Wildlife Ecotoxicology- an under examined element of Veterinary Science

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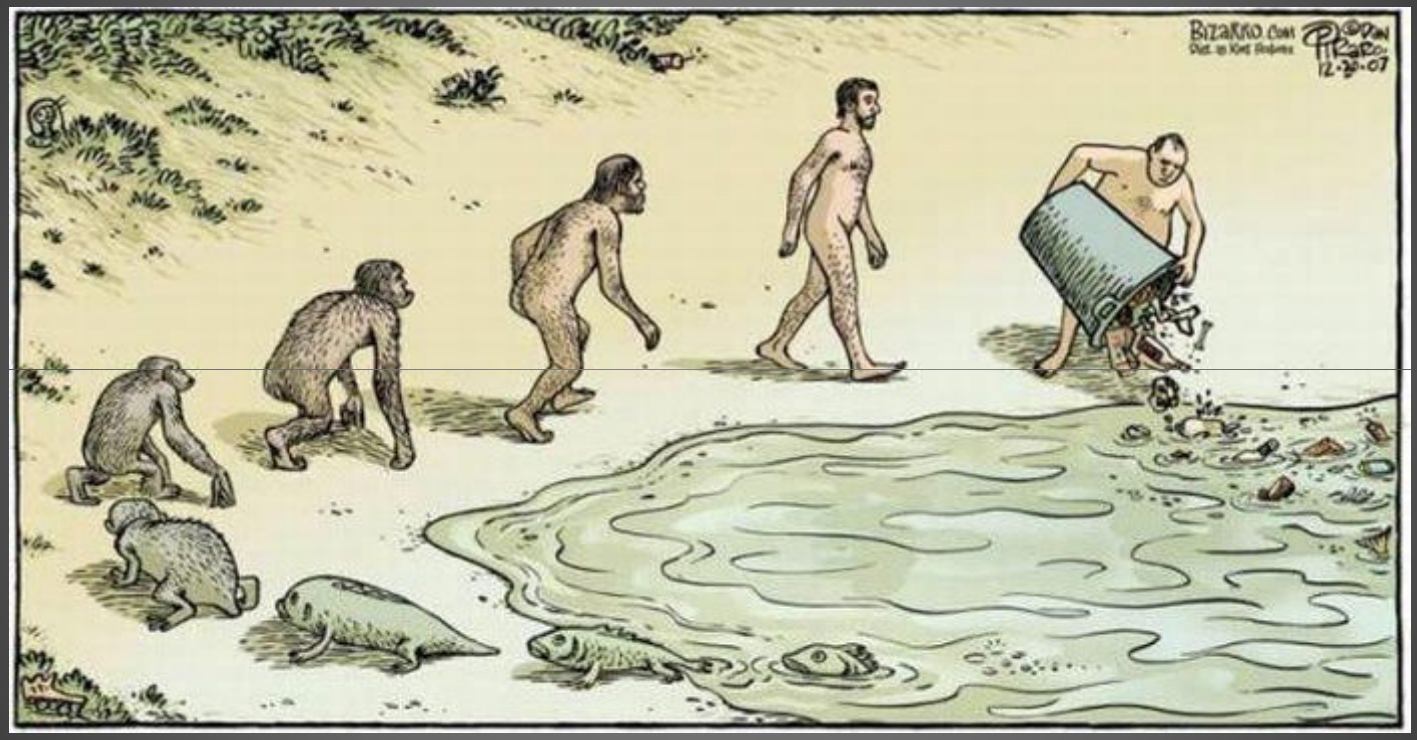
Member, Aquatic Animal Health Chapter, Australian College of Veterinary Scientists

Ecotoxicology

- An attempt to assess the toxicity of chemicals to a range of biota
- Correct assessment assumes we must know:
  - mechanism of action
  - full lifecycle impacts on all species of all biota
  - dose response/toxicity curves
  - Toxicity/ fate of all metabolites
  - impact of climates/water/soil type
  - outcomes of mixtures/ pulse exposures/ bioaccumulation

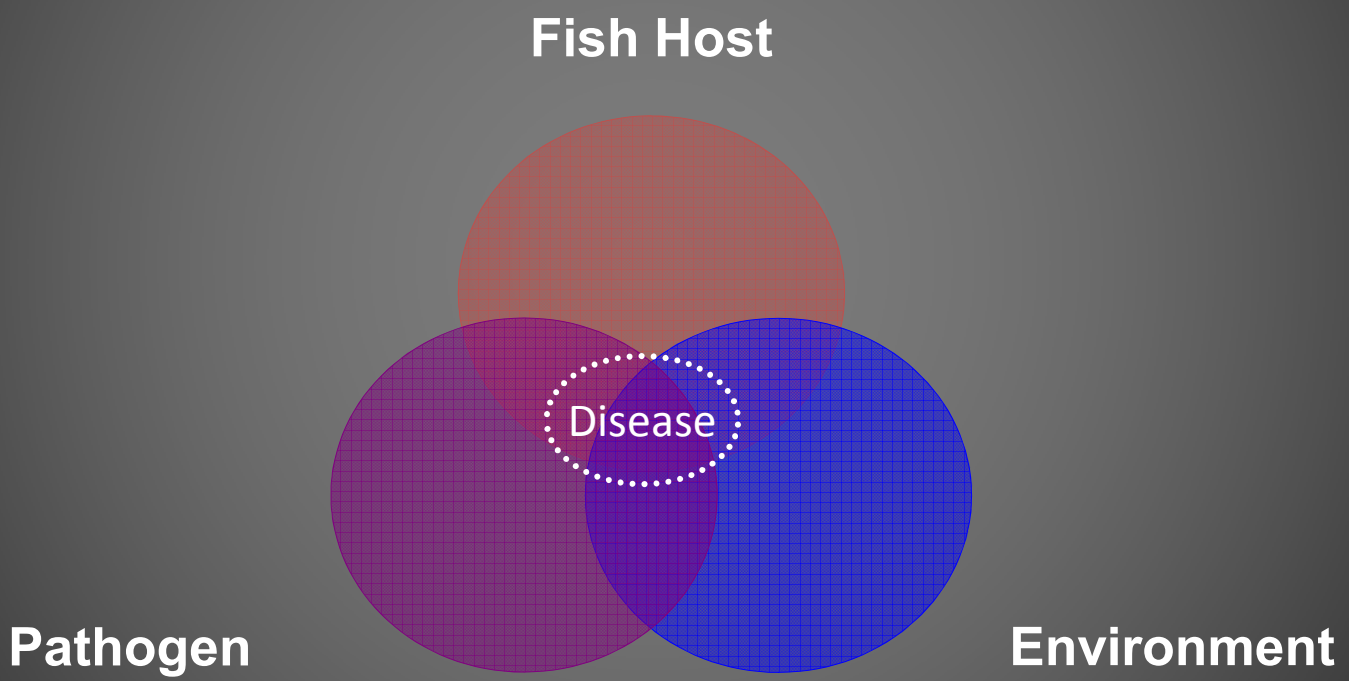
Progression or Regression?



Presenting evidence that:

1. Environmental toxins exposures are ubiquitous and worsening
2. They are causing endocrine disrupting effects in Australian wildlife- more than gender bending
3. They are causing immunosuppression
4. They are causing epigenetic effects
5. The regulatory systems are not controlling exposure
6. The sewage system is not removing them
7. The veterinary profession is failing to protect animals health and welfare by ignoring/contributing to this issue

The lost third dimension: Environment



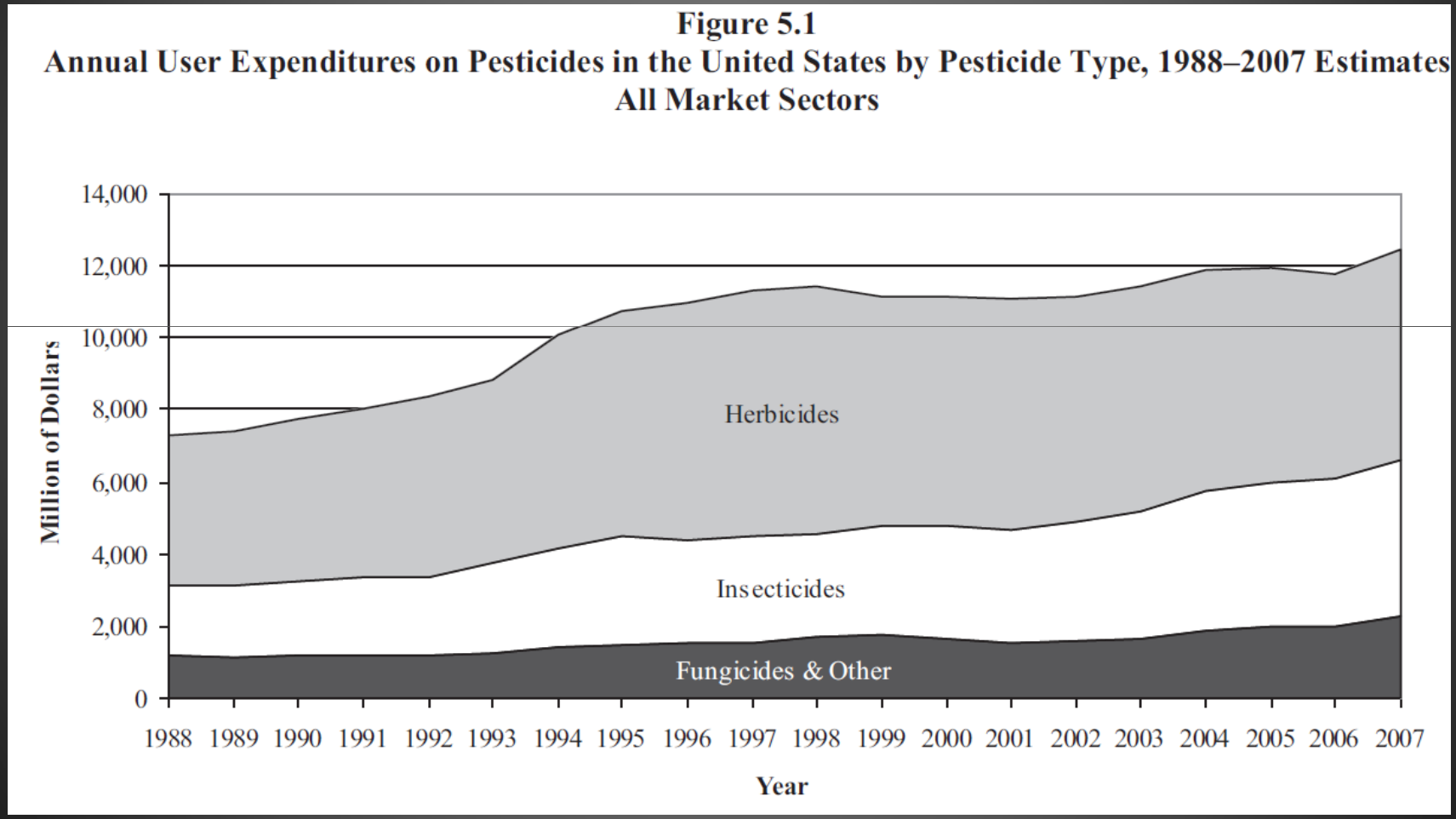
Sources of environmental toxins

- Industrial: dioxins; plasticisers; pthalates; surfactants; heavy metals; hydrocarbons; flame retardants
- Sewage: pharma; agvetchem; surfactants
- Agriculture: pesticides (herbicide, fungicide, insecticide, rodenticide); wetting agents (surfactants); heavy metals; dioxins contaminants
- Urban stormwater: hydrocarbons; pesticides

http://www.someworthwhilequotes.com/INDUSTRIALISATIONINFORMATION.html

http://www.greendiary.com/entry/china-in-the-midst-of-environment-collapse-courtesy-economic-growth/

Global pesticide expenditure €5.6 trillion (euro) (Hartung 2009)



Source: US EPA, published February 2011

Add industrial and pharmaceutical pollutants (Boxall 2004)

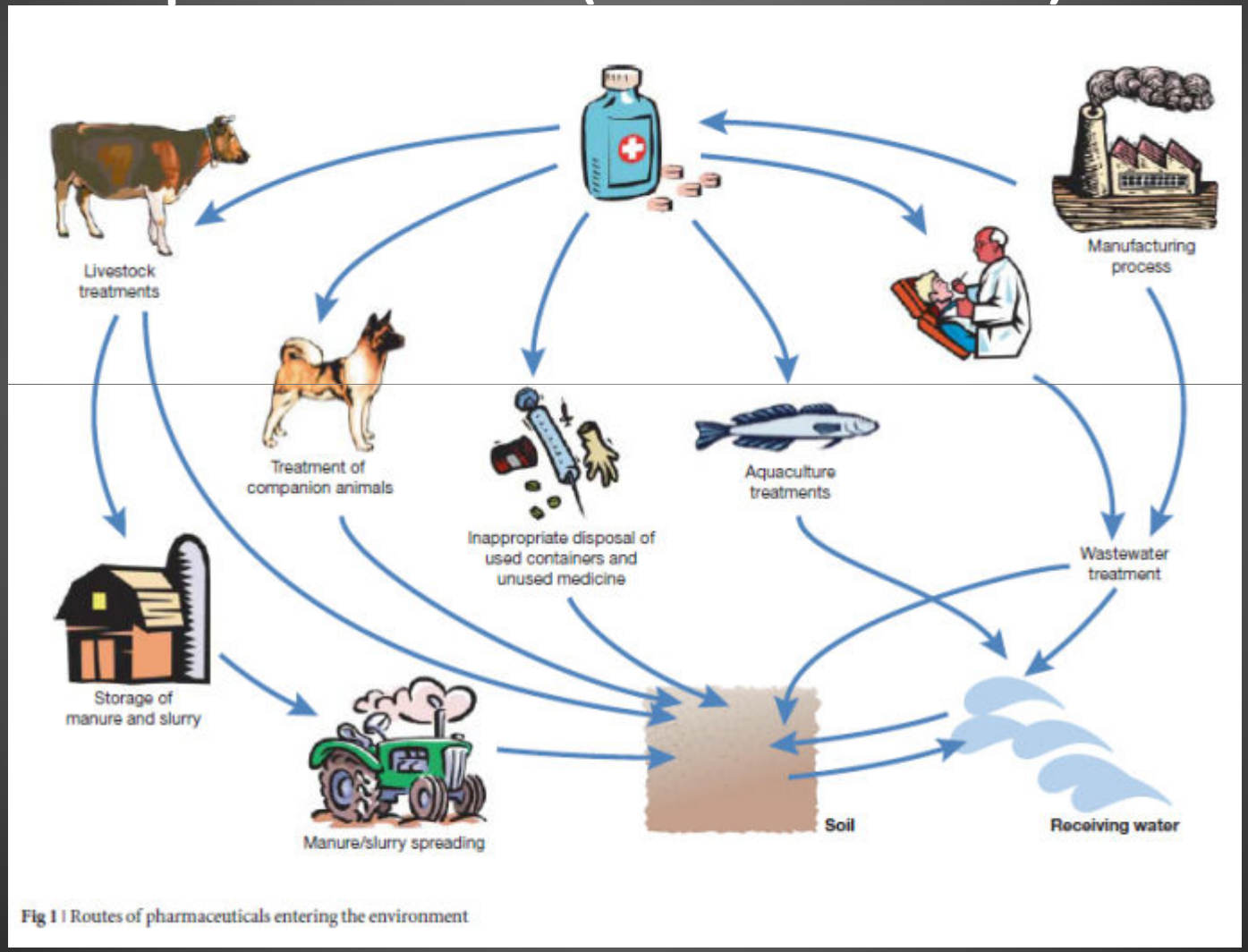
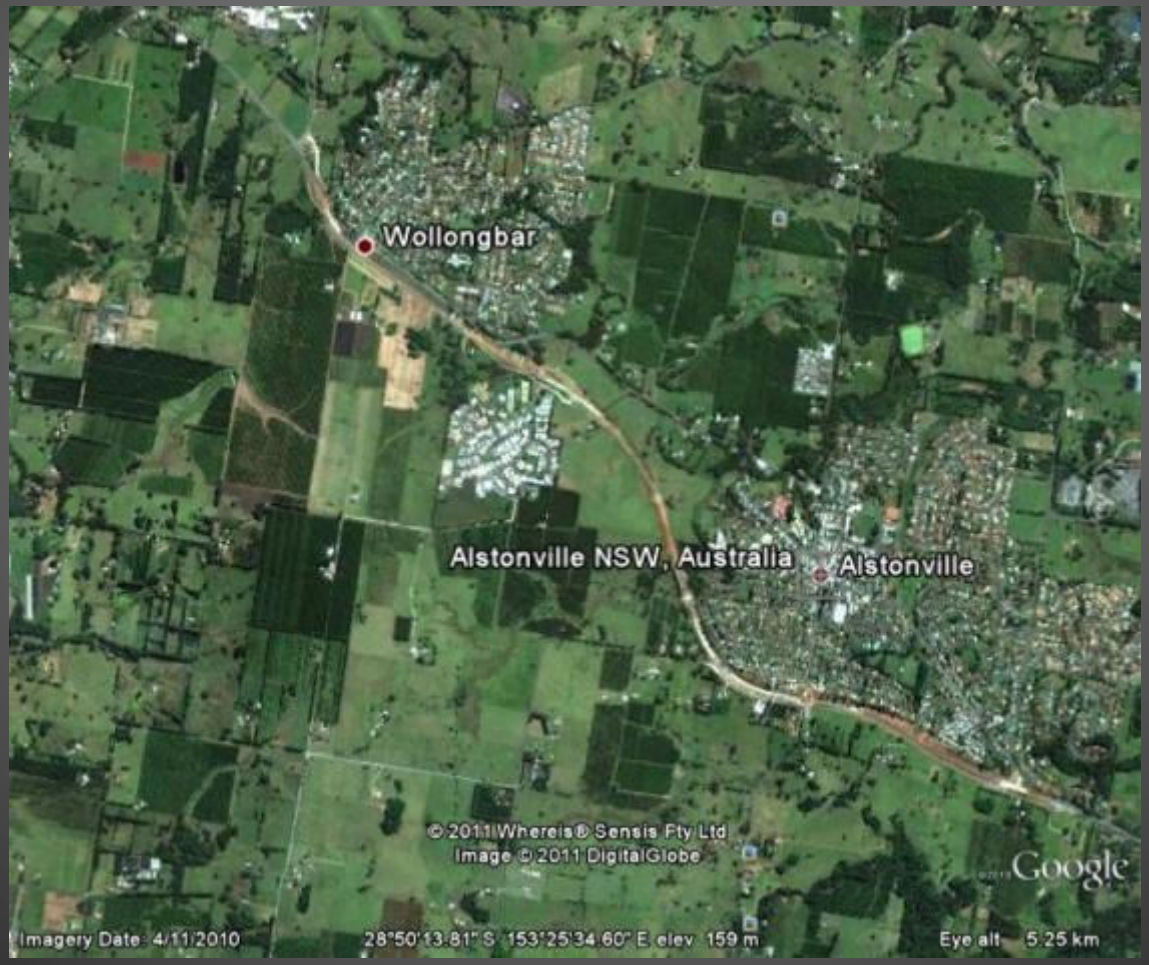


Fig 1 | Routes of pharmaceuticals entering the environment

Vectors of toxins to aquatic environment

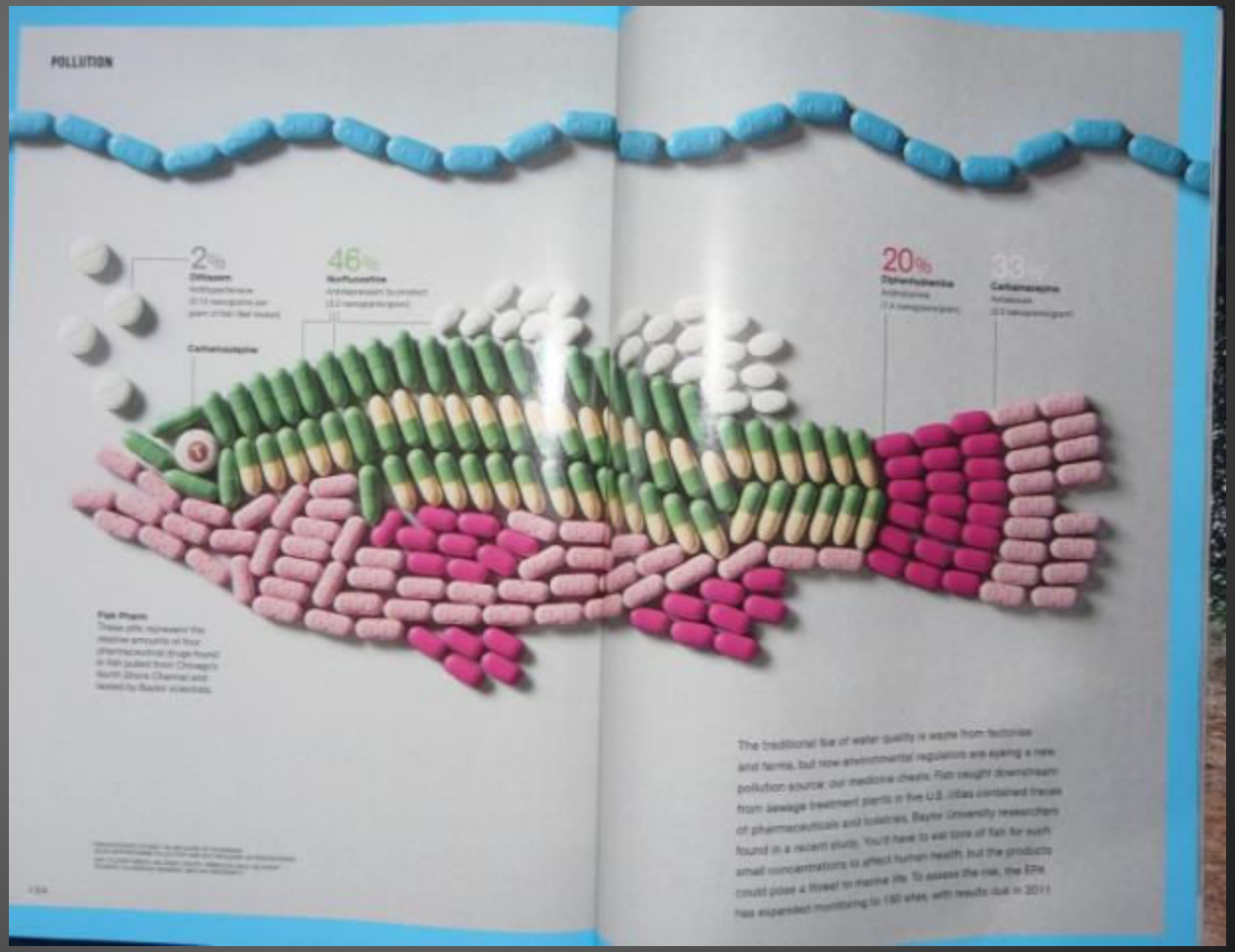
- Rainfall
- Spray drift
- Volatisation
- Groundwater

The interfaces: humans; wildlife; agriculture



Human pharmaceuticals in fish downstream of Chicago sewage

- Diltiazem-antihypertensive
- Diphenhydramine-antihistamine
- Carbamazepine-anti-seizure
- Norfluoxitine-antidepressant



Cooks River, Sydney Australia

- **Sydney river an "open sewer"**
- 24 October 2011

",..... found high concentrations of a wide range of chemicals in the Cooks River, including paracetamol and ibuprofen, as well as insect repellents such as DEET and cosmetic parabens. All are either excreted from the body into toilets or are washed off in the shower -- and all wind up in the sewerage system."

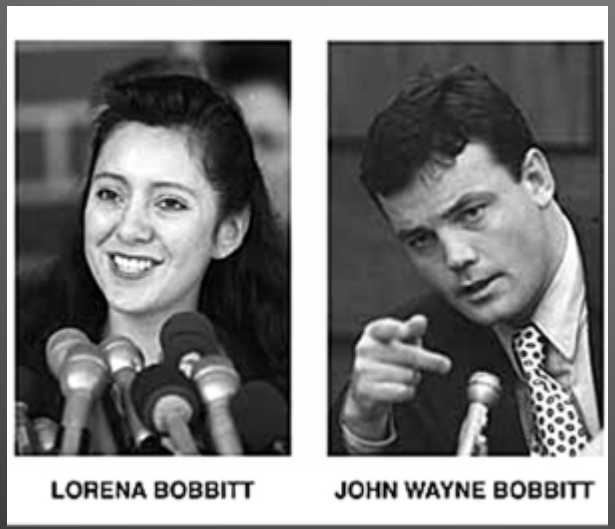
Sydney Offshore outfalls discharge 100ng/L of EDC's- will this mean less aggressive surfers?

Can pharmaceuticals interfere with the synthesis of active androgens in male fish? An in vitro study

Denise Fernandes *, Sabine Schnell, Cinta Porte *

Environmental Chemistry Department, IDAEA-CSIC, Jordi Girona 18, 08034 Barcelona, Spain

- Anti-depressants- fluvoxamine, fluoxetine
- Strong inhibitors of enzymes involved in synthesis of oxy-androgens
- Oxy-androgens influence spermatogenesis, reproductive behaviour, secondary sexual characteristics



Scientific Statement of 14,000 US Endocrinologists in 2009

Present evidence that EDC's are affecting

1. Male, female reproduction
2. Breast development and cancer
3. Prostate cancer
4. Neuroendocrinology
5. Thyroid
6. Metabolism and obesity
7. Cardiovascular endocrinology

“Better” regulation of AgVet chemicals- DAFF 2012 – better get a bucket, I’m dizzy from spin

- All AgVet chemicals are registered forever
- 80 are banned elsewhere but are “safe” here
- New “better” regulation requires review every 7-15 years, but will not require an update of data to contemporary standards
- EU requires this, registrants that fail to supply data have products removed = -700
- Food production in the EU has not ceased as a result of the removal of numerous toxic pesticides
- There are no new resources to complete the extra reviews- no increase to chemical sales levy
- New chemicals are safer so bring them in faster?

Occupational Exposure to Pesticides and Risk of Non-Hodgkin's Lymphoma

L. Fritschi[1], G. Benke[2], A. M. Hughes[3], A. Kricker[3], J. Turner[4], C. M. Vajdic[5], A. Grulich[5], S. Milliken[4], J. Kaldor[5], and B. K. Armstrong[3]

- Substantial exposure to any pesticide was associated with a **trebling** of the risk of non-Hodgkin's lymphoma (odds ratio ¼ 3.09, 95% confidence interval: 1.42, 6.70) American Journal of Epidemiology 2005

The President's Cancer Panel

LaSalle D. Leffall, Jr., M.D., F.A.C.S., *Chair*
Charles R. Drew Professor of Surgery
Howard University College of Medicine
Washington, DC 20059

Margaret L. Kripke, Ph.D.
Vivian L. Smith Chair and Professor Emerita
The University of Texas
M.D. Anderson Cancer Center
Houston, TX 77030

This report is submitted to the President of the United States in fulfillment of the obligations of the President's Cancer Panel to appraise the National Cancer Program as established in

The Panel was particularly concerned to find that the true burden of environmentally induced cancer has been grossly underestimated. With nearly 80,000 chemicals on the market in the

April 2010
For further information on the President's Cancer Panel
or additional copies of this report, please contact:

Abby B. Sandler, Ph.D.
Executive Secretary
President's Cancer Panel
6116 Executive Boulevard
Suite 220, MSC 8349
Bethesda, MD 20814-8349
301-451-9399
pcp-r@mail.nih.gov


"COULD YOU HURRY AND FIND A CURE FOR CANCER? THAT WOULD BE SO MUCH EASIER THAN PREVENTION"
ASBESTOS INDUSTRY
CHEMICAL AND PESTICIDE INDUSTRIES
FOOD AND DRUG INDUSTRIES
TOBACCO INTERESTS
GOVT.
POLLUTING INDUSTRIES
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Soto Sonnenschein 2011

Environmental causes of cancer: endocrine disruptors as carcinogens

Ana M. Soto and Carlos Sonnenschein

Abstract | Environmental endocrine disrupting chemicals (EDCs), including pesticides and industrial chemicals, have been and are released into the environment producing deleterious effects on wildlife and humans. The effects observed in animal models after exposure during organogenesis correlate positively with an increased incidence of malformations of the male genital tract and of neoplasms and with the decreased sperm quality observed in European and US populations. Exposure to EDCs generates additional effects, such as

- More deformities
- More infertility
- More cancer- think again about aeitiology of turtle neoplasia; tassie devil neoplasia

American Journal of Epidemiology
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Vol. 157, No. 5
Printed in U.S.A.
DOI: 10.1093/aje/kwf216

ORIGINAL CONTRIBUTIONS

Neurodegenerative Diseases and Exposure to Pesticides in the Elderly

Isabelle Baldi[1], Pierre Lebailly[2], Brahim Mohammed-Brahim[1], [illegible] Dartigues[3], and Patrick Brochard[1]

[1] Laboratoire Santé Travail Environnement, Institut de Santé Publique d'E[illegible] Segalen Bordeaux 2, Bordeaux, France.
[2] Groupe Régional d'Etudes sur le Cancer, Centre François Baclesse, Ur[illegible]
[3] INSERM U330, Université Victor Segalen Bordeaux 2, Bordeaux, Franc[illegible]

Received for publication January 31, 2002; accepted for publication Sept[illegible]

	Increase
Dementia	3 times
Parkinson's disease	5 times

Eur J Epidemiol. 2011 Apr 20. [Epub ahead of print]

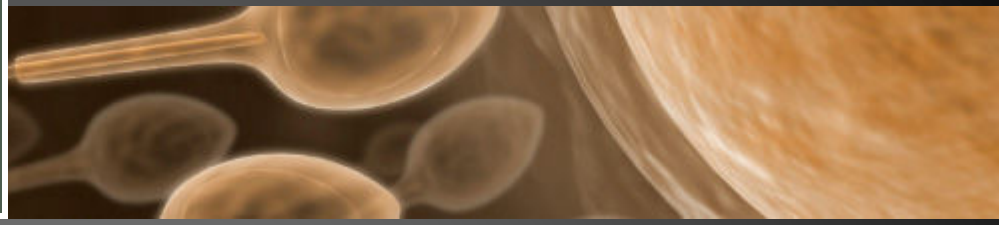
Parkinson's disease risk from ambient exposure to pesticides.

Wang A, Costello S, Cockburn M, Zhang X, Bronstein J, Ritz B.

Our results suggest that pesticides affecting different mechanisms that contribute to dopaminergic neuron death may act together to increase the risk of PD considerably.

TEDX

The Endocrine Disruption Exchange



http://www.endocrinedisruption.com/endocrine.TEDXList.overview.php

~800 endocrine disruptors on the TEDX List

Every chemical on the TEDX List has one or more verified citations to published, accessible, primary scientific research demonstrating effects on the endocrine system- many are found in pesticide products

Creator: Theo Colburn- an extraordinary scientist

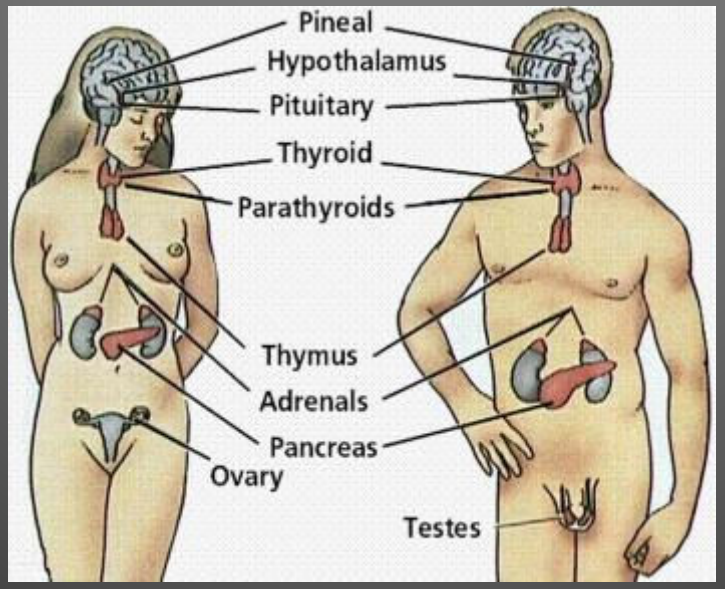
,...which are in water wildlife drinks, air they breathe, and on food they eat

Synergistic Disruption of External Male Sex Organ Development by a Mixture of Four Antiandrogens

Sofie Christiansen,[1,] Martin Scholze,[2,*] Majken Dalgaard,[1] Anne Marie Vinggaard,[1] Marta Axelstad,[1] Andreas Kortenkamp,[2] and Ulla Hass[1]*

[1]Department of Toxicology and Risk Assessment, National Food Institute, Technical University of Denmark, Søborg, Denmark; [2]School of Pharmacy, University of London, London, United Kingdom

CONCLUSIONS: Because unhindered androgen action is essential for human male development in fetal life, these findings are highly relevant to human risk assessment. Evaluations that ignore the possibility of combination effects may lead to considerable underestimations of risks associated with exposures to chemicals that disrupt male sexual differentiation.



Review

Demasculinization and feminization of male gonads by atrazine: Consistent effects across vertebrate classes☆

Tyrone B. Hayes[a,*], Lloyd L. Anderson[b], Val R. Beasley[c], Shane R. de Solla[d], Taisen Iguchi[e], Holly Ingraham[f], Patrick Kestemont[g], Jasna Kniewald[h], Zlatko Kniewald[h], Valerie S. Langlois[i], Enrique H. Luque[j], Krista A. McCoy[k], Mónica Muñoz-de-Toro[j], Tomohiro Oka[l], Cleida A. Oliveira[m], Frances Orton[n], Sylvia Ruby[o], Miyuki Suzawa[f], Luz E. Tavera-Mendoza[p], Vance L. Trudeau[q], Anna Bolivar Victor-Costa[m], Emily Willingham[r]

Atrazine is the most commonly detected pesticide contaminant of ground water, surface water, and precipitation. Atrazine is also an endocrine disruptor that, among other effects, alters male reproductive tissues when animals are exposed during development. Here, we apply the nine so-called "Hill criteria" (Strength, Consistency, Specificity, Temporality, Biological Gradient, Plausibility, Coherence, Experiment, and Analogy) for establishing cause–effect relationships to examine the evidence for atrazine as an endocrine disruptor that demasculinizes and feminizes the gonads of male vertebrates. We present experimental evidence that the effects of atrazine on male development are consistent across all vertebrate classes examined and we present a state of the art summary of the mechanisms by which atrazine acts as an endocrine disruptor to produce these effects.

Health check: Concerns have been raised over birth defects in baby flying foxes found near Cairns Library in the city.
Spray season on tropical fruit crops (mango, lychee)

- 07 Jan 2010: **USA Report**
- **Behind Mass Die-Offs, Pesticides Lurk as Culprit**
- ***In the past dozen years, three new diseases have decimated populations of amphibians, honeybees, and — most recently — bats. Increasingly, scientists suspect that low-level exposure to pesticides could be contributing to this rash of epidemics.***

Exposure to Persistent Organic Pollutants and First-Year Survival Probability in Gray Seal Pups

AILSA J. HALL,*,† GARETH O. THOMAS,† AND BERNIE J. MCCONNELL†
Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, St Andrews, Fife, KY16 8LB Scotland and Center for Chemicals Management, Lancaster Environment Center, Lancaster University, Lancaster, LA1 4YQ U.K.

Review

Amphibians and agricultural chemicals: Review of the risks in a complex environment

Reinier M. Mann [a,b,*], Ross V. Hyne [b], Catherine B. Choung [c], Scott. P. Wilson [d]

[a] *Centre for Ecotoxicology, Department of Environmental Sciences, University of Technology – Sydney, Sydney, NSW 2006, Australia*
[b] *Ecotoxicology and Environmental Contaminants Section, Department of Environment and Climate Change, New South Wales, PO Box 29, Lidcombe, NSW 1825, Australia*
[c] *Department of Biological Sciences and Physical Geography, Macquarie University, NSW 2109, Australia*
[d] *Centre for Environmental Management, Central Queensland University, PO Box 1319, Gladstone, QLD 4680, Australia*

The literature on the various mechanisms by which amphibians may be affected by agricultural chemicals is reviewed.

SEND TO MATT

Probe continues into dolphin deaths

THE legacy of Perth's pesticide use and WA-first outbreak of a usually non-fatal skin virus lay under the scalpel of Murdoch University veterinary pathologist Nahiid Stephens, who did four post-mortems on six dead Swan River dolphins last year.

The ongoing investigation by Dr Stephens and her Murdoch and Curtin university colleagues into the deaths is now a year old.

Speaking at a dolphin forum in Fremantle last month, Dr Stephens said levels of the 1986-banned insecticide dieldrin and the electricity transformer lubricant PCB were at very high levels in the dolphins.

A member of the 100-strong audience said the insecticide was sprayed on Perth homes for decades.

"That's a good point. We have very sandy soils in WA and they were used against termites. The point is these are banned chemicals now and this is the legacy we have in the environment," Dr Stephens said.

However, the chemicals are not highly toxic when locked up in the mammals' blubber.

Dr Stephens wants to know what role they played in the deaths when the greatest amounts were in the animals with the highest fat levels.

She and her fellow researchers became worried after a three-death cluster in June, 2009, and another trio of fatalities from September to October, compared to the sole stranding expected in the river each year.

Two mature dolphins had blistering skin lesions from the usually non-fatal pox virus known as tattoo skin disease affecting juveniles that have immunity by adulthood.

"It's very weakly pathogenic and the infection is usually self-limiting and does not result in the deep, ulcerated lesions we saw," Dr Stephens said.

She continues to look at three reasons why the innocuous virus became potentially lethal.

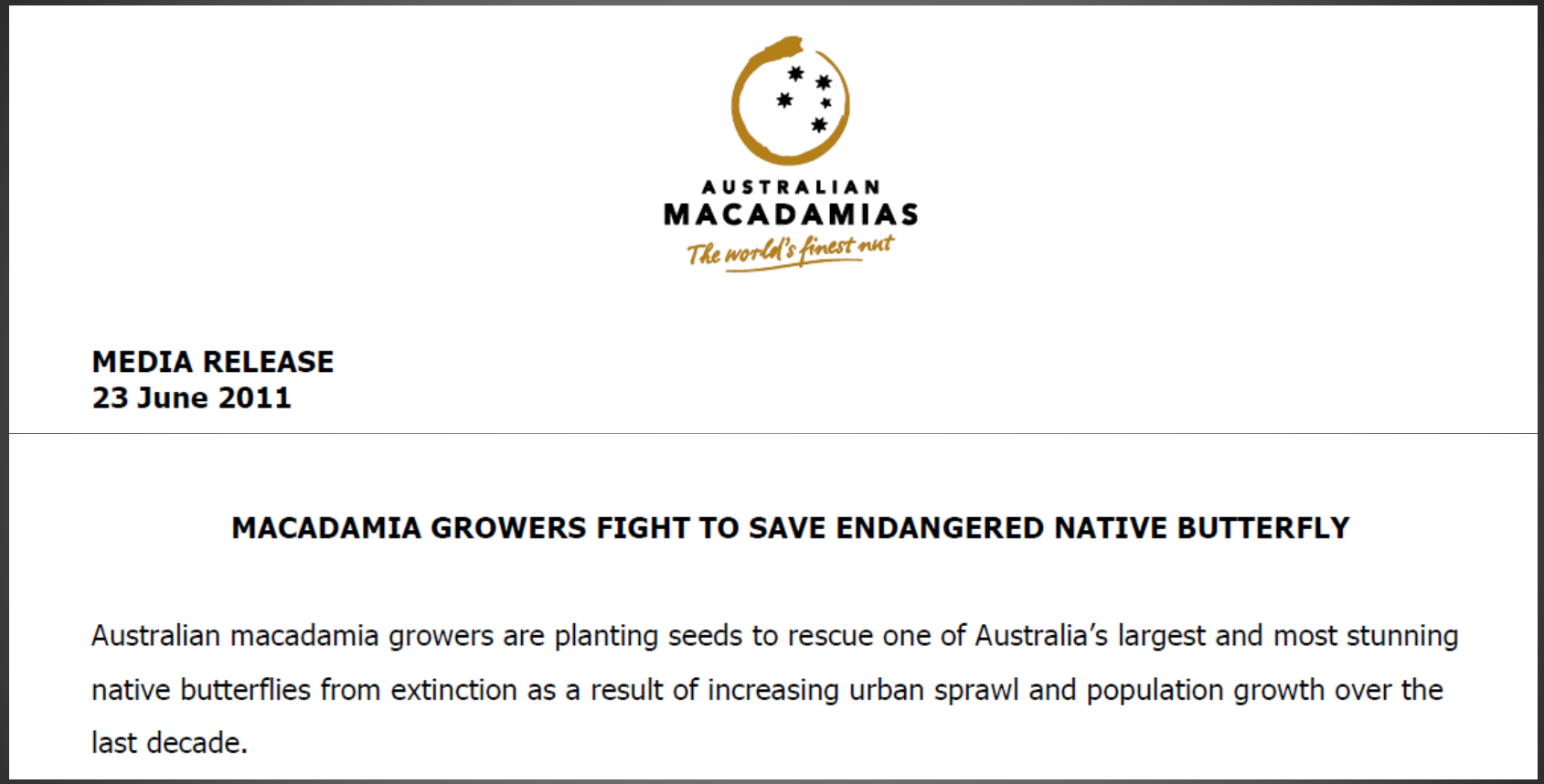
"It could be a virus with increased virulence, that low salinity caused cellular damage to the skin by disrupting the electrolyte balance of the cells, or reduced immunity," Dr Stephens said.

Murdoch University veterinary pathologist Nahiid Stephens.

The trio could have operated in combination and no single factor caused the deaths of all six dolphins or one death attributed to a single cause.

Overseas researchers continue to test dolphin tissue samples for information indicating how the causes of the deaths interacted.

Industry Greenwashing



AUSTRALIAN MACADAMIAS
The world's finest nut

MEDIA RELEASE
23 June 2011

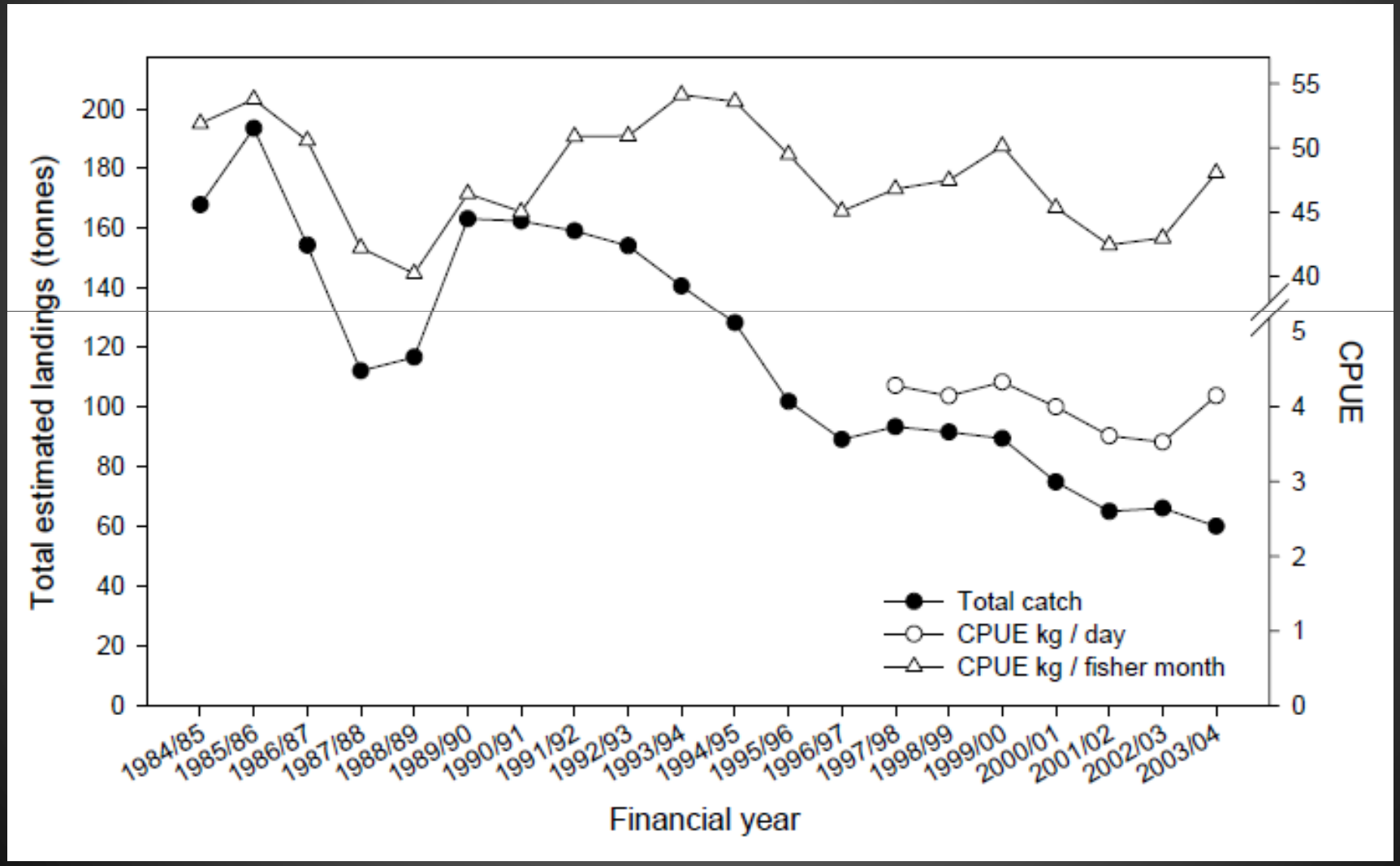
MACADAMIA GROWERS FIGHT TO SAVE ENDANGERED NATIVE BUTTERFLY

Australian macadamia growers are planting seeds to rescue one of Australia's largest and most stunning native butterflies from extinction as a result of increasing urban sprawl and population growth over the last decade.

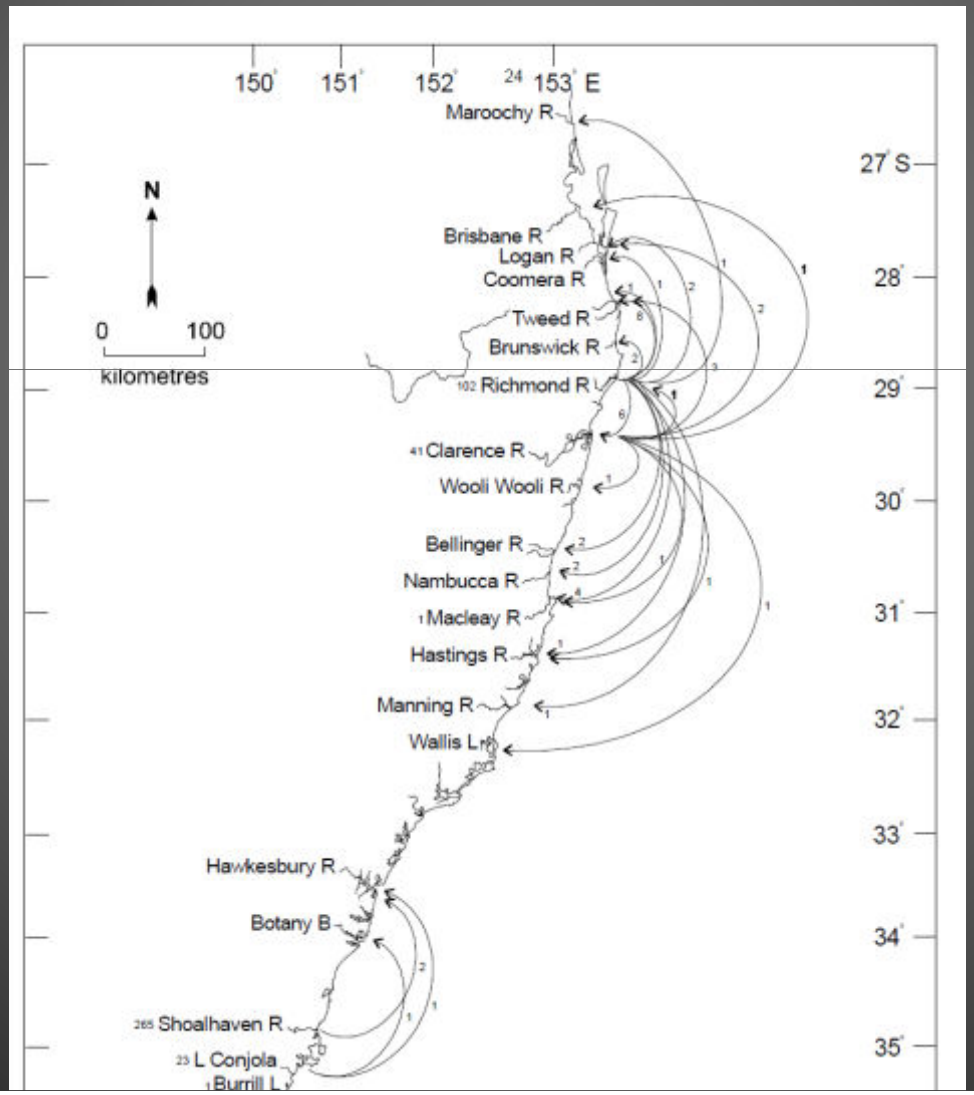
- Whilst spraying carbamates; organophosphates; synthetic pyrethroids; soft chemistry- is that like a hand gun vs bazooka????

Do inshore fisheries have a problem?

Mulloway in decline



Mulloway movements- our interconnected world



Pumicestone passage 1906

Pumicestone passage 2010

Oysters trying to get out of the water

Dying oyster clump Morteon Bay 2011

Image: Ben Diggles

Pollution impacts on fisheries

- Endocrine disruption
- Immunosuppression
- Epigenetic modification
- Habitat destruction
- Reduced food volume availability
- Toxicity of larvae feeds
- Changed feed particle size for larvae
- Sediment + Nutrient

EDC effects mostly unassessed for Agvet chemicals in Australia

Natural mixtures of persistent organic pollutants (POP) increase weight gain, advance puberty, and induce changes in gene experssion associated with steroid hormones and obesity in female zebrafish, Lyche JL, Nourizadeh-Lillabadi R, Almaas C, Stavik B, Berg V, Skare JU, Alestrom P and Ropstad E, *Journal of Toxicology and Environmental Health, Part A: Current Issues*, 2010, 73 (15) 1032-1057pp.

DDT / acaricide / bridged diphenyl / organochlorine / insecticide / health effects / human / puberty

Endocrine Disruption- CSIRO Nov 2010

- Myers: examined mosquito fish sites near dairy farms and STP. Suggest endocrine disruption is occurring in Victoria
- Webb: evidence of endocrine disruption in fish and shrimp in Swan-Canning WA
- Anderson et al 2010: evidence of endocrine disruption in oysters in Maroochy and Noosa Rivers, Qld.
- Richmond R oysters?? V few left to test.

Canada lake experiment- 2007

Collapse of a fish population after exposure to a synthetic estrogen

Karen A. Kidd*†, Paul J. Blanchfield*, Kenneth H. Mills*, Vince P. Palace*, Robert E. Evans*, James M. Lazorchak‡, and Robert W. Flick‡

5 parts per trillion of synthetic estrogen led to fish gender change and population crash

Immunosuppression: Glyphosate formulations in NZ 2010

Journal of Applied Ecology

British Ecological Society

Journal of Applied Ecology doi: 10.1111/j.1365-2664.2010.01791.x

Synergistic effects of glyphosate formulation and parasite infection on fish malformations and survival

David W. Kelly[1,2*], Robert Poulin[2], Daniel M. Tompkins[1] and Colin R. Townsend[2]

218 *Transactions of the Royal Society of New Zealand.*
Vol. 75, Part 2, pp. 218-230. Plates 14–16. 1 Fig.

The Life Cycle of the Heterophyoid Trematode *Telogaster opisthorchis* n.g., n.sp.

By W. V. MACFARLANE, Canterbury University College.

[*Received by the Editor, April 30, 1945; issued separately, September, 1945.*]

Fish-Snail-Parasite lifecycle

Galaxid fish - primary host

Parasite miracidia leave fish to find intermediate host snail

Mud Snail – intermediate host

Cercaria leave snail to infect fish

Rethink “emerging pathogens”

- Start thinking:
- immunosuppression
- Platypus mucor
- Echidna staphlococcal pododermatitis
- Hendra expression
- Wombat mange

Review

Endocrine disrupting chemicals and disease susceptibility

Thaddeus T. Schug[a,*], Amanda Janesick[b], Bruce Blumberg[b], Jerrold J. Heindel[a]

[a] National Institute of Environmental Health Sciences, Division of Extramural Research and Training, Cellular, Organ and Systems Pathobiology Branch, Research Triangle Park, NC 27709, USA

[b] Department of Developmental and Cell Biology, 2011 Biological Sciences 3, University of California, Irvine, CA 92697-2300, United States

A B S T R A C T

Environmental chemicals have significant impacts on biological systems. Chemical exposures during early stages of development can disrupt normal patterns of development and thus dramatically alter disease susceptibility later in life. Endocrine disrupting chemicals (EDCs) interfere with the body's endocrine system and produce adverse developmental, reproductive, neurological, cardiovascular, metabolic and immune effects in humans. A wide range of substances, both natural and man-made, are thought to cause endocrine disruption, including pharmaceuticals, dioxin and dioxin-like compounds, polychlorinated biphenyls, DDT and other pesticides, and components of plastics such as bisphenol A (BPA) and phthalates. EDCs are found in many everyday products – including plastic bottles, metal food cans, detergents, flame retardants, food additives, toys, cosmetics, and pesticides. EDCs interfere with the synthesis, secretion, transport, activity, or elimination of natural hormones. This interference can block or mimic hormone action, causing a wide range of effects. This review focuses on the mechanisms and modes of action by which EDCs alter hormone signaling. It also includes brief overviews of select disease endpoints associated with endocrine disruption.

Environmental Science & Technology

pub

Effects of Pesticides Monitored with Three Sampling Methods in 24 Sites on Macroinvertebrates and Microorganisms

Ralf B. Schäfer,[*,†,‡] Vincent Pettigrove,[§,∥] Gavin Rose,[⊥] Graeme Allinson,[§,#] Adam Wightwick,[#] Peter C. von der Ohe,[▽] Jeff Shimeta,[†] Ralph Kühne,[○] and Ben J. Kefford[†,◆]

- 48 pesticides detected in 5 months
- Levels were v low parts per trillion (below ANZECC “safe” levels
- Yet, the combined effect caused harm telling us the ANZECC guideline is NOT protective.
- Sediment concentrations often 1000 times higher than water concentration

FUNDED BY VICTORIAN DPI

Do agrichemicals stay put? Are chemists assumptions correct?

Sediments, nutrients and pesticide residues in event flow conditions in streams of the Mackay Whitsunday Region, Australia

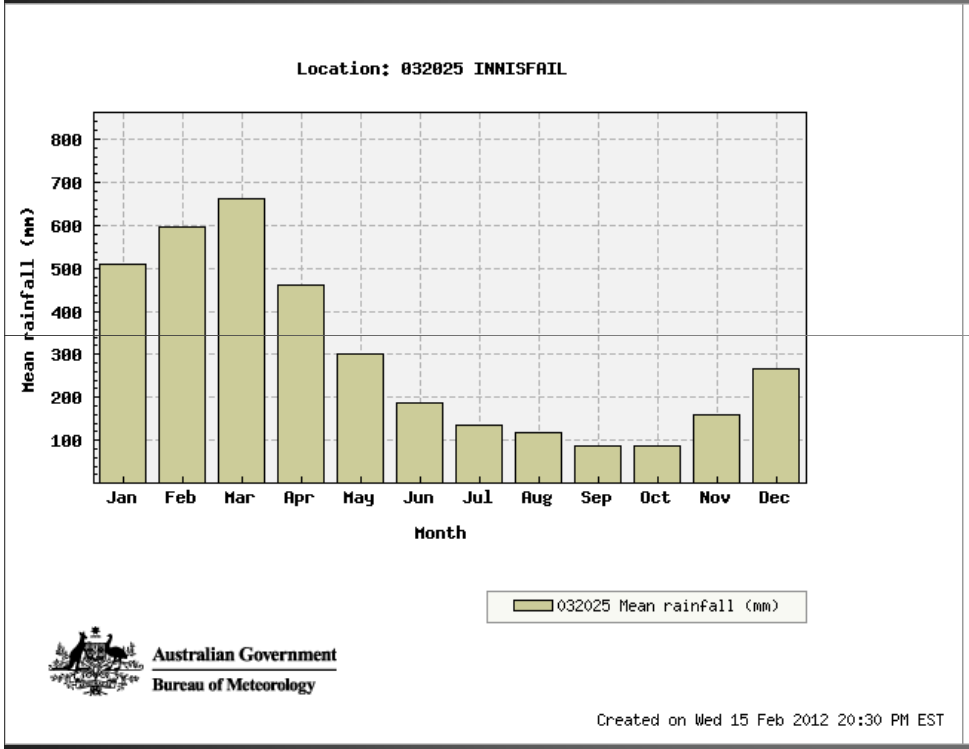
C. Mitchell [a], J. Brodie [b,*], I. White [c]

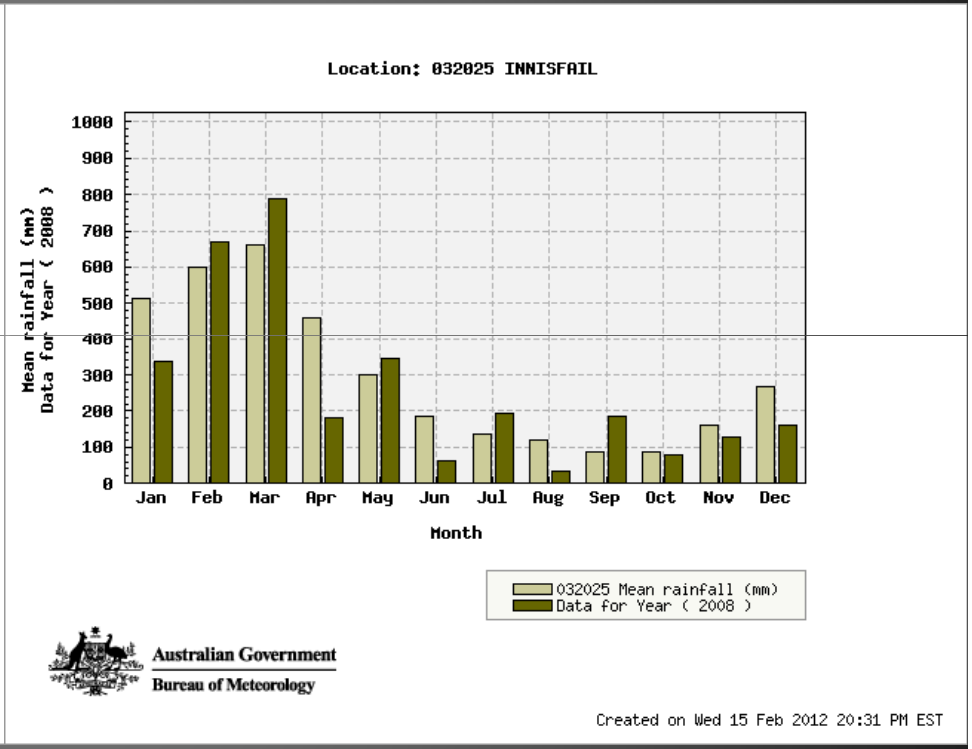
- Herbicides: atrazine, diuron, 2,4-D, hexazinone and ametryn
- Drinking water guidelines for atrazine and 2,4-D were exceeded,
- Ecosystem protection for diuron were exceeded at three sites
- Similar concentrations were found in the three smaller streams measured in 2003.

APVMA review diuron

- Banned in Europe
- Review decided to restrict use in Australia as it kills seagrass, threatens reef, kills mangroves etc
- Now available only for use in “dry” season months in Australia
- Can APVMA predict rainfall?
- Is half-life of chemical longer than 1 day?
- How much are you willing to pay for your cup cake?

Rain is not predictable- but toxicity to exposed biota is





When risk assessments get it wrong

- The result is not risk
- The result is HARM
  - Seagrass declining
  - Oysters disappearing
  - Blue-green algae blooms
  - Bioaccumulation loading

Small amounts add up = dead algae and sea grass (aka fish pasture)

Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Additive toxicity of herbicide mixtures and comparative sensitivity of tropical benthic microalgae

Marie Magnusson[a,b,c], Kirsten Heimann[b], Pamela Quayle[d,1], Andrew P. Negri[e,*]

[a] AIMS@JCU, Australian Institute of Marine Science, James Cook University, Townsville, QLD 4811, Australia
[b] School of Marine and Tropical Biology, James Cook University, Townsville, QLD 4811, Australia
[c] School of Pharmacy and Molecular Sciences, James Cook University, Townsville, QLD 4811, Australia
[d] The University of Queensland, National Research Centre of Environmental Toxicology (EnTox), 39 Kessels Road, Coopers Plains 4108, Australia
[e] Australian Institute of Marine Science, PMB 3, Townsville, MC, QLD 4810, Australia

ARTICLE INFO

Keywords:
Herbicide

ABSTRACT

Natural waters often contain complex mixtures of unknown contaminants potentially posing a threat to marine communities through chemical interactions. Here, acute effects of the photosystem II inhibiting

Gladstone Harbour Jan 2004

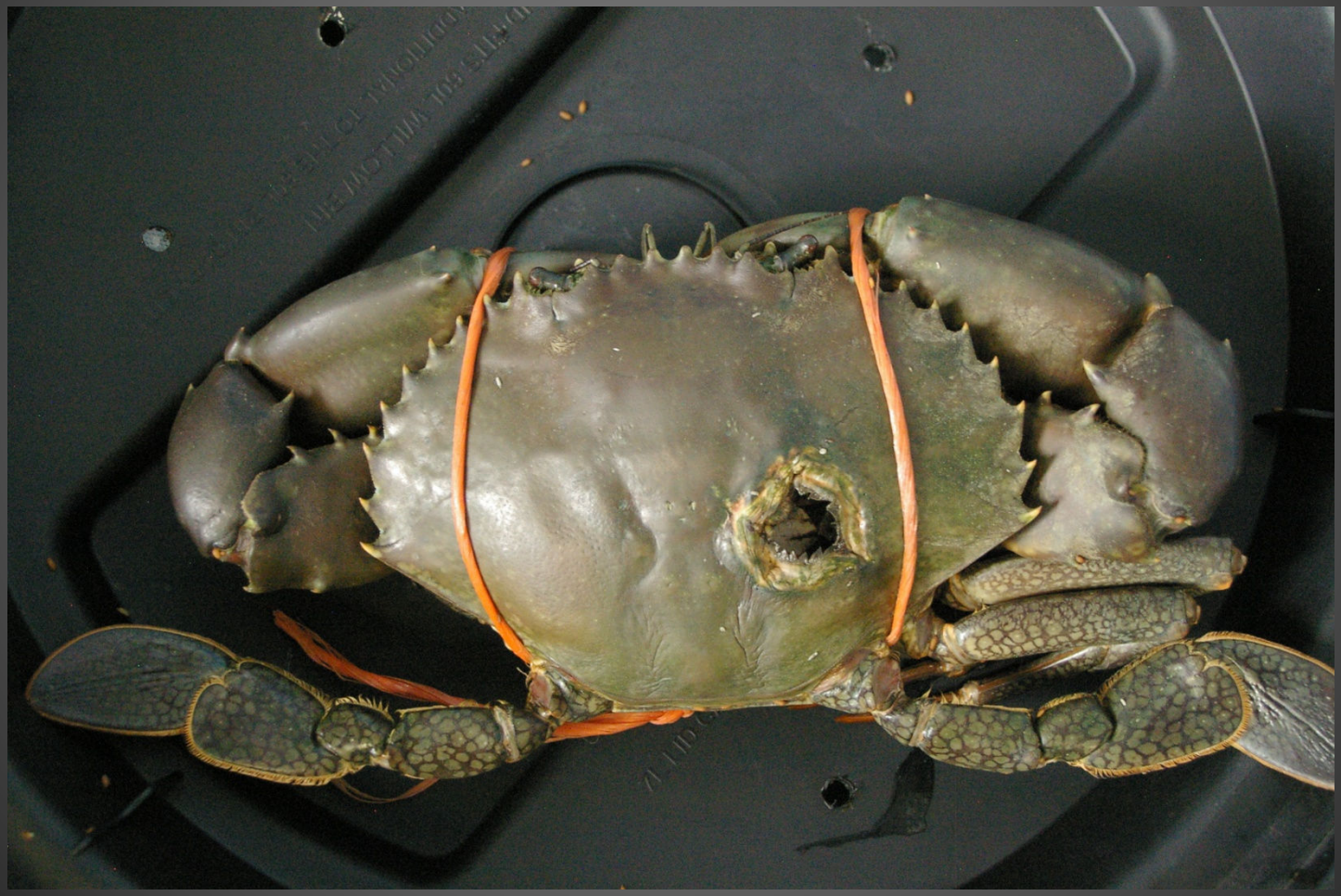
Gladstone Harbour Jul 2011

Dredging Gladstone Harbour

Emaciated turtles

- Vicky Darling “starving to death” as floods killed seagrass in a “natural” event
- How so?
- Dugongs necropsied at same time, had 10kg of seagrass in their stomach- how?

50% mud crabs now have ulcers or rust spots near dredging



Ascites- but safe to eat according to Biosecurity Qld

Queenfish- hyperparasitism

Bull shark- hyperparasitism

Points of interest

- 13 months after flood- harbour at full marine salinity not
- Abundant food adjacent barramundi

- Support the independent investigation:
- Donate at: gladstonefishingresearchfund.org.au

Special Issue: SBiRM: Impact of Environmental Toxicants on Reproductive Function

Review

Birth Defects in Wildlife: The Role of Environmental Contaminants as Inducers of Reproductive and Developmental Dysfunction

Certain wildlife taxa such as amphibians are especially vulnerable to chemical perturbation and are suffering alarming population declines. Amphibian field studies have found severe hindlimb and other developmental abnormalities and it has been demonstrated that the greater the agricultural intensity, the greater the number and severity of defects in toad populations. Alligators living in contaminated lakes have shown a significant reduction in penis size and fish exposed to tributyltin have shown tail deformities and abnormal eye development. Physiological and molecular responses to chemical insult are often con-

Great Barrier Grief- 2012 in press Marine Pollution Bulletin

Terrestrial pollutant runoff to the Great Barrier Reef: An update of issues, priorities and management responses

J.E. Brodie [a,*], F.J. Kroon [b], B. Schaffelke [c], E.C. Wolanski [a], S.E. Lewis [a], M.J. Devlin [a], I.C. Bohnet [d], Z.T. Bainbridge [a], J. Waterhouse [a], A.M. Davis [a]

(Darnell et al., this volume). Whether these programs will be enough to 'save the reef' with respect to water quality impacts, however, is unknown and an analysis on ecologically relevant load reduction targets by Kroon (this volume) suggests it is not.

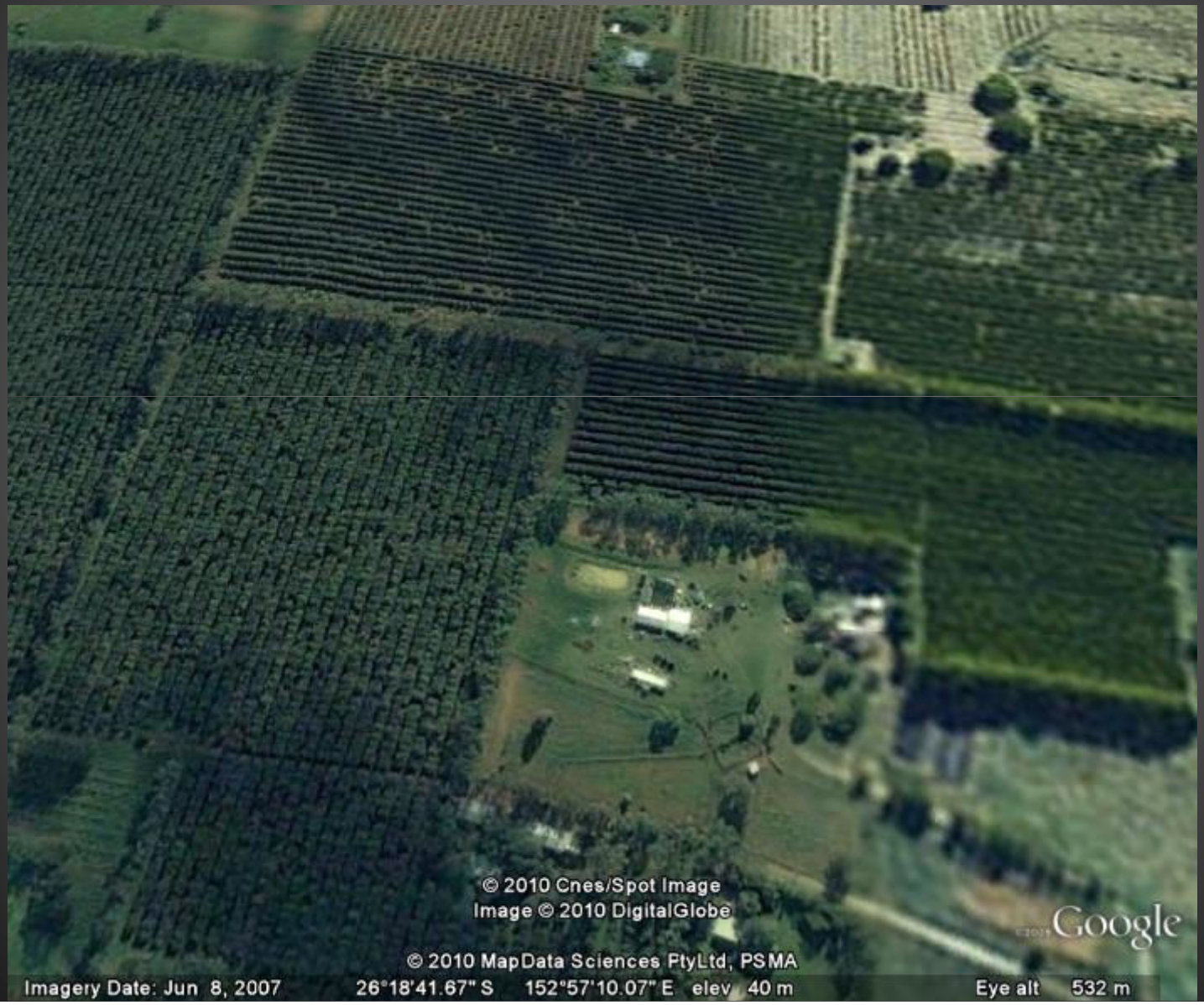
Sunland fish hatchery deformed larvae


12/12/2010 19:25

Volatising: eg dichlorvos & many others

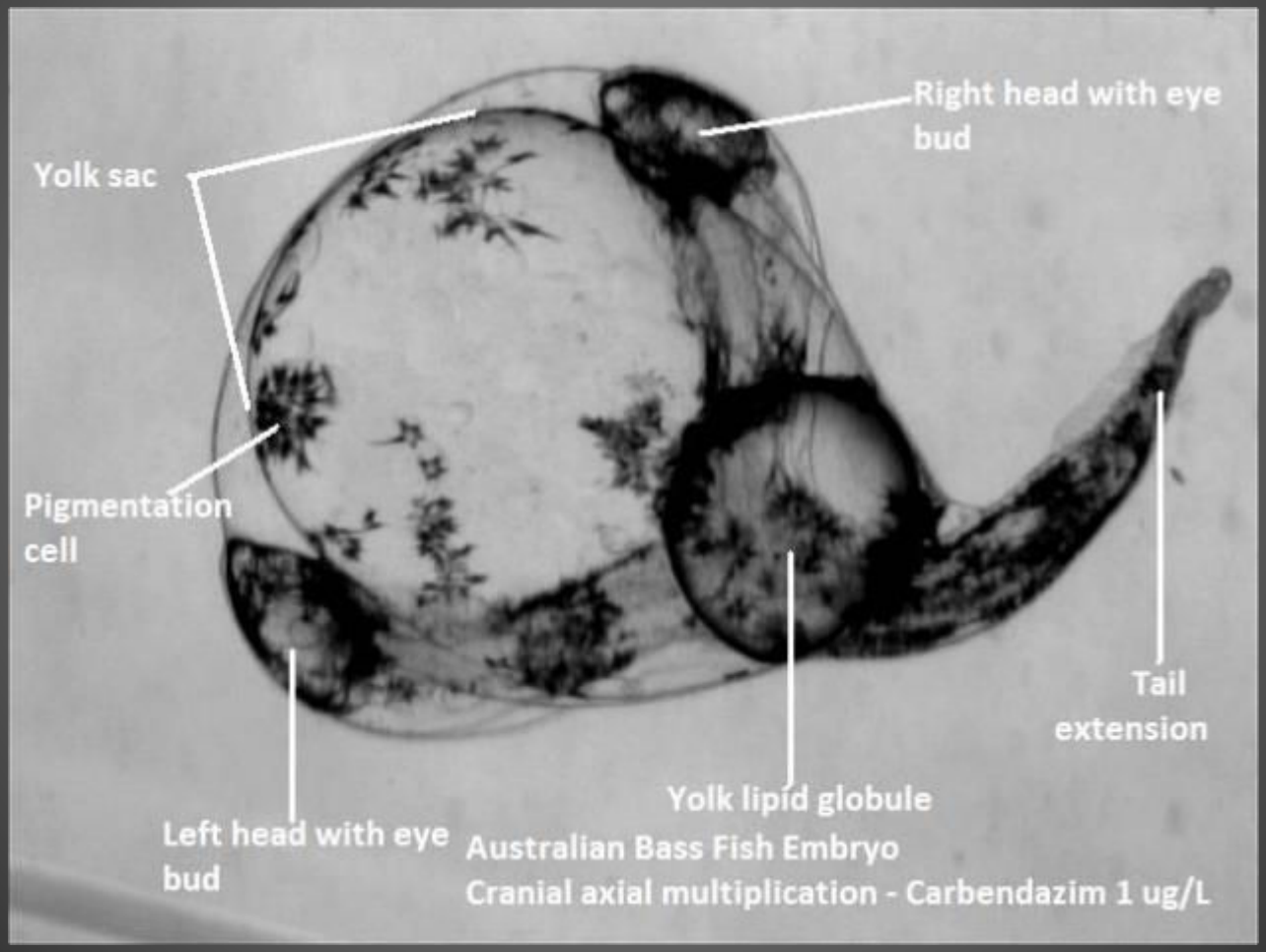
- **Researchers Study Pesticide Pathways into the Atmosphere**
- http://www.ars.usda.gov/is/pr/2011/110712.htm
- By Ann Perry
  July 12, 2011
-
- ***New ARS studies indicate that some pesticides used in corn production volatilize directly into the air and that pesticide losses from volatilization sometimes exceeds pesticide losses from runoff.***

Fish hatchery surrounded by nuts




2 headed bass
Image: G Gilson

2010- 2 headed bass



Axial bifurcation: 2 heads
Image: M Landos

Dichlorvos-induced developmental toxicity in Zebrafish

Turgay Sisman

Toxicol Ind Health 2010 26: 567 originally published online 11 June 2010
DOI: 10.1177/0748233710373089


Sunland Fish Hatchery
2011- cardiac oedema


Normal larvae

Convulsing larvae time coincident with spraying, and absence of infectious disease on pathology

2011 International papers

The unpredictable effects of mixtures of androgenic and estrogenic chemicals on fish early life

M.P. Sárria [a], M.M. Santos [a], M.A. Reis-Henriques [a], N.M. Vieira [a,b], N.M. Monteiro [c,d,*]

profound implications in population structure could be expected, ranging from a decrease in recruitment to a disruption of sexual selection

Environmental toxicology: Population modeling of cod larvae shows high sensitivity to loss of zooplankton prey

Leif Christian Stige [a,*], Geir Ottersen [b,a], Dag Ø. Hjermann [a], Padmini Dalpadado [c], Louise K. Jensen [d], Nils Chr. Stenseth [a,e]

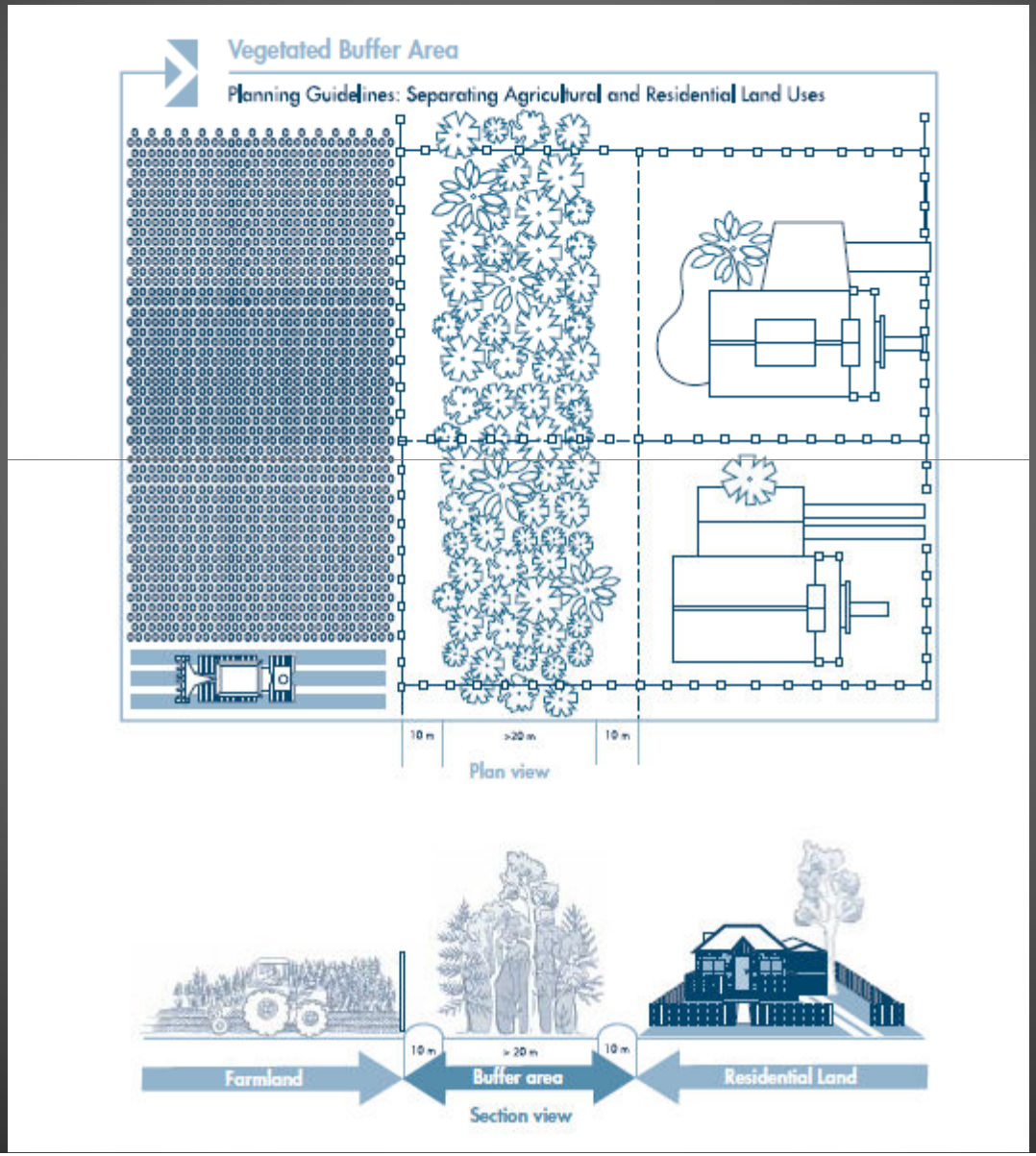
Two factors determine whether pollution is likely to affect a population indirectly through loss of prey: firstly, the sensitivity of the prey to the pollutants, and secondly, the sensitivity of the predator population to loss of prey at the given life stage

How does it happen? Buffer vegetation- reality vs best practice

Air-blast spray application to macadamias- best drift application method

Source: Courier Mail

Buffer guidelines 1997



Buffer compliance to guideline- 1997

- are of a minimum total width of 40 m;

FAIL

- contain random plantings of a variety of tree and shrub species of differing growth habits, at spacings of 4–5 m for a minimum width of 20 m;

FAIL

- include species with long, thin and rough foliage which facilitates the more efficient capture of spray droplets;

FAIL

- provide a permeable barrier which allows air to pass through the buffer. A porosity of 0.5 is acceptable (approximately 50% of the screen should be air space);

FAIL

- foliage is from the base to the crown;

FAIL

- include an area of at least 10 m clear of vegetation or other flammable material to either side of the vegetated area;

FAIL

Farmers real world quandary

- Have 1-2 weeks to kill pest or risk losing crop
- Is faith well placed in regulator to provide safe products? Endosulfan slow ban; Diuron slow ban? Still allow 80 actives removed from use in EU.
- Never modelled spray drift in nut orchards
- What to do, if weather conditions are not conducive to safe spraying according to numerous guidelines?

- Option A: Lose crop, go broke, foreclose
- Option B: Spray and hope for no visible harm, or investigation of effects, and that cancer treatment will save them

Can birds or bees read signs?
Or
Fish read pesticide labels?
Or farmers in real world when faced with crop loss?

Northern Rivers 2010

- It rained and blew 42 out of 45 days around flowering on macadamia orchards
- The industry sprayed daily- and few were profitable
- What options has NSW DII- given farmers to control pests in the real world?
- Have organic options been supported to the same extent as pesticide options?

Dead honey bees at fish hatchery

Honey bee declines- US and Europe

- **Weighing Risk Factors Associated with Bee Colony Collapse Disorder by Classification and Regression Tree Analysis**
- VanEngelsdorp et al 2010.
- ",..highlights,..the effect of sublethal pesticide exposure on pathogen prevalence and the role of variability in bee tolerance to pesticides on colony survivorship."

Pesticide exposure in honey bees results in increased levels of the gut pathogen Nosema

- Jeffery S. Pettis, Dennis vanEngelsdorp, Josephine Johnson and Galen Dively

  Naturwissenschaften (2012) 99:153–158

- The finding that individual bees with undetectable levels of the target pesticide, after being reared in a sub-lethal pesticide environment within the colony, had higher Nosema is significant. Interactions between pesticides and pathogens could be a major contributor to increased mortality of honey bee colonies, including colony collapse disorder, and other pollinator declines worldwide.

Honey bee science

- **Translocation of Neonicotinoid Insecticides from Coated Seeds to Seedling Guttation Drops: A Novel Way of Intoxication for Bees**
- Girolami et al 2009
- “When bees consume guttation drops, collected from plants grown from neonicotinoid-coated seeds, they encounter death within few minutes.”

What to do?

- Lobby Government
- Tell all your friends
- Protect your children
- Protect yourself
- Grow your own organic vegetables
- Talk to the public and other health professionals- educate

Read more,... Talk more,.. Get involved

- Otherwise I'll have to change my business name to Future-less Fisheries Veterinary Service