Total Syntheses of (+)-Aquatolide and Related Humulanolides

What is the name of the starting material?
D-(–)-pantolactone

5) What is the name of the reaction?
Propose a mechanism and geometry?
intramolecular Nozaki-Hiyama-Takai-Kishi olefination

8) Propose a mechanism
Hint: it is a cascade of three reactions.
Only one ring in the final product

9) What is the name reaction?
Takai-Utimoto olefination

(+)-aquatolide
10) DMP
11) BF$_3$•OEt$_2$, MeOH
12) h$_\nu$, Hg lamp
13) BF$_3$•OEt$_2$

14) h$_\nu$, Hg lamp
15) m-CPBA
16) h$_\nu$, Hg lamp
17) DMP, NaHCO$_3$
18) NaI, TFA
19) TFAA, Et$_3$N
20) NaI, DMF, 60 ºC

12 and 16) How would you classify these two photochemical reactions? 
*Hint: step 11 and step 15 are same class of reaction but the product is different. What is the difference?*

14) *Hint: Isomerization only*

(originally proposed structure of aquatolide)

(+)-aquatolide
Step 8 mechanism: ROM–RCM–CM cascade

Step 12 and 16: Photochemical [2+2] cycloaddition regioselectivity