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cagtaaaaat acttaaaaaa cttggcgaag aacacgagcg acgggggctt gttgacgatt 3120

acggaggtga caaagatatt gaaggtattt aa 3152

<210> 148

<211> 1347

<212> DNA

<213> Hydra magnipapillata

<400> 148

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aaaagtatgg ctatggagct ctttcataca acttactctt agccgcagcc acaattcaat 120

gggcaacact tataaatgca tggataaaac aacgaatgca aaaaaatagc aatcattttg 180

aaggcaatcc aactaaaatt aaagttggag tgacagacat gataacggct gattttacgg 240

cgacagctgt tctcatttct tatggtgcag ttatcggcaa ggctagtcgt gtccagcttt 300

ttgtgatgac tattgtagaa tgtgtgatct ttgctatcaa cgaaaacata attatggaat 360

atctaaaaat ttcagacgtt ggagggacaa ttgtactgca tgtgttcggt gcttactttg 420

gactggcagt ttcatttatc ttaaaaaacc attcagattt aaaacataaa gaaggatccg 480

aataccattc tgatatcttc tctatgattg gcacattgtt tttatgggta ttttggccaa 540

gttttaatgc cggtttactt ggagacaaat caattcaaca aagtcgagct ttggtaaaca 600

catacttttc cctggcagct tgtgttttaa cttcattcgc gtgttcttcc tttgtcaaca 660

agaaatttaa gttaaacatg gttcatattc aaaatgcaac acttgctgga ggagttgcag 720

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ctggttgtat aagcgtactt ggatacaatt accttacgcc aatattaaat aaacataaaa 840

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gtggagcagt agcggcggca gctattaaac caaaaagtta ttatgataaa gatgactttt 960

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gataaaactc ttttttttaa tttaatttat aaggaaaaca aatagtggta tgagaaaatg 1320

cgtaaattta acaatgaaat ccttaaa 1347

<210> 149

<211> 1440

<212> DNA

<213> Hydra magnipapillata

<400> 149

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gaatattttg caacaagtcg ttccacttac aatcaattgt gttgtgatta tcagttgcca 120

aatgaagttt atgtcaaagc tgctttatta aatcaaagtg gaaatatttt tggaaaagct 180

gttaataatc cagagaaatt agctactact aagattttgg ttatagagga ggtcacagaa 240

gacacaaaag ttgaagatga cttagaattg aaagagtctc tcttggatga gcaagaatat 300

caaaagcaac atcctcttga cgctcttgag ggagatatga aagcaatgac actacataga 360

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cctggtagtt tacctacaaa gcgttcaatt ccattcaaaa taaaattaga taggccaatg 480

ataactgcag atgcaattat tgaaaaaact agatgtcaat tagcaataca ggaagcaatt 540

ggagaaataa aaaaaaagac ttgcatagac tttaagccac atgaagatga agcaaactat 600

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cagaagattt tgataactat tcgaacttgc tacaaaggta ctatgttgca tgaaattctt 720

catactcttg gaatgatgca cgaacatact cgaccagatc gcgatagtta cataagcatt 780

aatattacaa atataaaaga tggtatgatg aagaactttg aaaagtatgc ccatttaatt 840

ggagatgact tgccatatga ttatgaaagc atcatgcatc ctcctgttaa ctggttttcc 900

aaagatccac aaaaccttaa tacaattaaa ccaaacaaca ttatttacca agaccaaaaa 960

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agaagaaaaa aaataggaaa acacgccgtc aaattaatga agcgacgaaa gcacaaaaac 1380

tgaaatacaa gaaaatatta ataaaatatt tatagtattg aaatttagat tttttttta 1440

1440

<210> 150

<211> 1378

<212> DNA

<213> Hydra magnipapillata

<400> 150

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cagcaaagaa atgctccaag tcttgcgaaa agatatcacc ttatcctaca aatttttttg 120

aagacatagt tccacatttt gtaaataata gacccactgt aggagttgta gcaatggaaa 180

tacttggtca gaaaatgctg gtagaagttc cttggtctga aaacaaagat tactttggaa 240

gctcttttgt aaaacttttg gacgcggcag gagcaagagc tgtaccaatt aaagaggata 300

ttactaaaaa agatttaaat atccttttgc acaaaataaa tggagtcatt ataccaggtg 360

gtgatgctga cattggagat tccggttatg aacgaatttc aaagcaaatt atcaaccact 420

caaaaaaaat ggcaaaaaaa aacattactt ttcctgtgct tggaatatgc cgtggggctc 480

agatgatgat gattgcagaa gcagacaaag acttttttagt tgagacagac tccttaaatt 540

acagcattcc gttagacttt acagatgaag cgcgagaaag tcgcctcttt ggacatgccc 600

cacaaggatt gtttgacgct cttgggacaa aagctataac ttttaacgcg cataaagcag 660

gcattccaac cgtaaacttc tacaataaca caaagctgat ggaaaccttt agagcaatat 720

caacaaatta tgatcgaaac ggcactcaat ttataagtac atttgaaggt cgacatgcac 780

ctttatacgg tcttcagtgg catcctgaaa aatctctatt tgtttttaat ccagttctgg 840

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cagaaacacg aaagaatcct aattctttca gagatcgagc cgatgaacaa aatcatcttc 960

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gaagaaaaca aaacaaaaca aaaaaaaaaa aacaaacacg cgtgttaaca tattgtgatt 1260

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gatattgttg tattatattt gtttcgttta taaaaagata taaattcatt tgacttca 1378

<210> 151

<211> 764

<212> DNA

<213> Hydra magnipapillata

<400> 151

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tgctgtaaat aggcaaaaag cgttcaagcg caacattacc aaagattttc aaagtatttt 120

aagtcagtta ttttgtaggc tcattagtaa agaagcctct aaagataaca aagatgagat 180

ctatcgcagc tttcctcctc ctggttgctg ttaccaacgc aaaaactctg catgaatctt 240

taagaaagag aagcccacag gcttgcagtg gtgactgccc agctgtttgt gcaccagctt 300

gtttaccaat ttgctgtgta cctccacctc caccaccacc accaccacca ccaccaccac 360

ctccaccacc accaccacca cctccaccac cacttccact cccaggaaat ccaggacctc 420

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caccaggacc accaggaaac ccaggacaag ggggtttacc tggccaacct gcccctccac 540

cacctccatg tcctccaatt tgtcctgttc aatgcattcc aacttgtcca caatactgtt 600

gcccagcaaa gaggaagtaa agtaccaaac atctttgaca cttgtttatt aagtgaaaag 660

atatctcata taatgcagca atgttcttca atccacttta atcaaaatga aaacgataaa 720

tggatgtaaa taaaacaaga aatataatga gttcattcat aata 764

<210> 152

<211> 634

<212> DNA

<213> Hydra magnipapillata

<400> 152

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ctgttaccaa cgcaaaaact ctgcatgaat ctttaagaaa gagaagccca caggcttgca 120

gtggtgactg cccagctgtt tgtgcaccag cttgtttacc aatttgctgt gtacctccac 180

ctccaccacc accaccacca ccaccaccac cacctccacc accaccacca ccacctccac 240

caccacttcc actcccagga aatccaggac ctccaggacg accaggacct ccaggaggcc 300

caggaccaat gggaccacca ggacctccag gaccaccagg accaccagga aacccaggac 360

aaggggggttt acctggccaa cctgcccctc caccacctcc atgtcctcca atttgtcctg 420

ttcaatgcat tccaacttgt ccacaatact gttgcccagc aaagaggaag taaagtacca 480

aacatctttg acacttgttt attaagtgaa aagatatctc atataatgca gcaatgttct 540

tcaatccact ttaatcaaaa tgaaaacgat aaatggatgt aaataaaaca agaaatataa 600

tgagttcatt cataatattg ttatttattt taaa 634

<210> 153

<211> 1590

<212> DNA

<213> Hydra magnipapillata

<400> 153

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gttgcaacgt ttttagagtg gatgaaacat tttattcaat atgtgaaatg ttcaccagct 120

aatccagtgt ttttacttct tgacaaccac gagagccatg tttcaattgt gtgtttagat 180

ttggctaaaa aaaatagcat aactatgctg tcctttccac cacattgtag tcacaagtta 240

cagccattag atcggtcagt ttatgggcca ctgaaacttt attacaatgc agcctgtgat 300

gattggattg tatctaatcc aagatcgatg accatatatg atatagcttc agttgtaagg 360

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attgaaccct ttaatcctaa catattttct gataatgagt ttttttcttc atatgtaaca 480

gaccgtccag aacctattac tgctaaccct tttccaggtg ttgttgatcc agttcatgcc 540

ccagctttta atcaatcatt gatgtcaagt ctgtcatctg gttcagcttg tagtgtattg 600

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catcaagcaa gtctagaaaa aattaggcca tttccaaaag ctggatcaag gaaatccatt 720

aaaggatgtt tatgtaaaga tattcgagga atgaaaagtc ctatgatggc gagatatgta 780

aatagtagtt gcgagacaaa caacaacacg acagatcaca attataatca ctacgatact 840

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<210> 154

<211> 598

<212> DNA

<213> Hydra magnipapillata

<400> 154

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tgactgccca gctgtgtgcg caccagcttg tttacaagtt tgttgtatgg ctccacctcc 180

accaccacca ccacccccac caccaccacc accacctcca ccaccaccac cacctccacc 240

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